

**SIEMENS**

# SIMOTION, SINAMICS S120 & SIMOTICS

Equipment for Production Machines










Motion Control

Catalog  
PM 21

Edition  
2013

Answers for industry.

## Related catalogs

<p><b>Motion Control Drives</b> SINAMICS and Motors for Single-Axis Drives</p> <p>E86060-K5531-A101-A1-7600 E86060-E5531-A101-A1-7600 (News)</p>	D 31	
<p><b>SINAMICS Drives</b> SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units E86060-K5511-A101-A5-7600</p>	D 11	
<p><b>SINAMICS S120</b> Chassis Format Units and Cabinet Modules <b>SINAMICS S150</b> Converter Cabinet Units E86060-K5521-A131-A3-7600</p>	D 21.3	
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<p><b>SIMATIC</b> Products for Totally Integrated Automation and Micro Automation E86060-K4670-A101-B3-7600 E86060-K7010-A121-A1-7600 (News)</p>	ST 70	
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### Products for Automation and Drives

CA 01

Interactive Catalog

DVD: E86060-D4001-A510-D2-7600



### Mall

Information and ordering platform  
in the Internet
[www.siemens.com/industrymall](http://www.siemens.com/industrymall)


## CD-ROM for Catalog PM 21 · 2013

In the CD-ROM that accompanies Catalog  
PM 21 · 2013, you will find:

- Information about planning/configuring based on the technical documentation; additional technical documentation can be found under:  
[www.siemens.com/automation/support](http://www.siemens.com/automation/support)
- Dimensional drawings of our motors in PDF/ DXF format or via CAD CREATOR  
[www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)
- Glossary for the explanation of terms and functions
- Catalog PM 21 · 2013 in electronic form (PDF format)



### Hardware and software requirements:

- Intel Pentium 1 GHz or higher
- Minimum 512 MB of RAM
- Screen resolution 1024 × 768 pixels
- CD-ROM drive, at least 16 ×
- Windows XP/Vista/7
- Acrobat Reader 7.0 or higher
- MS Internet Explorer V6.0 (SP2) or higher

### Start

Insert the CD-ROM into the CD-ROM drive.

The program starts automatically.

If the AutoRun function is not activated in your system, start file start.hta from the CD-ROM using the Windows Explorer.

### Note

Installation is not necessary to view the information on this CD-ROM. This does not apply, however, when using dimensional drawings in DXF format.

### Hotline

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# Motion Control SIMOTION, SINAMICS S120 & SIMOTICS

Equipment for Production Machines

Catalog PM 21 · 2013



The products and systems described in this catalog are distributed under application of a certified quality and environmental management system in accordance with DIN EN ISO 9001 (Certified Registration No. 001258 QM) and DIN EN ISO 14001 (Certified Registration No. 081342 UM). The certificate is recognized by all IQNet countries.

Supersedes:  
Catalog PM 21 · 2011

Refer to the Industry Mall for current updates of this catalog:

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The products contained in this catalog can also be found in the Interactive Catalog CA 01.

Order No.:  
E86060-D4001-A510-D2-7600

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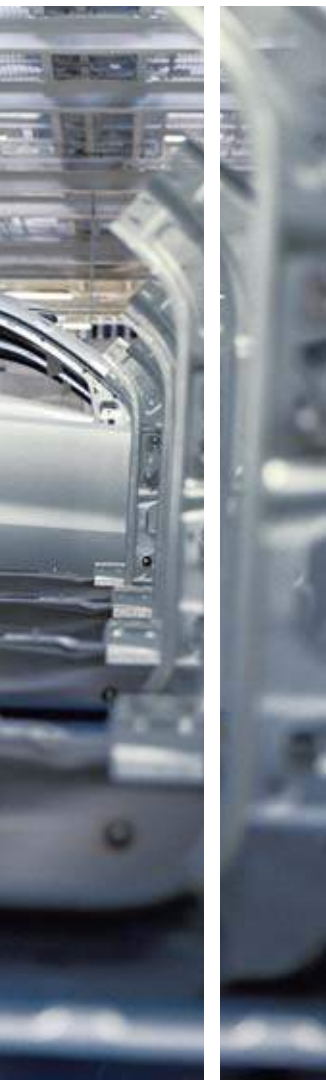
# SIMOTION, SINAMICS S120 & SIMOTICS

## Overview

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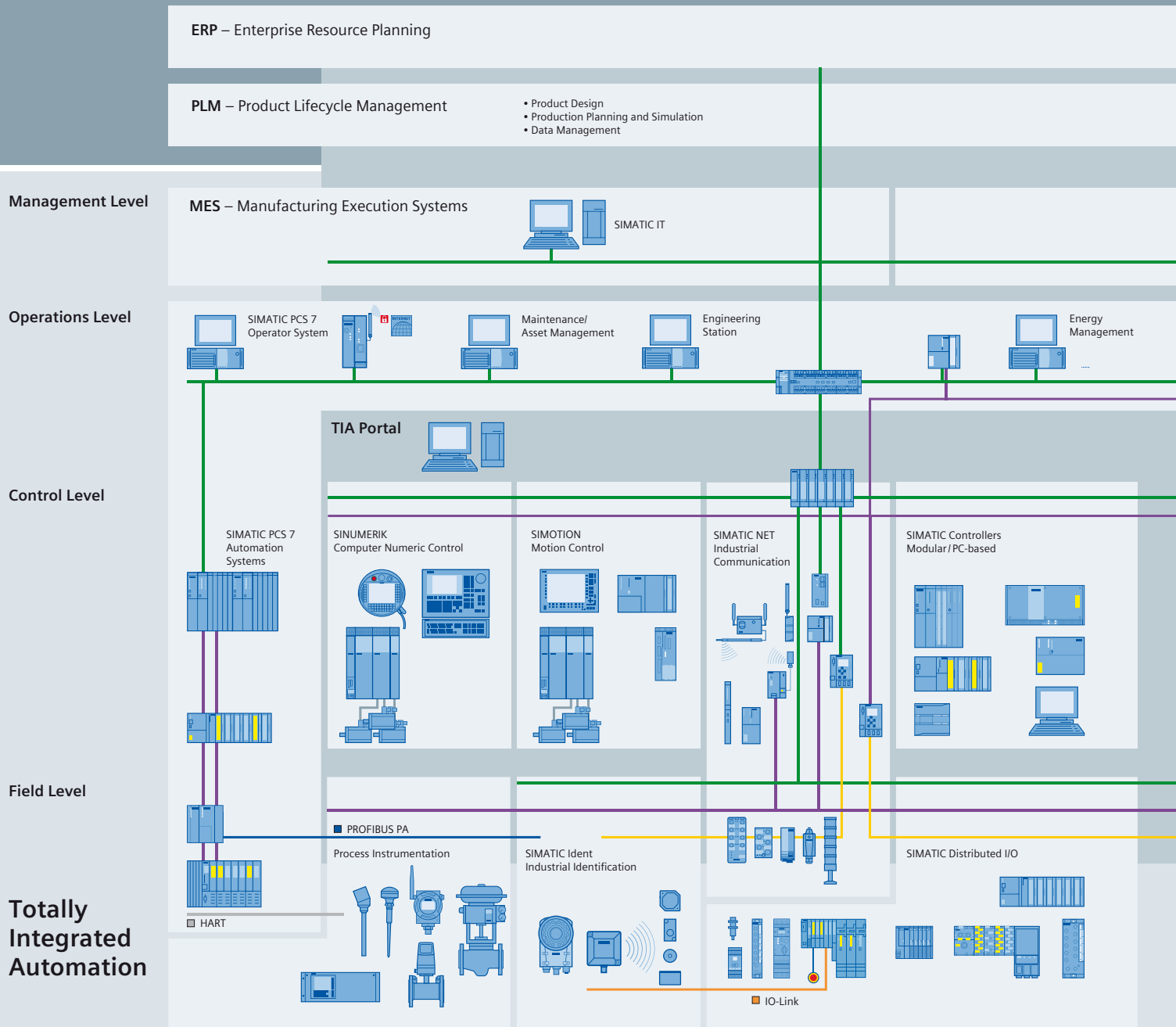
## Answers for industry.

Siemens Industry answers the challenges in the manufacturing and the process industry as well as in the building automation business. Our drive and automation solutions based on Totally Integrated Automation (TIA) and Totally Integrated Power (TIP) are employed in all kinds of industry. In the manufacturing and the process industry. In industrial as well as in functional buildings.

Siemens offers automation, drive, and low-voltage switching technology as well as industrial software from standard products up to entire industry solutions. The industry software enables our industry customers to optimize the entire value chain – from product design and development through manufacture and sales up to after-sales service. Our electrical and mechanical components offer integrated technologies for the entire drive train – from couplings to gear units, from motors to control and drive solutions for all engineering industries. Our technology platform TIP offers robust solutions for power distribution.

The high quality of our products sets industry-wide benchmarks. High environmental aims are part of our eco-management, and we implement these aims consistently. Right from product design, possible effects on the environment are examined. Hence many of our products and systems are RoHS compliant (Restriction of Hazardous Substances). As a matter of course, our production sites are certified according to DIN EN ISO 14001, but to us, environmental protection also means most efficient utilization of valuable resources. The best example are our energy-efficient drives with energy savings up to 60 %.

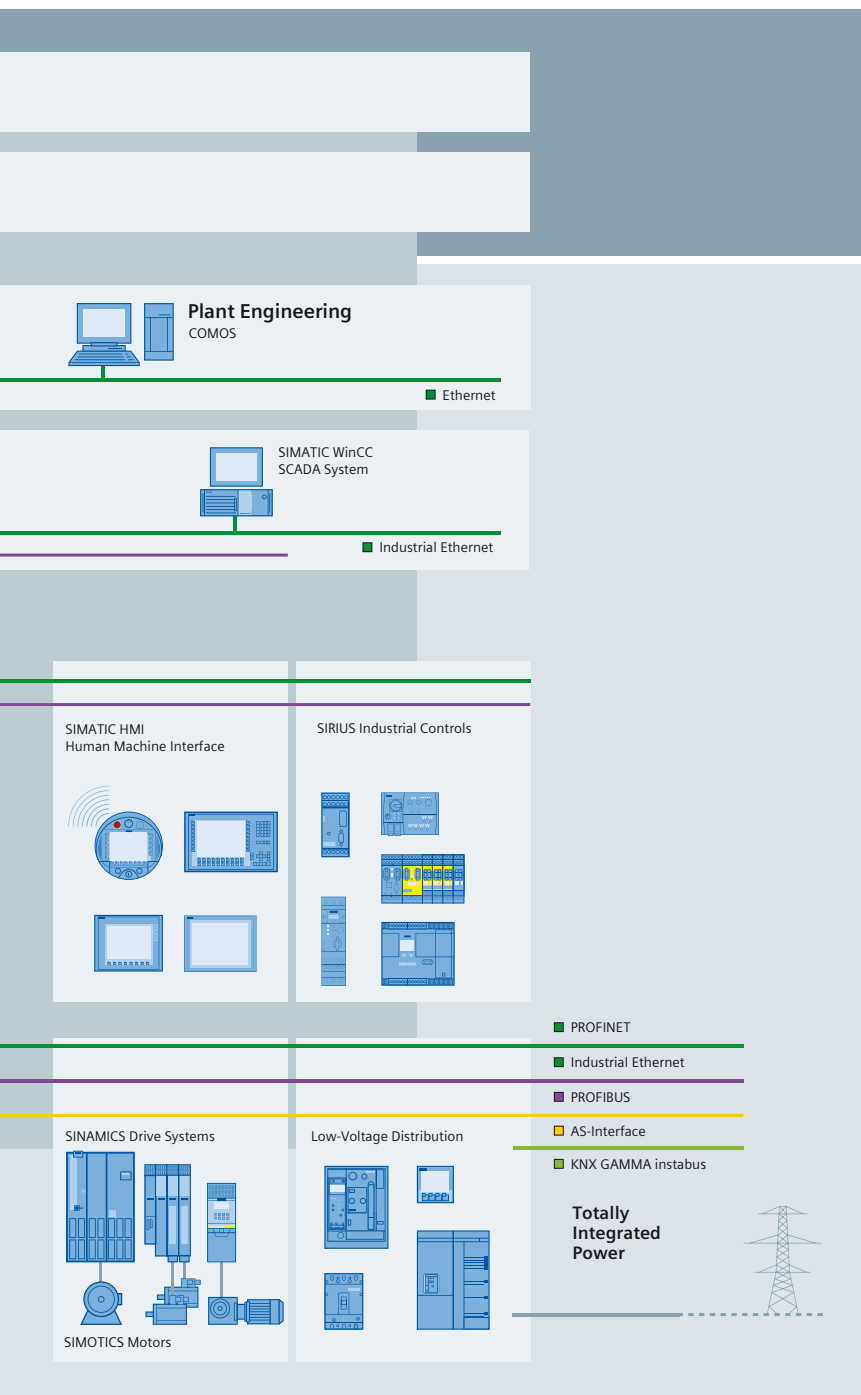
Check out the opportunities our automation and drive solutions provide. And discover how you can sustainably enhance your competitive edge with us.



# Setting standards in productivity and competitiveness.

**Totally Integrated Automation.**





## TIA is characterized by its unique continuity.

It provides maximum transparency at all levels with reduced interfacing requirements – covering the field level, production control level, up to the corporate management level. With TIA you also profit throughout the complete life cycle of your plant – starting with the initial planning steps through operation up to modernization, where we offer a high measure of investment security resulting from continuity in the further development of our products and from reducing the number of interfaces to a minimum.

## The unique continuity is already a defined characteristic at the development stage of our products and systems.

The result: maximum interoperability – covering the controller, HMI, drives, up to the process control system. This reduces the complexity of the automation solution in your plant. You will experience this, for example, in the engineering phase of the automation solution in the form of reduced time requirements and cost, or during operation using the continuous diagnostics facilities of Totally Integrated Automation for increasing the availability of your plant.

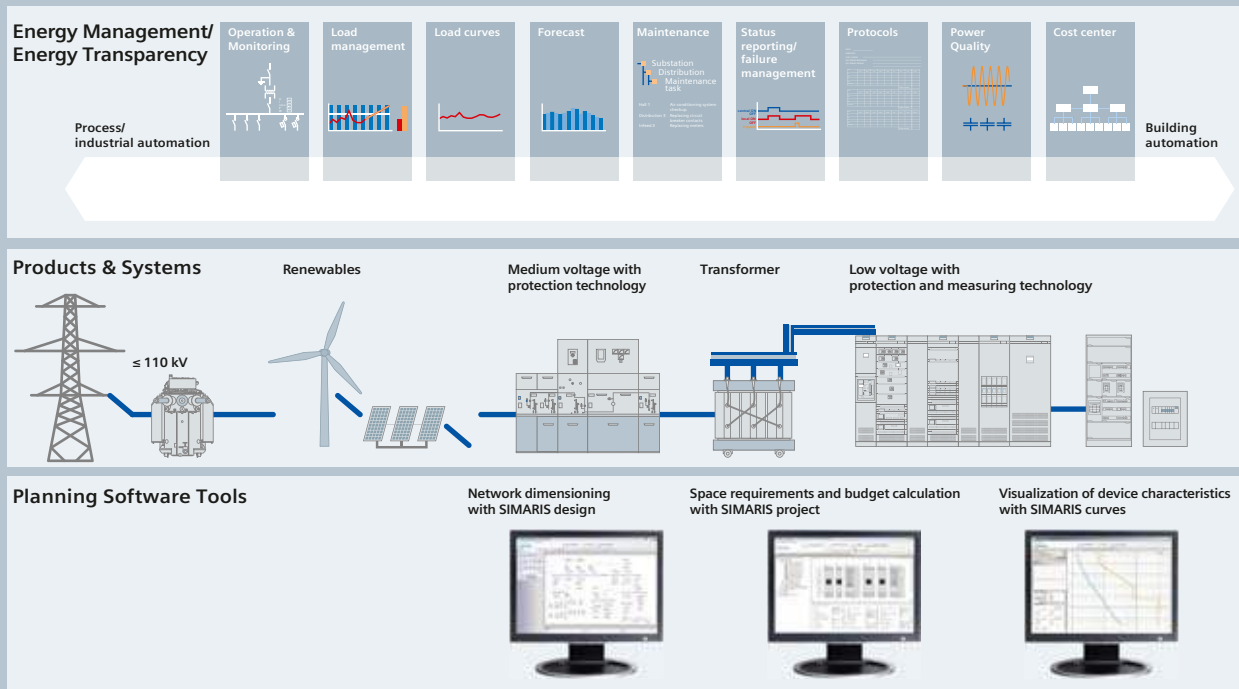
IA/DT TIA En 17.07.12

Thanks to Totally Integrated Automation, Siemens provides an integrated basis for the implementation of customized automation solutions – in all industries from inbound to outbound.



**Totally Integrated Power:  
Future-proof power supply  
from one source.**

# Software tools, products, systems and support for integrated electrical power distribution



The power supply system acts like a “vital artery”, forming the basis for the reliable and efficient functioning of all electrically operated building installations. Electrical power distribution therefore requires integrated solutions. Our answer: Totally Integrated Power (TIP).

This includes software tools and support for planning and configuration and a complete, optimally aligned product and system portfolio for integrated power distribution from medium-voltage switchgear right to socket outlets.

The power distribution products and systems can be interfaced to building or industrial automation systems (Total Building Solutions or Totally Integrated Automation) via communication-capable circuit breakers and components, allowing the full potential for optimization that an integrated solution offers to be exploited throughout the project cycle – from planning right through to installation and operation.

Get more information:

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[www.siemens.com/simaris](http://www.siemens.com/simaris)  
[www.siemens.com/specifications](http://www.siemens.com/specifications)

IA/DT TIP En 13.11.12



# System overview



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# System overview

1

## Excellence in Motion Control

### *Motion Control Solutions "Made by Siemens"*

The Motion Control Systems division of the Automation and Drive Technologies offers complete future-oriented automation solutions for machine tools and production machines.

Thanks to the strong innovation capacity, the sector know-how and the outstanding customer benefit of these solutions, Siemens is one of the leading suppliers of Motion Control Systems worldwide. For this reason, we can supply many references in different areas.



### *Innovative products, systems, solutions and services for each sector*

Siemens Motion Control Systems achieve very high requirements: All products stand out through the use of the latest technologies, high functionality and quality. In addition, the individual systems and products are optimally matched to one another so that they can be easily and consistently combined into an economic machine solution.

Examples of this are the Motion Control System SIMOTION and the drive system SINAMICS. These products constitute an innovative system platform, with which you can optimally adapt the control system to machine requirements. As a result you can find optimized, economic and future-oriented Motion Control solutions for different sectors such as the packaging, plastics and glass, timber and metal, textile and printing industries which can be easily expanded for increased requirements and combined with our high performance servo, linear, torque and standard motors.

Furthermore, Siemens supports its customers over the entire life cycle of a machine, e.g. with worldwide presales and aftersales service at more than 295 service points in 130 countries or with special services for Motion Control solutions such as application consulting and Mechatronics Support.



### *Application support: The safe path to top solutions*

Several application centers in China, France, Germany, Italy, Turkey and the USA support the specialist and application consultants on site who accompany customer projects from planning through startup – from the idea to the operational machine.

Application consulting includes:

- Planning and implementing projects
- Technical verification with test configuration and simulation
- Development of requirements and functional specifications
- Application workshops and customer-specific training courses

### *Partnership for joint success*

During this cooperation Siemens not only supports its customers, but also includes them as technology partners in the development process of systems and components which results in practical and future-oriented automation solutions.

In this way Siemens helps its customers to increase productivity, competitiveness and profitability over the long term.

## Energy efficiency due to targeted energy management

### Siemens sets the standard in energy efficiency and energy management

In industrial applications, energy efficiency has a large impact on electrical drive systems in particular, as these account for more than 70% of industrial energy consumption (source: ZVEI EU-15/2002)

The SIMOTION Motion Control system is combined with the SINAMICS S120 drive system and SIMOTICS motors from Siemens to create energy-efficient solutions with high degrees of efficiency which help to achieve considerable reductions in energy consumption.

### Energy efficiency in drive technology

Siemens supports its customers during every phase of the energy-management process, at the product and system level as well as with planning.

At the product level with:

- Energy consumption measurement
- High degrees of energy efficiency already in the design phase

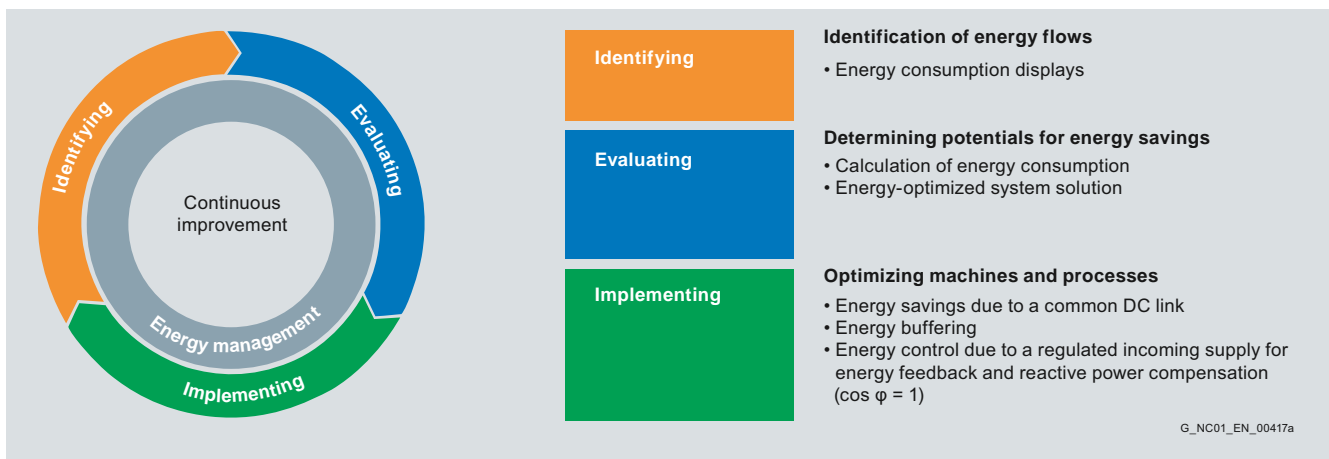
At the system level with:

- Energy savings due to a common DC link
- Energy buffering
- Energy control due to a regulated incoming supply

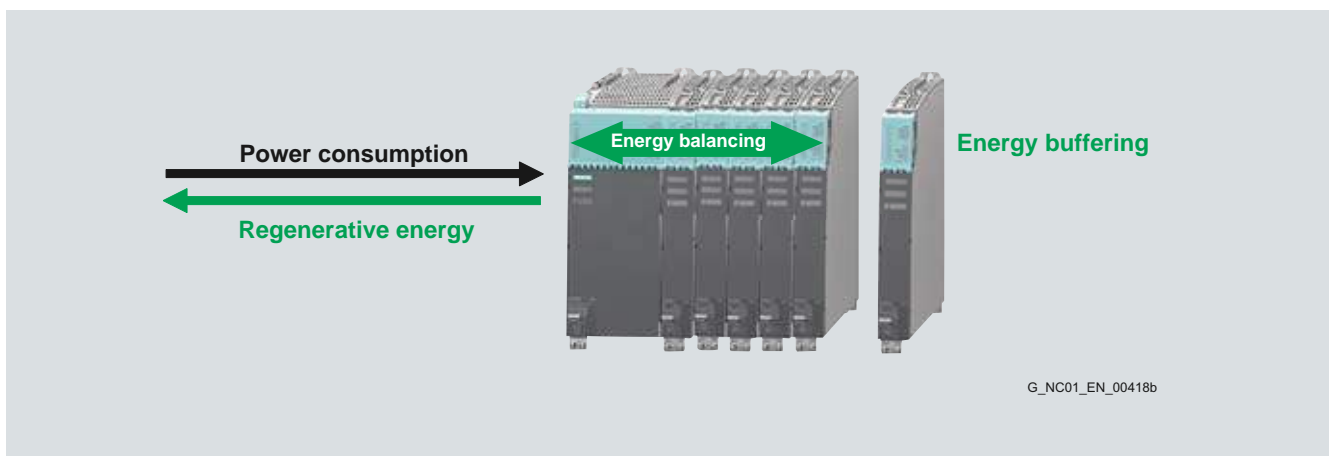
At the planning level with:

- Calculation of energy consumption
- Energy-optimized system solution

Energy management is a process in three phases:



Example: Increasing the energy efficiency at the system level with the SINAMICS S120 drive system



# System overview

## The SINAMICS drive family



Mixer/mills



Plastics



Converting



Machine tools

Pumps/fans/  
compressors

Textiles



Packaging



Conveyor systems



Printing machines



Woodworking



Renewable energies

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Application areas of the SINAMICS drive family

### Application

SINAMICS is the family of drives from Siemens designed for industrial machine and plant construction. SINAMICS offers solutions for all drive tasks:

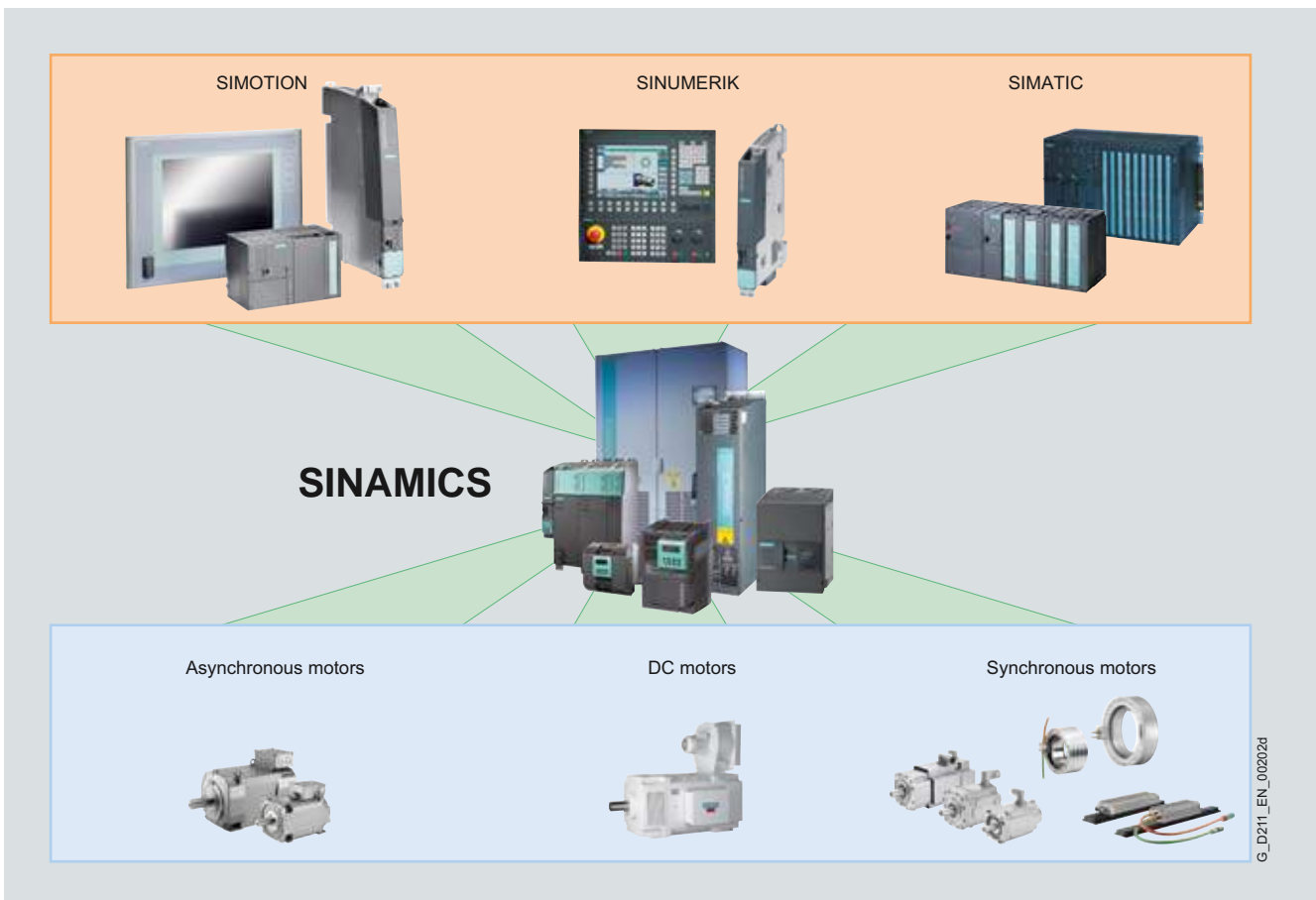
- Simple pump and fan applications in the process industry
- Demanding single-motor drives in centrifuges, presses, extruders, elevators, as well as conveyor and transport systems
- Drive line-ups in textile, plastic film, and paper machines, as well as in rolling mill plants
- High-precision servo drives for the manufacture of wind turbines
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines

### Product variants

Depending on the application, the SINAMICS range offers the ideal variant for any drive task.

- SINAMICS G is designed for standard applications with asynchronous motors. These applications have less stringent requirements regarding the dynamic performance of the motor speed.
- SINAMICS S handles demanding drive tasks with synchronous and asynchronous (induction) motors and fulfills stringent requirements regarding
  - the dynamic performance and accuracy
  - integration of extensive technological functions in the drive control system.
- SINAMICS DCM is the DC drive belonging to the SINAMICS family. As a result of its expandability across the board, it addresses both basic as well as demanding applications in drive technology and in complementary markets.





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SINAMICS as part of the Siemens modular automation system

#### **Platform concept and Totally Integrated Automation**

All SINAMICS versions are based on a platform concept. Common hardware and software components, as well as standardized tools for design, configuration and commissioning tasks, ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks without system gaps. The different SINAMICS versions can be easily combined with each other.

SINAMICS is part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering engineering, data management and communication at the automation level, result in extremely cost-effective solutions based on SIMOTION, SINUMERIK and SIMATIC control systems.

#### **Quality management according to DIN EN ISO 9001**


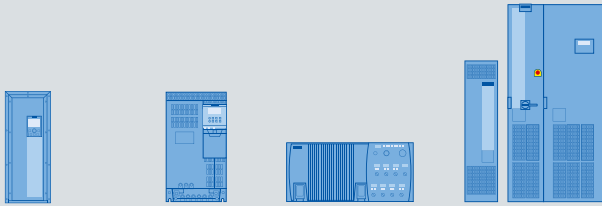

SINAMICS conforms to the most exacting quality requirements. Comprehensive quality assurance measures in all development and production processes ensure a consistently high level of quality.

Of course, our quality management system is certified by an independent authority in accordance with DIN EN ISO 9001.

# System overview

## The SINAMICS drive family

1

Low-Voltage AC Converters								
For basic applications		For high-quality applications				For basic servo drives		
								
SINAMICS G110		SINAMICS G110D		SINAMICS G120P	SINAMICS G120	SINAMICS G120D	SINAMICS G130/G150	SINAMICS S110
V/f Control		V/f Control/FCC		V/f Control / Vector Control				Servo Control
0.12 ... 3 kW		0.75 ... 7.5 kW		0.37 ... 90 kW	0.37 ... 250 kW	0.75 ... 7.5 kW	75 ... 2700 kW	0.12 ... 90 kW
Pumps, fans, conveyor belts		Conveyor technology		Pumps, fans, conveyor belts, compressors, mixers, mills, extruders				Single-axis positioning applications for machine and plant engineering
Common Engineering Tools								
SIZER for Siemens Drives – for simple planning and configuration					STARTER – for fast commissioning, optimization and diagnostics			

### System properties

The SINAMICS range is characterized by the following system properties:

- Standard functionality based on a single platform concept
- Standardized engineering
- High degree of flexibility and combination capability
- Broad power range
- Designed for global use
- SINAMICS Safety Integrated
- Higher efficiency and effectiveness
- High energy efficiency
- Versatile interfacing facilities to higher-level controllers
- Totally Integrated Automation

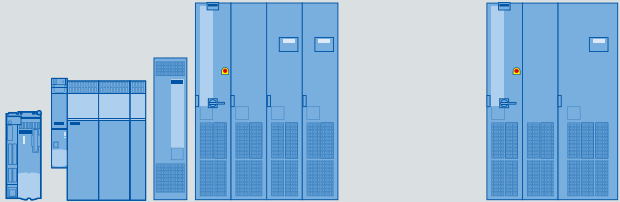
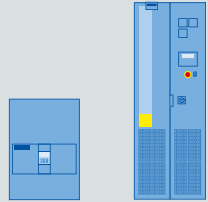
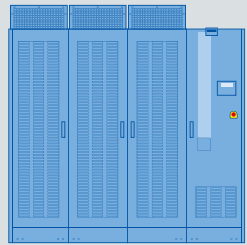
### Application areas

Tailored to suit different application areas, the SINAMICS range encompasses the following products:

#### AC low-voltage converters (line supply < 1000 V)

- **SINAMICS G110**  
- The versatile drive for low power ratings
- **SINAMICS G120C**  
- The compact drive with higher power density
- **SINAMICS G120P**  
- The specialist for pumps, fans, and compressors
- **SINAMICS G120**  
- The modular single-motor drive for low up to medium power ratings
- **SINAMICS G110D**  
- The distributed, compact single-motor drive in a high degree of protection for basic applications
- **SINAMICS G120D**  
- The distributed, modular single-motor drive in a high degree of protection for sophisticated applications
- **SINAMICS G130** and **SINAMICS G150**  
- The universal drive solution for single-motor drives with a high power rating
- **SINAMICS S110**  
- The basic positioning drive for single-axis applications

## The SINAMICS drive family

Low-Voltage AC Converters		DC Converters	Medium-Voltage AC Converters
For demanding applications		For basic and demanding applications	For high-power applications
			
SINAMICS S120		SINAMICS DCM	SINAMICS GM150/SM150/GL150/SL150
V/f Control / Vector Control / Servo Control		Closed-loop speed control / torque control	V/f Control / Vector Control
0.12 ... 4500 kW	75 ... 1200 kW	6 kW ... 30 MW	1 ... 120 MW
Motion Control applications in production machines (packaging, textile, printing, paper, plastic), machine tools, plants and process lines, metal forming technology, renewable energies	Test stands, cross cutters, centrifuges	Rolling mills, cross cutters and shears, wire-drawing machines, extruders and kneaders, presses, elevator and crane installations, cableways and lifts, mining hoists, test stand drives	Pumps, fans, compressors, mixers, extruders, mills, rolling mills, mining hoist drives, excavators, test stands and marine drives

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## Common Engineering Tools

SIZER for Siemens Drives – for simple planning and configuration

STARTER – for fast commissioning, optimization and diagnostics

*Application areas (continued)*AC low-voltage converters (line supply < 1000 V)

- **SINAMICS S120**  
- The flexible, modular drive system for demanding drive tasks
- **SINAMICS S150**  
- The drive solution for demanding single-motor drives with a high power rating

DC converter (line supply voltage < 1000 V)

- **SINAMICS DCM**  
- The scalable drive system for basic and demanding applications

AC medium-voltage converters (line supply voltage > 1000 V)

- **SINAMICS GM150**  
- The universal drive solution for single-motor drives
- **SINAMICS SM150**  
- The drive solution for demanding single-motor and multimotor drives
- **SINAMICS GL150**  
- The drive solution for synchronous motors up to 120 MW
- **SINAMICS SL150**  
- The drive solution for slow speed motors with the highest torques and overloads

# System overview

## SINAMICS S120 built-in devices

1



### Flexibility for successful machine concepts

As part of the SINAMICS drive family, the SINAMICS S120 drive system is a modular system for high-performance applications in machine and plant engineering. SINAMICS S120 offers high-performance single-axis and multi-axis drives for a very broad range of industrial applications. By virtue of its scalability and flexibility, SINAMICS S120 is the ideal system for satisfying the ever increasing demand for more axes and better performance. SINAMICS S120 supports flexible machine designs and speedy implementation of customized drive solutions.

### The response to ever increasing demands

Modern machines must be built at ever lower cost, but deliver ever greater productivity. The SINAMICS S120 drive concept meets both these challenges! It is easy to configure and thus helps to reduce project completion times. Its excellent dynamic response and accuracy permit higher cycle rates for maximum productivity.

### Applications in machine and plant engineering

Regardless of whether the application involves continuous material webs or cyclic, highly dynamic processes – SINAMICS S120 means increased machine performance in many industries:

- Packaging machines
- Plastics processing machines
- Textile machines
- Printing machines
- Paper machines
- Hoisting equipment
- Handling and assembly systems
- Machine tools
- Rolling mills
- Test stands
- Renewable energy

### Modularity for mechanical engineering

SINAMICS S120 is designed to allow free combination of power and control performance. Multi-axis drives with higher-level motion control can be implemented with the SINAMICS S120 modular system as easily as single-drive solutions.

### Greater flexibility with central control intelligence

On the SINAMICS S120, the drive intelligence is combined with closed-loop control functions into Control Units.

These units are capable of controlling drives in Vector, Servo and V/f modes. They also perform the speed and torque control functions plus other intelligent drive functions for all axes on the drive.

### Free performance selection for Vector and Servo control modes

The use of a SINAMICS S120 Vector control is recommended for drive solutions with continuous material webs, for example, wire-drawing machines, film and paper machines, as well as for hoisting gear, centrifuges and marine drives with harmonic, circular motion.

Servo control with SINAMICS S120 is employed for cyclic processes with precise, highly dynamic position control and servo motors, e.g. in textile, packaging, printing machines and machine tools.

### SINAMICS S120 – Functions for better efficiency

- Basic functions: Speed control, torque control, positioning functions
- Intelligent starting functions for independent restart after power supply interruption
- BICO technology with interconnection of drive-related I/Os for easy adaptation of the drive system to its operating environment
- Integrated safety functions for rational implementation of safety concepts
- Regulated infeed/regenerative feedback functions for preventing undesirable reactions on the supply, allowing recovery of braking energy and ensuring greater stability against line fluctuations.

### DRIVE-CLiQ – The digital interface between all components

All SINAMICS S120 components, including the motors and encoders, are interconnected by a shared serial interface called DRIVE-CLiQ. DRIVE-CLiQ forms the backplane for the complete drive system. The standardized cables and connectors reduce the variety of different parts and cut storage costs. Converter boards (Sensor Modules) for converting standard encoder signals to DRIVE-CLiQ are available for third-party motors or retrofit applications.

### Swift and automatic: The electronic rating plate

An important digital linkage element of the SINAMICS S120 drive system are the electronic type plates integrated in every component. They allow all drive components to be detected automatically via a DRIVE-CLiQ link. As a result, data do not need to be entered manually during commissioning or component replacement – helping to ensure that drives are commissioned successfully! The electronic rating plates of the motors contain, for example, the parameters of the electrical equivalent circuit diagram and the characteristic data of the built-in motor encoder in addition to information such as order and identification numbers.

## SINAMICS S120 built-in devices

### Modular design ensures flexibility and scalability

DC/AC units (= Motor Modules) – available in compact booksize, booksize and chassis formats – are characterized by their modular design. All the drive intelligence is organized into Control Units. The Control Units perform all the closed-loop control functions for the drive line-up. They also handle all other drive functions such as the interconnection of drive-related I/Os, positioning functions, and feature PROFIBUS DP or PROFINET as the central interface for linking to higher-level automation systems.

Line Modules function as the central energy supply to the voltage-source DC link. Line Modules are optionally available with regulated infeed/regenerative feedback to provide a constant DC link voltage and high level of supply compatibility. Motor Modules supply the motors with energy from the DC link.

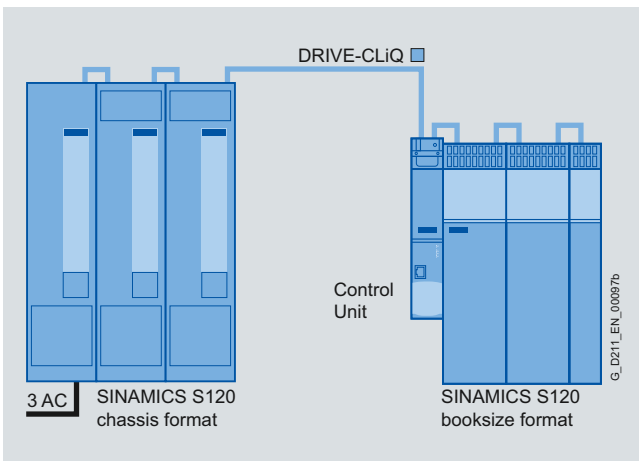
On AC/AC units, the infeed and motor power supply functions are combined in one device, the Power Module – available in blocksize and chassis formats. For single-axis applications, drive control functions are performed by a special Control Unit (CU310-2) mounted on the Power Module and for multi-axis applications, by a Control Unit (e.g. CU320-2) connected by a DRIVE-CLiQ link. In this case, a Control Unit Adapter is mounted on the Power Module in place of the Control Unit.



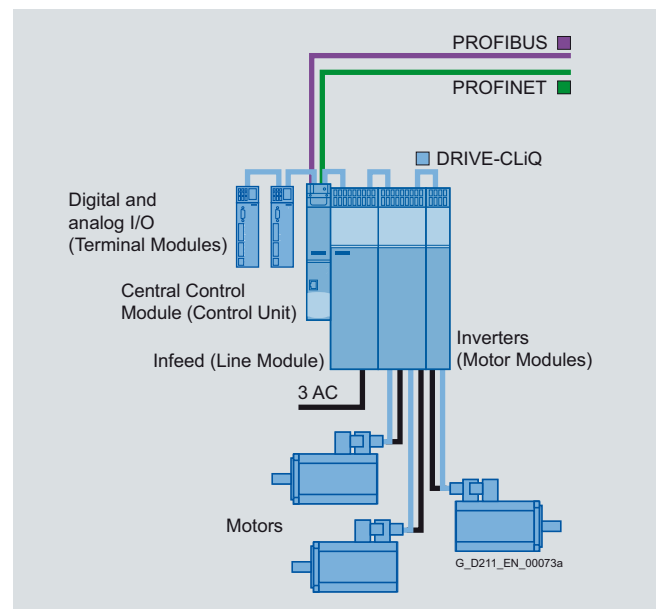
SINAMICS S120 blocksize, booksize compact, booksize and chassis formats

### All formats can be combined as required

The different SINAMICS S120 formats can be combined freely thanks to their DRIVE-CLiQ interfaces, e.g. Line Modules in chassis format can be freely combined with Motor Modules in booksize format for multi-axis applications with high total output.



SINAMICS S120 Control Units in booksize and chassis formats

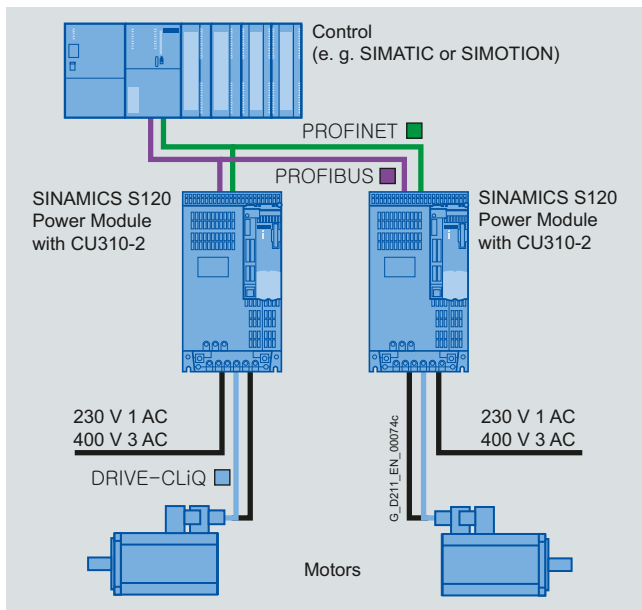


Example configuration of SINAMICS S120 booksize format

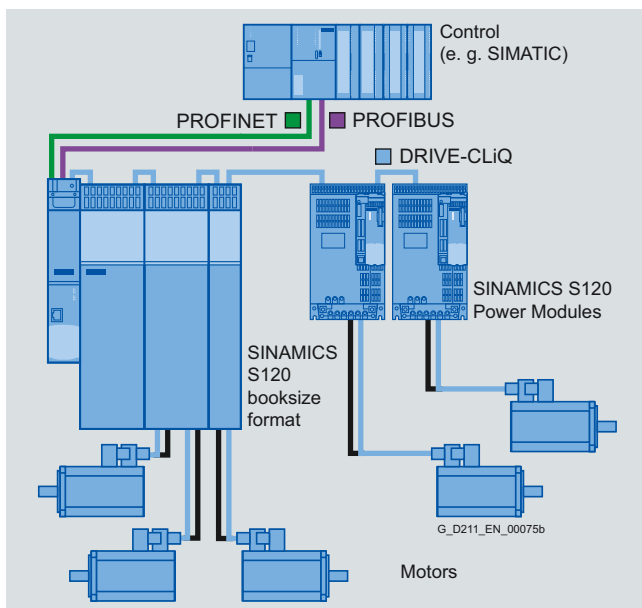
# System overview

## SINAMICS S120 built-in devices

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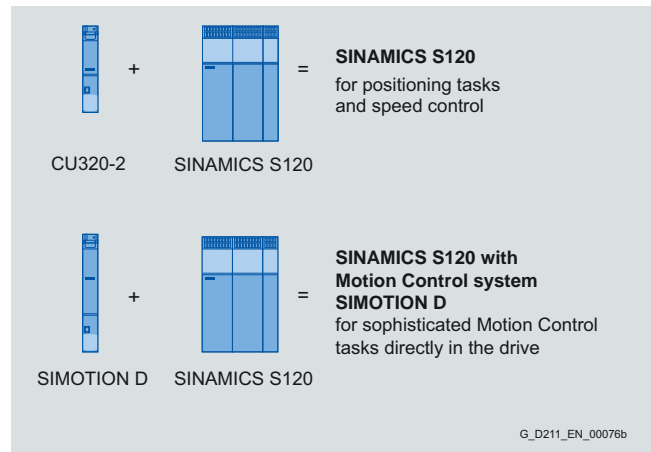
Example configuration of SINAMICS S120 blocksize format



Example configuration of SINAMICS S120 booksize and blocksize formats

### SINAMICS S120 and SIMOTION – The perfect team

Modern machines must be capable of handling ever more complex Motion Control tasks and performing them with increasing accuracy and speed. In regard to this requirement, the SIMOTION Motion Control System and high-performance SINAMICS S120 drive system form a perfect team. The SIMOTION D variant, which is physically integrated in the SINAMICS S120 drive, is the ideal solution for machines with a large number of axes and stringent precision requirements. This distributed automation structure allows the machine to be segmented into various axis groupings, with each grouping controlled by a separate SIMOTION Motion Control System. The SIMOTION systems communicate either via PROFIBUS DP or PROFINET. Another important aspect: The compact machine design thanks to the distributed automation structure and a Control Unit directly in the drive.



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Scalable MOTION CONTROL functionality

### Totally Integrated Automation – The unique automation platform

With Totally Integrated Automation (TIA), Siemens is the only single-source provider to offer an integrated spectrum of products and systems for all industries. Tailored to meet individual customer requirements, industry-specific automation solutions can be implemented efficiently on the basis of TIA. Lower life-cycle costs for plant operation and a significant reduction in the time to market result in a marked improvement in productivity and greater investment security.

#### Easy – Totally Integrated Automation with SINAMICS S120

Apart from SIMATIC, SIMOTION and SINUMERIK, SINAMICS is also one of the core components of TIA. The STARTER commissioning tool is therefore an integral element of the TIA platform. It is thus possible to parameterize, program and commission all components in the automation system using a standardized engineering platform and without any gaps. The system-wide data management functions ensure consistent data and simplify archiving of the entire plant project.

#### PROFIBUS

PROFIBUS DP, the standard fieldbus of the TIA system, is supported by all SINAMICS S120 variants. It provides a high-performance, system-wide communication network which links all automation components: HMI, controls, drives and I/O devices.

#### PROFINET – for enhanced performance and open IT communication

SINAMICS S120 is also available with a PROFINET interface. This Ethernet-based bus enables control data to be exchanged at high speed via PROFINET IO with IRT or RT and makes SINAMICS S120 a suitable choice for integration in top-performance multi-axis applications.

At the same time, PROFINET also uses standard IT mechanisms (TCP/IP) to transport information, e.g. operating and diagnostic data, to higher-level systems. A SINAMICS S120 with this interface can thus easily be integrated into factory IT networks.

## SINAMICS S120 built-in devices

### The components of the SINAMICS S120 drive system

#### SINAMICS S120 drive system

**Line-side components**  
 Line reactors  
 Line filters  
 Active Interface Modules



**Line Modules**  
 Basic Line Modules  
 Smart Line Modules  
 Active Line Modules



**Power supply**  
 For applicable 24 V device, see Catalog KT 10.1



**DC link components**  
 Braking Modules  
 Braking resistors  
 Capacitor Module  
 Control Supply Module



**Control Units**  
 CU310-2  
 CU320-2



**Control Units SIMOTION**  
 D410-2  
 D425-2  
 D435-2  
 D445-2  
 D455-2  
 CX32-2



**Motor Modules**  
 Single Motor Modules  
 Double Motor Modules



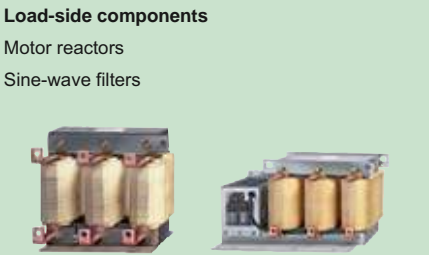
**Supplementary system components**



**Power Modules**



**Load-side components**  
 Motor reactors  
 Sine-wave filters

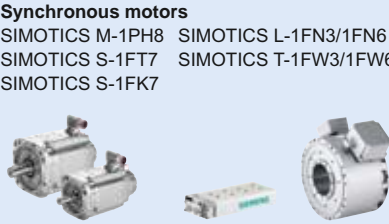


#### AC motors

**Asynchronous motors**  
 SIMOTICS M-1PH8

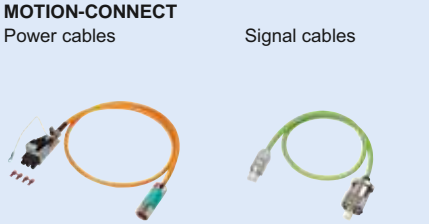


**Synchronous motors**  
 SIMOTICS M-1PH8 SIMOTICS L-1FN3/1FN6  
 SIMOTICS S-1FT7 SIMOTICS T-1FW3/1FW6  
 SIMOTICS S-1FK7



#### Connection system

**MOTION-CONNECT**  
 Power cables      Signal cables



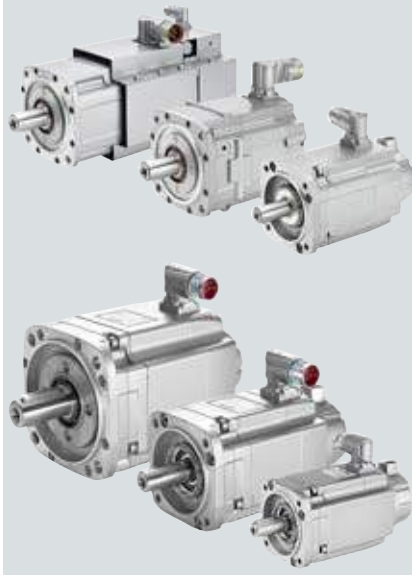
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# System overview

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## SIMOTICS motors

### SIMOTICS servomotors


**Synchronous motors  
SIMOTICS S-1FT7**

Machines with the highest demands in dynamic response and precision. Very low torque ripple for exacting standards in machine tools.

**Synchronous motors  
SIMOTICS S-1FK7**

Robots and handling systems, wood, glass, ceramics and stone processing, packaging, plastics and textile machines

**Compact geared motors  
SIMOTICS S-1FK7-DYA**

Handling systems, wood, glass and ceramics processing, packaging machines, injection molding and foil stretching machines, auxiliary axes

**Geared servomotors  
SIMOTICS S-1FK7**

Packaging machines, high-bay racking units, wood, glass and ceramics processing, beverage filling plants, conveyor belts

### SIMOTICS main motors


**Asynchronous motors  
SIMOTICS M-1PH8**

Main drives in presses and extruders, converting applications, paper and printing industries, crane applications

**Synchronous motors  
SIMOTICS M-1PH8**

Main drives in presses and extruders, converting applications, paper and printing industries, crane applications

### SIMOTICS linear motors and SIMOTICS torque motors


**Linear motors  
SIMOTICS L-1FN3**

Extremely fast dynamic response and very quick traversing speeds, highly dynamic and flexible mechanical engineering, oscillating motions

**Linear motors  
SIMOTICS L-1FN6**

Exacting requirements of precision combined with fast dynamic response, handling and linked axes, long traverse paths

**Built-in torque motors  
SIMOTICS T-1FW6**

Rotary tables, rotary indexing machines, rollers and winders, swivel axes, spindle machines, machine tools

**Complete torque motors  
SIMOTICS T-1FW3**

Injection molding machines, extruders, foil stretching machines, rollers and winders, rotary tables, paper machines, shredders



## SIMOTICS motors

*The ideal SIMOTICS motor for any application*

Users of Motion Control drives are demanding ever more compact and dynamic motors in a very wide range of power ratings and variants, as well as mechanically integrated solutions. Siemens offers a wide range of servomotors, main motors, linear motors and torque motors to satisfy these demands.

A suitable SIMOTICS motor of asynchronous or synchronous design is available for every Motion Control task – with ratings ranging from 0.05 kW to 1340 kW.

*Uniform integrated system solutions*

All SIMOTICS motors for Motion Control applications are optimally designed to operate with the SINAMICS S120 drive system.

SIMOTICS motors equipped with a DRIVE-CLiQ interface ensure quick commissioning, smooth operation and simple diagnostic procedures. The DRIVE-CLiQ interface transfers the electronic rating plate data of the motors, e.g. their unique identification number and rating data such as voltage, current and torque, to the Control Unit.

Pre-assembled MOTION-CONNECT signal and power cables offer an easy, reliable method for connecting the components. Precisely tailored Motion Control solutions – state of the art in all rating classes – are made possible by a combination of globally available standard components and the control systems.

*Powerful tools and competent support*

Siemens offers expert advice and efficient tools to help users select the right motor solution. Experienced specialists are always ready to lend a hand in designing mechanically integrated motor solutions.

- SIZER for Siemens Drives engineering tool
  - User-friendly support in dimensioning motor and gear unit  
[www.siemens.com/sizer](http://www.siemens.com/sizer)
- CAD CREATOR
  - Dimension drawing and 2D/3D CAD generator  
[www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)

## MOTION-CONNECT connection system

MOTION-CONNECT includes connection systems and components which are optimally tailored to individual areas of application. MOTION-CONNECT cables feature state-of-the-art connection systems to ensure fast, reliable connection of different components. The use of pre-assembled MOTION-CONNECT cables ensures high quality and system-tested, problem-free operation.



Power cables and signal cables

MOTION-CONNECT cables are available in two versions to suit different applications:

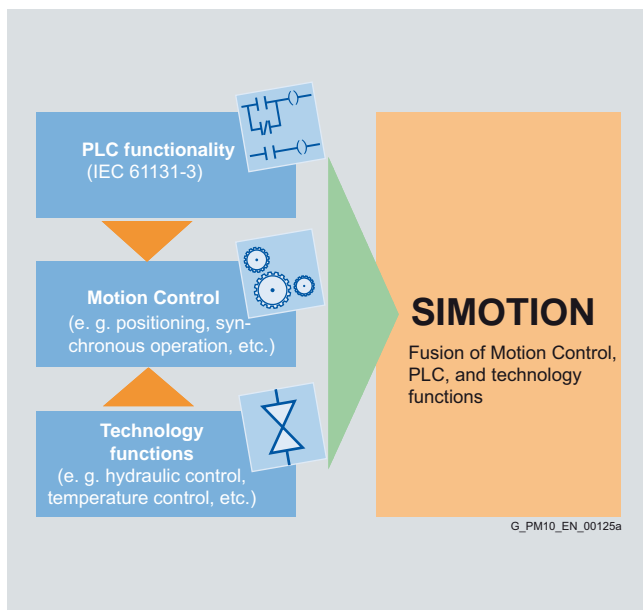
- **MOTION-CONNECT 500**  
The solution for predominantly fixed installation.
- **MOTION-CONNECT 800PLUS**  
Ideally satisfies all requirements for use in machine tools and production machines. The cables meet all exacting mechanical requirements for application in cable carriers on machine tools and production machines and are resistant to cutting oils.

MOTION-CONNECT cables are available as power cables or signal cables, preassembled or by the meter depending on the application. The preassembled cables can be ordered in length units of 10 cm (4 in) and can be extended, if necessary.

# System overview

## The SIMOTION system

1



SIMOTION is recommended for all machines with Motion Control tasks – from simple to high-performance. The focus is on a simple and flexible solution for the greatest possible range of Motion Control tasks.

SIMOTION is based on the fusion of Motion Control with two other control functions which are found in most machines: PLC and technology functions.

This approach means that Motion Control of axes and control of the complete machine can be implemented within the same system. The same applies to technology functions, such as pressure control of a hydraulic axis. A seamless switch can be made from position-controlled positioning mode to pressure control.

**Combining the three open-loop control functions of Motion Control, PLC and technology functions has the following benefits:**

- Reduced engineering overhead and increased machine performance
- Fast system response – Time-critical interfaces between the individual components are no longer required
- Simple, uniform and transparent programming as well as diagnostics of the entire machine

The SIMOTION system is made up of three components:

### Engineering system

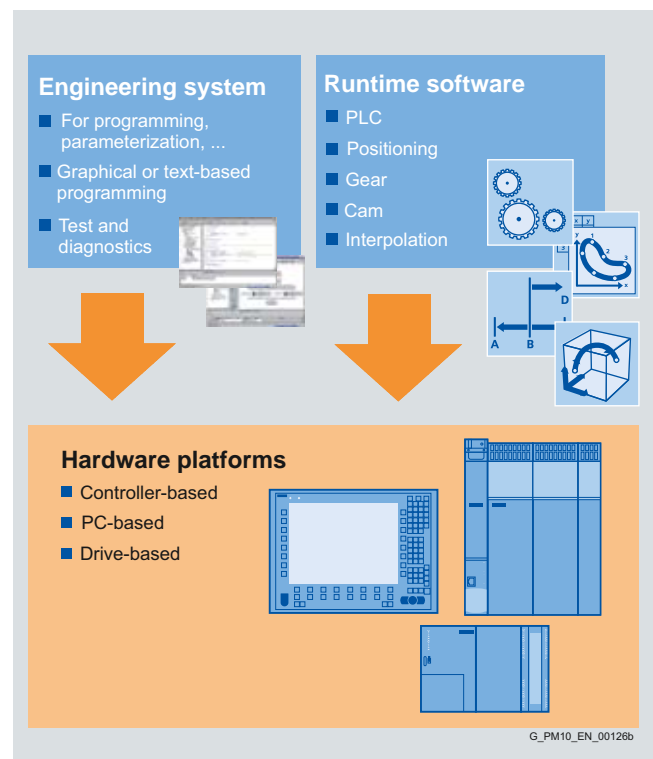
It enables Motion Control, PLC and technology functions to be incorporated in one comprehensive, integrated system and provides all the necessary tools: From programming and parameterization through testing and commissioning, to diagnostics.

### Runtime system

The runtime system offers a high-performance execution system for cyclic and sequential tasks. The runtime software modules make the different PLC, Motion Control and technology functions available. By selecting the appropriate modules, the overall functionality of the system can be flexibly adapted to the machine.

### Hardware platforms

The hardware platforms are the basis of the SIMOTION Motion Control System. The application created with the engineering system and the associated runtime software modules can be implemented on different hardware platforms.



### The fast path to the automation solution

Thanks to the SIMOTION system components and the concept of ready-to-apply standard applications and complete machine solutions called SIMOTION Easy Set (Ready to Run), it is possible to reduce engineering costs, speed up project completion times and implement successful automation systems more quickly.

**One concept – 3 platforms**

Automation systems are primarily identified by the following characteristics:

- System-specific characteristics, e.g. functionality and engineering
- Hardware-dependent characteristics, e.g. performance, design and expandability

However, mechanical engineering demands vary greatly, depending on the version of the machine in question.

Every hardware platform has its benefits when used in certain applications.

The various platforms can also be combined very easily, which is a particular advantage in modular machines and plants. This is because the individual hardware platforms always have the same system characteristics, i.e. functionality and engineering are always identical, irrespective of the platform used.

PROFIBUS or PROFINET can be used to create the link to the drives and the I/Os remotely.

PROFIBUS/PROFINET can also be used for communication with HMI devices such as SIMATIC HMI or higher-level controllers such as SIMATIC S7. This means that SIMATIC HMI panels as well as PCs with WinCC flexible can be used as operator systems. Even 3rd party applications communicate with SIMOTION by means of the OPC interface.

**SIMOTION D – Compact and integrated in the drive**

In SIMOTION D, the SIMOTION functionality is integrated directly in the closed-loop control module of the SINAMICS S120 drive system. Therefore, the complete system (consisting of the open-loop control and the drive) is extremely compact and powerful.

Two SIMOTION D versions are available:

- As a SIMOTION D410-2 single-axis system with multi-axis option (blocksize format)
- As a SIMOTION D4x5-2 multi-axis system in four performance variants for up to 128 axes (booksize format)

This finely graded performance ensures the highest degree of scalability and flexibility. The field of application ranges from single axes to high-performance multi-axis machines. For visualization and operation SIMATIC HMI devices can be connected via PROFIBUS, PROFINET or Ethernet depending on the SIMOTION D variant. Distributed I/O is connected via PROFIBUS or PROFINET.

# System overview

1

## Hardware platforms

### *SIMOTION C – Modularity and flexibility*



SIMOTION C is a motion controller based on the SIMATIC S7-300 design.

It is available in two variants which differ in terms of their interfaces, but not with respect to Motion Control functionality or performance. In addition to the already integrated interfaces, both controllers can be expanded using I/O modules from the SIMATIC S7-300 range.

Variant C240 with its four drive and encoder interfaces is ideal for machine automation applications and the operation of drives with analog setpoint interface or stepper drives. As a result, this variant is particularly suitable for machine retrofits.

Variant C240 PN with its three PROFINET ports, which support PROFINET with IRT as well as TCP/IP and RT communication, is used to automate machines on the basis of PROFINET. It is capable of operating PROFINET drives with PROFIdrive, as well as PROFINET I/Os, such as SIMATIC ET 200S High Speed.

Both variants are equipped additionally with two PROFIBUS interfaces via which drives with PROFIdrive profile as well as standard I/Os can be connected. In addition, both controllers feature an Industrial Ethernet interface, thus offering further communication options.

### *SIMOTION P – Open for other tasks*



SIMOTION P is a PC-based Motion Control System. The capabilities of the portfolio of PC-based controllers with SIMOTION P320-3, the embedded PC for Motion Control, and SIMOTION P350-3 with the operating system Windows XP Professional are well-demonstrated in practice – and not just for high-end tasks.

SIMOTION P320-3 has been created for Embedded PC Motion Control applications. Thanks to the Embedded Windows operating system and elimination of rotating parts in the PC, the SIMOTION P320-3 is particularly compact and ideal for applications in harsh environments. Both PCs are equipped with the usual real-time expansion for SIMOTION. This means that in addition to SIMOTION machine applications, it is possible to run other PC applications at any time including, for example, the SIMOTION engineering system, an operator application, a process data evaluation routine or standard PC applications.

With its excellent processor performance, SIMOTION P350-3 is predestined for applications with exacting performance requirements (such as hydraulic applications with highly dynamic position and pressure control loops).

SIMOTION P320-3 is particularly suitable for harsh operating environments. Its small footprint makes it the preferred choice for many applications in which available space and highly rugged design play a key role.

The SIMOTION P350-3 can be operated by a variety of different SIMOTION panel fronts. These are available in various screen sizes and can either be operated using a keyboard and mouse, or a touch screen. The SIMOTION P320-3 can be linked to the SIMOTION fronts by means of the Remote Panel PC Kit. For both PC variants, the SIMATIC flat panel series offers further scope for solutions in which the PC is not directly connected to the front panel.

SIMOTION P350-3 is available in either a PROFIBUS or PROFINET variant for the connection of I/Os, while SIMOTION P320-3 is available only as a PROFINET variant.

## Runtime system

**Multi-layer software architecture**

With SIMOTION, motion tasks in many different machines are performed easily and uniformly.

To facilitate this, a very special, multi-layer architecture was chosen as the runtime system. All SIMOTION devices provide basic functionality such as PLC functionality with a command set according to IEC 61131-3. You can expand this basic functionality using the included technology packages and function libraries.

**Scalable functionality**

The technology packages, function libraries and multi-layer architecture of the runtime system combine to achieve the scalable functionality of SIMOTION.

**Scalable**

- Thanks to various functionality levels
- Thanks to software modules and technology packages with extensive functionality

**Flexible**

- Thanks to the integrated, freely programmable PLC following IEC 61131-3 standards
- Thanks to technology packages that can be used limitlessly
- Thanks to a broad functional scope with a complex command set as well as function blocks according to the PLCopen standard
- Thanks to the option to run servo, vector, stepper, and hydraulic drives
- Thanks to the ability to combine the various technology packages and function libraries

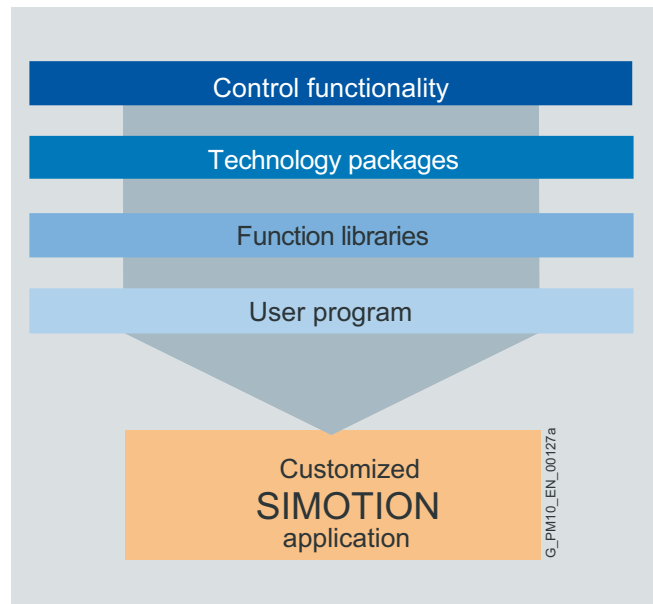
**Expandable**

- Thanks to standard functions of the function libraries

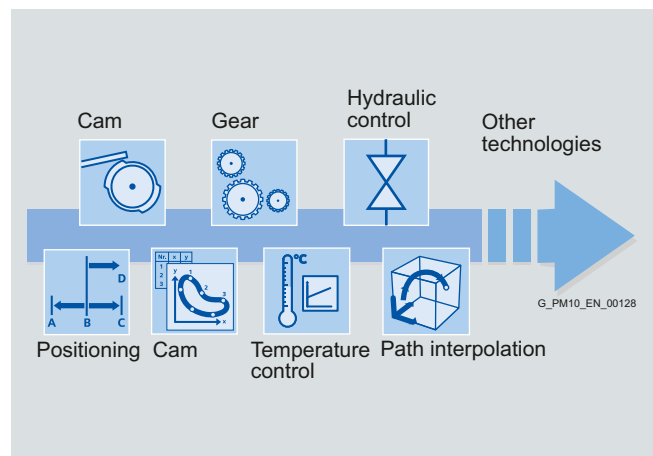
**Technology packages**

Each of these packages provides complete functionality for the technology in question. For example, the Motion Control technology package provides all functions for precise positioning movements, including camming.

It also handles the cyclic exchange of setpoints and actual values with the drive including position control, calculation of the movement profile, removal or overriding of motions, homing functions, encoder changeover, axis release, status information, and more.



In addition to the Motion Control technology package (including positioning, synchronous operation, output cam, and path interpolation), packages for other technologies, e.g. temperature control, are also available.

**Function libraries**

The function libraries offer standard functions

- For integration of special I/O modules (e.g. counter modules, communication modules, AS-Interface)
- For expanding the system functions (e.g. closed-loop controllers)

Modular user functions can also be stored as libraries for standardized implementation in projects.

## Engineering system

### *Focus is on user friendliness*

As the performance capability of a system grows, so do the requirements of its user friendliness. This is the only means of ensuring the usability of the system. With SCOUT, the engineering system for SIMOTION, particular emphasis has therefore been placed on user friendliness:

- The engineering for Motion Control, PLC and technology as well as the drive configuration and commissioning are all performed in the same manner in the same engineering environment.
- All tasks are largely resolved in a graphical manner: Configuring, programming, testing and commissioning.
- Intuitive operation, context-sensitive help functions and automatic consistency checks make engineering easier, especially for those users who are new to Motion Control programming.
- All the tools that are associated with the SCOUT engineering system are integrated, giving a uniform Look & Feel.

The SCOUT engineering system supports you step-by-step, making the engineering easy and efficient.

SCOUT can be used in SIMATIC STEP 7, either with standardized data management and configuring procedures, or as a stand-alone engineering tool (SCOUT Stand-Alone).

### *Programming for everyone*

One of the options listed below can be selected for programming SIMOTION with the SCOUT engineering system:

- Graphic programming with Motion Control Chart (MCC)
- Graphic programming with Drive Control Chart (DCC)
- Ladder logic (LAD)/Function block diagram (FBD), as known from the PLC
- High-level language Structured Text (ST)

In addition to Motion Control commands (e.g. referencing of axis), commands for I/O access, logic and calculations, sub-routine calls and control of the program flow are also available.

Complex motion relationships are also easy to set up using the graphical cam editors.

### *Central management with integrated tools*

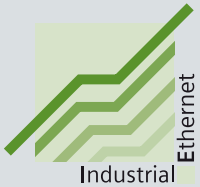
All the data for your complete machine can be managed in a single project: Configuration data, programs, movement profiles, and drive data.

The appropriate tools are then called from the central project management, e.g. for entering a cam or for commissioning a drive.

### *Test and diagnostics*

SCOUT supports the testing, commissioning and error diagnostics of SIMOTION applications with a series of tools, such as those providing program status, control variables, trace, and the axis control panel.

# Communication

The logo for PROFIBUS, featuring the word "PROFI" in blue letters above a horizontal line, and the word "BUS" in blue letters below the line.The logo for PROFINET, featuring the word "PROFI" in green letters above a horizontal line, and the word "NET" in green letters below the line.

2/2	<b>PROFIBUS</b>
2/3	<b>Industrial Ethernet</b>
2/4	<b>PROFINET</b>
2/7	<b>PROFINET for SIMOTION and SINAMICS S120</b>
2/9	<b>PROFIdrive</b>

## PROFIBUS

## Overview

2



### PROFIBUS – The most successful open fieldbus in automation

The demands of users for an open, vendor-independent communication system resulted in the specification and standardization of the PROFIBUS protocol.

PROFIBUS defines the technical and functional features of a serial fieldbus system with which distributed programmable field controllers of the low-end (sensor/actuator level) to mid performance range (cell level) can be networked.

Standardization according to IEC 61158 / EN 50170 provides future protection for your investment.

Through the conformity and interoperability test performed by the test laboratories authorized by PROFIBUS & PROFINET International (PI) and the certification of the devices by PI, the user can rest assured that quality and functionality are also ensured for multi-vendor installations.

#### PROFIBUS variants

Three different PROFIBUS variants have been defined to fulfill the wide range of different requirements at the field level:

PROFIBUS FMS (Fieldbus Message Specification) – the universal solution for communication tasks on the field and cell level of the industrial communication hierarchy.

PROFIBUS PA (Process Automation) – the variant for applications in process automation. PROFIBUS PA uses the intrinsically safe transmission technology specified in IEC 61158-2.

PROFIBUS DP (Distributed Peripherals) – this variant, which is optimized for speed, is tailored especially for the communication of automation systems with distributed IO stations and drives. PROFIBUS DP is characterized by its very short response times and high degree of fault tolerance and replaces cost-intensive parallel signal transmission with 24 V and the measured value transmission with 0/4 ... 20 mA technology.

## Design

### Bus nodes for PROFIBUS DP

PROFIBUS DP distinguishes between two different master classes and one slave class:

#### DP master Class 1

The DP master Class 1 is the central component in PROFIBUS DP. The central master station exchanges information with distributed stations (DP slaves) in a fixed, repeated message cycle.

#### DP master Class 2

Devices of this type are used (programming, configuration or control devices) during start-up, for configuring the DP system, for diagnostics or controlling the plant during normal operation. A DP master Class 2 can be used, for example, to read the input, output, diagnostics and configuration data of the slaves.

#### DP slave

A DP slave is an IO device which receives output information or setpoints from the DP master and sends input information, measured values or actual values to the DP master in response. A DP slave never sends data automatically, it must always be prompted by the DP master.

The volume of input and output data depends on the device and can be up to 244 bytes per DP slave and transfer direction.

## Function

### Functional scope in DP masters and DP slaves

The functional scope can differ between DP masters and DP slaves. The functional scope is different for DP-V0, DP-V1 and DP-V2.

#### DP-V0 communication functions

The DP-V0 master functions comprise the functions "Configuration", "Parameter Assignment", "Read Diagnostics Data" as well as cyclic reading of input data/actual values and writing output data/setpoints.

#### DP-V1 communication functions

The DP-V1 function expansions make it possible to perform acyclic read and write functions as well as processing cyclic data communication. This type of slave must be supplied with extensive parameterization data during start-up and during normal operation. These acyclicly transferred parameterization data are only rarely changed in comparison to the cyclic setpoints, actual values, and measured values, and are transferred at lower priority in parallel with the cyclic high-speed user data transfer. Detailed diagnostic information can be transferred in the same way.

#### DP-V2 communication functions

The extended DP-V2 master functions mainly comprise functions for isochronous operation and direct data exchange between DP slaves.

- **Isochronous mode:**  
Isochronous mode is implemented by means of an equidistant signal in the bus system. This cyclic, equidistant cycle is sent by the DP master to all bus nodes in the form of a Global Control Telegram. Master and slaves can then synchronize their applications with this signal. The signal jitter between cycles is less than 1  $\mu$ s.
- **Slave-to-slave communication:**  
The "publisher/subscriber" model is used to implement slave-to-slave communication. Slaves declared as publishers make their input data/actual values and measured values available to other slaves, the subscribers, for reading. This is performed by sending the response frame to the master as a broadcast. Slave-to-slave communication is therefore a cyclic process.

### PROFIBUS for SINAMICS and SIMOTION

SINAMICS and SIMOTION use the PROFIBUS protocol PROFIBUS DP.

SINAMICS S120 drives can operate only as DP slaves and support all communication functions, i.e. DP-V0, DP-V1 and DP-V2.

The SIMOTION systems can be used both as DP masters and DP slaves. The DP-V0, DP-V1 and DP-V2 communication functions are supported.



## Overview

Ethernet is the basic Internet technology for worldwide networking. The many possibilities of intranet and Internet, which have been available for office applications for a long time, are now utilized for production automation with Industrial Ethernet.

IT technology as well as the use of distributed automation systems is continuously increasing. This entails breaking up complex control tasks into small, simple control systems close to the drive. This increases the demand for communication and consequently a comprehensive and powerful communication system.

Industrial Ethernet offers a powerful area and cell network according to IEEE 802.3 (ETHERNET) for industrial applications.

## Benefits

Ethernet enables a very fast data transfer (10/100 Mbit/s, 1/10 Gbit/s) and at the same time has full-duplex capability. It therefore provides an ideal base for communication tasks in the industrial sector. With a share of over 90%, Ethernet is the number one network worldwide and offers important features which have essential advantages:

- Fast commissioning thanks to the simplest connection method
- High availability since existing networks can be extended without any adverse effects
- Almost unlimited communication performance because scalable performance is available through switching technology and high data rates when required
- Networking of different application areas such as office and production areas
- Company-wide communication based on WAN (Wide Area Network) technology or the Internet
- Investment protection from continuous compatibility with further developments

In order to make Ethernet suitable for industrial applications, considerable expansions with respect to functionality and design are required:

- Network components for use in harsh industrial environments
- Fast assembly of the RJ45 connectors
- Failure protection through redundancy
- Expanded diagnostics and message concept
- Use of future-oriented network components (e.g. switches)

SIMATIC NET offers corresponding network components and products.

## Design

### Industrial Ethernet for SINAMICS and SIMOTION

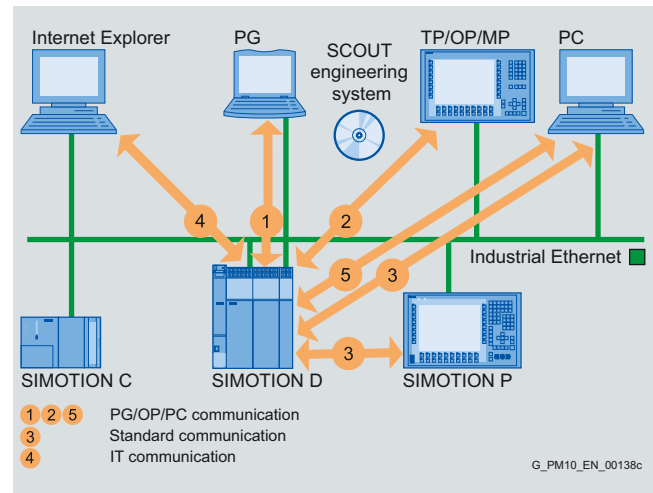
SINAMICS S offers Control Units and Communication Boards with PROFINET interface based on 100 Mbit Ethernet. Process communication in real time as well as engineering and HMI over standard TCP/IP are therefore possible simultaneously.

The CU320-2 Control Unit has an Ethernet interface at the front which enables service and engineering tasks to be performed easily.

SIMOTION can be integrated into any Industrial Ethernet communication architecture because each SIMOTION device offers at least one Ethernet interface as standard.

Industrial Ethernet is used in SIMOTION for data communication. Cyclic process communication with SINAMICS drives and distributed I/O is implemented over PROFIBUS DP or PROFINET IO and PROFdrive.

## Function



### Communication with SIMOTION over Industrial Ethernet

#### PG/OP/PC communication (1,2,5)

- Engineering and diagnostics with SIMOTION SCOUT (1)
- Connection of SIMATIC HMI Panels with Ethernet interface using WinCC flexible (2)
- For example, open communication of vendor-specific HMI tools over OPC server from SIMATIC NET (5)

#### Standard communication (3)

This uses the basic protocols UDP and TCP/IP, which are also used for Ethernet. In this way, SIMOTION offers the corresponding system functions for UDP and TCP/IP communication. This permits data to be exchanged over TCP/IP and UDP communication between:

- Different SIMOTION devices (3)
- SIMOTION and SIMATIC S7 devices (3)
- SIMOTION devices and any other device which uses standard TCP/IP or UDP communication. Such devices can be any kind of PC with any kind of operating system or other programmable controllers (3)

#### IT communication (4)

IT communication is performed using protocols which are based on the basic TCP/IP protocol. The most important IT protocols are:

- HTTP: Hypertext Transfer Protocol
- FTP: File Transfer Protocol
- SMTP: Simple Mail Transfer Protocol
- SNMP: Simple Network Management Protocol

SIMOTION supports the HTTP/HTTPS and FTP protocol. In addition, the following communication options are available for SIMOTION:

- Web pages in the SIMOTION device (4)  
A standard Internet browser can be used to access pre-defined web pages with diagnostics information on the SIMOTION device. Furthermore, user-defined web pages can be stored in the SIMOTION device which contain information defined by the user.
- OPC XML-DA (4)  
SIMOTION offers an OPC XML-DA server integrated into the device. This server supplies SIMOTION process data. Communication from any external device is performed with the SOAP protocol (in accordance with the specification of the OPC Foundation), which is integrated into the HTTP protocol.

## PROFINET

### Overview

2

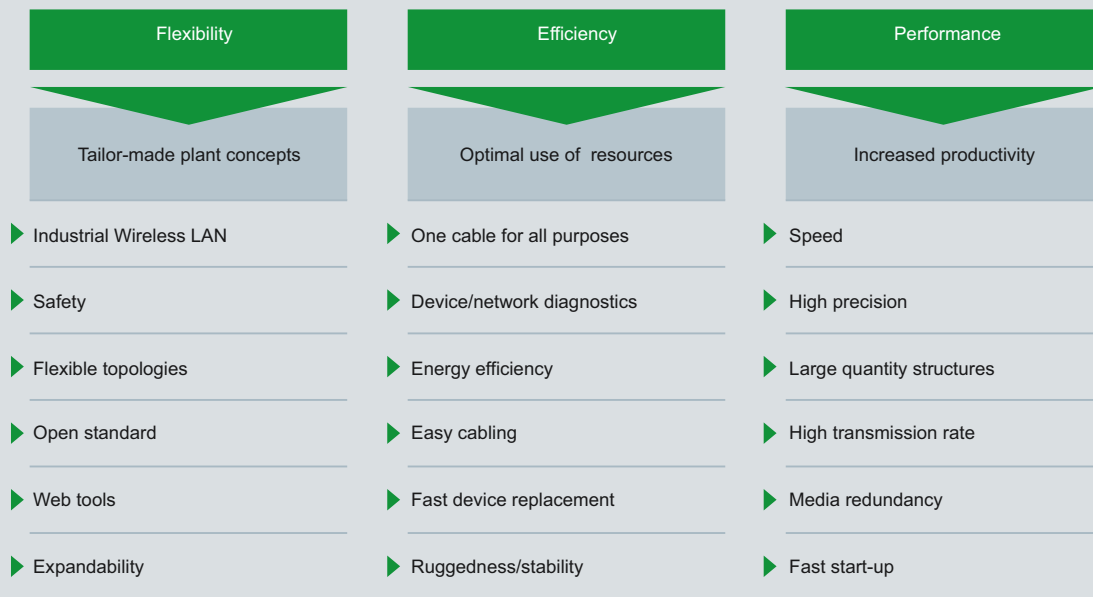


### PROFINET – The Ethernet standard for automation

PROFINET is the leading Industrial Ethernet standard for automation with more than 3 million nodes worldwide.

PROFINET increases companies' success by accelerating processes, boosting productivity, and increasing plant availability.

#### Your advantages at a glance



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### Flexibility

Short response times and optimized processes are prerequisites for competitiveness in global markets, because product life-cycles are becoming shorter and shorter.

PROFINET ensures maximum flexibility in plant structures and production processes, and it enables you to implement innovative machine and plant concepts. Mobile devices, for example, can be integrated into relatively inaccessible locations.

### Flexible topologies

PROFINET also enables the use of star, tree, and ring topologies in addition to the linear topology characterized by the established fieldbuses. This is made possible by switching technology via active network components, such as Industrial Ethernet switches and media converters, or by the integration of switch functionality into the field devices. This results in increased flexibility in machine and plant planning, as well as savings in cabling.

The PROFINET network can be installed without any specialist knowledge and meets all requirements relevant to the industrial environment. The PROFINET Guideline "Cabling and Interconnection Technology" provides network installation support for manufacturers and users. Symmetrical copper cables or RFI-resistant fiber-optic cables are used depending on the application. Devices from different manufacturers are easily connected via standardized and rugged plug-in connectors (up to IP65/IP67 degree of protection).

Thanks to the integration of switch functionality into the devices, linear topologies can be formed that are configured based on an existing machine or plant structure. This results in savings in cabling overhead and cuts down on components such as external switches.

### IWLAN

PROFINET also supports wireless communication with Industrial Wireless LAN and thus opens up new application fields. For example, technologies subject to wear such as contact wires can be replaced and automated guided vehicle systems and mobile operator panels can be used.

### Safety

The PROFIsafe safety profile, which has been tried and tested with PROFIBUS and which permits the transmission of standard and safety-related data on a single bus cable, can also be used with PROFINET. No special network components are required for fail-safe communication, standard switches and standard network transitions can be used without restrictions. In addition, fail-safe communication is equally possible via Industrial Wireless LAN (IWLAN).

## Overview

### Open standard

PROFINET, the open vendor-independent standard (IEC 61158/IEC 61784), is supported by PROFIBUS and PROFINET International (PI). It stands for maximum transparency, open IT communication, network security and simultaneous real-time communication.

Due to its openness, PROFINET creates the basis for a uniform automation network in the plant to which all of the machines and devices can be connected. The integration of existing parts of the plant, using PROFIBUS for example, can also be achieved without any problems through the use of network transitions.

### Use of web tools

PROFINET's unrestricted support for TCP/IP permits the use of standard web services such as web servers in the device. Independently of the tool used, information from the automation level can be accessed from almost anywhere at any time using a commercially available Internet browser. This considerably simplifies commissioning and diagnostics. Each user can decide for himself how much openness to the IT world he will permit for his machine or plant. Thus, PROFINET can be easily operated as an isolated plant network or it can be connected to the office network or the Internet via suitable security modules, such as the SCALANCE S modules. This allows new teleservice concepts or even the fast exchange of production data.

### Expandability

On the one hand, PROFINET permits the easy integration of existing systems and networks without great effort. Thus, PROFINET protects the investments in existing plant units which communicate via PROFIBUS and other fieldbuses such as AS-Interface, for example. On the other hand, additional PROFINET stations can be added at any time. Network infrastructures can be expanded using additional network components, both wired and wireless versions – even during operation.

### Efficiency

Global competition means that companies must deploy their resources economically and efficiently. This applies to production especially. PROFINET ensures more efficiency here. Simple engineering guarantees fast commissioning, and reliable devices enable high plant availability. Comprehensive diagnostics and maintenance concepts help to reduce plant downtimes and maintenance costs to a minimum.

### One cable for all purposes

PROFINET permits simultaneous fieldbus communication in isochronous mode and standard IT communication (TCP/IP) via one cable. This real-time communication for the transmission of user/process data and diagnostic data is performed on a single cable. Specific profile communication (PROFIsafe, PROFIdrive and PROFIenergy) can be integrated without additional cabling overhead. This solution provides a wide range of functions with a low degree of complexity.

### Device and network diagnostics

By retaining the field-proven PROFIBUS device model, the same diagnostic information is available with PROFINET. In addition, device diagnostics also includes read-out of module-specific and channel-specific data from the devices. This enables simple and fast location of faults. In addition to the availability of device information, the top priority in network management is reliability of network operation.

The Simple Network Management Protocol (SNMP) has become established in existing networks as the de-facto standard for the maintenance and monitoring of network components and their functions. PROFINET uses this standard and provides users with the option of servicing networks using familiar tools such as the SINEMA Server network management software.

In order to facilitate the maintenance of PROFINET devices, both locally and also remotely via a secure VPN connection, application-specific Web sites in the familiar HTML standard can be created on the integral Web server of the field devices.

### Energy efficiency

Moving toward the green factory: PROFIenergy is a profile that provides functions and mechanisms for PROFINET field devices that support energy-efficient production.

The vendor and device-independent profile defined by PNO allows energy consumption and costs to be significantly reduced: PROFIenergy enables specific loads that are not required to be switched off. This noticeably reduces energy costs during pauses in production. PROFIenergy facilitates automated activation and deactivation of technologically related plant sections. The coordination is performed centrally by means of a higher-level controller, and the networking via PROFINET. This means that during long pauses, as much energy as possible is saved. Plant sections that are switched off for short periods contribute to the even distribution and most efficient use of energy.

The use of PROFIenergy is made easier for the machine builder by its integration into well-known series of products. In addition, PROFIenergy is defined in such a way that the necessary function blocks can be integrated into existing automation systems at a later date.

### Easy cabling

Stringent demands are placed on the installation of cables in the industrial environment. There is also the requirement to set up error-free industry-standard networks in the shortest possible time without specialist knowledge.

Siemens offers FastConnect, a system that meets all these requirements: FastConnect is the standards-compliant, industry-standard cabling system consisting of cables, connectors, and assembly tools for PROFINET networks. The time spent for connecting the terminal devices is minimized thanks to the easy installation using only a single tool, and installation errors can be avoided thanks to the practical color-coding. Both copper cables and glass fiber-optic cables can be assembled on-site in this way.

## PROFINET

### Overview

#### Fast device replacement

PROFINET devices are identified via a name that is assigned in the configuration. When replacing a defective device, a new device can be recognized by the IO Controller by means of topology information and have a name automatically assigned to it. An engineering tool is therefore not required when replacing devices.

This mechanism can also be used during the initial commissioning of a complete plant. Quick commissioning is thus especially possible for series machines.

#### Ruggedness

An automation network must be able to withstand most external sources of interference. The use of Switched Ethernet prevents faults in one section of the network from influencing the entire plant network. PROFINET enables the use of fiber-optic cables especially for areas that are critically sensitive to EMI.

#### Performance

Productivity and product quality determine market success. Precise motion control, dynamic drives, high-speed controllers, and the deterministic synchronization of devices are therefore key factors in achieving superior production. They allow high production speeds and simultaneously optimized product quality.

#### Speed and precision

Fast motion control applications need precise and deterministic data exchange. This is implemented thanks to isochronous drive controls using Isochronous Real-Time (IRT).

PROFINET permits high-speed and deterministic communication due to IRT and isochronous mode. The different cycles of a system (input, network, CPU processing and output) are also synchronized in the case of parallel TCP/IP traffic. PROFINET's short cycle times make it possible to increase the productivity of machines and plants, and to ensure product quality through high precision.

The standardized PROFIdrive drive profile enables vendor-independent communication between CPUs and drives.

#### Large quantity structures

Previous limitations in the scope of the machines and systems to be implemented can be easily overcome through the use of PROFINET. In a network, several controllers can interact with their assigned field devices. The number of field devices per PROFINET network is virtually unlimited – the entire band of IP addresses is available.

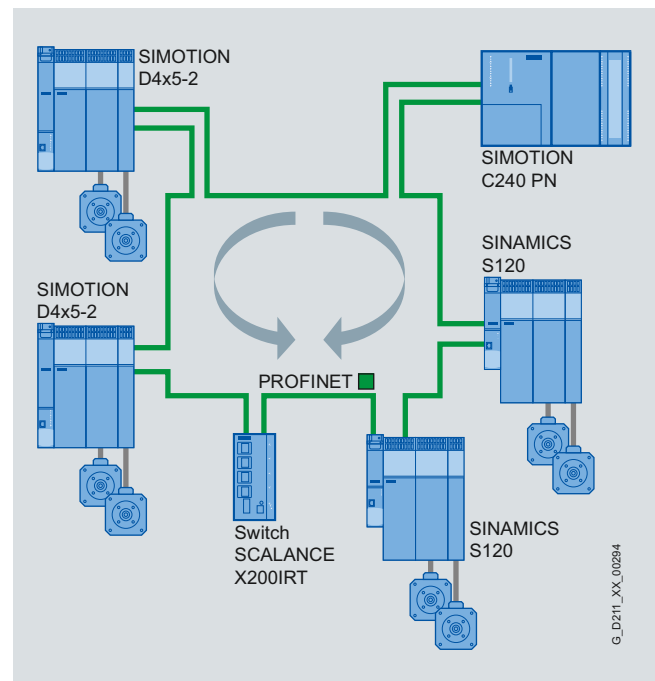
#### High transmission rate

By using 100 Mbit/s in full duplex mode, PROFINET achieves a significantly higher transmission rate than previous fieldbuses. Thanks to this, both the process data and other plant data can be transferred via TCP/IP without any problems. In this way, PROFINET combines the industrial requirements of simultaneously transferring fast IO data and large data quantities for other parts of the application. Even the transfer of large quantities of data such as by cameras does not affect the speed and the precision of the IO data transfer thanks to PROFINET mechanisms.

#### Media redundancy

Higher plant availability can be achieved by means of a redundant installation (ring topology). The media redundancy can be implemented both with the help of external switches and direct via integral PROFINET interfaces. Reconfiguration times of 200 ms can be achieved. In the case of an interruption to the communication in only one part of the ring installation, this means that a plant standstill is prevented and the necessary servicing and repair work can be carried out without time pressure.

For Motion Control applications, PROFINET offers extended media redundancy in ring topologies that operates bumplessly without any reconfiguration delay. In the event of an interruption in communication (due, for example, to a cable break), the process can continue to operate without interruption. This functionality is only currently supported by SIMOTION, SINAMICS S120 and SCALANCE X200IRT.



Bumpless media redundancy with SIMOTION, SINAMICS S120 and SCALANCE X200IRT

### Benefits

- PROFINET is the open Industrial Ethernet standard for automation
- PROFINET is based on Industrial Ethernet
- PROFINET uses TCP/IP and IT standards
- PROFINET is Real-Time Ethernet
- PROFINET permits seamless integration of fieldbus systems
- PROFINET supports fail-safe communication via PROFI-safe over IWLAN as well

### More information

Further information can be found at [www.siemens.com/profinet](http://www.siemens.com/profinet)

## Overview

## PROFINET – Functions of SIMOTION motion controllers

SIMOTION device	C240 PN	D410-2 DP/PN	D425-2 DP/PN	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN	P350-3	P320-3
Number of PROFINET interfaces	1	1	1 ... 2 (second interface is an option)	1 ... 2 (second interface is an option)	1 ... 2 (second interface is an option)	1 ... 2 (second interface is an option)	1	1
<b>Interface 1</b>								
PROFINET with IRT (isochronous mode)	✓	✓	✓	✓	✓	✓	✓	✓
Number of ports	3	2	3	3	3	3	4	3
Max. number of devices	64	64	64	64	64	64	64	64
Min. send clock in ms	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25
I-Device	✓	✓	✓	✓	✓	✓	✓	✓
Bumpless media redundancy (MRPD) <sup>1)</sup>	✓	–	✓	✓	✓	✓	–	✓
Step-change media redundancy (MRP)	✓	–	✓	✓	✓	✓	–	✓
PROFIsafe routing	✓	✓	✓	✓	✓	✓	✓	✓
PROFInergy (as controller)	✓	✓	✓	✓	✓	✓	✓	✓
<b>Interface 2 (option)<sup>2)</sup></b>								
PROFINET with IRT (isochronous mode)	–	–	✓	✓	✓	✓	–	–
Number of ports (CBE30-2 option board)	–	–	4	4	4	4	–	–
Max. number of devices	–	–	64	64	64	64	–	–
Min. send clock in ms	–	–	0.25	0.25	0.25	0.25	–	–
I-Device	–	–	✓	✓	✓	✓	–	–
Bumpless media redundancy (MRPD)	–	–	✓	✓	✓	✓	–	–
Step-change media redundancy (MRP)	–	–	✓	✓	✓	✓	–	–
PROFIsafe routing	–	–	✓	✓	✓	✓	–	–
PROFInergy (as controller)	–	–	✓	✓	✓	✓	–	–

<sup>1)</sup> To establish bumpless media redundancy (MRPD), a separate switch from the SCALANCE X200IRT series is required.

<sup>2)</sup> Optional second PROFINET interface over CBE30-2 (4 ports).

## PROFINET for SIMOTION and SINAMICS S120

### Overview

#### PROFINET – Functions of the SINAMICS S120 Control Units

SINAMICS S120	CU320-2 PN	CU320-2 DP (CBE20)	CU310-2 PN
PROFINET with IRT (isochronous mode)	✓	✓	✓
Number of ports	2	4	2
Min. send clock in ms	0.25	0.5	0.25
Shared device	✓	✓	✓
Bumpless media redundancy (MRPD)	✓	✓	✓
Step-change media redundancy (MRP)	✓	✓	✓
PROFIsafe	✓	✓	✓
PROFenergy	✓	✓	✓
PROFdrive	✓	✓	✓

#### PROFINET – Functions of SIMOTION TMC compact I/O

SIMOTION TMC compact I/O	TMC1x80 PN	TMC2x40 PN
PROFINET with IRT (isochronous mode)	✓	✓
Number of ports	2	2
Min. send clock in ms	0.25	0.25
Shared device	–	–
Bumpless media redundancy (MRPD)	–	–
Step-change media redundancy (MRP)	–	–
PROFenergy	–	–

#### PROFINET for SIMOTION and SINAMICS S120

SIMOTION and SINAMICS S120 are fully integrated in the PROFINET communication. Interaction with the following PROFINET components is possible:

- Distributed I/O on SIMOTION
- SIMOTION TMC as distributed compact I/O on a SIMOTION controller
- SINAMICS S120 on SIMATIC S7-CPU or SIMOTION
- SIMOTION as IO-Device on SIMATIC S7-CPU
- Active network components (e.g. SCALANCE) with SIMOTION and SINAMICS S120
- Wireless with SIMOTION and SINAMICS S120

When an automation topology is configured, the real-time classes RT and IRT can be used alongside each other on the same network or cable. It must, however, be noted that not all devices support both real-time classes RT and IRT. For devices that should be synchronized with IRT, it is important that all the PROFINET components that lie in between support the IRT real-time class.

## Overview

### *PROFdrive – The standardized drive interface for PROFIBUS and PROFINET*

PROFdrive defines the device behavior and the access procedure to internal drive data for electrical drives on PROFIBUS and PROFINET, from simple frequency converters up to high-performance servo controllers.

It contains a detailed description of how the communication functions "slave-to-slave communication", "constant bus cycle time" and "isochronous operation" are used for drive applications. In addition, it clearly specifies all device characteristics which influence interfaces connected to a controller over PROFIBUS or PROFINET. This includes the sequence control, encoder interface, standardization of values, definition of standard messages, and access to drive parameters, etc.

The PROFdrive profile supports both central as well as distributed motion control concepts.

### *What are profiles?*

Profiles specify specific properties and responses for devices and systems in automation. In this manner, manufacturers and users pursue the goal of defining common standards. Devices and systems that comply with a multi-vendor profile can interoperate on a fieldbus and can be operated interchangeably to a certain extent.

### *Do different profile types exist?*

A distinction is made between application profiles (general or specific) and system profiles:

- Application profiles (also known as device profiles) mainly refer to devices (e.g. drives) and contain an agreed selection of bus communication modes, as well as specific device applications.
- System profiles describe system classes and include the master functionality, program interfaces and integration methods.

### *Is PROFdrive future-proof?*

PROFdrive has been specified by PROFIBUS and PROFINET International (PI) and has been laid down in IEC 61800-7 as a future-proof standard.

### *The basic philosophy: Keep it simple*

The PROFdrive profile tries to keep the drive interface as simple as possible and free from technology functions. This philosophy ensures that reference models as well as the functionality and performance of the PROFIBUS/PROFINET master have no or very little influence on the drive interface.

### *One drive profile – Different application categories*

The integration of drives into automation solutions depends strongly upon the drive task. To cover the extensive range of drive applications from the simple frequency converter up to highly dynamic, synchronized multi-axis systems with a single profile, PROFdrive defines six application categories which define most drive applications:

- Category 1 – Standard drives (such as pumps, fans, stirring units, etc.)
- Category 2 – Standard drives with technology functions
- Category 3 – Positioning drives
- Category 4 – Motion control drives with central, higher-level motion control intelligence and the patented "Dynamic Servo Control" position control concept
- Category 5 – Motion control drives with central, higher-level motion control intelligence and position setpoint interface
- Category 6 – Motion control drives with distributed motion control intelligence integrated in the drives

## PROFIdrive

### Design

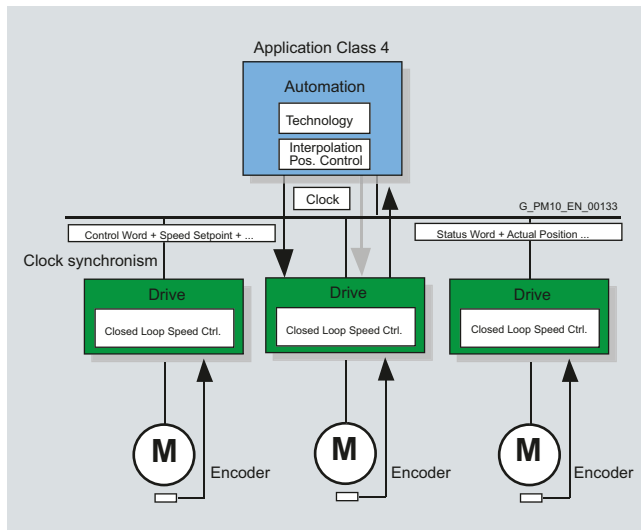
#### The PROFIdrive device model

PROFIdrive defines a device model based on function modules which cooperate in the device and generate the intelligence of the drive system. These modules have objects assigned to them which are described in the profile and are defined with respect to their functions. The overall functionality of a drive is therefore described through the sum of its parameters.

In contrast to other drive profiles, PROFIdrive defines only the access mechanisms to the parameters as well as a few profile parameters (about 30) such as the fault buffer, drive control and device identification.

All other parameters are vendor-specific which gives drive manufacturers great flexibility with respect to implementing control functions. The elements of a parameter are accessed acyclically over data records.

As a communication protocol, PROFIdrive uses DP-V0, DP-V1, and the DP-V2 expansions for PROFIBUS including the functions "Slave-to-Slave Communication" and "Isochronous Mode", or PROFINET IO with real-time classes RT and IRT.



#### PROFIdrive for motion control

Category 4 is the most important category for highly dynamic and highly complex motion control tasks. This application category describes in detail the master/slave relationship between the controller and the drives which are connected to each other over PROFIBUS and PROFINET.

The DSC (Dynamic Servo Control) function significantly improves the dynamic response and stiffness of the position control circuit by minimizing the dead times which usually occur for speed setpoint interfaces with an additional, relatively simple feedback network in the drive. The position control loop is closed in the drive which permits very fast position control cycles (e.g. 125 µs for SINAMICS S120) and thus limits dead times exclusively to the control behavior.

#### PROFIdrive for SIMOTION and SINAMICS

In SIMOTION and SINAMICS S120, the drive interface has been implemented according to the PROFIdrive profile V4 and application categories 1 to 4 (category 4 with and without DSC) and is referred to below as the PROFIdrive interface.

When SINAMICS S120 is used on SIMOTION, application category 4 with DSC is used by default.

### More information

Further information can be found at [www.profibus.com](http://www.profibus.com)

See Downloads / Technical descriptions & books / Drives/PROFIdrive / PROFIdrive Technology and Application – System Description



# SINAMICS S120 drive system











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# SINAMICS S120 drive system

## Overview

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	Double Motor Modules in booksize format	Two-axis DC/AC devices 2 x 3 ... 18 A (2 x 1.6 ... 9.7 kW)	<b>3/171</b>
<b>DC link components</b>			
	Braking Module in booksize compact format	For bringing the drive to a controlled standstill in the event of a power failure or limiting the voltage during generating operation	<b>3/178</b>
	Braking Module in booksize format	For bringing the drive to a controlled standstill in the event of a power failure or limiting the voltage during generating operation	<b>3/180</b>
	Braking Modules in chassis format	For bringing the drive to a controlled standstill in the event of a power failure or limiting the voltage during generating operation	<b>3/182</b>
	Braking resistors for blocksize format	8.2 ... 390 Ω	<b>3/186</b>
	Braking resistors for booksize format	5.7 ... 17 Ω	<b>3/188</b>
	Braking resistors for chassis format	2.2 ... 9.8 Ω	<b>3/190</b>
	Capacitor Module in booksize format	For bridging momentary power failures	<b>3/193</b>
	Control Supply Module in booksize format	24 V power supply, fed from the line and DC link	<b>3/194</b>
	DC link adapter for booksize format	For external supply of DC link voltage	<b>3/196</b>
	Voltage Clamping Module in booksize format	For oscillation damping of long cables	<b>3/197</b>
<b>Load-side power components</b>			
	Motor reactors for blocksize format	For reducing the voltage loading and increasing the motor cable length	<b>3/198</b>
	Motor reactors for booksize format		<b>3/201</b>
	Motor reactors for chassis format		<b>3/203</b>
	Sine-wave filter for chassis format	For producing virtually sinusoidal motor voltages	<b>3/207</b>
<b>Supplementary system components</b>			
	BOP20 Basic Operator Panel	Operator panel, two-line display	<b>3/209</b>
	CBC10 Communication Board	Option board for CU320-2 with CAN interface	<b>3/210</b>
	CBE20 Communication Board	Option board for CU320-2 with PROFINET interface	<b>3/211</b>
	CUA31 Control Unit adapter	Adapter for operating the Power Modules in blocksize format from a multi-axis CU320-2 Control Unit	<b>3/212</b>
	CUA32 Control Unit Adapter		<b>3/214</b>
	DMC20 DRIVE-CLiQ Hub Module	For the distribution of a DRIVE-CLiQ line, IP20	<b>3/216</b>
	DME20 DRIVE-CLiQ Hub Module	For the distribution of a DRIVE-CLiQ line, IP67	<b>3/218</b>
	TB30 Terminal Board	Option board for CU320-2 for the extension of the digital and analog inputs and outputs	<b>3/219</b>
	TM15 Terminal Module	Extension of the digital inputs and outputs	<b>3/221</b>
	TM31 Terminal Module	Extension of the digital inputs and outputs and analog inputs and outputs	<b>3/223</b>
	TM41 Terminal Module	Incremental encoder simulation and extension of the digital inputs/outputs and analog inputs	<b>3/226</b>
	TM54F Terminal Module	Safe activation of the Safety Integrated functions	<b>3/229</b>
	TM120 Terminal Module	Potential-controlled evaluation of 4 temperature sensors	<b>3/232</b>
	TM150 Terminal Module	DRIVE-CLiQ component for temperature evaluation	<b>3/234</b>
	VSM10 Voltage Sensing Module	Detection of exact line voltage conditions	<b>3/236</b>
Safe Brake Relay	Safe activation of a motor holding brake on Power Modules in blocksize format	<b>3/238</b>	
Safe Brake Adapter SBA	Safe brake activation for Motor Modules and Power Modules in chassis format	<b>3/239</b>	
<b>Encoder system connection</b>			
	SMC10 Sensor Module Cabinet-Mounted	Evaluation of a resolver	<b>3/242</b>
	SMC20 Sensor Module Cabinet-Mounted	Evaluation of an encoder with sin/cos signals or EnDat absolute encoder or an SSI encoder	<b>3/243</b>
	SMC30 Sensor Module Cabinet-Mounted	Evaluation of an incremental encoder with TTL or HTL signals or an SSI encoder	<b>3/244</b>
	SME20/SME25 Sensor Modules External	Encoder evaluation units for machine encoders	<b>3/245</b>
	SME120/SME125 Sensor Modules External	Encoder evaluation units for linear and torque motors	<b>3/247</b>

# SINAMICS S120 drive system

## System overview

### Overview

With its separate power units and Control Units, the SINAMICS S120 drive system can be perfectly adapted to a wide variety of different drive tasks.

The Control Unit is selected according to the number of drives to be controlled and the required performance level, while the power unit must be rated to meet the energy requirements of the system. The connection between the Control Unit and power unit is made very simply using the digital system interface DRIVE-CLiQ.

### Control Units



CU310-2 PN and SIMOTION D4x5-2 Control Units

### CU310-2 DP and CU310-2 PN Control Units

CU310-2 Control Units are designed to control a single drive. They feature as standard a PROFIBUS interface (CU310-2 DP) or PROFINET interface (CU310-2 PN) and a TTL/HTL encoder evaluation circuit.

### CU320-2 Control Unit

The CU320-2 Control Unit has been designed to control multiple drives. A CU320-2 Control Unit is capable of operating up to

- 12 drives in V/f control mode or
- 6 drives in Servo or Vector control mode.

The CU320-2 Control Unit can be used to control a group of single drives and implement basic drive technology functions.

### SIMOTION D Control Units

A SIMOTION D Control Unit is used for applications requiring coordinated Motion Control such as synchronous operation, electronic gear, cam disk or complex technology functions. SIMOTION D Control Units are available in a range of performance variants:

- SIMOTION D410-2 for controlling 1 to 3 axes
- SIMOTION D425-2 for controlling up to 16 axes
- SIMOTION D435-2 for controlling up to 32 axes
- SIMOTION D445-2 for controlling up to 64 axes
- SIMOTION D455-2 for controlling up to 128 axes

The STARTER commissioning tool is used to commission and diagnose the various types of SINAMICS drives through the Control Units. The SCOUT engineering system, which includes the STARTER tool, is required for SIMOTION D Control Units.

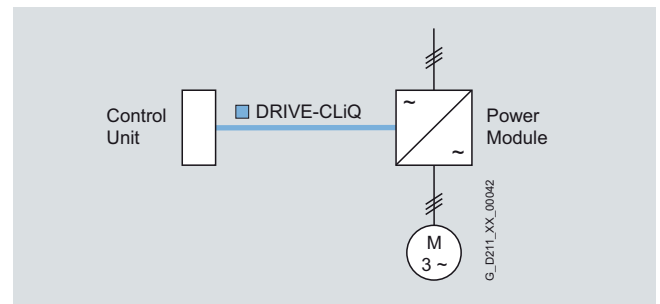
For further information about STARTER and SCOUT, see [Engineering software and chapter SIMOTION Motion Control System](#).

### Power Modules

The stand-alone version of a SINAMICS S120 drive system consists of a CU310-2 Control Unit and a Power Module. A mains rectifier, a voltage-source DC link and an inverter for supplying a motor are integrated in the Power Module.



Power Module in blocksize format with CU310-2 Control Unit



Power Modules are designed for single drives which are not capable of regenerating energy to the supply. Generated energy produced during braking can be converted to heat via braking resistors.

Power Modules can also be operated by a CU320-2 Control Unit, SIMOTION D4x5-2 or CX32-2 Controller Extension, e.g. in configurations where a single drive has been added to a multi-axis drive group. In this case, the Power Modules in blocksize format must be equipped with the CUA31/CUA32 Control Unit Adapter. This is connected with the CU320-2 Control Unit, SIMOTION D4x5-2 or CX32-2 Controller Extension using DRIVE-CLiQ. Power Modules in chassis format can be directly connected to the multi-axis Control Unit using a DRIVE-CLiQ cable.

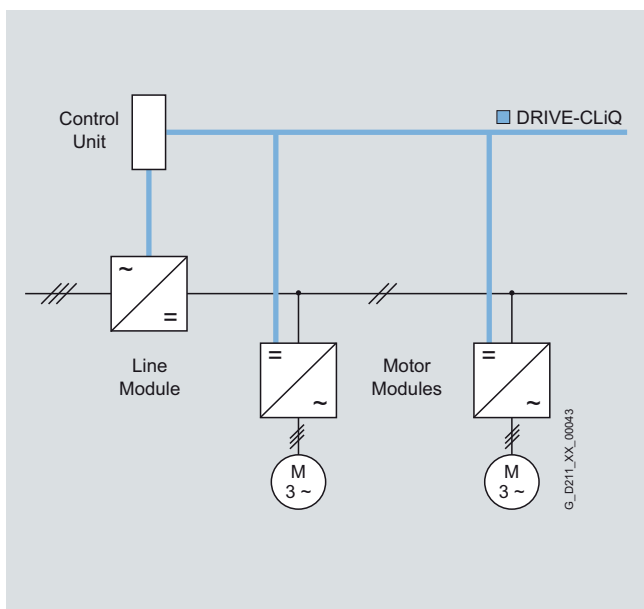
### Overview (continued)

#### Motor Modules

A voltage-source DC link and an inverter for supplying a motor are integrated in the Motor Module.



CU320-2 Control Unit, Line Module and three Motor Modules in booksize format



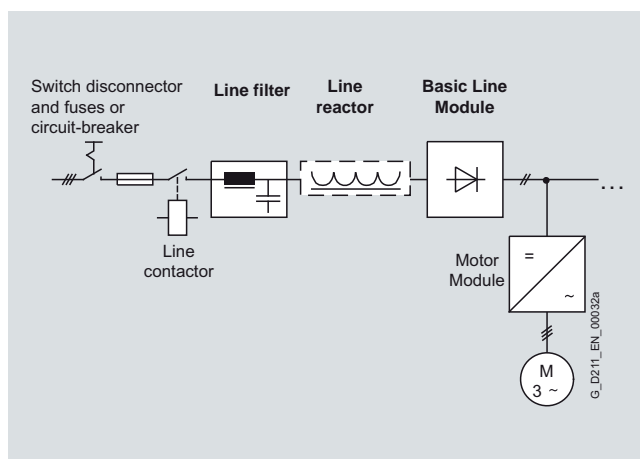
Motor Modules are designed for multi-axis drive systems and are controlled by a CU320-2 Control Unit, a SIMOTION D4x5-2 or CX32-2 Controller Extension. Motor Modules are interconnected by means of a shared DC busbar. Since the Motor Modules have a common DC link, they can exchange energy with one another, i.e. if one Motor Module operating in generator mode produces energy, the energy can be used by another Motor Module operating in motor mode. The voltage-source DC link is supplied with main line voltage by a Line Module.

#### Line Modules

Line Modules generate a DC voltage from the line voltage and supply Motor Modules with energy via the voltage-source DC link.

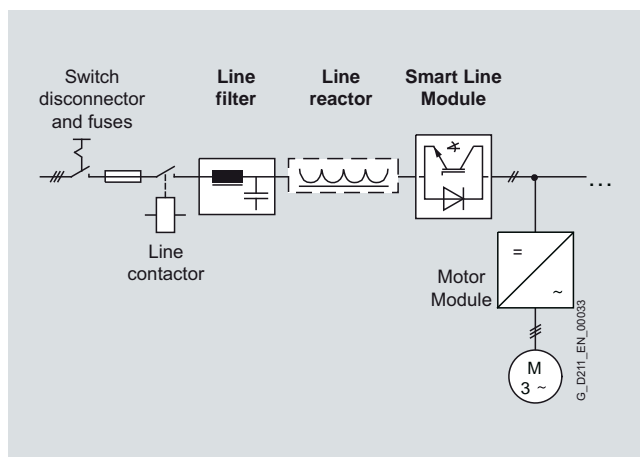
##### Basic Line Modules

Basic Line Modules are designed only for infeed operation, i.e. they are not capable of feeding regenerative energy back into the supply system. If regenerative energy is produced, e.g. when drives brake, it must be converted to heat by means of a Braking Module and a braking resistor. When a Basic Line Module is used as the infeed, the matching line reactor must be installed. A line filter can be installed optionally in order to restrict conducted interference to Class C2 limits (EN 61800-3).



##### Smart Line Modules

Smart Line Modules can supply energy and return regenerative energy to the supply system. A Braking Module and braking resistor are required only if the drives need to be decelerated in a controlled manner after a power failure (when energy cannot be recovered to the supply). When a Smart Line Module is used as the infeed, the matching line reactor must be installed. A line filter can be installed optionally in order to restrict conducted interference to Class C2 limits (EN 61800-3).



# SINAMICS S120 drive system

## System overview

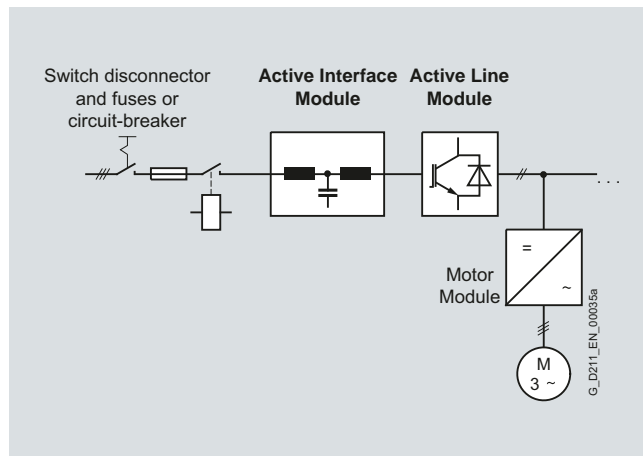
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### Overview (continued)

#### Active Line Modules

Active Line Modules can supply energy and return regenerative energy to the supply system. A Braking Module and braking resistor are required only if the drives need to be decelerated in a controlled manner after a power failure (when energy cannot be recovered to the supply). In contrast to Basic Line Modules and Smart Line Modules, however, Active Line Modules generate a regulated DC voltage which remains constant despite fluctuations in the line voltage. In this case, the line voltage must remain within the permissible tolerance range. Active Line Modules draw a virtually sinusoidal current from the supply which limits any harmful harmonics.

In order to operate an Active Line Module, it is absolutely essential to use the Active Interface Module for the appropriate rating. A line filter can be installed optionally in order to restrict conducted interference to Class C2 limits (EN 61800-3).



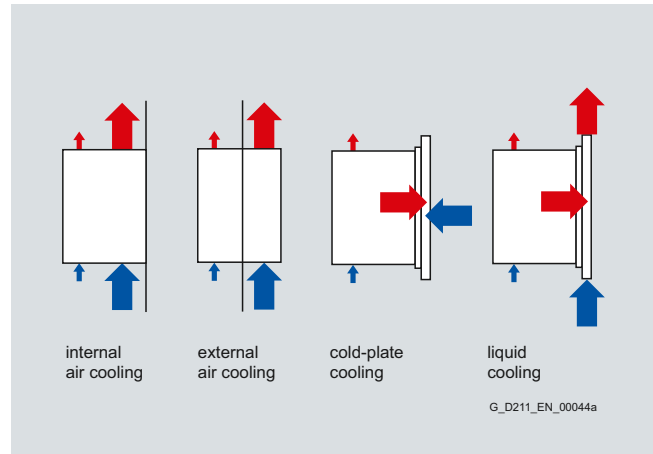
Please refer to chapter [System description – Dimensioning for more information about designing a drive system with SINAMICS S120](#).

Power Modules, Motor Modules and Line Modules are available in booksize, booksize compact, blocksize and chassis format:

- Power Modules in blocksize and chassis format
- Motor Modules and Line Modules in booksize, booksize compact and chassis format.

#### Type of cooling

Depending on the frame size, there are several cooling options:



#### Internal air cooling

In this standard solution, the power loss from the electronics and power units of the drive components is removed by natural cooling or by a forced-ventilation system and routed to the interior of the control cabinet.

#### External air cooling

External air cooling uses the "through-hole" method. The components' power unit heat sinks pass through the mounting surface in the control cabinet and can thus release the heat losses of the power circuit to a separate external cooling circuit. The only heat loss that remains in the cabinet is that emitted by the electronics. Degree of protection IP54 can be achieved at this "mechanical interface" – the external heat sink. The heat sink, with its cooling fins and the fan unit (part of the scope of supply), protrudes through the back into a separate ventilation duct, which can also open outwards.

#### Cold plate cooling

Units designed with cold plate cooling can pass the power unit heat losses to an external heat sink via a thermal interface on the unit's rear panel. This external heat sink is water-cooled, for example.

#### Liquid cooling

On liquid-cooled units, the power semiconductors are mounted on a heat sink through which the cooling medium flows. Most of the heat produced by the unit is absorbed by the cooling medium and can be dissipated outside the control cabinet.

### Overview (continued)

#### Customized applications

The devices can be purchased in the different formats as a complete system solution. The user profits from the know-how of the drive specialists and no longer has to consider the thermal design of the application. Especially in applications with devices that use cold plate cooling, external air cooling and liquid-cooled devices in chassis format, the user obtains a technically reliable solution and saves time on engineering. The system solution ranges, for example, from a drive line-up in booksize format with cold plate cooling completely installed on a common cooling plate through to complete control cabinets with a cooling system and temperature/condensation control.

[Further information on request.](#)

#### Energy efficiency

The SINAMICS S120 drive system saves energy by recovering energy from the axes and using it within the DC link group of a multi-axis configuration and by feeding it back into the supply system. Even at full infeed capacity, no unnecessary heat is generated in the control cabinet.

Because the Active Line Modules prevent capacitive and inductive reactive currents, SINAMICS S120 also ensures that no unnecessary power losses occur in the power supply and that no current harmonics occur. This not only prevents detrimental effects on other loads, but it also reduces the heat generated in the control cabinet.

#### System components

System components are divided into the following categories:

- **DC link components**  
e.g. Braking Modules and braking resistors
- **Power components on the output side**  
e.g. motor reactors
- **Supplementary system components**  
e.g. Terminal Modules, Operator Panels and Communication Boards
- **Encoder system interface**  
for connecting various types of encoders to SINAMICS S120

# SINAMICS S120 drive system

## System overview

### Overview (continued)

#### Booksize format

Booksize format units are optimized for multi-axis applications and are mounted adjacent to one another. The connection for the shared voltage-source DC link is an integral feature. The booksize format offers the full range of cooling options: Internal air cooling, external air cooling, cold plate cooling and liquid cooling in some cases.



#### Booksize compact format

Derived from the booksize format we developed the booksize compact format for machines with particularly high requirements for the compactness of their drives. The booksize compact format combines all benefits of the booksize format and provides the same performance with an even smaller overall height and an extended overload capability. The booksize compact format is thus particularly suitable for integration into machines with high dynamic requirements and confined installation conditions.



The booksize compact format has the same design for the cooling methods of internal air cooling and cold plate cooling.

#### Blocksize format

Blocksize format units are optimized for single-axis applications and are supplied only as Power Modules.

The CU310-2 Control Unit can be snapped onto them directly. The units are cooled by internal air cooling or liquid cooling.



#### Chassis format

Higher-output units (approximately 100 kW and above) are constructed in chassis format. These are available as Line Modules, Power Modules and Motor Modules. Chassis format units are cooled by an internal air cooling circuit as standard. For special applications, e.g. for extrusion or marine applications, liquid-cooled devices can be ordered. The CU310-2 Control Unit can be integrated in the Power Modules.





# SINAMICS S120 drive system

## System overview

### Overview (continued)

#### Cabinet Module format

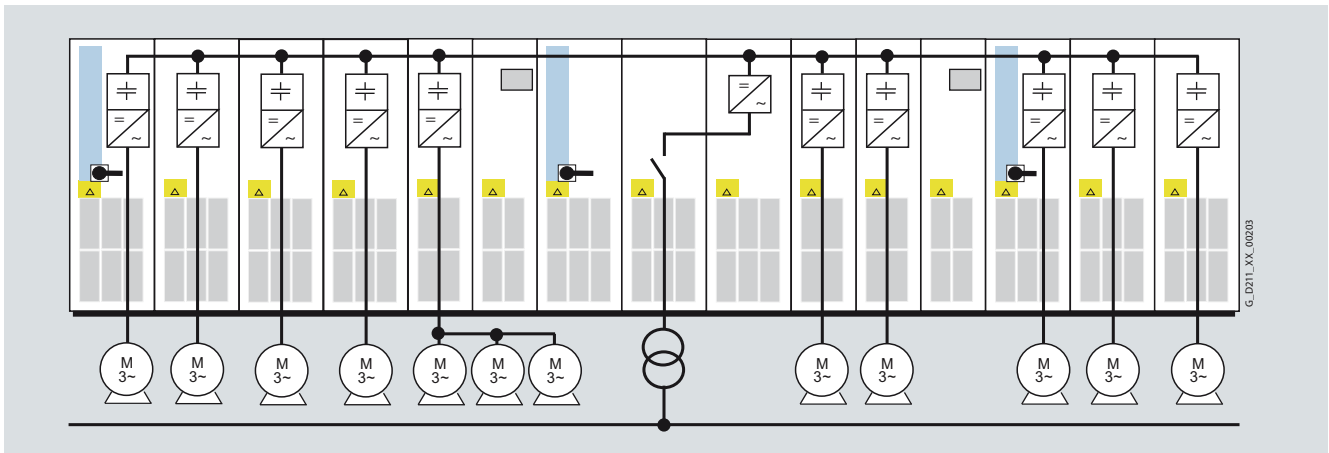
Apart from the built-in converter units described in this catalog, SINAMICS S120 Cabinet Modules represent a cabinet-mounted system that is specially designed for use in plant construction and can be combined with drive cabinet series with a total output of up to 4500 kW (6000 HP).

The modular system is ideally suited to multi-motor drives with a central supply infeed and a common DC busbar, of the type typically used in, for example, paper-making machines, roller mills, test stands, or hoisting gear. The modular concept allows

all components to be combined to meet requirements in a closed cabinet system.

For the Cabinet Modules, apart from Motor Modules, the three Basic Line Module, Smart Line Module and Active Line Module infeeds are available as well as special Braking Modules and Auxiliary Modules. The system is available with the degrees of protection IP20, IP21, IP23, IP43 and IP54. Communication between the Power Modules and the central Control Unit takes place via DRIVE-CLiQ.

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Example of a drive line-up with SINAMICS S120 Cabinet Modules for a multi-motor drive

The power range can be extended as required by means of a parallel connection of up to 4 individual modules.

[Further information is available on request.](#)

# SINAMICS S120 drive system

## General technical specifications

### Technical specifications

Unless specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS S120 drive system.

<b>Electronics power supply</b>	24 V DC, -15 %/+20 %
<b>Vibratory load</b>	
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2M3
- All units and components except for chassis format	
- Chassis format units	Class 2M2
• Operation	
Test values acc. to EN 60068-2-6	Test Fc
	10 ... 58 Hz: Constant deflection 0.075 mm (0.0030 in)
	58 ... 150 Hz: Constant acceleration = 9.81 m/s <sup>2</sup> (1 × g)
<b>Shock stressing</b>	
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2M3
- All units and components except for chassis format	
- Chassis format units	Class 2M2
• Operation	
Test values acc. to EN 60068-2-27	Test Ea
- Booksize and blocksize formats FSA to FSC	147 m/s <sup>2</sup> (15 × g)/11 ms
- Blocksize format FSD to FSF	49 m/s <sup>2</sup> (5 × g)/30 ms
- Chassis format	98 m/s <sup>2</sup> (10 × g)/20 ms
<b>Ambient conditions</b>	
• Protection class acc. to EN 61800-5-1	Class I (with protective conductor system) and Class III (PELV)
• Touch protection	DIN VDE 0106 Part 100 and BGV A 3 when used properly
• Type of cooling	Internal/external air cooling, power units with forced air cooling by means of built-in fan
<b>Permissible ambient/coolant temperature (air) during operation</b>	
• For line-side components, Power Modules, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F), <a href="#">see derating characteristics</a>
• For Control Units, supplementary system components, DC link components, and Sensor Modules	0 ... 55 °C (32 ... 131 °F) up to 2000 m (6562 ft) above sea level
<b>Climatic ambient conditions</b>	
• Storage <sup>1)</sup> acc. to EN 60721-3-1	Class 1K4 Temperature -25 ... +70 °C (-77 ... +158 °F)
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2K4 Temperature -40 ... +70 °C (-104 ... +158 °F) Max. air humidity 95 % at 40 °C (104 °F)
• Operation acc. to EN 60721-3-3	Class 3K3 Temperature 0 ... 55 °C (32 ... 131 °F) Condensation, splashwater, and ice formation are not permitted (EN 60204, Part 1)
<b>Environmental class/harmful chemical substances</b>	
• Storage <sup>1)</sup> acc. to EN 60721-3-1	Class 1C2
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2C2
• Operation acc. to EN 60721-3-3	Class 3C2
<b>Organic/biological influences</b>	
• Storage <sup>1)</sup> acc. to EN 60721-3-1	Class 1B1
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2B1
• Operation acc. to EN 60721-3-3	Class 3B1
<b>Degree of contamination</b> acc. to EN 61800-5-1	2

### European standards

EN 954-1	Safety of machinery – safety-related parts of control systems; Part 1: General design principles
EN 61508-1	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements
EN 50370-1	Electromagnetic compatibility (EMC) – Product family standard for machine tools Part 1: Radiated interference
EN 55011	Industrial, scientific and medical high-frequency devices (ISM devices) – radio interference – limit values and measuring techniques
EN 60204-1	Electrical equipment of machines Part 1: General definitions
EN 61800-3	Variable-speed electric drives Part 3: EMC product standard including specific test methods
EN 61800-5-1	Adjustable-speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements

### North American standards

UL508C	Power Conversion Equipment
CSA C22.2 No. 14	Industrial Control Equipment

### Approvals

cULus	Testing by UL (Underwriters Laboratories, <a href="http://www.ul.com">www.ul.com</a> ) according to UL and CSA standards
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### More information

For satisfactory and reliable operation of the drive system, original components of the SINAMICS system and the original Siemens accessories as described in this Catalog and the Configuration Manuals, in the functional descriptions or user manuals should be used.

The user must observe the configuring instructions.

Combinations that differ from the configuring instructions (also in conjunction with non-Siemens products) require a special agreement.

If no original components are used, for example, for repairs, approvals such as UL, EN and Safety Integrated can become invalid and thus the operation authorization for the machine with the non-Siemens components installed becomes invalid.

All of the approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated etc. have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals. The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose. In other cases, the vendor of these products is responsible for arranging that new certificates are issued.

[Please refer to chapter System description – Dimensioning for more engineering guidance to design a drive system with SINAMICS S120.](#)

**Note:** The products described in this catalog may cause high-frequency disturbances in a residential environment and necessitate the implementation of interference-suppression measures.

### Overview

#### Innovative system architecture with a central Control Unit

Electronically coordinated single drives work together to perform your drive tasks. Higher-level controllers operate the drives to achieve the required coordinated movement. This requires cyclic data exchange between the controller and the drives. This exchange usually took place via a field bus, which required a great deal of time and effort for installation and configuration. SINAMICS S120 takes a different approach: A central Control Unit controls the drives for all connected axes and also establishes the technological links between the drives and/or axes. Since all the required data is stored in the central Control Unit, it does not need to be transferred. Inter-axis connections can be established within a Control Unit and easily configured in the STARTER commissioning tool using a mouse.

- Simple technological tasks can be carried out automatically by the SINAMICS S120 Control Unit
- The **CU310-2 DP** or **CU310-2 PN** Control Unit are available for single drives
- The **CU320-2** Control Unit is designed for multi-axis applications
- Sophisticated Motion Control tasks can be implemented with the support of the more powerful **D410-2**, **D425-2**, **D435-2**, **D445-2** and **D455-2** Control Units of **SIMOTION D** (graded according to performance)

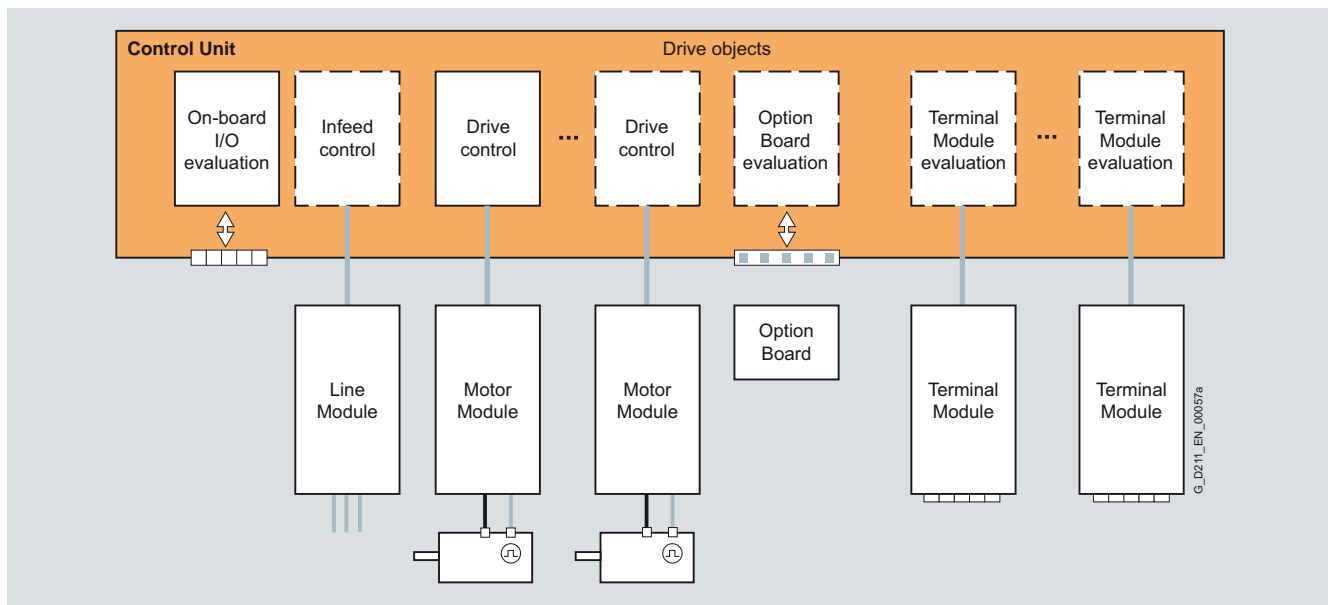
Each of these Control Units is based on an object-oriented SINAMICS S120 standard firmware which contains all of the most popular control modes and can be scaled to meet even the most advanced performance requirements.

The drive controls are supplied as ready-to-configure drive objects:

- Infeed Control for line infeed,
- Vector Control for the broad scope of rugged asynchronous (induction) motor applications
- Servo Control for permanent-field synchronous motors with demanding dynamic requirements
- $V/f$  control modes for simple applications such as group drives with SIEMOSYN motors

#### Drive objects

A drive object is a self-contained software function with its own parameters and, if necessary, its own fault messages and alarms.



#### Extended technology with SIMOTION

SIMOTION D Control Units support the coordinated Motion Control of multiple drives. Technology objects are implemented in addition to drive objects on these Control Units. These are grouped to form technology packages and make available extended Motion Control functions (e.g. synchronous operation, cam disk, path interpolation and others) or technological functions (e.g. a cam controller, a temperature or pressure control). The IEC 61131-3-compliant PLC integrated in SIMOTION D Control Units means that they are not just capable of controlling sequences of motions, but the entire machine including HMI and I/Os.

#### Comprehensive package of open-loop and closed-loop control functions

A wide variety of standard functions such as setpoint input, data set changeover, controller optimization and kinetic buffering ensure a high degree of functional reliability and excellent flexibility of application.

<sup>1)</sup> In transport packaging.

# SINAMICS S120 drive system

## Control Units

### Control Units

#### Overview (continued)

#### Overview of key open-loop and closed-loop control functions

	Closed-loop control types S120	Open-loop control types S120	Main functions S120 for booksize/chassis	Comment, note
<b>Infeed Control</b>	<ul style="list-style-type: none"> <li>• Booksize               <ul style="list-style-type: none"> <li>- Current control with/without mains sensor</li> <li>- <math>V_{DC}</math> control with/without mains sensor</li> </ul> </li> <li>• Chassis               <ul style="list-style-type: none"> <li>- Current control with mains sensor</li> <li>- <math>V_{DC}</math> control with mains sensor</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Booksize/chassis               <ul style="list-style-type: none"> <li>- Basic Mode Rectification only</li> <li>- Smart Mode Rectification and regenerative feedback</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Mains identification</li> <li>• Controller optimization</li> <li>• Harmonics filter</li> <li>• Automatic restart</li> </ul>	The mains sensor is the VSM 10 Voltage Sensing Module; "current" is the line current; 3-phase with line frequency
<b>Vector Control</b>	<ul style="list-style-type: none"> <li>• Asynchronous (induction) motor               <ul style="list-style-type: none"> <li>- Torque control with/without encoder</li> <li>- Speed control with/without encoder</li> </ul> </li> <li>• Torque motor               <ul style="list-style-type: none"> <li>- Torque control with encoder</li> <li>- Speed control with/without encoder</li> </ul> </li> <li>• Asynchronous (induction) motor, torque motor               <ul style="list-style-type: none"> <li>- Position control with encoder</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Linear/parabolic characteristic</li> <li>• Fixed-frequency characteristic (textile)</li> <li>• Independent voltage setpoint input</li> </ul>	<ul style="list-style-type: none"> <li>• Data set changeover</li> <li>• Extended setpoint input</li> <li>• Motor identification</li> <li>• Current/speed controller optimization</li> <li>• Technology controller</li> <li>• Basic positioner</li> <li>• Automatic restart</li> <li>• Flying restart with/without encoder</li> <li>• Kinetic buffering</li> <li>• Synchronization</li> <li>• Droop</li> <li>• Brake control</li> </ul>	<p>Mixed operation with <math>V/f</math> control modes is possible; it is for this reason that the <math>V/f</math> control modes are stored only once in the "Vector control" drive object</p> <p>Position control can be selected as a function module from both Servo and Vector mode.</p> <p>Synchronous motors (1FK and 1FT) and linear motors can be operated only in Servo mode.</p>
<b>Servo Control</b>	<ul style="list-style-type: none"> <li>• Asynchronous (induction) motor               <ul style="list-style-type: none"> <li>- Torque control with encoder</li> <li>- Speed control with/without encoder</li> </ul> </li> <li>• Synchronous motor, linear motor and torque motor               <ul style="list-style-type: none"> <li>- Torque control with encoder</li> <li>- Speed control with encoder</li> </ul> </li> <li>• All motor types               <ul style="list-style-type: none"> <li>- Position control with encoder</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Linear/parabolic characteristic</li> <li>• Fixed-frequency characteristic (textile)</li> <li>• Independent voltage setpoint input</li> </ul>	<ul style="list-style-type: none"> <li>• Data set changeover</li> <li>• Setpoint input</li> <li>• Motor identification</li> <li>• Damping application</li> <li>• Technology controller</li> <li>• Basic positioner</li> <li>• Brake control</li> </ul>	<p>Mixed operation with <math>V/f</math> control modes is possible; it is for this reason that the <math>V/f</math> control modes are stored only once in the "Vector control" drive object</p> <p>Position control can be selected as a function module from both Servo and Vector mode.</p>

### Overview (continued)

#### BICO technology

Every drive object contains a large number of input and output variables which can be freely and independently interconnected using Binector Connector Technology (BICO). A binector is a logic signal which can assume the value 0 or 1. A connector is a numerical value, e.g. the actual speed or current setpoint.

#### Drive Control Chart (DCC)

DCC Drive Control Chart for SINAMICS S120 for simple, graphical configuration of control, logic and calculation functions at the drive level.

It expands the possibilities for easy configuring of technology functions for the SIMOTION Motion Control system as well as for the SINAMICS S120 drive system.

The user-friendly DCC editor supports easy graphical configuration and a clear presentation of control loop structures.

The associated block library contains a large choice of closed-loop control, calculation and logic modules as well as more complex open-loop and closed-loop control functions.

Drive Control Chart for SINAMICS S120 therefore provides a convenient basis for resolving drive-level open-loop and closed-loop control tasks directly in the converter.

#### Function module

The basic positioner EPos can be called on all SINAMICS S120 Control Units as an additionally activatable function module. The basic positioner can be used to resolve basic Motion Control tasks without additional external technological outlay from the drive itself.

The **Technology controller** is designed as a PID controller. It is suitable for implementing controls for regulating variables such as fill level, temperature, tension, pressure, flow rate and dancer position.

#### Integral safety functions (Safety Integrated)

The Control Units support comprehensive safety functions.

The integrated safety functions are the Safety Integrated Basic Functions

- STO = Safe Torque Off
- SBC = Safe Brake Control
- SS1 = Safe Stop 1

and the Safety Integrated Extended Functions that require a license

- SS2 = Safe Stop 2
- SOS = Safe Operating Stop
- SLS = Safely-Limited Speed
- SSM = Safe Speed Monitor
- SDI = Safe Direction
- SLP = Safely-Limited Position

(abbreviations in accordance with IEC 61800-5-2)

If the extended integrated safety functions are used, licenses, supplementary system components such as TM54F terminal modules, or suitable safety controls will be necessary.

For further information on the integrated safety functions see chapter [Safety Integrated](#).

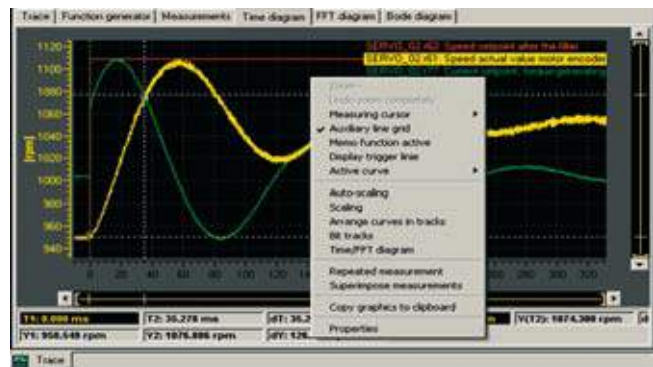
#### CompactFlash card

The functions of the SINAMICS S120 drives are stored on a CompactFlash card. This card contains the firmware and parameter settings for all drives in the form of a project. The CompactFlash card can also hold additional projects, which means that the correct project can be accessed immediately when series machines of different types are commissioned. When the Control Unit has booted, the data on the CompactFlash card are read and loaded to the RAM.

The firmware is organized in objects. Drive objects are used to implement open-loop and closed-loop control functions for Line Modules, Motor Modules, Power Modules and other system components connected by DRIVE-CLiQ.

#### Diagnostics optimally supported by trace function

The time characteristics of input and output variables associated with drive objects can be measured by the integrated trace function and displayed using the STARTER commissioning tool. The trace can record up to 4 signals simultaneously. A recording can be triggered dependent on freely selectable boundary conditions, e.g. the value of an input or output variable.



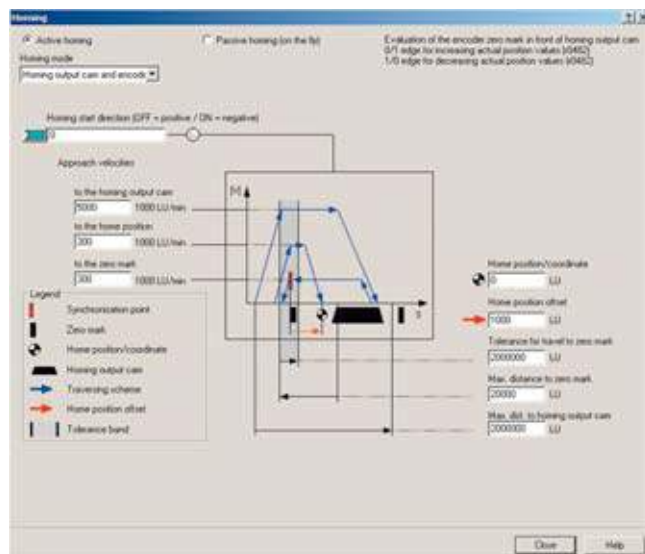
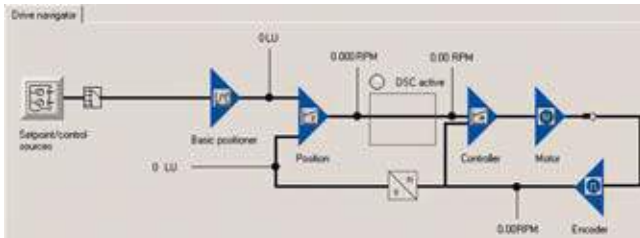
# SINAMICS S120 drive system

## Control Units

### EPos basic positioner

#### Overview

Integrated functionality for absolute and relative positioning of linear and rotary axes with motor encoders or machine encoders.



The EPos basic positioner in the SINAMICS S120 drive system provides powerful and precise positioning functions. Due to its flexibility and adaptability, the basic positioner can be used for a wide range of positioning tasks.

The functions are easy to handle both during commissioning and during operation, and the comprehensive monitoring functions are outstanding.

In many applications, external position controls can thus be dispensed with.

The EPos basic positioner is used to position linear and rotary axes (modulo) in absolute/relative terms with rotary as well as linear motor encoder or machine encoder (indirect or direct measuring system).

EPos is a function module that can be activated in Servo Control and in Vector Control.

User-friendly configuring and commissioning including control panel (operation using PC) and diagnostics with the STARTER commissioning tool.

In addition to extremely flexible positioning functions, EPos offers a high degree of user-friendliness and reliability thanks to integral monitoring and compensation functions.

Different operating modes and their functionality increase flexibility and plant productivity, for example, by means of "on-the-fly" and bumpless correction of the Motion Control.

Preconfigured PROFIdrive positioning frames are available which, when selected, automatically establish the internal "connection" to the basic positioner.

#### Functionality of the EPos basic positioner

Lower-level closed-loop position control with the following essential components

- Position actual value sensing (including the lower-level measuring probe evaluation and reference mark search)
- Position controller (including limits, adaptation and pre-control calculation)
- Monitoring functions (standstill, positioning and dynamic following error monitoring, cam signals)

Mechanical system

- Backlash compensation
- Modulo offset

Limits

- Speed/acceleration/delay/jerk limitation
- Software limit switch (traversing range limitation by means of position setpoint evaluation)
- Stop cams (traversing range limitation by means of hardware limit switch evaluation)

Homing and alignment

- Set reference point (for an axis at standstill that has reached its target position)
- Search for reference (separate mode including reversing cam functionality, automatic reversal of direction, homing to "output cam and encoder zero mark" or only "encoder zero mark" or "external zero mark (BERO)")
- Flying referencing (seamless homing possible during "normal" traversing with the aid of the measuring input evaluation; generally evaluation, e.g. of a BERO. Subordinate function for the modes "jog", "direct setpoint specification/MDI" and "traversing blocks").
- Absolute encoder alignment

Traversing blocks mode (64 traversing blocks)

- Positioning using traversing blocks that can be stored in the drive unit including block change enable conditions and specific tasks for an axis that was previously referenced
- Traversing block editor using STARTER
- A traversing block contains the following information:
  - Job number and job (e.g. positioning, waiting, GOTO set jump, setting of binary outputs, travel to fixed stop)
  - Motion parameters (target position, velocity, override for acceleration and deceleration)
  - Mode (e.g.: hide block, continuation conditions such as "Continue\_with\_stop", "Continue\_flying" and "Continue\_externally using high-speed probe inputs")
  - Job parameters (e.g. wait time, block step conditions)

Direct setpoint input (MDI) mode

- Positioning (absolute, relative) and setting-up (endless closed-loop position control) using direct setpoint inputs (e.g. via the PLC using process data)
- It is always possible to influence the motion parameters during traversing (on-the-fly setpoint acceptance) as well as for on-the-fly change between the setup and positioning modes
- The direct setpoint specification operating mode (MDI) can also be used in the relative positioning or setup mode if the axis is not homed. This means that on-the-fly synchronization and re-homing can be carried out using "flying referencing".

Jog mode

- Closed-loop position-controlled traversing of the axis with the "endless position controlled" or "jog incremental" modes, which can be toggled between (traverse through a "step width")

# SINAMICS S120 drive system

## Control Units

### CU310-2 Control Unit for single-axis drives

#### Overview



CU310-2 PN and CU310-2 DP Control Units

The CU310-2 Control Unit that is designed for the communication and open-loop/closed-loop control functions of a SINAMICS S120 (AC/AC) is combined with the PM340 Power Module to create a powerful single-axis drive. PROFINET (PN) and PROFIBUS (DP) variants are available for fieldbus communication.

#### Design

CU310-2 Control Units feature the following connections and interfaces as standard:

- Fieldbus interface
  - CU310-2 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
  - CU310-2 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
- 1 DRIVE-CLiQ socket for communication with the DRIVE-CLiQ motor or other DRIVE-CLiQ devices (e.g. Sensor Modules or Terminal Modules)
- 1 encoder evaluation for evaluating the following encoder signals
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 1 PE (protective earth) connection
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 temperature sensor input (KTY84-130 or PTC)
- 3 parameterizable, fail-safe (can be used with firmware version 4.5 and higher) digital inputs (isolated) or alternatively 6 parameterizable digital inputs (isolated). The fail-safe digital inputs can be routed, i.e. they can be routed via PROFIsafe to a higher-level controller.
- 5 parameterizable digital inputs (floating)
- 1 parameterizable, fail-safe (can be used with firmware version 4.5 and higher) digital output (isolated) or alternatively 1 digital output (isolated)
- 8 parameterizable bidirectional digital inputs/outputs (non-floating)
- 1 analog input, either  $\pm 10$  V (resolution 12 bit + sign) or  $\pm 20$  mA (11 bit + sign)
- 1 Ethernet interface (socket RJ45) for commissioning and diagnostics
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 1 PM-IF interface for communication with the Power Modules in blocksize format
- 3 test sockets and one reference ground for commissioning support
- 1 interface for the BOP20 Basic Operator Panel

The status of the CU310-2 Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310-2 Control Unit for diagnostic procedures.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

#### Integration

The CU310-2 Control Unit drives Power Modules in blocksize format via the PM-IF interface. DRIVE-CLiQ motors or Sensor Modules (SMC) can also be connected to the integrated DRIVE-CLiQ socket to permit the operation of motors without a DRIVE-CLiQ interface.

Parameters can be changed directly on the device with the BOP20 Basic Operator Panel. The BOP20 Basic Operator Panel can also be snapped onto the CU310-2 Control Unit during operation to perform troubleshooting procedures.

The CU310-2 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310-2 Control Unit requires a CompactFlash card with firmware version V4.5 or higher.

A CU310-2 PN Control Unit communicates with the higher-level control system using PROFINET IO and the PROFIdrive V4 profile.

The SINAMICS S120 drive system with the CU310-2 PN Control Unit then assumes the function of a PROFINET IO device and can perform the following functions:

- PROFINET IO device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real-Time), minimum send cycle 500  $\mu$ s
- Connects to controls as PROFINET IO devices using PROFIdrive compliant with Specification V4
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 2-port switch with two RJ45 sockets based on the ERTEC ASIC. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

A 24 V supply voltage must be connected to terminal X124 for the digital outputs to be used. The CU310-2 Control Unit requires a CompactFlash card with firmware V4.5 or higher.

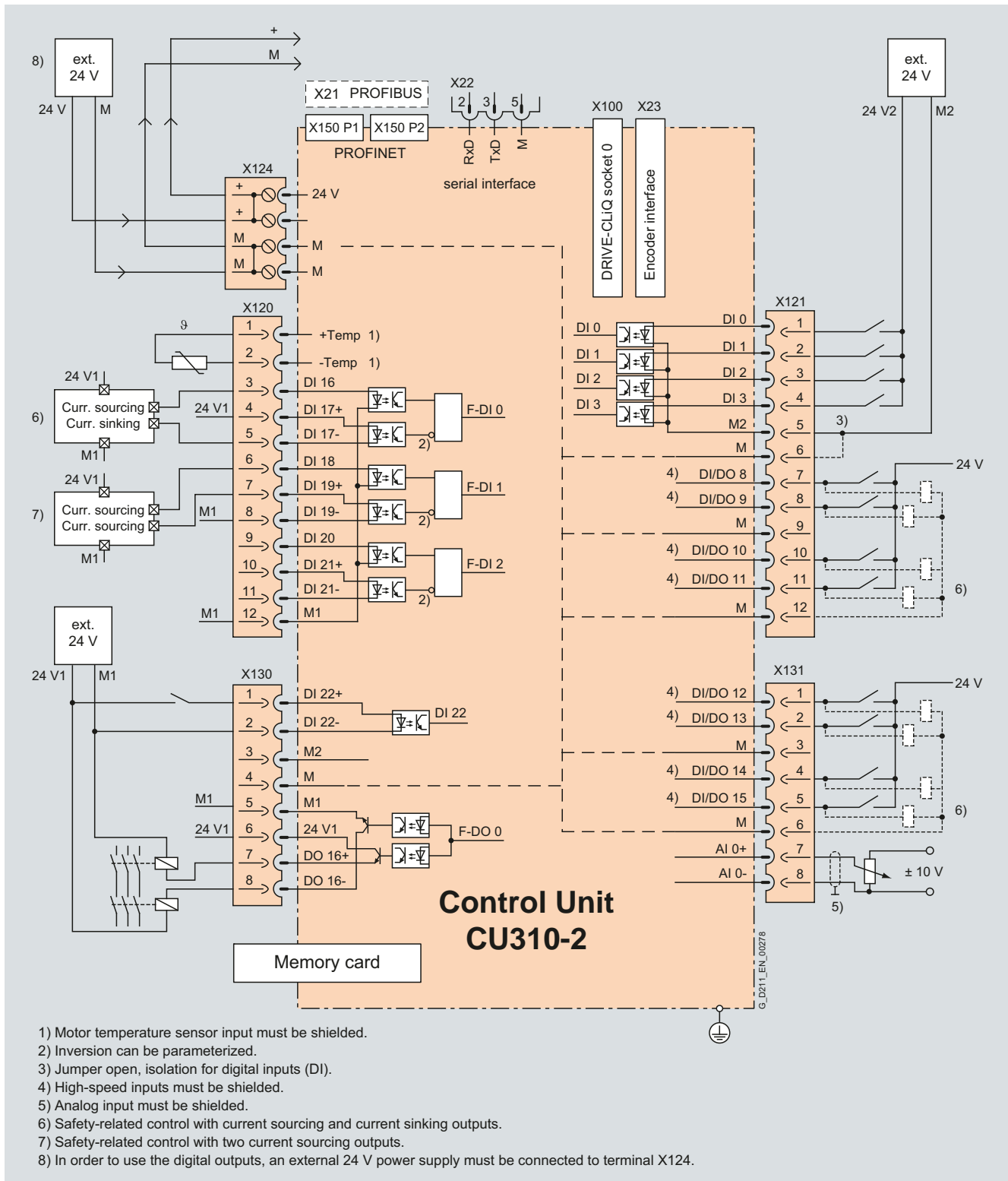
# SINAMICS S120 drive system

## Control Units

### CU310-2 Control Unit for single-axis drives

#### Integration

3



Connection example of CU310-2 Control Unit



#### Technical specifications

<b>CU310-2 Control Unit</b> PROFINET: 6SL3040-1LA01-0AA0 PROFIBUS: 6SL3040-1LA00-0AA0	
<b>Current requirement, max.</b> At 24 V DC, without taking account of digital outputs and DRIVE-CLiQ supply	0.35 A for CU310-2 + 0.5 A for PM340 Power Module
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Fuse protection, max.</b>	20 A
<b>Digital inputs</b>	in accordance with IEC 61131-2 Type 1 5 floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs 3 parameterizable, fail-safe digital inputs (isolated) or alternatively 6 parameteriz- able digital inputs (isolated)
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Delay time of high-speed digital inputs <sup>1)</sup> , approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 μs
- H → L	50 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b> (sustained short-circuit strength)	8 bidirectional non-floating digital outputs/digital inputs
• Voltage	24 V DC
• Load current per digital output <sup>2)</sup> , max.	500 mA
• Delay time <sup>1)</sup> , typ./max.	
- L → H	150 μs/400 μs
- H → L	75 μs/100 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Analog input</b>	1 analog input for current or voltage input, switchable
• Voltage	-10 ... +10 V; $R_i > 100 \Omega$
• Current	-20 ... +20 mA; $R_i > 250 \Omega$
• Max. range that can be resolved	-11 ... +11 V
• Common-mode range	±12 V
• Resolution	13 bit (with respect to the maximum range that can be resolved)

<b>CU310-2 Control Unit</b> PROFINET: 6SL3040-1LA01-0AA0 PROFIBUS: 6SL3040-1LA00-0AA0	
<b>Encoder evaluation</b>	<ul style="list-style-type: none"> <li>• Incremental encoder TTL/HTL</li> <li>• SSI encoder without incremental signals</li> </ul>
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBaud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) <sup>3)</sup>
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals <sup>3)</sup>
- SSI encoder	100 m (328 ft)
<b>Power loss</b>	< 20 W
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	73 mm (2.87 in)
• Height	191 mm (7.52 in)
• Depth	75 mm (2.95 in)
<b>Weight, approx.</b>	0.95 kg (2 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CU310-2 PN Control Unit</b> Without CompactFlash card	<b>6SL3040-1LA01-0AA0</b>
<b>CU310-2 DP Control Unit</b> Without CompactFlash card	<b>6SL3040-1LA00-0AA0</b>
<b>Accessories</b>	
<b>STARTER commissioning tool</b>	<b>6SL3072-0AA00-0AG0</b>
<b>Accessories for re-ordering</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

For information on connectors and cables, please refer to  
Catalog IK PI and the Siemens Industry Mall:  
[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input or output is processed.

<sup>2)</sup> In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

<sup>3)</sup> Signal cables twisted in pairs and shielded.

# SINAMICS S120 drive system

## Control Units

### CompactFlash card for CU310-2

#### Overview



The CompactFlash card contains the firmware and parameter settings. The CompactFlash card is plugged into the appropriate slot on the CU310-2 Control Unit.

#### Design

A CU310-2 Control Unit can perform the communication, open-loop and closed-loop control functions for one Power Module. The performance expansion is not required in this case.

In addition to the firmware, the CompactFlash card also contains licensing codes which are required to enable firmware options (Safety Integrated Extended Functions in the current version). The Safety Integrated Extended Functions must be ordered via the order code **F01** in addition to the order number.

The firmware option can also be enabled on-site, for example, if the Safety Integrated Extended Functions are to be enabled retrospectively. You will need the serial number of the CompactFlash card and the Order No. of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

#### Selection and ordering data

Description	Order No.
<b>CompactFlash card for CU310-2 PN and CU310-2 DP Control Units without safety license</b>	
including Certificate of License	<b>6SL3054-0E</b> ■ <b>00-1BA0</b>
<b>CompactFlash card for CU310-2 PN and CU310-2 DP Control Units with safety license</b>	
including Certificate of License and with safety license	<b>6SL3054-0E</b> ■ <b>00-1BA0-Z F01</b>
Firmware <b>V4.5</b>	<b>F</b>
Firmware <b>V4.6</b>	<b>G</b>
<b>Post-licensing</b>	
Safety Integrated Extended Functions option including Certificate of License for one axis for upgrading the license of a CompactFlash card.	<b>6SL3074-0AA10-0AA0</b>

#### Overview



The communication, open-loop and closed-loop control functions for one or more Motor Modules and the Line Module are executed in a CU320-2 Control Unit. The CU320-2 Control Unit is designed for multi-axis operation.



CU320-2 DP Control Unit with BOP20 Basic Operator Panel

#### Design

CU320-2 Control Units feature the following interfaces as standard:

- 4 × DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ devices, e.g. Motor Modules, Active Line Modules, Sensor Modules, Terminal Modules
- CU320-2 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFDrive V4 profile
- CU320-2 DP: 1 PROFIBUS interface with PROFDrive V4 profile
- 12 parameterizable digital inputs (floating)
- 8 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 interface for the BOP20 Basic Operator Panel
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 1 slot for mounting an option module (e.g. TB30 Terminal Board)
- 2 rotary coding switches for manually setting the PROFIBUS address
- 1 Ethernet interface for commissioning and diagnostics
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection
- 1 ground connection

A shield connection for the signal cable shield on the option module is located on the CU320-2 Control Unit.

The available option slot is used to expand the interfaces, for example, to include additional terminals or for communication purposes.

The status of the CU320-2 Control Unit is indicated via multi-color LEDs.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

The CU320-2 Control Unit can be mounted on the side of the Line Module in booksize format via brackets integrated in a Line Module. The CU320-2 Control Unit can also be fixed to the wall of the control cabinet using the integrated fixing lugs. As the CU320-2 Control Unit is not as deep as the Line Modules, suitable spacers are available to increase the depth of the CU320-2 Control Unit to 270 mm (10.6 in).

#### Integration

DRIVE-CLiQ components, for example, Motor Modules and Active Line Modules, can be connected to a CU320-2 Control Unit. The number of modules depends on the performance required, including duty type and additional functions.

The BOP20 Basic Operator Panel can also be snapped onto the CU320-2 Control Unit during operation to perform troubleshooting procedures.

The CU320-2 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

The CU320-2 PN Control Unit requires a CompactFlash card with firmware V4.4 or higher.

The CU320-2 DP Control Unit requires a CompactFlash card with firmware V4.3 or higher.

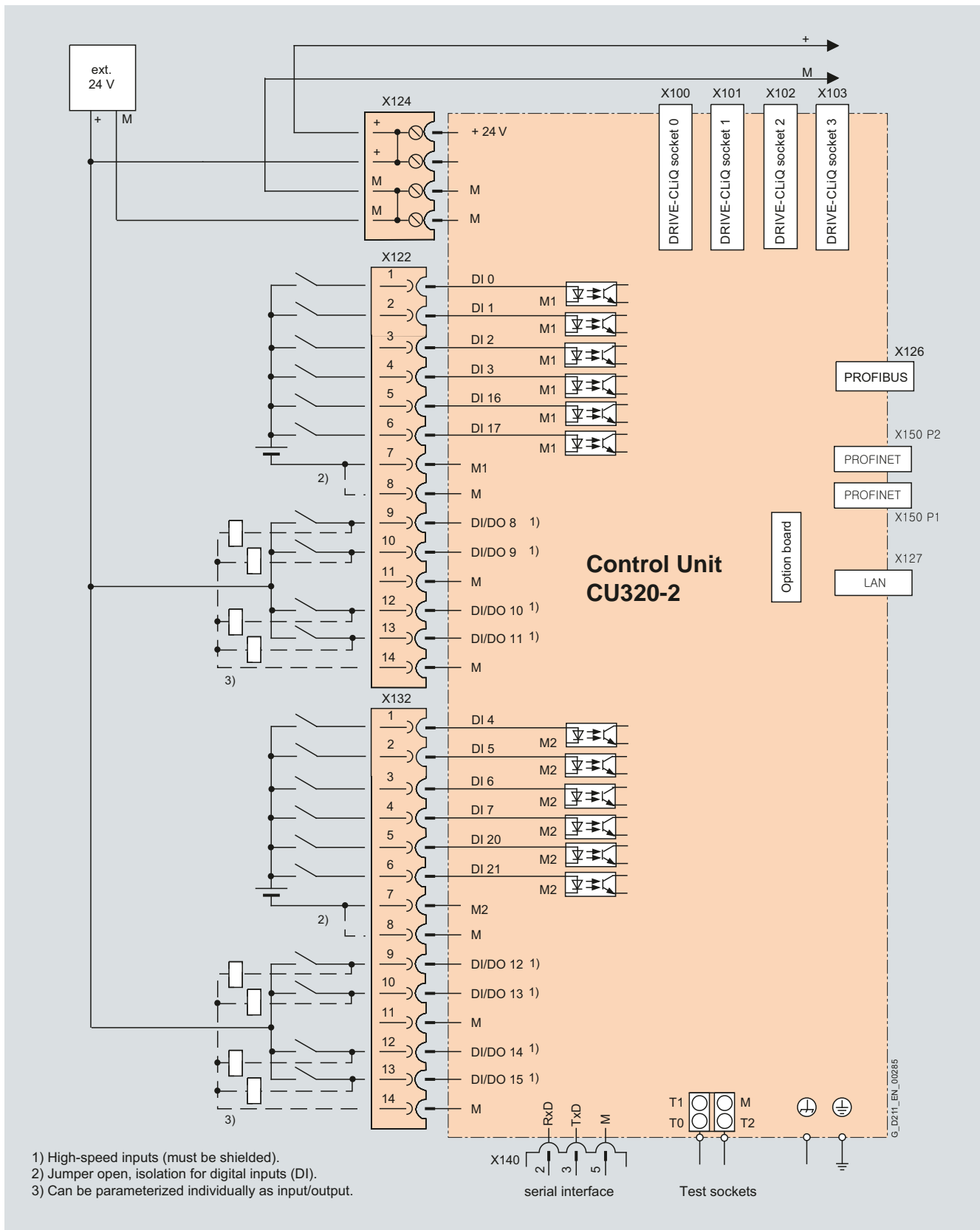
# SINAMICS S120 drive system

## Control Units

### CU320-2 Control Unit

#### Integration (continued)

3



Connection example of a CU320-2 Control Unit

#### Technical specifications

<b>CU320-2 Control Unit</b> PROFINET: 6SL3040-1MA01-0AA0 PROFIBUS: 6SL3040-1MA00-0AA0	
<b>Current requirement, max.</b> At 24 V DC, without taking account of digital outputs, expansion option slot and DRIVE-CLiQ supply	1.0 A
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Fuse protection, max.</b>	20 A
<b>Digital inputs</b>	In accordance with IEC 61131-2 type 1 12 floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	9 mA
• Delay time of digital inputs <sup>1)</sup> , approx.	
- L → H	5 μs
- H → L	50 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b> (sustained short-circuit strength)	8 bidirectional non-floating digital outputs/digital inputs
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Delay time <sup>1)</sup> , typ./max.	
- L → H	150 μs/400 μs
- H → L	75 μs/100 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Power loss</b>	24 W
<b>PE connection</b>	M5 screw
<b>Ground connection</b>	M5 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	300 mm (11.8 in)
• Depth	226 mm (8.90 in)
<b>Weight, approx.</b>	2.3 kg (5 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CU320-2 PN Control Unit</b> Without CompactFlash card	<b>6SL3040-1MA01-0AA0</b>
<b>CU320-2 DP Control Unit</b> Without CompactFlash card	<b>6SL3040-1MA00-0AA0</b>
<b>Accessories</b>	
<b>Spacers</b> (2 units) For increasing the depth of the CU320-2 Control Unit to 270 mm (10.6 in) (if the integrated brackets are not used, but the depth still has to be 270 mm (10.6 in))	<b>6SL3064-1BB00-0AA0</b>
<b>STARTER commissioning tool</b>	<b>6SL3072-0AA00-0AG0</b>
<b>Accessories for re-ordering</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input or output is processed.

# SINAMICS S120 drive system

## Control Units

### CompactFlash card for CU320-2

#### Overview



The CompactFlash card contains the firmware and parameter settings. The CompactFlash card is plugged into the appropriate slot on the CU320-2 Control Unit.

#### Design

A CU320-2 Control Unit can perform the communication, open-loop and closed-loop control functions for several Motor Modules. The computing capacity requirement increases in proportion to the number of connected Motor Modules and system components and in relation to the dynamic response required. The performance expansion is required for the CU320-2 Control Unit for 4 axes or more. The utilization of the CU320-2 Control Unit can be calculated with the SIZER configuration tool.

In addition to the firmware, the CompactFlash card also contains licensing codes which are required to enable firmware options (the performance expansion and the Safety Integrated Extended Functions in the current version). To order the Safety Integrated Extended Functions (see [chapter Safety Integrated](#)), order codes must be stated (**F..**) in addition to the Order No. for each axis.

The firmware options can also be enabled on-site, for example, if the performance expansions required are not known at the time of placing the order or the Safety Integrated Extended Functions must be enabled retrospectively. You will need the serial number of the CompactFlash card and the Order No. of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

#### Selection and ordering data

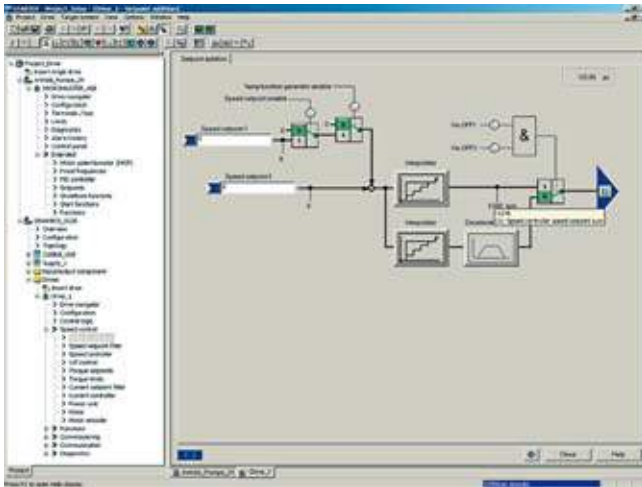
Description	Order No.
<b>CompactFlash card for CU320-2 Control Unit without Safety license</b>	
- Without performance expansion	6SL3054-0E 00-1BA0
- With performance expansion firmware option	6SL3054-0E 01-1BA0
<b>CompactFlash card for CU320-2 Control Unit with Safety license</b>	
• For 1 axis	
- Without performance expansion	6SL3054-0E 00-1BA0-Z F01
- With performance expansion firmware option	6SL3054-0E 01-1BA0-Z F01
• For 2 axes	
- Without performance expansion	6SL3054-0E 00-1BA0-Z F02
- With performance expansion firmware option	6SL3054-0E 01-1BA0-Z F02
• For 3 axes	
- Without performance expansion	6SL3054-0E 00-1BA0-Z F03
- With performance expansion firmware option	6SL3054-0E 01-1BA0-Z F03
• For 4 axes	
- With performance expansion firmware option	6SL3054-0E 01-1BA0-Z F04
• For 5 axes	
- With performance expansion firmware option	6SL3054-0E 01-1BA0-Z F05
• For 6 axes	
- With performance expansion firmware option	6SL3054-0E 01-1BA0-Z F06
Firmware <b>V4.5</b>	F
Firmware <b>V4.6</b>	G
<b>Post-licensing</b>	
• Performance expansion option including Certificate of License for upgrading the license of a CompactFlash card	6SL3074-0AA01-0AA0
• Safety Integrated Extended Functions option including Certificate of License for one axis for upgrading the license of a CompactFlash card. This option must be ordered once for each axis, max. 6x for one CompactFlash card	6SL3074-0AA10-0AA0

# SINAMICS S120 drive system

## Engineering software

### STARTER commissioning tool

#### Overview



The user-friendly STARTER commissioning tool can be used for

- Commissioning
- Optimizing and
- Diagnostics

This software can be operated either as a standalone PC application, integrated in SIMATIC STEP 7 with TIA compatibility via Drive ES Basic, or it can be integrated into the SCOUT engineering system (for SIMOTION). The basic functions and handling are the same in both cases.

In addition to the SINAMICS drives, the STARTER also supports MICROMASTER 4 devices.

The project wizards can be used to create the drives within the structure of the project tree.

Beginners are supported by solution-based dialog guidance, whereby a standard graphics-based display maximizes clarity when setting the drive parameters.

First commissioning is guided by a wizard which makes all the basic settings in the drive. Therefore, getting a motor up and running is merely a question of setting a few of the drive parameters as part of the drive configuration process.

The individual settings required are made using graphics-based parameterization screens, which also precisely visualize the principle of operation of the drive.

Examples of individual settings that can be made include:

- How terminals are used
- Bus interface
- Setpoint channel (e.g. fixed setpoints)
- Closed-loop speed control (e.g., ramp-function generator, limits)
- BICO interconnections
- Diagnostics

For experts, the expert list can be used to specifically and quickly access individual parameters at any time. An individual compilation of frequently used parameters can be saved in dedicated user lists and watch tables.

In addition, the following functions are available for optimization purposes:

- Self-optimization of the controller settings (depending on drive unit)
- Trace (depending on the drive unit, this is not supported for
  - MICROMASTER 4
  - SINAMICS G110
  - SINAMICS G120 < firmware V4.4
  - SINAMICS G110D
  - SINAMICS G120D)

Diagnostics functions provide information about:

- Control/status words
- Parameter status
- Conditions of use
- Communication states

#### Performance features

- User-friendly: Only a small number of settings need to be made for successful first commissioning: The motor starts to rotate
- Solution-oriented dialog-based user guidance simplifies commissioning
- Self-optimization functions reduce manual effort for optimization.

#### Minimum system requirements

The following minimum requirements must be complied with:

- Hardware
  - PG or PC with Pentium III min. 1 GHz (recommended > 1 GHz)
  - Work memory 1 GB (2 GB recommended)
  - Screen resolution 1024 × 768 pixels, 16-bit color depth
  - Free hard disk memory: min. 3 GB
- Software
  - Microsoft Internet Explorer V6.0 or higher
  - 32-bit operating systems:
    - Microsoft Windows Server 2003 SP2
    - Microsoft Windows Server 2008
    - Microsoft Windows XP Professional SP3
    - Microsoft Windows 7 Professional incl. SP1
    - Microsoft Windows 7 Ultimate incl. SP1
    - Microsoft Windows 7 Enterprise incl. SP1 (standard installation)
  - 64-bit operating systems:
    - Microsoft Windows 7 Professional SP1
    - Microsoft Windows 7 Ultimate SP1
    - Microsoft Windows 7 Enterprise SP1 (standard installation)
    - Microsoft Windows Server 2008 R2

#### Selection and ordering data

	Order No.
<b>STARTER commissioning tool</b> for SINAMICS and MICROMASTER	<b>6SL3072-0AA00-0AG0</b>
English/French/German Italian/Spanish	

# SINAMICS S120 drive system

## Engineering software

### STARTER commissioning tool

#### Accessories

##### Connection

Depending on the version of the Control Unit, the Control Unit (CU) of the drive unit can communicate with the programming device (PG) or PC via a serial interface, PROFIBUS, or Ethernet/PROFINET. The following accessories are available for the particular drive system as listed in the following table.

#### More information

Updates for the STARTER commissioning tool are also available on the Internet at [www.siemens.com/starter/downloads](http://www.siemens.com/starter/downloads)

#### Selection and ordering data

		Order No.
• RS232	<b>SIMATIC S7 connecting cable</b> Null modem cable, 6 m (19.7 ft)	<b>6ES7901-1BF00-0XA0</b>
• PROFIBUS	<b>PROFIBUS communication module CP 5512</b> PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/XP Professional and PCMCIA 32	<b>6GK1551-2AA00</b>
	<b>PROFIBUS communication module CP 5711</b> USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m (6.56 ft)) included in scope of supply	<b>6ES7901-4BD00-0XA0</b>
	<b>SIMATIC DP plug-in cable</b> 12 Mbaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	<b>6ES7901-4BD00-0XA0</b>
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–



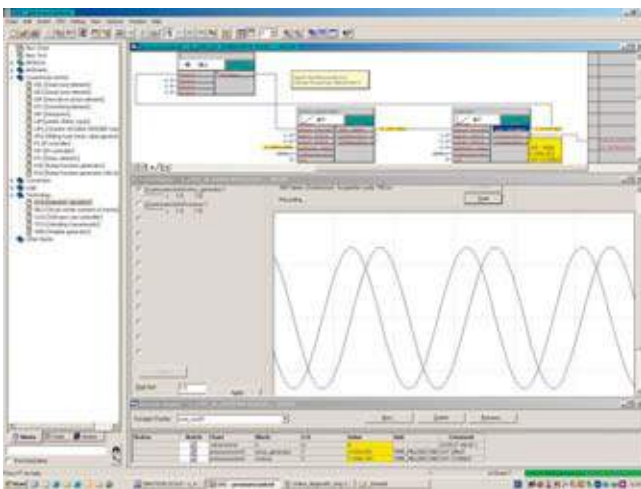
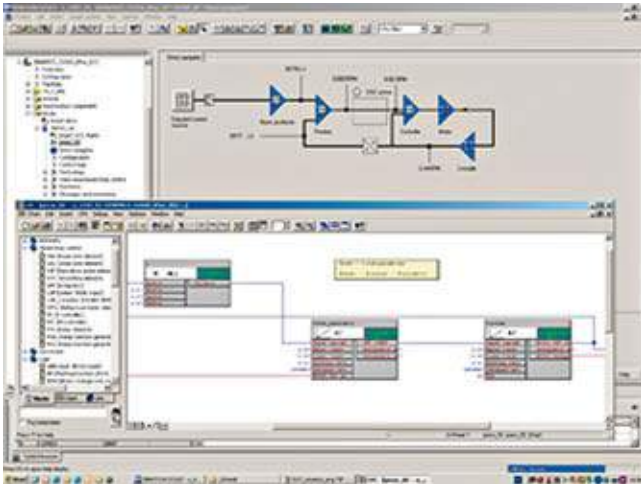
# SINAMICS S120 drive system

## Engineering software

### Drive Control Chart (DCC)

#### Overview

Drive Control Chart (DCC) expands the scope of device functions by means of freely available closed-loop control, calculation and logic modules and offers a means by which technological functions can be graphically configured in the SINAMICS S120 drive system. DCC is installed as a supplementary application to the STARTER commissioning tool.



Drive Control Chart expands the facility for the simplest possible configuring of technological functions, both for the SIMOTION Motion Control System as well as for the SINAMICS S120 drive system. For users, this opens up a new dimension regarding the adaptability of the systems mentioned to the specific functions of their machines. DCC has no restrictions with regard to the number of usable functions; this is only limited by the performance capability of the target platform.

The user-friendly DCC Editor enables easy graphics-based configuration, allows control loop structures to be clearly represented and provides a high degree of reusability of diagrams that have already been created.

The open-loop and closed-loop control functions are defined by using multi-instance-capable blocks (Drive Control Blocks (DCBs)) from a pre-defined library (DCB library) that are selected and graphically linked with one another by dragging and dropping. Test and diagnostic functions allow the program behavior to be verified and, in the case of a fault, the cause identified.

The block library encompasses a large selection of closed-loop, arithmetic and logic blocks, as well as comprehensive open-loop and closed-loop control functions.

For logically combining, evaluating and acquiring binary signals, all commonly used logic functions are available for selection (AND, XOR, on/off delay, RS flipflop, counter, etc.). A wide range of arithmetic functions, such as absolute value generation, dividers and minimum/maximum evaluation are available to monitor and evaluate numerical quantities. In addition to the closed-loop drive control, axial winder functions, closed-loop PI controllers, ramp-function generators or wobble generators can be configured simply and easily.

Closed-loop control structures can be programmed with almost no restrictions in conjunction with the SIMOTION Motion Control System. These can then be combined with other program sections to form an overall program.

Drive Control Chart for SINAMICS S120 also provides a convenient basis for resolving drive-level open-loop and closed-loop control tasks directly in the converter. This further extends the possibility of adapting SINAMICS to the particular application. Local data processing in the drive supports the implementation of modular machine concepts and results in an increase in the overall machine performance.

#### Minimum hardware and software requirements

See the SCOUT or STARTER engineering software, since DCC is installed in addition to this.

#### Selection and ordering data

DCC comprises the graphical configuring tool (DCC Editor) and the block library (DCB Library).

DCC is installed in addition to the SCOUT or STARTER engineering software.

The necessary engineering license for each PC (floating) for DCC is acquired at the same time the order is placed; additional runtime licenses are not required.

DCC can be ordered in two versions: as version for SIMOTION and SINAMICS applications, or as version for SINAMICS applications only.

Existing licenses for DCC version V2.1 can also be used for DCC V2.2 SP1.

An upgrade variant for the engineering license can be selected for existing DCC V2.0 versions.

	Order No.
<b>DCC SIMOTION/SINAMICS V2.2 SP1 for SCOUT/STARTER V4.3 SP1</b> Graphical configuration with Drive Control Chart DCC editor + DCB libraries for use on SIMOTION and SINAMICS S120	
<ul style="list-style-type: none"> <li>• Single engineering license, with data carrier</li> </ul>	<b>6AU1810-1JA22-1XA0</b>
<ul style="list-style-type: none"> <li>• Upgrade engineering license, with data carrier</li> </ul>	<b>6AU1810-1JA22-1XE0</b>
<b>DCC SINAMICS V2.2 SP1 for STARTER V4.3 SP1</b> Graphical configuration with Drive Control Chart DCC editor + DCB library for use on SINAMICS S120	
<ul style="list-style-type: none"> <li>• Single engineering license, with data carrier</li> </ul>	<b>6AU1810-1HA22-1XA0</b>
<ul style="list-style-type: none"> <li>• Upgrade engineering license, with data carrier</li> </ul>	<b>6AU1810-1HA22-1XE0</b>

#### More information

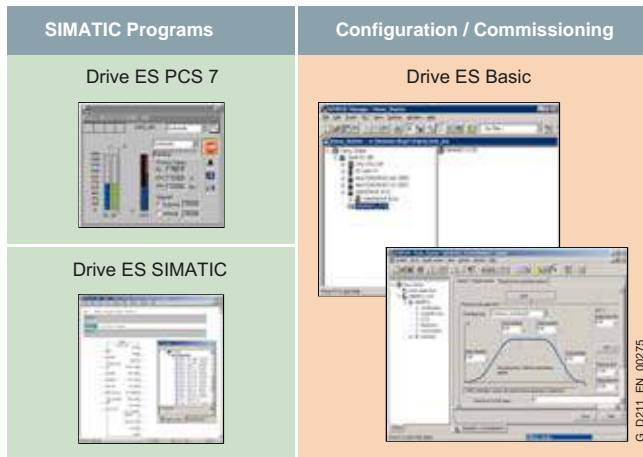
Updates for the STARTER commissioning tool are also available on the Internet at [www.siemens.com/starter](http://www.siemens.com/starter)

# SINAMICS S120 drive system

## Engineering software

### Drive ES engineering software

#### Overview



Drive ES is the engineering system used to integrate Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively in terms of communication, configuration and data management.

It is based on the operator interface of the STEP 7 Manager, the essential element when it comes to engineering.

Various software packages are available for selection:

- Drive ES Basic
- Drive ES SIMATIC
- Drive ES PCS 7

#### Application

##### Drive ES Basic

Drive ES Basic is for first-time users of the world of Totally Integrated Automation and the basic software for setting the parameters of all drives online and offline in this environment. Drive ES Basic enables both the automation system and the drives to be handled using the SIMATIC Manager user interface. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC routing and teleservice to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions, slave-to-slave communication, equidistance mode and isochronous mode with PROFIBUS DP and ensures that drives with PROFINET IO are simply integrated into the SIMATIC environment.

##### Drive ES SIMATIC

Drive ES SIMATIC is used for simple parameterization of STEP 7 communication instead of time-consuming programming. It requires STEP 7 to be installed.

It features a SIMATIC function block library; this means that the PROFIBUS and/or PROFINET IO interface can be simply and reliably programmed in the SIMATIC CPU for the drives.

There is no need for separate, time-consuming programming of the data exchange between the SIMATIC CPU and the drive.

All Drive ES users need to remember is:

**Copy – Modify – Load – finished.**

Customized, fully developed function blocks are copied from the library into your project.

Frequently used functions are fully preprogrammed:

- Read out complete diagnostics buffer automatically from the drive
- Download complete parameter set automatically from the SIMATIC CPU to the drive, e.g. when a device has to be replaced
- Automatically download partial parameter sets (e.g. for recipe or product change) from the SIMATIC CPU to the drive
- Upload the complete parameter assignment or partial parameter sets from the drive to the SIMATIC CPU, i.e. update.

Detailed contents of the Drive ES SIMATIC package

- **"PROFIBUS DP" communications software** for SIMATIC S7-300 with CPUs with integrated DP interface (function block libraries DRVDPS7, POSMO), SIMATIC S7-400 with CPUs with integrated DP interface or with CP 443-5 (DRVDPS7, POSMO function block libraries) and SIMATIC S7-300 with CP 342-5 (DRVDPS7C function block library)
- **"USS protocol" communications software** for SIMATIC S7-300 with integral PtP interfaces or with CP 340/341 and SIMATIC S7-400 with CP 441 (DRVUSS7 function block library)
- **STEP 7 slave object manager** for easy configuration of drives as well as for non-cyclic PROFIBUS DP communication with the drives
- **STEP 7 device object manager** for easy configuration of drives with PROFINET IO interfaces (V5.4 and higher)
- **SETUP program** for installing the software in the STEP 7 environment
- **"PROFINET IO" communications software** for SIMATIC S7-300 with CPUs with integrated PN interface, SIMATIC S7-400 with CPUs with integrated PN interface or with CP (DRVDPS7 block library, respectively). PROFINET IO and PROFIBUS DP use the same blocks from the DRVDPS7 library, i.e. the blocks are able to serve both buses with a common block (only for V5.4 and higher)

##### Drive ES PCS 7

Drive ES PCS 7 links the drives with a PROFIBUS DP interface into the SIMATIC PCS 7 process control system, and it requires that SIMATIC PCS 7, V6.1 and higher has first been installed. Drive ES PCS 7 provides a function block library with function blocks for the drives and the corresponding faceplates for the operator station which enables the drives to be operated from the PCS 7 process control system. From version V6.1 and higher, drives will also be able to be represented in the PCS 7 Maintenance Station.

Detailed contents of the Drive ES PCS 7 package

- **Block library for SIMATIC PCS 7** Faceplates and control blocks for SIMOVERT MASTERDRIVES VC and MC, as well as MICROMASTER/MIDIMASTER of the third and fourth generation and SIMOREG DC MASTER and SINAMICS
- **STEP 7 slave object manager** for easy configuration of drives as well as for non-cyclic PROFIBUS DP communication with the drives
- **SETUP program** for installing the software in the PCS 7 environment

# SINAMICS S120 drive system

## Engineering software

### Drive ES engineering software

3

#### Selection and ordering data

Description	Order No.
<b>Drive ES Basic V5.5 SPx <sup>*)</sup></b> Configuration software for the integration of drives into TIA (Totally Integrated Automation) Requirement: STEP 7 from V5.3, SP3 and higher Supplied as: DVD Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Floating license, 1 user</li> </ul>	<b>6SW1700-5JA00-5AA0</b>
<ul style="list-style-type: none"> <li>Floating license (copy license), 60 users</li> </ul>	<b>6SW1700-5JA00-5AA1</b>
<ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JA00-0AB2</b>
<ul style="list-style-type: none"> <li>Update service for copy license, 60 users</li> </ul>	<b>6SW1700-0JA00-1AB2</b>
<ul style="list-style-type: none"> <li>Upgrade from V5.x to V5.5 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-5JA00-5AA4</b>
<b>Drive ES SIMATIC V5.5 SPx <sup>*)</sup></b> Function block library for SIMATIC for the parameterization of communication with the drives Requirement: STEP 7 from V5.3, SP3 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> </ul>	<b>6SW1700-5JC00-5AA0</b>
<ul style="list-style-type: none"> <li>Runtime license (without data carrier)</li> </ul>	<b>6SW1700-5JC00-1AC0</b>
<ul style="list-style-type: none"> <li>Upgrade from V5.x to V5.5 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-5JC00-5AA4</b>
<b>Drive ES PCS 7 V6.1 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives Requirement: PCS 7 V6.1 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> </ul>	<b>6SW1700-6JD00-1AA0</b>
<ul style="list-style-type: none"> <li>Runtime license (without data carrier)</li> </ul>	<b>6SW1700-5JD00-1AC0</b>
<ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JD00-0AB2</b>
<b>Drive ES PCS 7 V7.0 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives Requirement: PCS 7 V7.0 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> </ul>	<b>6SW1700-7JD00-0AA0</b>
<ul style="list-style-type: none"> <li>Runtime license (without data carrier)</li> </ul>	<b>6SW1700-5JD00-1AC0</b>
<ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JD00-0AB2</b>
<ul style="list-style-type: none"> <li>Upgrade from V5.x to V7.0 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-7JD00-0AA4</b>
<b>Drive ES PCS 7 V7.1 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives Requirement: PCS 7 V7.1 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> </ul>	<b>6SW1700-7JD00-1AA0</b>
<ul style="list-style-type: none"> <li>Runtime license (without data carrier)</li> </ul>	<b>6SW1700-5JD00-1AC0</b>
<ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JD00-0AB2</b>
<ul style="list-style-type: none"> <li>Upgrade from V6.x to V7.1 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-7JD00-1AA4</b>

<sup>\*)</sup> Orders are automatically supplied with the latest Service Pack (SP).

Description	Order No.
<b>Drive ES PCS 7 V8.0 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives in the classic style (like the predecessor) Requirement: PCS 7 V8.0 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> </ul>	<b>6SW1700-8JD00-0AA0</b>
<ul style="list-style-type: none"> <li>Runtime license (without data carrier)</li> </ul>	<b>6SW1700-5JD00-1AC0</b>
<ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JD00-0AB2</b>
<ul style="list-style-type: none"> <li>Upgrade from V6.x to V8.0 SPx <sup>*)</sup></li> </ul>	<b>6SW1700-8JD00-0AA4</b>
<b>Drive ES PCS 7 APL V8.0 SPx <sup>*)</sup></b> Function block library for PCS 7 for the integration of drives in APL style Requirement: PCS 7 V8.0 and higher Supplied as: CD-ROM Languages: Ger, Eng, Fr, It, Sp with electronic documentation	
<ul style="list-style-type: none"> <li>Single-user license incl. 1 runtime license</li> </ul>	<b>6SW1700-8JD01-0AA0</b>
<ul style="list-style-type: none"> <li>Runtime license (without data carrier)</li> </ul>	<b>6SW1700-5JD00-1AC0</b>
<ul style="list-style-type: none"> <li>Update service for single-user license</li> </ul>	<b>6SW1700-0JD00-0AB2</b>

#### More information

More information is available on the Internet at:  
[www.siemens.com/drivesolutions](http://www.siemens.com/drivesolutions)

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in blocksize format

#### Design



PM340 Power Modules in blocksize format, frame sizes FSA to FSF

The PM340 Power Modules in blocksize format feature the following connections and interfaces as standard:

- Line connection
- PM-IF interface for connection of the PM340 Power Module and CU310-2/SIMOTION D410-2 Control Unit or CUA31/CUA32 Control Unit Adapter. The PM340 Power Module also supplies power to the CU310-2/SIMOTION D410-2 Control Unit or CUA31/CUA32 Control Unit Adapter by means of an integrated power supply
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Motor connection made with screw-type terminals or screw studs
- Control circuit for the Safe Brake Relay for controlling a holding brake
- 2 PE (protective earth) connections

Power Modules without integrated line filter can be connected to grounded TN/TT and non-grounded IT systems. Power Modules with integrated line filter are suitable only for connection to TN systems with grounded star point.

The integrated Braking Unit (Braking Chopper) is rated with the capability to continuously utilize the external braking resistor. The temperature of the external braking resistor must be monitored to provide protection against thermal overloading.

#### Integration



PM340 Power Module in blocksize format with CU310-2 DP Control Unit



PM340 Power Module in blocksize format with CUA31 Control Unit Adapter

# SINAMICS S120 drive system

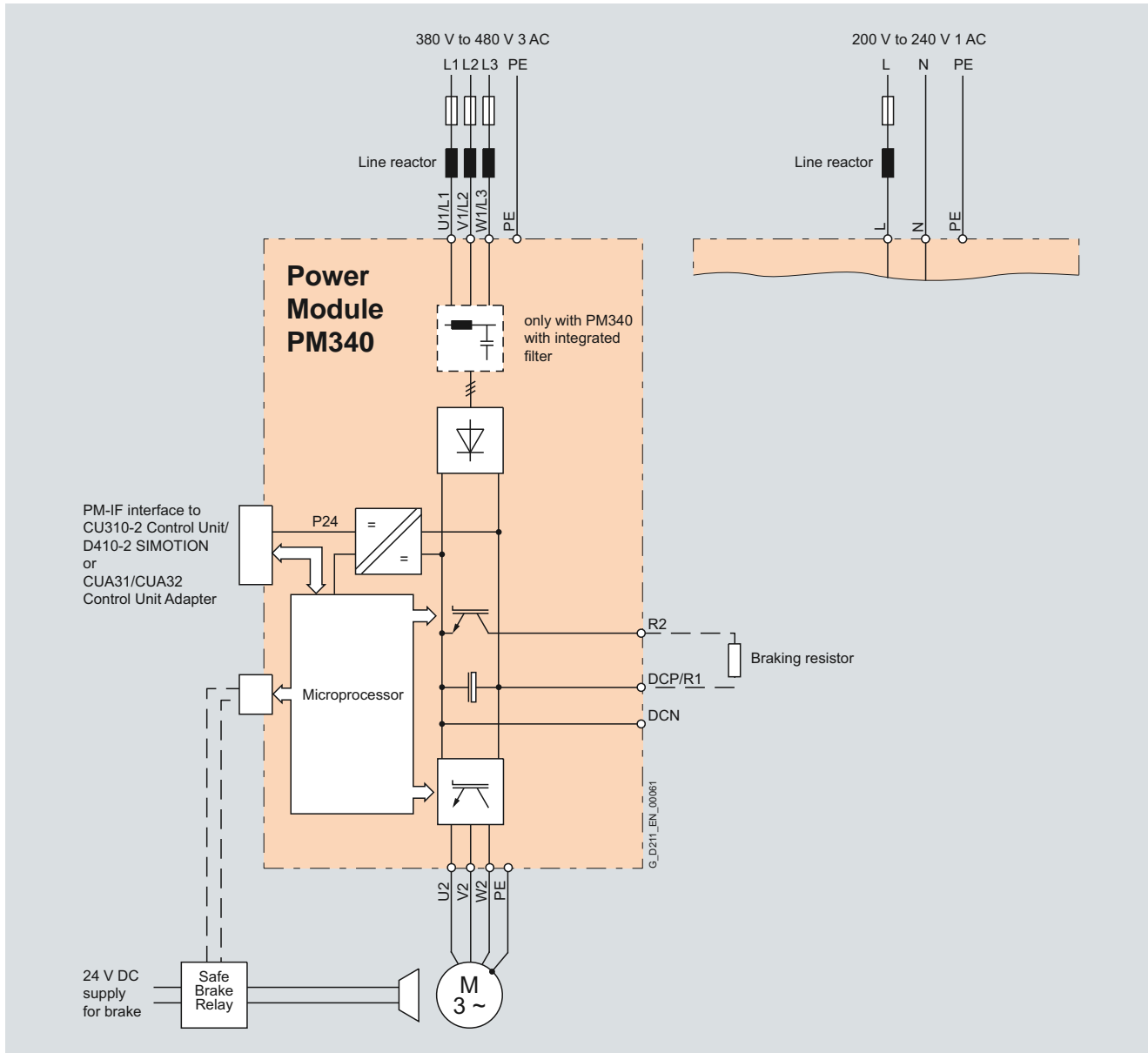
## Power Modules and line-side components

**Air-cooled Power Modules in blocksize format**

3

### Integration (continued)

The PM340 Power Modules in blocksize format communicate with the CU310-2/SIMOTION D410-2 Control Unit or the CUA31/CUA32 Control Unit Adapter via the PM-IF interface.



Connection example of PM340 Power Module in blocksize format

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in blocksize format

#### Integration (continued)

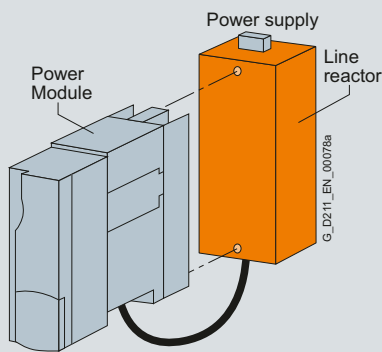
Many system components for PM340 Power Modules are designed as base components, i.e. the component is mounted on the baseplate and the PM340 Power Module in front of them in a space-saving construction. Up to two base components can be mounted in front of one another

	FSA	FSB	FSC	FSD	FSE	FSF
Line filter	✓	–	–	–	–	–
Line reactor	✓	✓	✓	✓	✓	○
Braking resistor	✓	✓	○	○	○	○
Motor reactor	✓	✓	✓	○	○	○

✓ = suitable as base-type

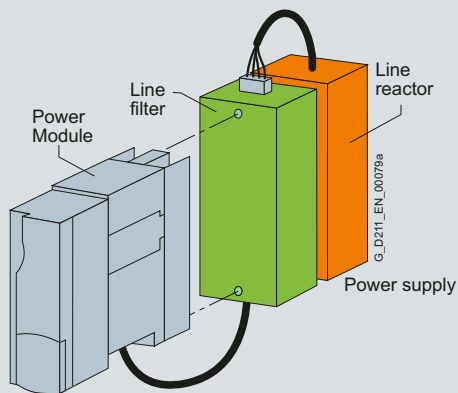
○ = not suitable as base-type

– = not available (use Power Modules with integrated line filter)



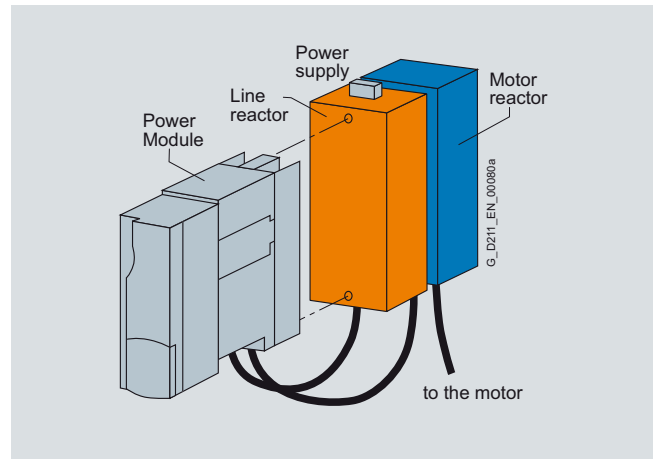
Basic layout of a PM340 Power Module with line reactor as base component

The line-side reactors are equipped with terminals on the line side and with a pre-assembled cable on the Power Module side. When installed, the mains terminals are at the top on frame sizes FSA to FSC, and at the bottom on frame sizes FSD and FSE.



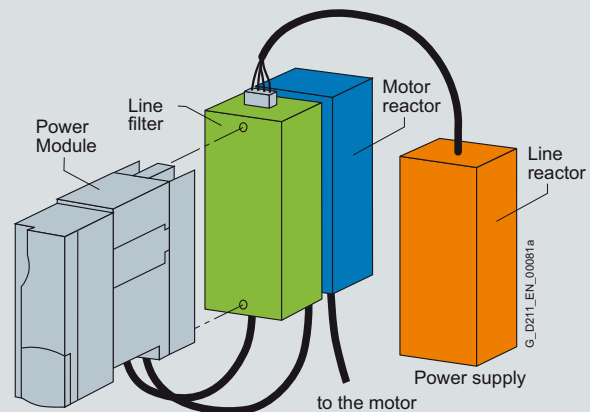
PM340 Power Module in frame size FSA with line reactor and line filter

If a line filter is installed in addition to the line reactor on frame size FSA, the components must be arranged as shown in the diagram above. In this case, the line connection is at the bottom.



PM340 Power Module in frame size FSA with line reactor and motor reactor

Power Modules of frame size FSB and higher are available with integrated line filters, alleviating the need for an external line filter in this case.



PM340 Power Module in frame size FSA with line filter, line reactor and motor reactor

For configurations involving more than two base-type system components, e.g. line reactor + motor reactor + braking resistor, individual components must be mounted to the side of the Power Module. In this instance, the line and motor reactors must be installed behind the Power Module and the braking resistor to the side.

# SINAMICS S120 drive system

## Power Modules and line-side components

Air-cooled Power Modules  
in blocksize format

### Technical specifications

#### Air-cooled PM340 Power Module in blocksize format 6SL3210-1S...

<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	200 ... 240 V 1 AC $\pm 10\%$ (in operation $-15\% < 1$ min) or 380 ... 480 V 3 AC $\pm 10\%$ (in operation $-15\% < 1$ min)
<b>Line</b>	
• Power Modules without integrated line filter	Grounded TN/TT systems and non-grounded IT systems
• Power Modules with integrated line filter	TN systems with grounded star point
<b>Line frequency</b>	47 ... 63 Hz
<b>Line power factor</b> at rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	$> 0.96$
• Total ( $\lambda$ )	
- 200 ... 240 V 1 AC	0.45 ... 0.7
- 380 ... 480 V 3 AC	0.65 ... 0.95
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>Precharging frequency</b> of the DC link, max.	1x every 30 s
<b>DC link voltage, approx.</b>	1.35 x line voltage
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 600 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC $-15\%/+20\%$
<b>Radio interference suppression</b>	
• Standard	No radio interference suppression
• With line filter	Category C2 to EN 61800-3
<b>Type of cooling</b>	Forced air cooling by means of built-in fan
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 12849-1 or EN 954-1. <a href="#">For further information, see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating  
[For further information see chapter System description – Dimensioning.](#)

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in blocksize format

#### Technical specifications (continued)

<b>Line voltage</b> 200 ... 240 V 1 AC		<b>Air-cooled PM340 Power Module in blocksize format</b>		
		6SL3210-1SB11-0...	6SL3210-1SB12-3...	6SL3210-1SB14-0...
<b>Output current</b>				
• Rated current $I_{rated}$	A	0.9	2.3	3.9
• Base-load current $I_H$	A	0.8	2.0	3.4
• For S6 duty (40 %) $I_{S6}$	A	1.4	3.3	5.5
• $I_{max}$	A	2.0	4.6	7.8
<b>Type rating</b> <sup>1)</sup>	kW (HP)	0.12 (0.2)	0.37 (0.5)	0.75 (0.75)
• Based on $I_{rated}$				
<b>Rated pulse frequency</b>	kHz	4	4	4
<b>Power loss</b>	kW	0.06	0.075	0.11
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	< 45	< 45	< 45
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0
<b>Rated input current</b> <sup>2)</sup> with/without line reactor	A	1.4/2.2	4/6	6.5/10
<b>Resistance value</b> of the external braking resistor	Ω	≥ 180	≥ 180	≥ 180
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)
<b>Line connection</b> L, N				
• Conductor cross-section				
	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2				
• Conductor cross-section				
	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>Motor connection</b> U2, V2, W2				
• Conductor cross-section				
	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>PE connection</b>				
		M4 screw	M4 screw	M4 screw
<b>Motor cable length</b> <sup>3)</sup> , max. (without external options)				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>				
		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth				
- PM340	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)
- PM340 with CU310-2/D410-2	mm (in)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)
- PM340 with CUA31/CUA32	mm (in)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)
<b>Frame size</b>				
		FSA	FSA	FSA
<b>Weight, approx.</b>				
	kg (lb)	1.2 (3)	1.3 (3)	1.3 (3)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.

<sup>2)</sup> The input current depends on the motor load and line impedance.  
The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_k = 1\%$ .

<sup>3)</sup> Max. motor cable length 15 m (49 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.



# SINAMICS S120 drive system

## Power Modules and line-side components

Air-cooled Power Modules  
in blocksize format

### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Air-cooled PM340 Power Module in blocksize format</b>				
		6SL3210-1SE11-3UA0	6SL3210-1SE11-7UA0	6SL3210-1SE12-2UA0	6SL3210-1SE13-1UA0	6SL3210-1SE14-1UA0
<b>Output current</b>						
• Rated current $I_{rated}$	A	1.3	1.7	2.2	3.1	4.1
• Base-load current $I_H$	A	1.1	1.5	1.9	2.7	3.6
• For S6 duty (40 %) $I_{S6}$	A	1.3	2.0	2.5	3.5	4.5
• $I_{max}$	A	2.6	3.4	4.4	6.2	8.2
<b>Type rating</b> <sup>1)</sup>						
• Based on $I_{rated}$	kW (HP)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)
• Based on $I_H$	kW (HP)	0.37 (0.5)	0.55 (0.5)	0.75 (0.75)	1.1 (1)	1.5 (2)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Power loss</b>	kW	0.10	0.10	0.10	0.11	0.11
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)	0.005 (0.02)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	< 45	< 45	< 45	< 45	< 45
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0	1.0	1.0
<b>Rated input current</b> <sup>2)</sup> with/without line reactor	A	1.3/1.7	1.7/2.2	2.2/2.6	3.1/3.9	4.1/4.8
<b>Resistance value</b> of the external braking resistor	Ω	≥ 390	≥ 390	≥ 390	≥ 390	≥ 390
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line connection</b> U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>Motor connection</b> U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>PE connection</b>		M4 screw	M4 screw	M4 screw	M4 screw	M4 screw
<b>Motor cable length</b> <sup>3)</sup> , max.						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth						
- PM340	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)
- PM340 with CU310-2/D410-2	mm (in)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)	234.6 (9.24)
- PM340 with CUA31/CUA32	mm (in)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)	175.3 (6.90)
<b>Frame size</b>		FSA	FSA	FSA	FSA	FSA
<b>Weight, approx.</b>	kg (lb)	1.2 (3)	1.2 (3)	1.2 (3)	1.2 (3)	1.2 (3)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.

<sup>2)</sup> The input current depends on the motor load and line impedance.  
The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_k = 1\%$ .

<sup>3)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in blocksize format

#### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Air-cooled PM340 Power Module in blocksize format</b>					
		6SL3210-1SE16-0...	6SL3210-1SE17-7...	6SL3210-1SE21-0...	6SL3210-1SE21-8...	6SL3210-1SE22-5...	6SL3210-1SE23-2...
<b>Output current</b>							
• Rated current $I_{rated}$	A	5.9	7.7	10.2	18	25	32
• Base-load current $I_H$	A	5.2	6.8	9.1	14	21	27
• For S6 duty (40 %) $I_{S6}$	A	6.4	8.3	10.8	19.6	27.8	37.1
• $I_{max}$	A	11.8	15.4	20.4	26.4	38	52
<b>Type rating</b> <sup>1)</sup>							
• Based on $I_{rated}$	kW (HP)	2.2 (3)	3 (5)	4 (5)	7.5 (10)	11 (15)	15 (20)
• Based on $I_H$	kW (HP)	2.2 (3)	3 (4)	4 (5)	5.5 (10)	7.5 (15)	11 (20)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4	4
<b>Power loss</b>	kW	0.14	0.16	0.18	0.24	0.30	0.40
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.009 (0.3)	0.009 (0.3)	0.009 (0.3)	0.038 (1.3)	0.038 (1.3)	0.038 (1.3)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	< 50	< 50	< 50	< 60	< 60	< 60
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0	1.0	1.0	1.0
<b>Rated input current</b> <sup>2)</sup> with/without line reactor	A	5.6/6.7	7.5/8.9	9.8/12.4	17.1/23.1	24.6/32.6	33/39
<b>Resistance value</b> of the external braking resistor	Ω	≥ 160	≥ 160	≥ 160	≥ 56	≥ 56	≥ 56
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line connection</b> U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 6	1.0 ... 6	1.0 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 6	1.0 ... 6	1.0 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>Motor connection</b> U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 6	1.0 ... 6	1.0 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>PE connection</b>		M5 screw	M5 screw	M5 screw	M5 screw	M5 screw	M5 screw
<b>Motor cable length</b> <sup>3)</sup> , max.							
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)	153 (6.02)	153 (6.02)	153 (6.02)	188.4 (7.42)	188.4 (7.42)	188.4 (7.42)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	333.4 (13.13)	333.4 (13.13)	333.4 (13.13)
• Depth							
- PM340	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	185 (7.28)	185 (7.28)	185 (7.28)
- PM340 with CU310-2/D410-2	mm (in)	254.6 (10.02)	254.6 (10.02)	254.6 (10.02)	274.6 (10.81)	274.6 (10.81)	274.6 (10.81)
- PM340 with CUA31/CUA32	mm (in)	195.3 (7.69)	195.3 (7.69)	195.3 (7.69)	215.3 (8.48)	215.3 (8.48)	215.3 (8.48)
<b>Frame size</b>		FSB	FSB	FSB	FSC	FSC	FSC
<b>Weight, approx.</b>	kg (lb)	4.0 (9)	4.0 (9)	4.0 (9)	6.5 (14)	6.5 (14)	6.5 (14)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.

<sup>2)</sup> The input current depends on the motor load and line impedance.  
The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_k = 1\%$ .

<sup>3)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

# SINAMICS S120 drive system

## Power Modules and line-side components

Air-cooled Power Modules  
in blocksize format

### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Air-cooled PM340 Power Module in blocksize format</b>				
		6SL3210-1SE23-8...	6SL3210-1SE24-5...	6SL3210-1SE26-0...	6SL3210-1SE27-5...	6SL3210-1SE31-0...
<b>Output current</b>						
• Rated current $I_{rated}$	A	38	45	60	75	90
• Base-load current $I_H$	A	33	40	48	65	80
• For S6 duty (40 %) $I_{S6}$	A	49	58	78	98	117
• $I_{max}$	A	64	76	90	124	150
<b>Type rating</b> <sup>1)</sup>						
• Based on $I_{rated}$	kW (HP)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Based on $I_H$	kW (HP)	15 (20)	18.5 (30)	22 (30)	30 (50)	37 (60)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Power loss</b>	kW	0.38	0.51	0.69	0.99	1.21
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.022 (0.8)	0.022 (0.8)	0.039 (1.4)	0.022 (0.8)	0.039 (1.4)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	< 60	< 60	< 61	< 60	62
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0	1.0	1.0
<b>Rated input current</b> <sup>2)</sup> with/without line reactor	A	40/46	47/53	63/72	78/88	94/105
<b>Resistance value</b> of the external braking resistor	Ω	≥ 27	≥ 27	≥ 27	≥ 15	≥ 15
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line connection</b> U1/L1, V1/L2, W1/L3		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35	10 ... 35	10 ... 35
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35	10 ... 35	10 ... 35
<b>Motor connection</b> U2, V2, W2		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35	10 ... 35	10 ... 35
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Motor cable length</b> <sup>3)</sup> , max.						
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)
• Height PM340 without/with int. filter	mm (in)	418.3/511 (16.5/20.1)	418.3/511 (16.5/20.1)	418.3/511 (16.5/20.1)	498.3/633 (19.6/24.9)	498.3/633 (19.6/24.9)
• Depth						
- PM340	mm (in)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)
- PM340 with CU310-2/D410-2	mm (in)	293.1 (11.5)	293.1 (11.5)	293.1 (11.5)	293.1 (11.5)	293.1 (11.5)
- PM340 with CUA31/CUA32	mm (in)	233.8 (9.20)	233.8 (9.20)	233.8 (9.20)	233.8 (9.20)	233.8 (9.20)
<b>Frame size</b>		FSD	FSD	FSD	FSE	FSE
<b>Weight, approx.</b> PM340 without/with int. filter	kg (lb)	15.9/19.3 (35/43)	15.9/19.3 (35/43)	15.9/19.3 (35/43)	19.8/27.1 (44/60)	19.8/27.1 (44/60)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.

<sup>2)</sup> The input current depends on the motor load and line impedance.  
The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_k = 1\%$ .

<sup>3)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in blocksize format

#### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC	<b>Air-cooled PM340 Power Module in blocksize format</b>			
		6SL3210-1SE31-1...	6SL3210-1SE31-5...	6SL3210-1SE31-8...
<b>Output current</b>				
• Rated current $I_{rated}$	A	110	145	178
• Base-load current $I_H$	A	95	115	155
• For S6 duty (40 %) $I_{S6}$	A	143	188	231
• $I_{max}$	A	180	220	290
<b>Type rating <sup>1)</sup></b>				
• Based on $I_{rated}$	kW (HP)	55 (75)	75 (100)	90 (125)
• Based on $I_H$	kW (HP)	45 (60)	55 (75)	75 (100)
<b>Rated pulse frequency</b>	kHz	4	4	4
<b>Power loss</b>	kW	1.42	1.93	2.31
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.094 (3.3)	0.094 (3.3)	0.117 (4.1)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	< 60	< 60	65
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0
<b>Rated input current <sup>2)</sup></b> with/without line reactor	A	115/129	151/168	186/204
<b>Resistance value</b> of the external braking resistor	Ω	≥ 8.2	≥ 8.2	≥ 8.2
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)
<b>Line connection</b> U1/L1, V1/L2, W1/L3		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm <sup>2</sup>	120	120	120
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm <sup>2</sup>	120	120	120
<b>Motor connection</b> U2, V2, W2		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm <sup>2</sup>	120	120	120
<b>PE connection</b>		M8 screw	M8 screw	M8 screw
<b>Motor cable length <sup>3)</sup>, max.</b>				
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	350 (13.8)	350 (13.8)	350 (13.8)
• Height PM340 without/with int. filter	mm (in)	634/934 (25.0/36.8)	634/934 (25.0/36.8)	634/934 (25.0/36.8)
• Depth				
- PM340	mm (in)	315.5 (12.4)	315.5 (12.4)	315.5 (12.4)
- PM340 with CU310-2/D410-2	mm (in)	405.1 (15.9)	405.1 (15.9)	405.1 (15.9)
- PM340 with CUA31/CUA32	mm (in)	345.8 (13.6)	345.8 (13.6)	345.8 (13.6)
<b>Frame size</b>		FSF	FSF	FSF
<b>Weight, approx.</b> PM340 without/with int. filter	kg (lb)	50.7/66.7 (112/147)	50.7/66.7 (112/147)	50.7/66.7 (112/147)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.

<sup>2)</sup> The input current depends on the motor load and line impedance.  
The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_k = 1\%$ .

<sup>3)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

# SINAMICS S120 drive system

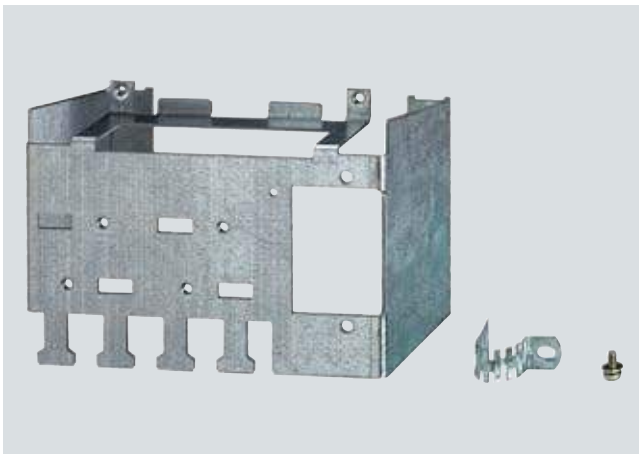
## Power Modules and line-side components

Air-cooled Power Modules  
in blocksize format

### Selection and ordering data

Rated output current	Type rating	Frame size	Air-cooled PM340 Power Module in blocksize format <u>without</u> line filter	Air-cooled PM340 Power Module in blocksize format <u>with</u> integrated line filter
A	kW (HP)		Order No.	Order No.
<b>Line voltage 200 ... 240 V 1 AC</b>				
0.9	0.12 (0.2)	FSA	<b>6SL3210-1SB11-0UA0</b>	<b>6SL3210-1SB11-0AA0</b>
2.3	0.37 (0.5)	FSA	<b>6SL3210-1SB12-3UA0</b>	<b>6SL3210-1SB12-3AA0</b>
3.9	0.75 (0.75)	FSA	<b>6SL3210-1SB14-0UA0</b>	<b>6SL3210-1SB14-0AA0</b>
<b>Line voltage 380 ... 480 V 3 AC</b>				
1.3	0.37 (0.5)	FSA	<b>6SL3210-1SE11-3UA0</b>	–
1.7	0.55 (0.75)	FSA	<b>6SL3210-1SE11-7UA0</b>	–
2.2	0.75 (1)	FSA	<b>6SL3210-1SE12-2UA0</b>	–
3.1	1.1 (1.5)	FSA	<b>6SL3210-1SE13-1UA0</b>	–
4.1	1.5 (2)	FSA	<b>6SL3210-1SE14-1UA0</b>	–
5.9	2.2 (3)	FSB	<b>6SL3210-1SE16-0UA0</b>	<b>6SL3210-1SE16-0AA0</b>
7.7	3 (5)	FSB	<b>6SL3210-1SE17-7UA0</b>	<b>6SL3210-1SE17-7AA0</b>
10.2	4 (5)	FSB	<b>6SL3210-1SE21-0UA0</b>	<b>6SL3210-1SE21-0AA0</b>
18	7.5 (10)	FSC	<b>6SL3210-1SE21-8UA0</b>	<b>6SL3210-1SE21-8AA0</b>
25	11 (15)	FSC	<b>6SL3210-1SE22-5UA0</b>	<b>6SL3210-1SE22-5AA0</b>
32	15 (20)	FSC	<b>6SL3210-1SE23-2UA0</b>	<b>6SL3210-1SE23-2AA0</b>
38	18.5 (25)	FSD	<b>6SL3210-1SE23-8UA0</b>	<b>6SL3210-1SE23-8AA0</b>
45	22 (30)	FSD	<b>6SL3210-1SE24-5UA0</b>	<b>6SL3210-1SE24-5AA0</b>
60	30 (40)	FSD	<b>6SL3210-1SE26-0UA0</b>	<b>6SL3210-1SE26-0AA0</b>
75	37 (50)	FSE	<b>6SL3210-1SE27-5UA0</b>	<b>6SL3210-1SE27-5AA0</b>
90	45 (60)	FSE	<b>6SL3210-1SE31-0UA0</b>	<b>6SL3210-1SE31-0AA0</b>
110	55 (75)	FSF	<b>6SL3210-1SE31-1UA0</b>	<b>6SL3210-1SE31-1AA0</b>
145	75 (100)	FSF	<b>6SL3210-1SE31-5UA0</b>	<b>6SL3210-1SE31-5AA0</b>
178	90 (125)	FSF	<b>6SL3210-1SE31-8UA0</b>	<b>6SL3210-1SE31-8AA0</b>

### Accessories



Example of shield connection kit for PM340 frame size FSB

Description	Order No.
<b>Shield connection kit</b> for PM340	
• Frame size FSA	<b>6SL3262-1AA00-0BA0</b>
• Frame size FSB	<b>6SL3262-1AB00-0DA0</b>
• Frame size FSC	<b>6SL3262-1AC00-0DA0</b>
• Frame sizes FSD and FSE	<b>6SL3262-1AD00-0DA0</b>
• Frame size FSF	<b>6SL3262-1AF00-0DA0</b>

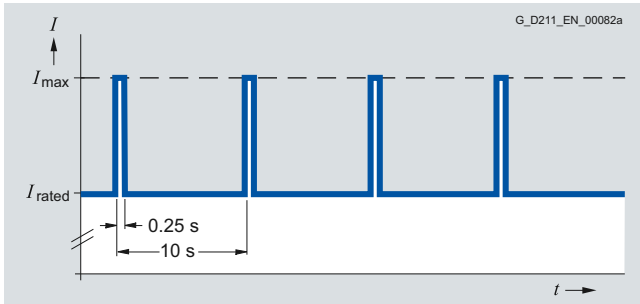
# SINAMICS S120 drive system

## Power Modules and line-side components

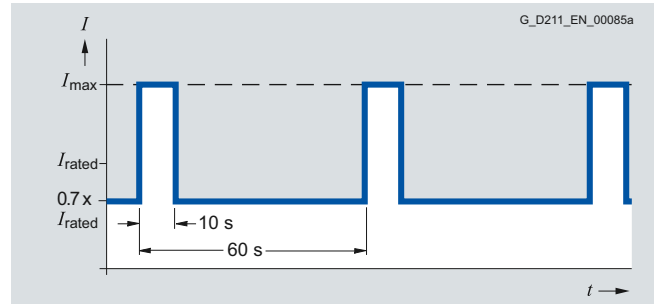
### Air-cooled Power Modules in blocksize format

#### Characteristic curves

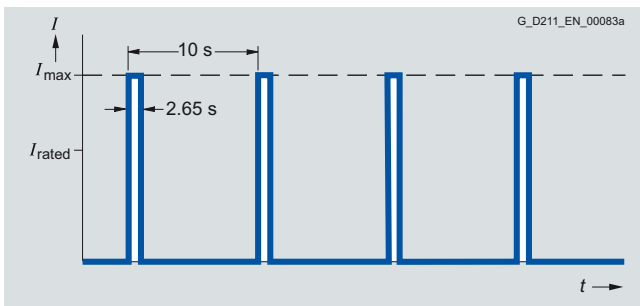
##### Overload capability



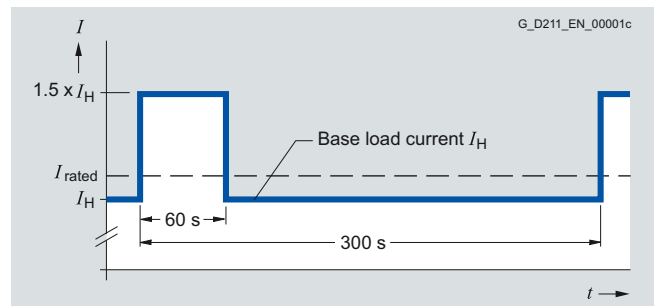
Load cycle with previous load



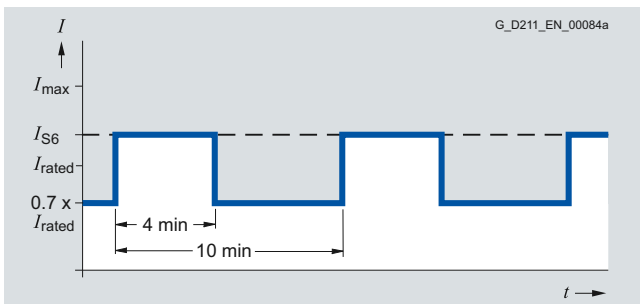
S6 load cycle with previous load with a load cycle period of 60 s



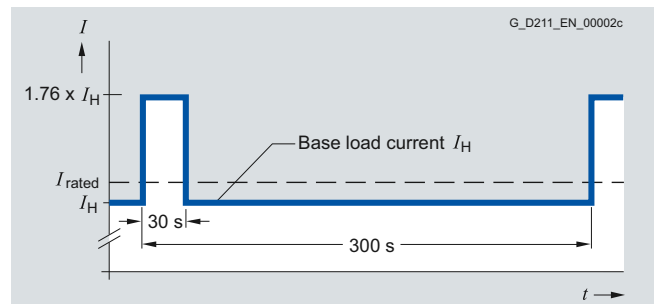
Load cycle without previous load



Load cycle with 60 s overload with a load cycle period of 300 s



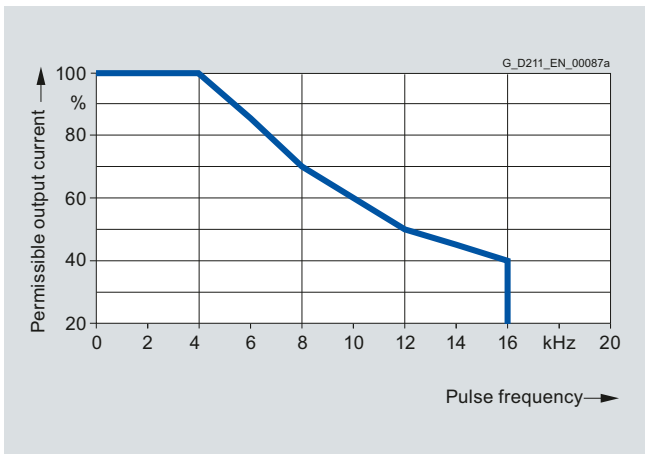
S6 load cycle with previous load with a load cycle period of 600 s



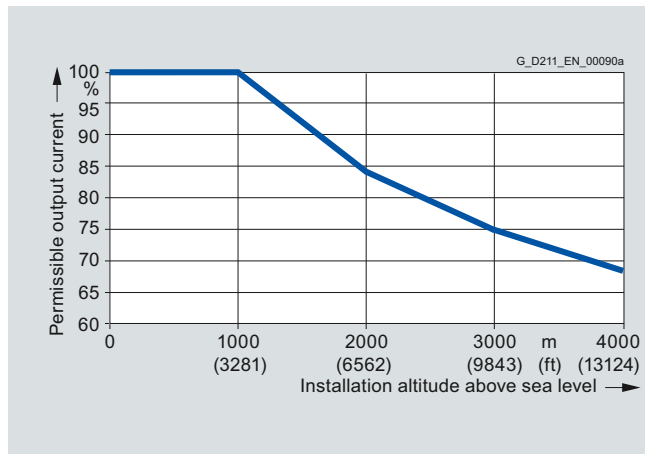
Load cycle with 30 s overload with a load cycle period of 300 s

**Characteristic curves (continued)**

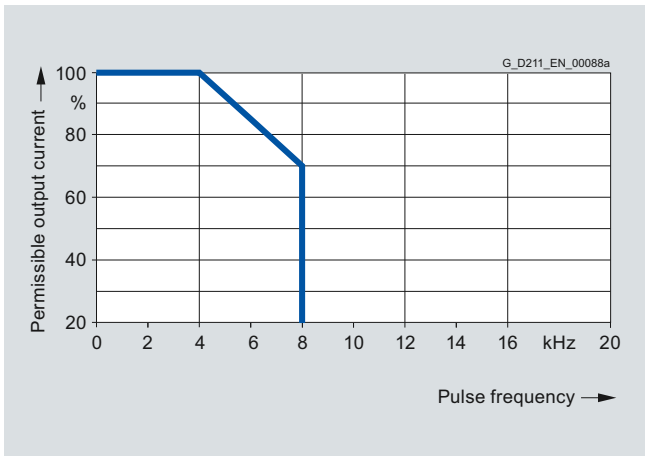
**Derating characteristics**



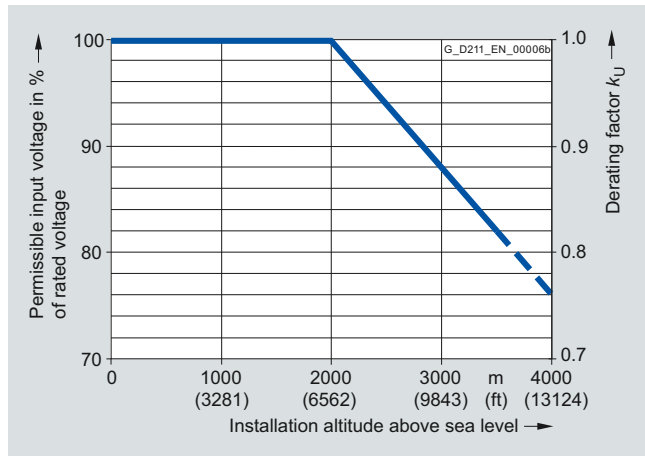
Frame sizes FSA to FSE: Output current dependent on pulse frequency



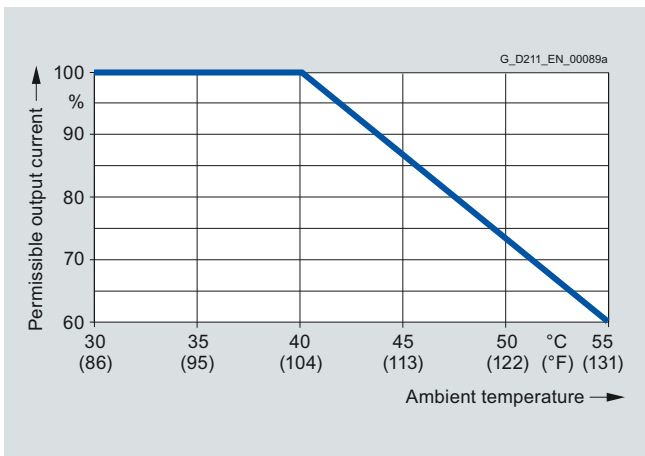
Output current dependent on installation altitude



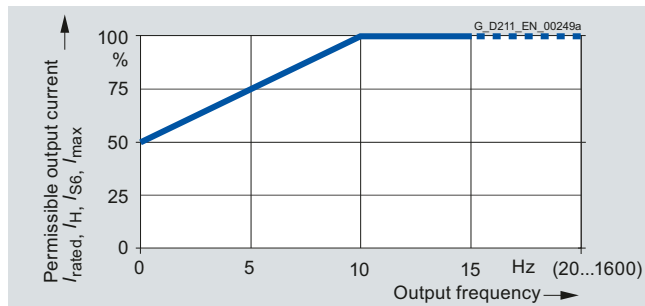
Frame size FSF: Output current dependent on pulse frequency



Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Output current dependent on output frequency

# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in blocksize format

#### Line reactors

#### Overview



Line reactors for PM340 Power Modules frame sizes FSA to FSE



Line reactor for PM340 Power Modules frame size FSF

Line reactors limit the low-frequency harmonic effects and reduce the load on the other loads in the same supply system. Line reactors also reduce current peaks at the converter input, e.g. in the event of commutating dips.

For this reason, line reactors should always be used in combination with unfiltered PM340 devices and line voltages with a high harmonic content (industrial networks).

[For further information see chapter System description – Dimensioning.](#)

#### Integration

The line reactors for PM340 Power Modules of frame sizes FSA to FSE are designed as base components.

The line reactor is attached to the mounting surface and the Power Module is mounted directly on the line reactor. The cables to the Power Module are already connected at the line reactor.

The line reactor is connected to the line connection through terminals.



PM340 Power Module frame size FSB with base line reactor and shield connection kit



# SINAMICS S120 drive system

## Power Modules and line-side components

Power Modules in blocksize format  
Line reactors

3

### Technical specifications

<b>Line voltage</b> <b>200 ... 240 V 1 AC</b>		<b>Line reactor</b>	
		6SE6400-3CC00-4AB3	6SE6400-3CC01-0AB3
<b>Rated current</b>	A	3.4	8.1
<b>Power loss, approx.</b> at 50/60 Hz	W	12.5/15	11.5/14.5
<b>Line connection</b> U1, V1, W1		Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	6	6
<b>Load connection</b>		Cable	Cable
• Conductor cross-section		3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )
• Length, approx.	m (ft)	0.38 (1.25)	0.38 (1.25)
<b>PE connection</b>		M5 screw stud	M5 screw stud
<b>Degree of protection</b> <sup>1)</sup>		IP20	IP20
<b>Dimensions</b>			
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)
• Height	mm (in)	201 (7.91)	201 (7.91)
• Depth	mm (in)	50 (1.97)	50 (1.97)
<b>Weight, approx.</b>	kg (lb)	1.3 (3)	1.3 (3)
<b>Approvals, according to</b>		cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated output current)	6SL3210-1SB11--0... (0.9 A) 6SL3210-1SB12--3... (2.3 A)	6SL3210-1SB14--0... (3.9 A)

<b>Line voltage</b> <b>380 ... 480 V 3 AC</b>		<b>Line reactor</b>					
		6SE6400-3CC00-2AD3	6SE6400-3CC00-4AD3	6SE6400-3CC00-6AD3	6SL3203-0CD21-0AA0	6SL3203-0CD21-4AA0	6SL3203-0CD22-2AA0
<b>Rated current</b>	A	1.9	3.5	4.8	9	11.6	25
<b>Power loss</b> at 50/60 Hz	W	6/7	12.5/15	7.5/9	9/11	27/32	98/118
<b>Line connection</b> U1, V1, W1		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6	6
<b>Load connection</b>		Cable	Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG10 (2.5 mm <sup>2</sup> )
• Length, approx.	m (ft)	0.38 (1.25)	0.38 (1.25)	0.38 (1.25)	0.46 (1.51)	0.46 (1.51)	0.49 (1.61)
<b>PE connection</b>		M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud
<b>Degree of protection</b> <sup>1)</sup>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	153 (6.02)	153 (6.02)	190 (7.48)
• Height	mm (in)	201 (7.91)	201 (7.91)	201 (7.91)	270 (10.63)	270 (10.63)	336 (13.23)
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	70 (2.76)	70 (2.76)	50 (1.97)
<b>Weight, approx.</b>	kg (lb)	1.2 (3)	1.3 (3)	1.3 (3)	3.4 (7.5)	3.4 (7.5)	6.3 (14)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated output current)	6SL3210-1SE11-3... (1.3 A) 6SL3210-1SE11-7... (1.7 A)	6SL3210-1SE12-2... (2.2 A) 6SL3210-1SE13-1... (3.1 A)	6SL3210-1SE14-1... (4.1 A)	6SL3210-1SE16-0... (5.9 A) 6SL3210-1SE17-7... (7.7 A)	6SL3210-1SE21-0... (10 A)	6SL3210-1SE21-8... (18 A) 6SL3210-1SE22-5... (25 A)

<sup>1)</sup> With correctly connected load connection cable.

# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in blocksize format

#### Line reactors

#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Line reactor</b>					
		6SL3203-0CD23-5AA0	6SL3203-0CJ24-5AA0	6SL3203-0CD25-3AA0	6SL3203-0CJ28-6AA0	6SE6400-3CC11-2FD0	6SE6400-3CC11-7FD0
<b>Rated current</b>	A	33	47	63	94	151	186
<b>Power loss</b> at 50/60 Hz	W	37/44	90/115	90/115	170/215	280/360	280/360
<b>Line connection</b> U1, V1, W1		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm <sup>2</sup>	16	16	16	50	–	–
<b>Load connection</b>		Cable	Cable	Cable	Cable	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section		4 × AWG10 (2.5 mm <sup>2</sup> )	4 × 16 mm <sup>2</sup>	4 × 16 mm <sup>2</sup>	4 × 35 mm <sup>2</sup>	–	–
• Length, approx.	m (ft)	0.49 (1.61)	0.7 (2.30)	0.7 (2.30)	0.7 (2.30)		
<b>PE connection</b>		M5 screw stud	M8 screw	M8 screw	M8 screw	M8 screw stud	M8 screw stud
<b>Degree of protection</b> <sup>1)</sup>		IP20	IP20	IP20	IP20	IP00	IP00
<b>Dimensions</b>							
• Width	mm (in)	190 (7.48)	275 (10.83)	275 (10.83)	275 (10.83)	240 (9.45)	240 (9.45)
• Height	mm (in)	336 (13.2)	455 (17.9)	455 (17.9)	577 (22.7)	228 (8.98)	228 (8.98)
• Depth	mm (in)	50 (1.97)	83.5 (3.29)	83.5 (3.29)	93.5 (3.68)	141 (5.55)	141 (5.55)
<b>Weight, approx.</b>	kg (lb)	6.4 (14)	13 (29)	13 (29)	19 (42)	25 (55)	25 (55)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus(55)	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated output current)	6SL3210-1SE23-2... (32 A)	6SL3210-1SE23-8... (38 A) 6SL3210-1SE24-5... (45 A)	6SL3210-1SE26-0... (60 A)	6SL3210-1SE27-5... (75 A) 6SL3210-1SE31-0... (90 A)	6SL3210-1SE31-1... (110 A) 6SL3210-1SE31-5... (145 A)	6SL3210-1SE31-8... (178 A)

<sup>1)</sup> With correctly connected load connection cable.

# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in blocksize format Line reactors

#### Selection and ordering data

Rated output current A	Type rating kW (HP)	Suitable for Power Module in blocksize format Type	Frame size	Line reactor Order No.
<b>Line voltage 200 ... 240 V 1 AC</b>				
0.9	0.12 (0.2)	6SL3210-1SB11-0...	FSA	<b>6SE6400-3CC00-4AB3</b>
2.3	0.37 (0.5)	6SL3210-1SB12-3...		
3.9	0.75 (0.75)	6SL3210-1SB14-0...	FSA	<b>6SE6400-3CC01-0AB3</b>
<b>Line voltage 380 ... 480 V 3 AC</b>				
1.3	0.37 (0.5)	6SL3210-1SE11-3UA0	FSA	<b>6SE6400-3CC00-2AD3</b>
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1)	6SL3210-1SE12-2UA0	FSA	<b>6SE6400-3CC00-4AD3</b>
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2)	6SL3210-1SE14-1UA0	FSA	<b>6SE6400-3CC00-6AD3</b>
5.9	2.2 (3)	6SL3210-1SE16-0...	FSB	<b>6SL3203-0CD21-0AA0</b>
7.7	3 (5)	6SL3210-1SE17-7...		
10	4 (5)	6SL3210-1SE21-0...	FSB	<b>6SL3203-0CD21-4AA0</b>
18	7.5 (10)	6SL3210-1SE21-8...	FSC	<b>6SL3203-0CD22-2AA0</b>
25	11 (15)	6SL3210-1SE22-5...		
32	15 (20)	6SL3210-1SE23-2...	FSC	<b>6SL3203-0CD23-5AA0</b>
38	18.5 (25)	6SL3210-1SE23-8...	FSD	<b>6SL3203-0CJ24-5AA0</b>
45	22 (30)	6SL3210-1SE24-5...		
60	30 (40)	6SL3210-1SE26-0...	FSD	<b>6SL3203-0CD25-3AA0</b>
75	37 (50)	6SL3210-1SE27-5...	FSE	<b>6SL3203-0CJ28-6AA0</b>
90	45 (60)	6SL3210-1SE31-0...		
110	55 (75)	6SL3210-1SE31-1...	FSF	<b>6SE6400-3CC11-2FD0</b>
145	75 (100)	6SL3210-1SE31-5...		
178	90 (125)	6SL3210-1SE31-8...	FSF	<b>6SE6400-3CC11-7FD0</b>

# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in blocksize format

#### Line filters

#### Overview

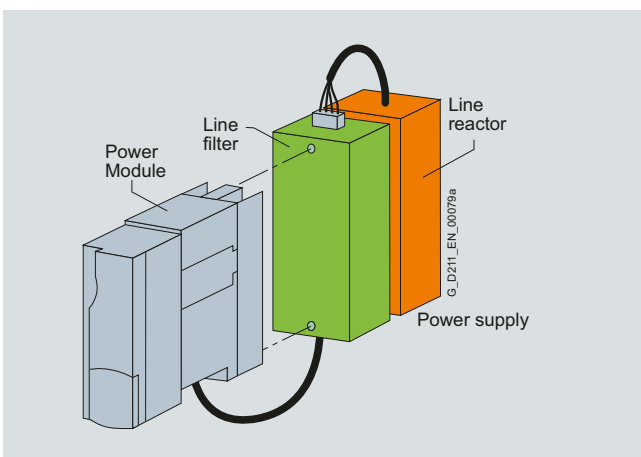


In plants with strict EMC requirements, the line filter for frame size FSA restricts the conducted interference emanating from the PM340 Power Module to the limit values of Class C2 as defined in EN 61800-3. The line filter is suited only for direct connection to TN (grounded) systems.

**Note:** The line filter is designed only for PM340 Power Modules of frame size FSA and a line voltage of 380 V to 480 V 3 AC. All other PM340 Power Modules are available with integrated line filter.

#### Integration

Line filter, line reactor and Power Module can be mounted in front of one another.



#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC	<b>Line filter</b> 6SE6400-2FA00-6AD0
<b>Rated current</b>	6 A
<b>Power loss</b>	< 5 W
<b>Line connection</b> L1, L2, L3	Screw-type terminals
• Conductor cross-section	1 ... 2.5 mm <sup>2</sup>
<b>PE connection</b>	M4 screw stud
<b>Load connection</b> U, V, W	Shielded cable
• Conductor cross-section	4 × 1.5 mm <sup>2</sup>
• Length, approx.	0.24 m (0.79 ft)
<b>Degree of protection</b>	IP20 (with correctly connected load connection cable)
<b>Dimensions</b>	
• Width	73.5 mm (2.89 in)
• Height	200 mm (7.87 in)
• Depth	44 mm (1.73 in)
<b>Weight, approx.</b>	0.5 kg (1 lb)
<b>Approvals, according to</b>	cURus
<b>Suitable for Power Module in blocksize format</b>	6SL3210-1SE11-... (1.3 A and 1.7 A)
Type (rated output current)	6SL3210-1SE12-... (2.2 A) 6SL3210-1SE13-... (3.1 A) 6SL3210-1SE14-... (4.1 A)

#### Selection and ordering data

Suitable for Power Modules in blocksize format Frame size FSA	<b>Line filter</b>
Type	Order No.
6SL3210-1SE11-... 6SL3210-1SE12-... 6SL3210-1SE13-... 6SL3210-1SE14-...	<b>6SE6400-2FA00-6AD0</b>

# SINAMICS S120 drive system

## Power Modules and line-side components

Power Modules in blocksize format  
Recommended line-side components

### Overview

Suitable line-side power components are assigned depending on the power rating of the Power Modules.

The following tables list recommended components and apply for ambient temperatures up to 40 °C (104 °F).

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

### Assignment of line-side power components to Power Modules in blocksize format

Rated output current	Type rating	Suitable for Power Module in blocksize format	Line contactor	Circuit breaker IEC 60947 and UL489/ CSA C22.2 No. 5-02	UL/CSA fuse, Class J		
					Available from: Mersen <a href="http://www.ep.mersen.com">www.ep.mersen.com</a>		
A	kW (HP)	Type 6SL3210-	Type	Order No.	Rated current	Size mm	Reference No.
<b>Line voltage 200 ... 240 V 1 AC</b>							
0.9	0.12 (0.2)	1SB11-0...	5TT57...	5SJ4206-7HG41	6 A	21 × 57	AJT6
2.3	0.37 (0.5)	1SB12-3...	5TT57...	5SJ4210-7HG41	10 A	21 × 57	AJT10
3.9	0.75 (0.75)	1SB14-0...	5TT57...	5SJ4216-7HG41	15 A	21 × 57	AJT15

Rated output current	Type rating	Suitable for Power Module in blocksize format	Line contactor	Circuit breaker IEC 60947	Circuit breaker UL489/ CSA C22.2 No. 5-02	Main switch
A	kW (HP)	Type 6SL3210-	Type	Order No.	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>						
1.3	0.37 (0.5)	1SE11-3UA0	3RT2015-...	3RV2011-1DA10	–	3LD2003-1TP51
1.7	0.55 (0.75)	1SE11-7UA0	3RT2015-...	3RV2011-1DA10	–	3LD2003-1TP51
2.2	0.75 (1)	1SE12-2UA0	3RT2015-...	3RV2011-1FA10	–	3LD2003-1TP51
3.1	1.1 (1.5)	1SE13-1UA0	3RT2015-...	3RV2011-1GA10	–	3LD2003-1TP51
4.1	1.5 (2)	1SE14-1UA0	3RT2015-...	3RV2011-1HA10	–	3LD2003-1TP51
5.9	2.2 (3)	1SE16-0...	3RT2015-...	3RV2011-1KA10	–	3LD2003-1TP51
7.7	3 (5)	1SE17-7...	3RT2015-...	3RV2011-4AA10	–	3LD2003-1TP51
10	4 (5)	1SE21-0...	3RT2016-...	3RV2021-4BA10	–	3LD2103-1TP51
18	7.5 (10)	1SE21-8...	3RT1025-...	3RV1031-4EA10	–	3LD2203-0TK51
25	11 (15)	1SE22-5...	3RT1026-...	3RV1031-4FA10	–	3LD2504-0TK51
32	15 (20)	1SE23-2...	3RT1034-...	3RV1031-4HA10	–	3LD2504-0TK51
38	18.5 (25)	1SE23-8...	3RT1035-...	3RV1042-4JA10	–	3LD2504-0TK51
45	22 (30)	1SE24-5...	3RT1036-...	3RV1042-4KA10	–	3LD2504-0TK51
60	30 (40)	1SE26-0...	3RT1044-...	3RV1042-4MA10	3VL2191-3KN30-....	3LD2704-0TK51
75	37 (50)	1SE27-5...	3RT1045-...	3VL1712-1DD33-....	3VL2110-3KN30-....	3LD2704-0TK51
90	45 (60)	1SE31-0...	3RT1046-...	3VL1716-1DD33-....	3VL2112-3KN30-....	3LD2804-0TK51
110	55 (75)	1SE31-1...	3RT1054-...	3VL3720-1DC36-....	3VL2115-3KN30-....	3KA5330-1GE01
145	75 (100)	1SE31-5...	3RT1056-...	3VL3720-1DC36-....	3VL3120-3KN30-....	3KA5530-1GE01
178	90 (125)	1SE31-8...	3RT1064-...	3VL4725-1DC36-....	3VL3125-3KN30-....	3KA5530-1GE01

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# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in blocksize format Recommended line-side components

#### Overview (continued)

Rated output current	Type rating	Suitable for Power Module in blocksize format	Fuse switch disconnecter	Switch disconnecter with fuse holders	Fuse	UL/CSA fuse, Class J <sup>1)</sup>		
						Available from: Mersen <a href="http://www.ep.mersen.com">www.ep.mersen.com</a>	Rated current	Size mm
A	kW (HP)	Type 6SL3210-	Order No.	Order No.	Order No.			
<b>Line voltage 380 ... 480 V 3 AC</b>								
1.3	0.37 (0.5)	1SE11-3UA0	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3804</b>	4 A	21 × 57	AJT4
1.7	0.55 (0.75)	1SE11-7UA0	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3804</b>	4 A	21 × 57	AJT4
2.2	0.75 (1)	1SE12-2UA0	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3801</b>	6 A	21 × 57	AJT6
3.1	1.1 (1.5)	1SE13-1UA0	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3803</b>	8 A	21 × 57	AJT8
4.1	1.5 (2)	1SE14-1UA0	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3803</b>	10 A	21 × 57	AJT10
5.9	2.2 (3)	1SE16-0...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3803</b>	10 A	21 × 57	AJT10
7.7	3 (5)	1SE17-7...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3805</b>	12 A	21 × 57	AJT12
10	4 (5)	1SE21-0...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3805</b>	15 A	21 × 57	AJT15
18	7.5 (10)	1SE21-8...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3810</b>	25 A	21 × 57	AJT25
25	11 (15)	1SE22-5...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3814</b>	35 A	27 × 60	AJT35
32	15 (20)	1SE23-2...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3817</b>	45 A	27 × 60	AJT45
38	18.5 (25)	1SE23-8...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3820</b>	50 A	27 × 60	AJT50
45	22 (30)	1SE24-5...	<b>3NP4010-0CH01</b>	<b>3KL5030-1GB01</b>	<b>3NA3822</b>	60 A	27 × 60	AJT60
60	30 (40)	1SE26-0...	<b>3NP4010-0CH01</b>	<b>3KL5230-1GB01</b>	<b>3NA3824</b>	90 A	29 × 117	AJT90
75	37 (50)	1SE27-5...	<b>3NP4010-0CH01</b>	<b>3KL5230-1GB01</b>	<b>3NA3830</b>	100 A	29 × 117	AJT100
90	45 (60)	1SE31-0...	<b>3NP4070-0CH01</b>	<b>3KL5230-1GB01</b>	<b>3NA3832</b>	125 A	41 × 146	AJT125
110	55 (75)	1SE31-1...	<b>3NP4070-0CH01</b>	<b>3KL5330-1GB01</b>	<b>3NA3836</b>	150 A	41 × 146	AJT150
145	75 (100)	1SE31-5...	<b>3NP4270-0CA01</b>	<b>3KL5530-1GB01</b>	<b>3NA3140</b>	200 A	41 × 146	AJT200
178	90 (125)	1SE31-8...	<b>3NP4270-0CA01</b>	<b>3KL5530-1GB01</b>	<b>3NA3144</b>	250 A	54 × 181	AJT250

<sup>1)</sup> Not suitable for 3NP and 3KL switch disconnectors.

# SINAMICS S120 drive system

## Power Modules and line-side components

**Air-cooled Power Modules  
in chassis format**

### Design



Power Module in chassis format with Control Unit (not included in scope of supply)

The Power Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 2 DC link connections for options, e.g. Braking Modules
- 3 DRIVE-CLiQ sockets
- 1 safe standstill input (enable pulses)
- 1 temperature sensor input (KTY84-130 or PTC/Pt100)
- 1 electronics power supply connection
- 1 motor connection
- 1 connection for Safe Brake Adapter
- 2 PE (protective earth) connections

The CU310-2/SIMOTION D410-2 Control Unit can be mounted in Power Modules of chassis format.

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable for connection to the CU310-2/SIMOTION D410-2 Control Unit
- One 24 V supply cable for connection to the CU310-2/SIMOTION D410-2 Control Unit
- 1 mounting plate for attaching the CU310-2/SIMOTION D410-2 Control Unit
- 1 set of warning signs in 30 languages

Power Modules in the chassis format can be connected to grounded TN/TT systems and non-grounded IT systems.

#### Application in multi-axis systems

Power Modules in chassis format can also be connected directly via DRIVE-CLiQ to a separate CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2. The appropriate DRIVE-CLiQ cable for the required distance must be ordered as an additional accessory (see [chapter MOTION CONNECT Connection system](#)). A CUA31/CUA32 adapter module need not be installed in the Power Module in chassis format.

### Selection and ordering data

Rated output current	Type rating	Air-cooled Power Module in chassis format
A	kW (HP)	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
210	110 (150)	<b>6SL3310-1TE32-1AA3</b>
260	132 (200)	<b>6SL3310-1TE32-6AA3</b>
310	160 (250)	<b>6SL3310-1TE33-1AA3</b>
380	200 (300)	<b>6SL3310-1TE33-8AA3</b>
490	250 (400)	<b>6SL3310-1TE35-0AA3</b>

#### **Accessories for re-ordering**

##### **Warning labels in 30 languages**

This set of foreign language warning signs can be placed on top of the standard English or German signs.

A set of signs is supplied with the units.

One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR

**6SL3166-3AB00-0AA0**

##### **SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units)**

For DRIVE-CLiQ port

**6SL3066-4CA00-0AA0**

# SINAMICS S120 drive system

## Power Modules and line-side components

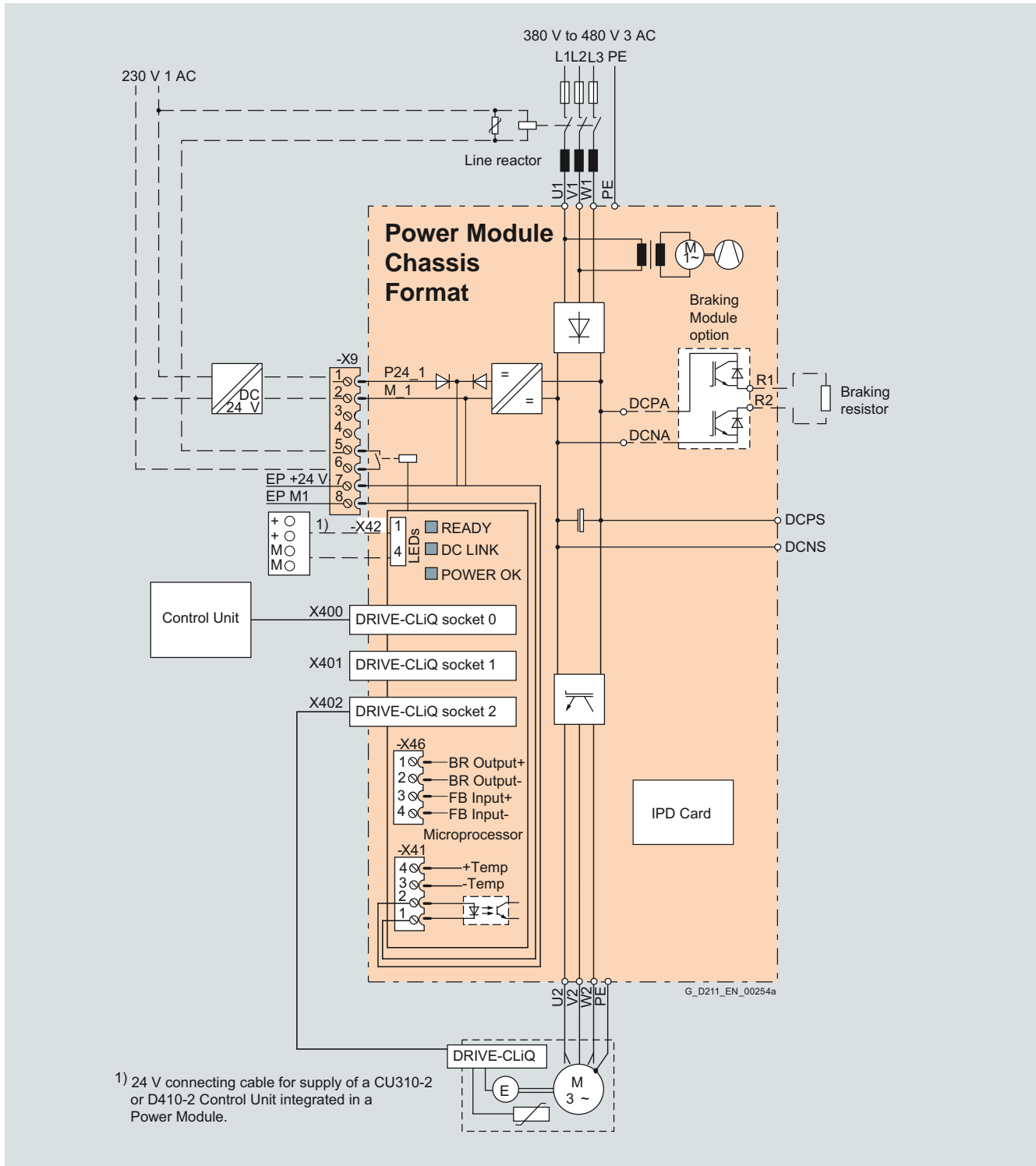
### Air-cooled Power Modules in chassis format

#### Integration

The air-cooled Power Modules in chassis format communicate with the higher-level Control Unit via DRIVE-CLiQ.

The Control Unit in this case could be a CU310-2, CU320-2 or a SIMOTION D Control Unit.

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Connection example of an air-cooled Power Module in chassis format

**Note:** The integrated 24 V power supply is permitted to be loaded with up to 2 A on connector X42. When the Control Unit is supplied over the integrated power supply, particular attention must be paid to the summed load of the digital outputs so that the 2 A maximum is not exceeded.



# SINAMICS S120 drive system

## Power Modules and line-side components

Air-cooled Power Modules  
in chassis format

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### Technical specifications

<b>Air-cooled Power Module in chassis format</b> 6SL3310-1TE3...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min)
<b>Line</b>	Grounded TN/TT systems and non-grounded IT systems
<b>Line frequency</b>	47 ... 63 Hz
<b>Line power factor</b> with a 3 AC connection voltage and rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>Precharging frequency</b> of the DC link, max.	1x every 300 s
<b>DC link voltage, approx.</b>	1.35 x line voltage
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 600 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Main contactor control</b> Terminal strip X9/5-6	240 V AC/ max. 8 A 30 V DC/ max. 1A
<b>Radio interference suppression</b>	
• Standard (in combination with line reactor)	Category C3 to EN 61800-3
• With line filter and line reactor	Category C2 to EN 61800-3
<b>Type of cooling</b>	Forced air cooling by means of built-in fan
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 2000 m (6562 ft) above sea level without derating, > 2000 ... 4000 m (6562 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. <a href="#">For further information, see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating.  
[For further information see chapter System description – Dimensioning.](#)

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in chassis format

#### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Air-cooled Power Module in chassis format</b>				
		6SL3310-1TE32-1AA3	6SL3310-1TE32-6AA3	6SL3310-1TE33-1AA3	6SL3310-1TE33-8AA3	6SL3310-1TE35-0AA3
<b>Output current</b>						
• Rated current $I_{rated}$	A	210	260	310	380	490
• Base-load current $I_L$	A	205	250	302	370	477
• Base-load current $I_H$	A	178	233	277	340	438
• For S6 duty (40 %) $I_{S6}$	A	230	285	340	430	540
• $I_{max}$	A	307	375	453	555	715
<b>Type rating</b> <sup>1)</sup>						
• Based on $I_{rated}$	kW (HP)	110 (150)	132 (200)	160 (250)	200 (300)	250 (400)
• Based on $I_H$	kW (HP)	90 (150)	110 (150)	132 (200)	160 (250)	200 (350)
<b>Rated pulse frequency</b>	kHz	2	2	2	2	2
<b>Current requirement with 24 V DC, max.</b> <sup>2)</sup>	A	0.8	0.8	0.9	0.9	0.9
<b>Power loss, max.</b>	kW	2.54	3.36	4.07	4.67	5.96
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.17 (6.00)	0.23 (8.12)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz	dB	66/67	68/72	68/72	68/72	68/72
<b>Rated input current</b>	A	229	284	338	395	509
<b>Line connection</b> U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>DC link connection</b> DCPA, DCNA (option Braking Module)		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
• Conductor cross-section, max.	mm <sup>2</sup>	1 × 35	1 × 35	1 × 50	1 × 50	1 × 50
<b>DC link connection</b> DCPS, DCNS		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
• Conductor cross-section, max.	mm <sup>2</sup>	1 × 35	1 × 35	1 × 70	1 × 70	1 × 70
<b>Motor connection</b> U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>PE connection</b>		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Motor cable length</b> <sup>3)</sup> , max.						
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)
• Height	mm (in)	1400 (55.1)	1400 (55.1)	1533 (60.3)	1533 (60.3)	1533 (60.3)
• Depth	mm (in)	356 (14.0) <sup>4)</sup>	356 (14.0) <sup>4)</sup>	549 (21.6)	549 (21.6)	549 (21.6)
<b>Frame size</b>		FX	FX	GX	GX	GX
<b>Weight, approx.</b>	kg (lb)	104 (229)	104 (229)	162 (357)	162 (357)	162 (357)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.

<sup>2)</sup> Current consumption of Power Module only. If a Control Unit is supplied with 24 V DC over the Power Module, its current consumption must be added.

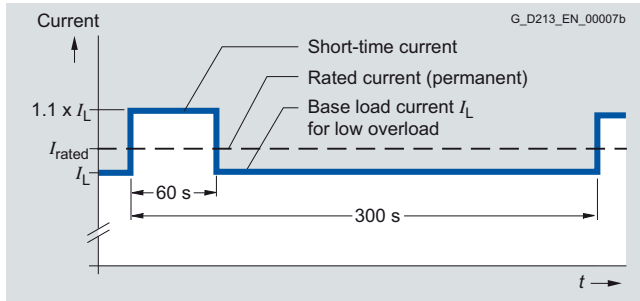
<sup>3)</sup> Motor cable length, max. 100 m (328 ft) (shielded) in conjunction with a line filter to maintain the limit values of EN 61800-3 Category C2.

<sup>4)</sup> Depth = 421 mm (16.6 in) including front cover when CU310-2/D410-2 Control Unit is installed.

#### Characteristic curves

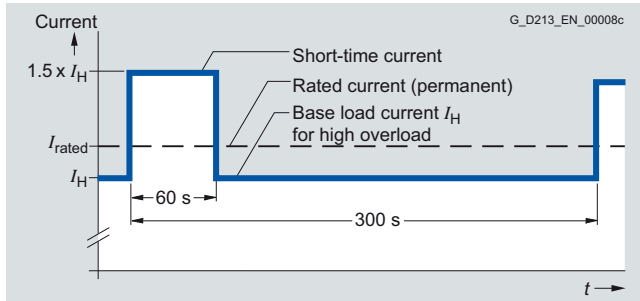
##### Overload capability

The base-load current  $I_L$  is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.

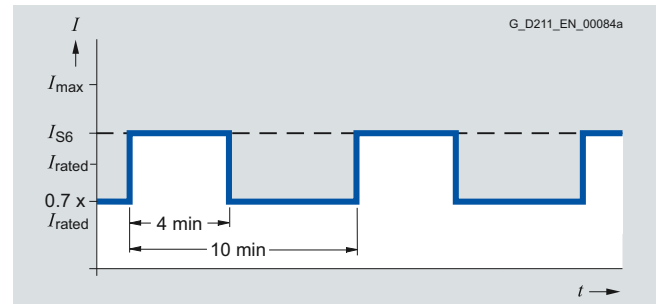


Low overload

The base-load current  $I_H$  is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.



High overload



S6 load cycle with previous load with a load cycle period of 600 s

# SINAMICS S120 drive system

## Power Modules and line-side components

### Air-cooled Power Modules in chassis format

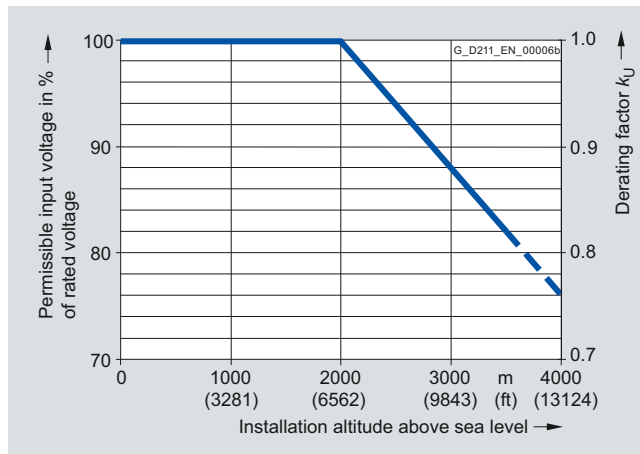
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#### Characteristic curves (continued)

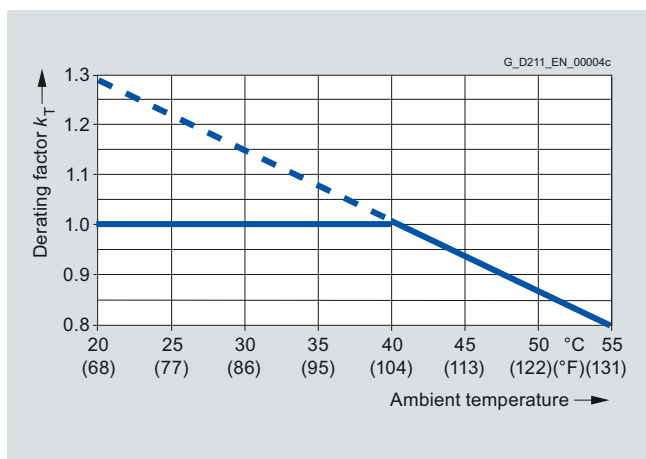
##### Derating factors

Output current dependent on pulse frequency

Power Module in chassis format	Rated output current	Derating factor
Type	A	for a pulse frequency of 4 kHz
6SL3310-1TE32-1AA3	210	<b>0.82</b>
6SL3310-1TE32-6AA3	260	<b>0.83</b>
6SL3310-1TE33-1AA3	310	<b>0.88</b>
6SL3310-1TE33-8AA3	380	<b>0.87</b>
6SL3310-1TE35-0AA3	490	<b>0.78</b>

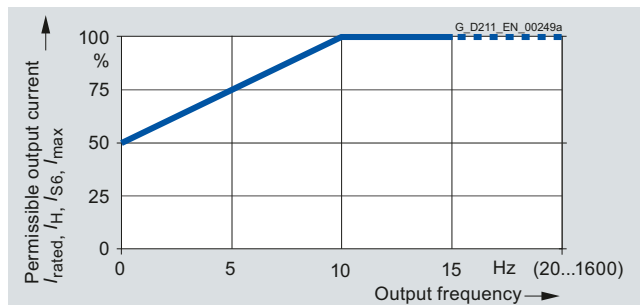


Voltage derating dependent on installation altitude

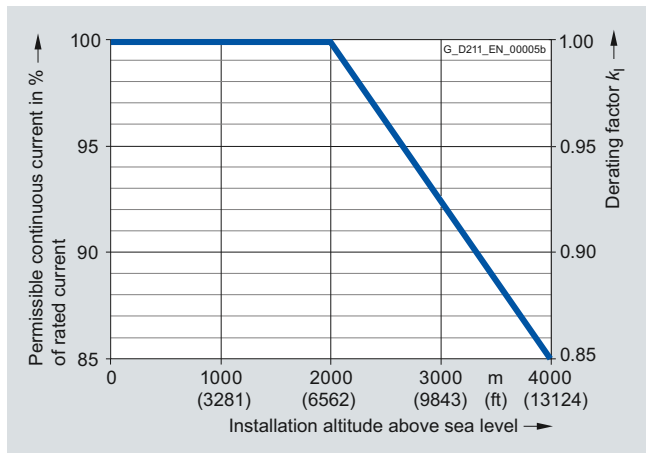


Current derating dependent on ambient temperature

Note: A factor  $k_T > 1$  must be applied only in conjunction with current derating dependent on installation altitude, see chapter System description – Dimensioning.



Current derating dependent on output frequency



Current derating dependent on installation altitude

# SINAMICS S120 drive system

## Power Modules and line-side components

### Liquid-cooled Power Modules in chassis format

#### Design



Liquid-cooled Power Module in chassis format with Control Unit (not included in scope of supply)

The liquid-cooled Power Modules in chassis format are suitable for applications in confined spaces and plants/machines that cannot be equipped with air-cooled devices due to air quality. The liquid-cooled Power Modules in chassis format impress customers with their extremely compact dimensions and low noise level. The devices can be installed vertically or horizontally on the rear panel of the control cabinet. The connections for the coolant are located at the bottom of the Power Module in the case of vertical mounting.

The power connections for the supply system and DC link are connected externally and the motor connections are routed downwards.

Liquid-cooled Power Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

The liquid-cooled Power Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 1 DC link connection
- 3 DRIVE-CLiQ sockets
- 1 safe standstill input (enable pulses)
- 1 temperature sensor input (KTY84-130 or PTC/Pt100)
- 1 electronics power supply connection
- 1 motor connection
- 1 connection for Safe Brake Adapter
- 2 PE (protective earth) connections
- 2 coolant connections

The CU310-2/SIMOTION D410-2 Control Unit can be mounted in liquid-cooled Power Modules of chassis format.

The scope of supply of the Power Modules includes:

- 1 DRIVE-CLiQ cable for connection to the CU310-2/SIMOTION D410-2 Control Unit
- One 24 V supply cable for connection to the CU310-2/SIMOTION D410-2 Control Unit
- 1 CD-ROM with manual in PDF version
- 1 set of warning signs in 30 languages
- 2 seals for coolant connections
- 2 protective caps for coolant connections

#### Application in multi-axis systems

Power Modules in chassis format can also be connected directly via DRIVE-CLiQ to a separate CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2. The appropriate DRIVE-CLiQ cable for the required distance must be ordered as an additional accessory (see chapter [MOTION-CONNECT connection systems](#)). A CUA31/CUA32 adapter module need not be installed in the Power Module in chassis format.

#### Selection and ordering data

Rated output current	Type rating	Liquid-cooled Power Module in chassis format
A	kW (HP)	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
210	110 (150)	<b>6SL3315-1TE32-1AA3</b>
260	132 (200)	<b>6SL3315-1TE32-6AA3</b>
310	160 (250)	<b>6SL3315-1TE33-1AA3</b>
490	250 (400)	<b>6SL3315-1TE35-0AA3</b>
<b>Accessories</b>		
<b>3-way valve DN15 3/4" connection <sup>1)</sup></b>		<b>VXP45.15-2.5</b>
<b>Actuator drive for 3-way valve <sup>1)</sup></b>		
• 230 V 1 AC		<b>SSC31</b>
• 24 V 1 AC		<b>SSC81</b>
<b>Accessories for re-ordering</b>		
<b>Warning labels in 30 languages</b>		<b>6SL3166-3AB00-0AA0</b>
This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR		
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units)</b>		<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port		

<sup>1)</sup> Recommended components for installing a flow control as condensation protection; manufacturer: Siemens SBT.  
For further information, see [Equipment Manual](#).

# SINAMICS S120 drive system

## Power Modules and line-side components

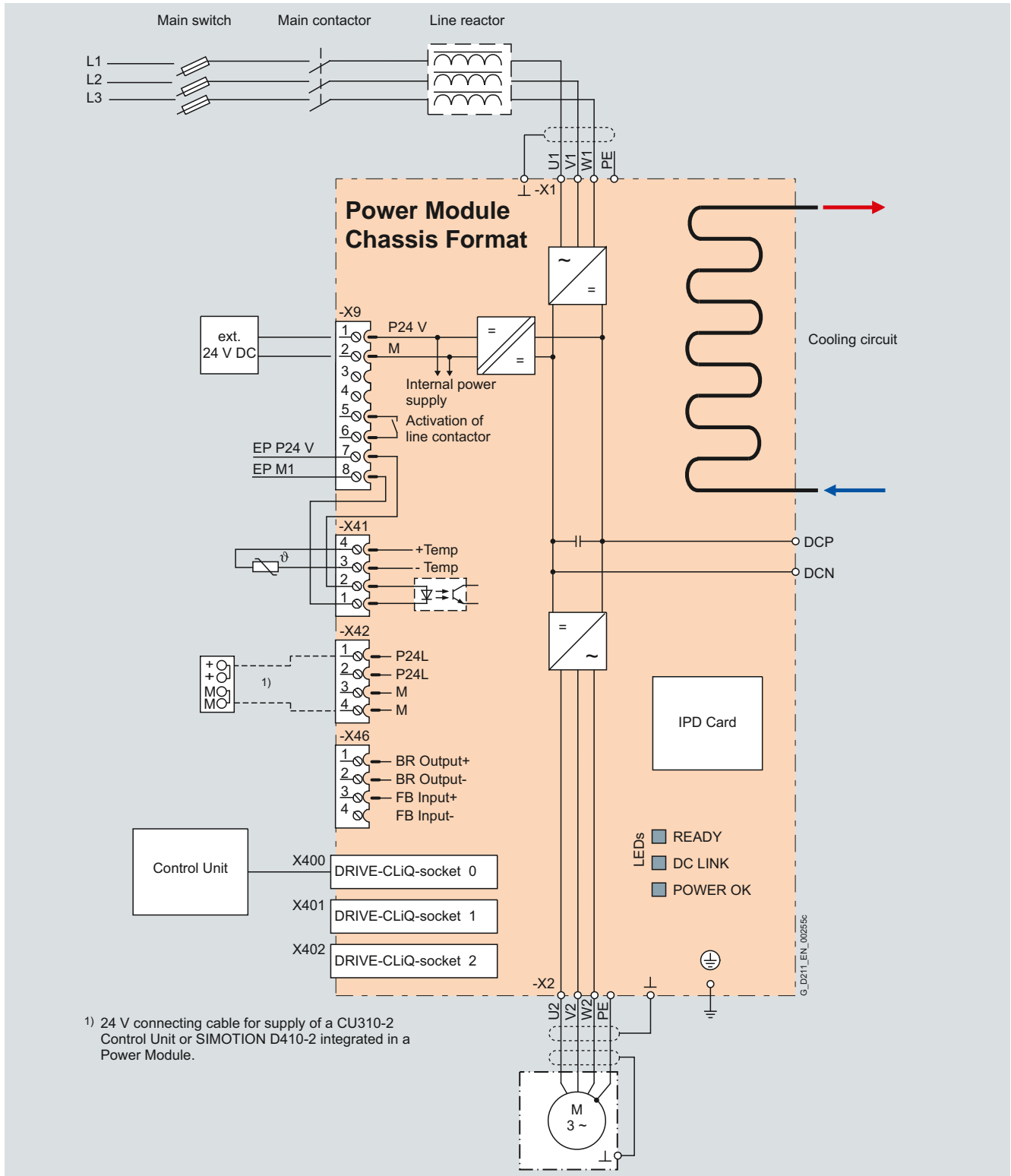
### Liquid-cooled Power Modules in chassis format

#### Integration

The liquid-cooled Power Modules in chassis format communicate with the higher-level Control Unit via DRIVE-CLiQ.

The Control Unit in this case could be a CU310-2, CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate liquid-cooled Power Modules.

3



1) 24 V connecting cable for supply of a CU310-2 Control Unit or SIMOTION D410-2 integrated in a Power Module.

Connection example of a liquid-cooled Power Module in chassis format

**Note:** The integrated 24 V power supply is permitted to be loaded with up to 2 A on connector X42. When the Control Unit is supplied over the integrated power supply, particular attention

must be paid to the summed load of the digital outputs so that the 2 A maximum is not exceeded.

# SINAMICS S120 drive system

## Power Modules and line-side components

Liquid-cooled Power Modules  
in chassis format

3

### Technical specifications

<b>Liquid-cooled Power Module in chassis format</b> 6SL3315-1TE3...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min)
<b>Line</b>	Grounded TN/TT systems and non-grounded IT systems
<b>Line frequency</b>	47 ... 63 Hz
<b>Line power factor</b> with a 3 AC connection voltage and rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Overvoltage category</b> acc. to EN 61800-5-1	Class III
<b>Precharging frequency</b> of the DC link	No limitation
<b>DC link voltage, approx.</b>	1.35 x line voltage
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 600 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Main contactor control</b> Terminal strip X9/5-6	240 V AC/ max. 8 A 30 V DC/ max. 1A
<b>Radio interference suppression</b>	
• Standard (in combination with line reactor)	Category C3 to EN 61800-3
<b>Type of cooling</b>	Liquid cooling with integrated heat exchanger in stainless-steel version
<b>Coolant <sup>2)</sup></b>	
• pH value	6.0 ... 9.0
• Chloride	< 200 mg/l
• Sulfate	< 240 mg/l
• Hardness	< 2.5 mmol/l <sup>3)</sup>
• Conductivity	< 2000 $\mu\text{S/cm}$
• Colony number	< 1000 col/ml <sup>4)</sup>
• Max. size of entrained particles	< 100 $\mu\text{m}$
<b>Cooling circuit</b>	
• System pressure with reference to the atmospheric pressure, max.	600 kPa
• Pressure drop at rated volumetric flow	70 kPa
• Recommended pressure range	80 ... 200 kPa
• Inlet temperature of liquid coolant	Dependent on the ambient temperature, condensation is not permitted 0 ... 45 °C (32 ... 113 °F) without derating > 45 ... 50 °C (113 ... 122 °F) <a href="#">see derating characteristics</a> (temperature range between 0 °C and 5 °C (32 ... 41 °F) with anti-freeze only; recommended anti-freeze: Antifrogen N from Clariant)
<b>Permissible ambient temperature (air) during operation</b>	Dependent on the inlet temperature of the coolant, condensation is not permissible 0 ... 45 °C (32 ... 113 °F) without derating > 45 ... 50 °C (113 ... 122 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 2000 m (6562 ft) above sea level without derating, > 2000 ... 4000 m (6562 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. <a href="#">For further information, see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating.

[For further information see chapter System description – Dimensioning.](#)

<sup>2)</sup> The values are applicable to coolant (water) without the addition of anti-freeze or inhibitors. When anti-freeze or inhibitors are added, the specifications of the manufacturer regarding water quality must be observed. The proportion of anti-freeze must not exceed a minimum concentration, otherwise the coolant has a marked corrosive effect. In the case of Antifrogen N, the recommended range of the ratio of Antifrogen N to water lies between 20/80 and 45/55 Vol. %

<sup>3)</sup> The hardness of the coolant, especially the concentration of calcium compounds should be kept to a minimum to prevent the build-up of damaging calcium deposits (lime scale). A hardness < 1.5 mmol/l is recommended.

<sup>4)</sup> The number of microbes should generally be as low as possible to prevent damage as a result of slime-producing, iron-depositing, corroding bacteria. In closed coolant circuits, the accumulation of microbes can be prevented, for example, by adding anti-freeze. The concentration of anti-freeze must only reach a minimum level to prevent corrosion, [see Footnote <sup>2\)</sup>](#).

# SINAMICS S120 drive system

## Power Modules and line-side components

### Liquid-cooled Power Modules in chassis format

#### Technical specifications (continued)

<b>Line voltage</b> <b>380 ... 480 V 3 AC</b>		<b>Liquid-cooled Power Module in chassis format</b>			
		6SL3315-1TE32-1AA3	6SL3315-1TE32-6AA3	6SL3315-1TE33-1AA3	6SL3315-1TE35-0AA3
<b>Output current</b>					
• Rated current $I_{rated}$	A	210	260	310	490
• Base-load current $I_L$	A	205	250	302	477
• Base-load current $I_H$	A	178	233	277	438
• For S6 duty (40 %) $I_{S6}$	A	230	285	340	540
• $I_{max}$	A	307	375	453	715
<b>Type rating <sup>1)</sup></b>					
• Based on $I_{rated}$	kW (HP)	110 (150)	132 (200)	160 (250)	250 (400)
• Based on $I_H$	kW (HP)	90 (150)	110 (150)	132 (200)	200 (350)
<b>Rated pulse frequency</b>	kHz	2	2	2	2
<b>Power loss, max.</b>					
• Total, approx.	kW	2.6	3.2	3.6	5.7
• Lost to ambient air, approx.	kW	0.06	0.07	0.09	0.14
<b>Cooling circuit</b>					
• Rated volumetric flow for water at 70 kPa pressure drop	dm <sup>3</sup> /min (l/min)	9	9	12	12
• Cooling circuit connection, inlet and return		Pipe thread ISO 228-G ¾ B (external thread ¾" flat-sealing)	Pipe thread ISO 228-G ¾ B (external thread ¾" flat-sealing)	Pipe thread ISO 228-G ¾ B (external thread ¾" flat-sealing)	Pipe thread ISO 228-G ¾ B (external thread ¾" flat-sealing)
• Liquid volume of integrated heat exchanger	dm <sup>3</sup> (l)	0.52	0.52	0.88	0.88
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz	dB	52	52	52	52
<b>Rated input current</b>	A	230	285	340	540
<b>Current requirement</b> at 24 V DC, max.	A	1.4	1.4	1.5	1.5
<b>Line connection</b> U1, V1, W1		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>DC link connection</b> DCP, DCN		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>Motor connection</b> U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>PE connection</b>		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 95	2 × 95	2 × 240	2 × 240
<b>Motor cable length, max.</b>					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm (in)	265 (10.4)	265 (10.4)	265 (10.4)	265 (10.4)
• Height	mm (in)	835.5 (32.9)	835.5 (32.9)	983 (38.7)	983 (38.7)
• Depth	mm (in)	549 (21.6)	549 (21.6)	549 (21.6)	549 (21.6)
<b>Frame size</b>		FL	FL	GL	GL
<b>Weight, approx.</b>	kg (lb)	77 (170)	77 (170)	108 (238)	108 (238)

<sup>1)</sup> Nominal HP based on asynchronous (induction) motors and 460 V 3 AC. For specific sizing select drive based on motor nameplate current and overload.



# SINAMICS S120 drive system

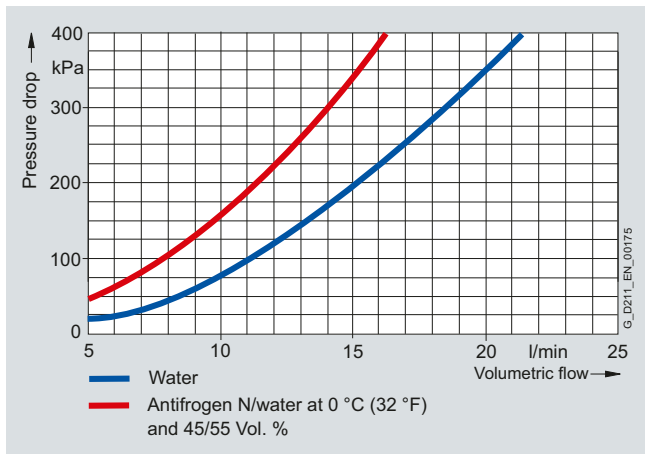
## Power Modules and line-side components

### Liquid-cooled Power Modules in chassis format

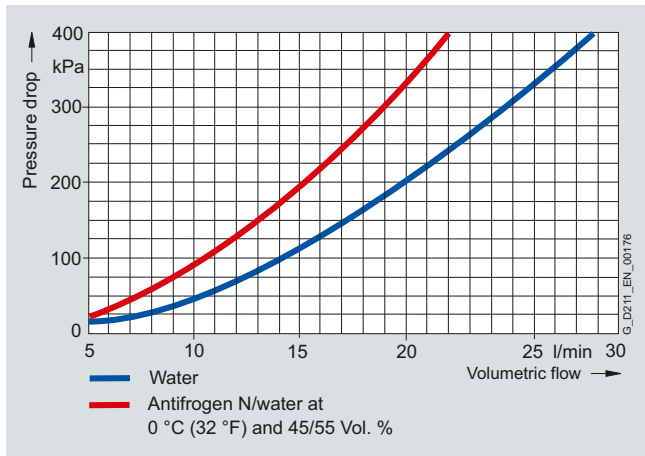
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#### Characteristic curves

##### Pressure drop



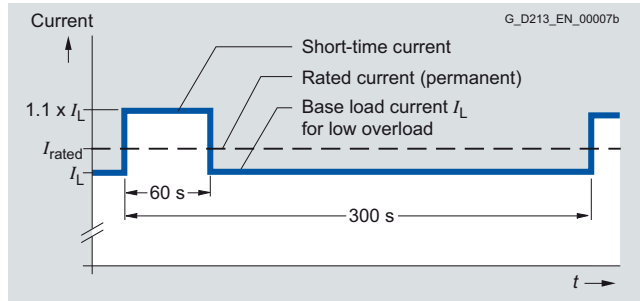
Pressure drop with frame size FL



Pressure drop with frame size GL

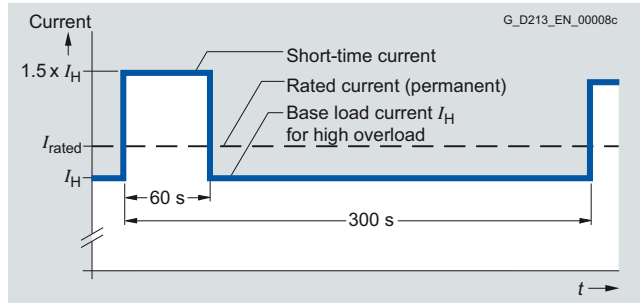
##### Overload capability

The base-load current  $I_L$  is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.

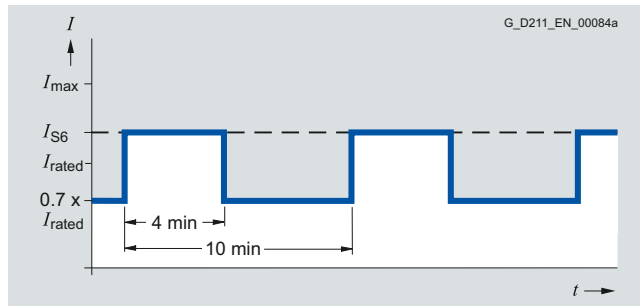


Low overload

The base-load current  $I_H$  is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.



High overload



S6 load cycle with previous load with a load cycle period of 600 s

# SINAMICS S120 drive system

## Power Modules and line-side components

### Liquid-cooled Power Modules in chassis format

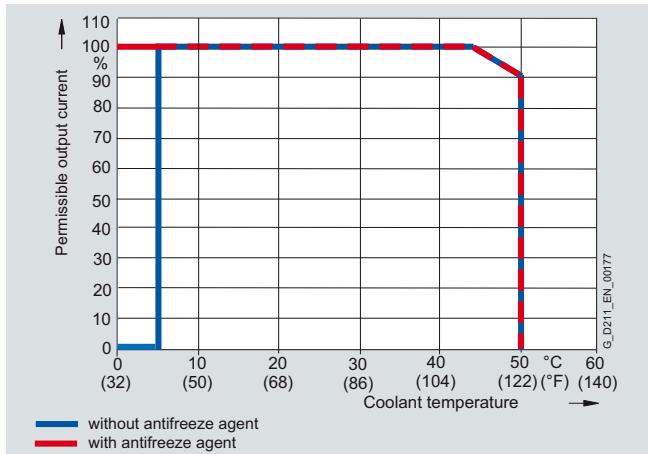
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#### Characteristic curves (continued)

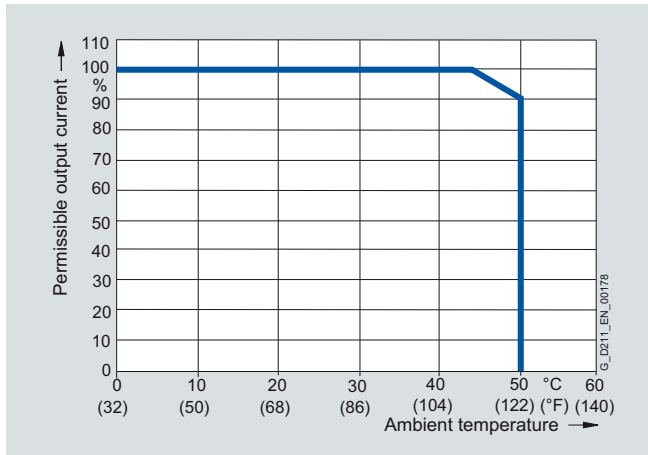
##### Derating factors

Output current dependent on pulse frequency

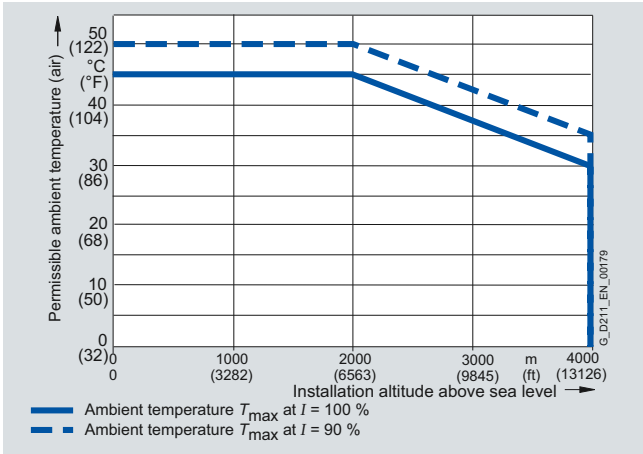
Liquid-cooled Power Modules in chassis format	Rated output current	Derating factor	
		for a pulse frequency of 2.5 kHz	for a pulse frequency of 4 kHz
Type	A		
6SL3315-1TE32-1AA3	210	<b>0.95</b>	<b>0.82</b>
6SL3315-1TE32-6AA3	260	<b>0.95</b>	<b>0.83</b>
6SL3315-1TE33-1AA3	310	<b>0.97</b>	<b>0.88</b>
6SL3315-1TE35-0AA3	490	<b>0.94</b>	<b>0.78</b>



Current derating dependent on temperature of the cooling liquid

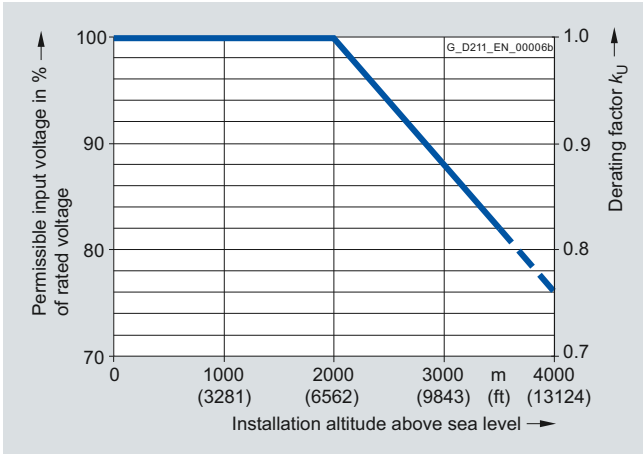


Current derating dependent on ambient temperature

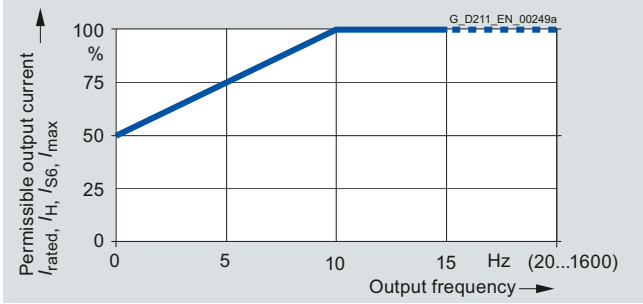


Current derating dependent on installation altitude

Note: For installation altitudes over 2000 m (6562 ft), current derating is required due to the power losses internally transferred to the ambient air. Current derating is not necessary when an additional external fan is used for ventilation.



Voltage derating dependent on installation altitude



Current derating dependent on output frequency

# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in chassis format Line reactors

#### Overview



Line reactors limit the low-frequency harmonic effects and reduce the load on the rectifiers of the Power Modules. The higher the rated output of the Power Modules, the lower the required inductance of the line reactor. A line reactor is not required where the effective supply impedance equals  $u_k > 3\%$ .

For further information see chapter System description – Dimensioning.

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#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor			
		6SL3000-0CE32-3AA0	6SL3000-0CE32-8AA0	6SL3000-0CE33-3AA0	6SL3000-0CE35-1AA0
Rated current	A	224	278	331	508
Power loss at 50/60 Hz	kW	0.24/0.27	0.21/0.25	0.23/0.27	0.31/0.37
Line connection 1U1, 1V1, 1W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw
Load connection 1U2, 1V2, 1W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw
PE connection		M6 screw	M6 screw	M6 screw	M6 screw
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)	300 (11.8)
• Height	mm (in)	248 (9.76)	248 (9.76)	248 (9.76)	269 (10.6)
• Depth	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	212.5 (8.37)
Weight, approx.	kg (lb)	24.5 (54)	26 (57)	27.8 (61)	38 (84)
Approvals, according to		cURus	cURus	cURus	cURus
Suitable for Power Module in chassis format	Type (rated output current)	6SL3310-1TE32-1... (210 A) 6SL3315-1TE32-1... (210 A)	6SL3310-1TE32-6... (260 A) 6SL3315-1TE32-6... (260 A)	6SL3310-1TE33-1... (310 A) 6SL3315-1TE33-1... (310 A)	6SL3310-1TE33-8... (380 A) 6SL3310-1TE35-0... (490 A) 6SL3315-1TE35-0... (490 A)

#### Selection and ordering data

Rated output current A	Type rating kW (HP)	Suitable for Power Module in chassis format Type	Frame size	Line reactor Order No.
Line voltage 380 ... 480 V 3 AC				
210	110 (150)	6SL3310-1TE32-1AA3 6SL3315-1TE32-1AA3	FX FL	<b>6SL3000-0CE32-3AA0</b>
260	132 (200)	6SL3310-1TE32-6AA3 6SL3315-1TE32-6AA3	FX FL	<b>6SL3000-0CE32-8AA0</b>
310	160 (250)	6SL3310-1TE33-1AA3 6SL3315-1TE33-1AA3	GX GL	<b>6SL3000-0CE33-3AA0</b>
380	200 (300)	6SL3310-1TE33-8AA3	GX	<b>6SL3000-0CE35-1AA0</b>
490	250 (400)	6SL3310-1TE35-0AA3 6SL3315-1TE35-0AA3	GX GL	

# SINAMICS S120 drive system

## Power Modules and line-side components

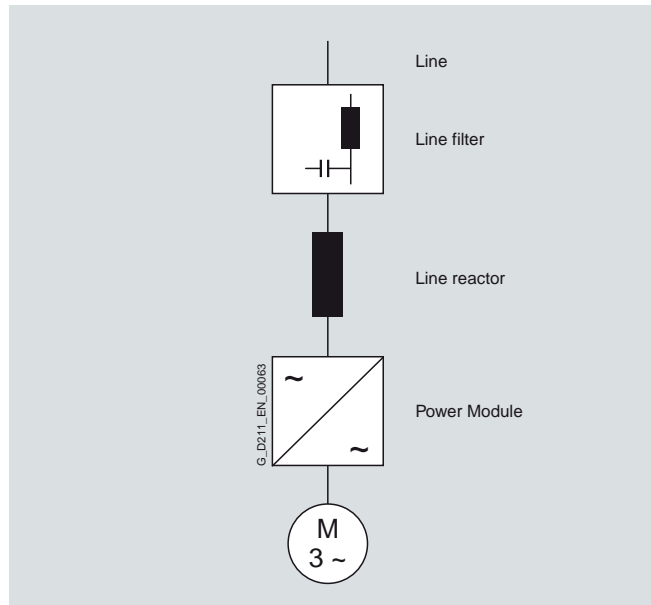
### Power Modules in chassis format

#### Line filters

#### Overview



#### Integration



In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Class C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems with grounded star point.

#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Line filter</b>		
		6SL3000-0BE32-5AA0	6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0
<b>Rated current</b>	A	250	440	600
<b>Power loss</b>	kW	0.05	0.05	0.06
<b>Line connection</b> 1U1, 1V1, 1W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
<b>Load connection</b> 1U2, 1V2, 1W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
<b>PE connection</b>		M8 hole	M8 hole	M10 hole
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	360 (14.2)	360 (14.2)	400 (15.7)
• Height	mm (in)	240 (9.45)	240 (9.45)	265 (10.4)
• Depth	mm (in)	116 (4.57)	116 (4.57)	140 (5.51)
<b>Weight, approx.</b>	kg (lb)	12.3 (27)	12.3 (27)	19 (42)
<b>Approvals, according to</b>		UR, cUR	UR, cUR	UR, cUR
<b>Suitable for Power Module in chassis format</b>	Type (rated output current)	6SL3310-1TE32-1... (210 A)	6SL3310-1TE32-6... (260 A) 6SL3310-1TE33-1... (310 A) 6SL3310-1TE33-8... (380 A)	6SL3310-1TE35-0... (490 A)

#### Selection and ordering data

Rated output current	Type rating	Suitable for Power Module in chassis format	<b>Line filter</b>
A	kW (HP)	Type	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>			
210	110 (150)	6SL3310-1TE32-1AA3	<b>6SL3000-0BE32-5AA0</b>
260	132 (200)	6SL3310-1TE32-6AA3	<b>6SL3000-0BE34-4AA0</b>
310	160 (250)	6SL3310-1TE33-1AA3	
380	200 (300)	6SL3310-1TE33-8AA3	
490	250 (400)	6SL3310-1TE35-0AA3	<b>6SL3000-0BE36-0AA0</b>

# SINAMICS S120 drive system

## Power Modules and line-side components

### Power Modules in chassis format Recommended line-side components

#### Overview

Suitable line-side power components are assigned depending on the power rating of the Power Modules.

The following tables list recommended components and apply for ambient temperatures up to 40 °C (104 °F).

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

#### Assignment of line-side power components to Power Modules in chassis format

Rated output current	Type rating	Suitable for Power Module in chassis format	Line contactor	Circuit breaker IEC 60947	Circuit breaker UL489/CSA C22.2 No. 5-02
A	kW (HP)	Type 6SL3310-	Type	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>					
210	110 (150)	1TE32-1AA3	<b>3RT1064-...</b>	<b>3VL4725-1DC36-0AA0</b>	<b>3VL3125-3KN30-0AA0</b>
260	132 (200)	1TE32-6AA3	<b>3RT1065-...</b>	<b>3VL4731-1DC36-0AA0</b>	<b>3VL4130-3KN30-0AA0</b>
310	160 (250)	1TE33-1AA3	<b>3RT1066-...</b>	<b>3VL4740-1DC36-0AA0</b>	<b>3VL4135-3KN30-0AA0</b>
380	200 (300)	1TE33-8AA3	<b>3RT1075-...</b>	<b>3VL5750-1DC36-0AA0</b>	<b>3VL4140-3KN30-0AA0</b>
490	250 (400)	1TE35-0AA3	<b>3RT1076-...</b>	<b>3VL5763-1DC36-0AA0</b>	<b>3VL4560-3KN30-0AA0</b>

Rated output current	Type rating	Suitable for Power Module in chassis format	Main switch	Fuse switch disconnecter	Switch disconnecter with fuse holders
A	kW (HP)	Type 6SL3310-	Order No.	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>					
210	110 (150)	1TE32-1AA3	<b>3KA5530-1GE01</b>	<b>3NP1143-1DA10</b>	<b>3KL5530-1GB01</b>
260	132 (200)	1TE32-6AA3	<b>3KA5730-1GE01</b>	<b>3NP1153-1DA10</b>	<b>3KL5730-1GB01</b>
310	160 (250)	1TE33-1AA3	<b>3KA5730-1GE01</b>	<b>3NP1153-1DA10</b>	<b>3KL5730-1GB01</b>
380	200 (300)	1TE33-8AA3	<b>3KA5730-1GE01</b>	<b>3NP1153-1DA10</b>	<b>3KL5730-1GB01</b>
490	250 (400)	1TE35-0AA3	<b>3KA5830-1GE01</b>	<b>3NP1163-1DA10</b>	<b>3KL6130-1GB00</b>

Rated output current	Type rating	Suitable for Power Module in chassis format	Fuse	UL/CSA fuse, Class J		
A	kW (HP)	Type 6SL3310-	Order No.	Available from: Mersen <a href="http://www.ep.mersen.com">www.ep.mersen.com</a>		
				Rated current	Size mm	Reference No.
<b>Line voltage 380 ... 480 V 3 AC</b>						
210	110 (150)	1TE32-1AA3	<b>3NA3144</b>	250 A	54 × 181	AJT250
260	132 (200)	1TE32-6AA3	<b>3NA3250</b>	300 A	54 × 181	AJT300
310	160 (250)	1TE33-1AA3	<b>3NA3254</b>	350 A	54 × 181	AJT350
380	200 (300)	1TE33-8AA3	<b>3NA3260</b>	400 A	54 × 181	AJT400
490	250 (400)	1TE35-0AA3	<b>3NA3372</b>	600 A	64 × 203	AJT600

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format

#### Overview



Basic Line Modules in booksize format

Basic Line Modules are used for applications in which no energy is returned to the supply or where the energy exchange between motor and generator axes takes place in the DC link. Basic Line Modules can only feed energy from the supply system into the DC link, energy cannot be fed back into the supply system. The DC link voltage is directly derived from the 3-phase line voltage via a 6-pulse bridge circuit. Basic Line Modules are designed for connection to grounded, star TN/TT systems and non-grounded, symmetrical IT systems. The connected Motor Modules are pre-charged over the integrated pre-charging resistors (20 kW and 40 kW) or through activation of the thyristors (100 kW).

The 20 kW and 40 kW Basic Line Modules are equipped with an integrated brake chopper. With the addition of an external braking resistor, they can be used for applications with intermittent regenerative operation such as stopping.

A Braking Module is required with a 100 kW Basic Line Module in addition to an external braking resistor for regenerative operation.

#### Design

The Basic Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection
- 3 DRIVE-CLiQ sockets
- 1 connection for braking resistor (20 kW and 40 kW Basic Line Modules only)
- 1 temperature sensor input

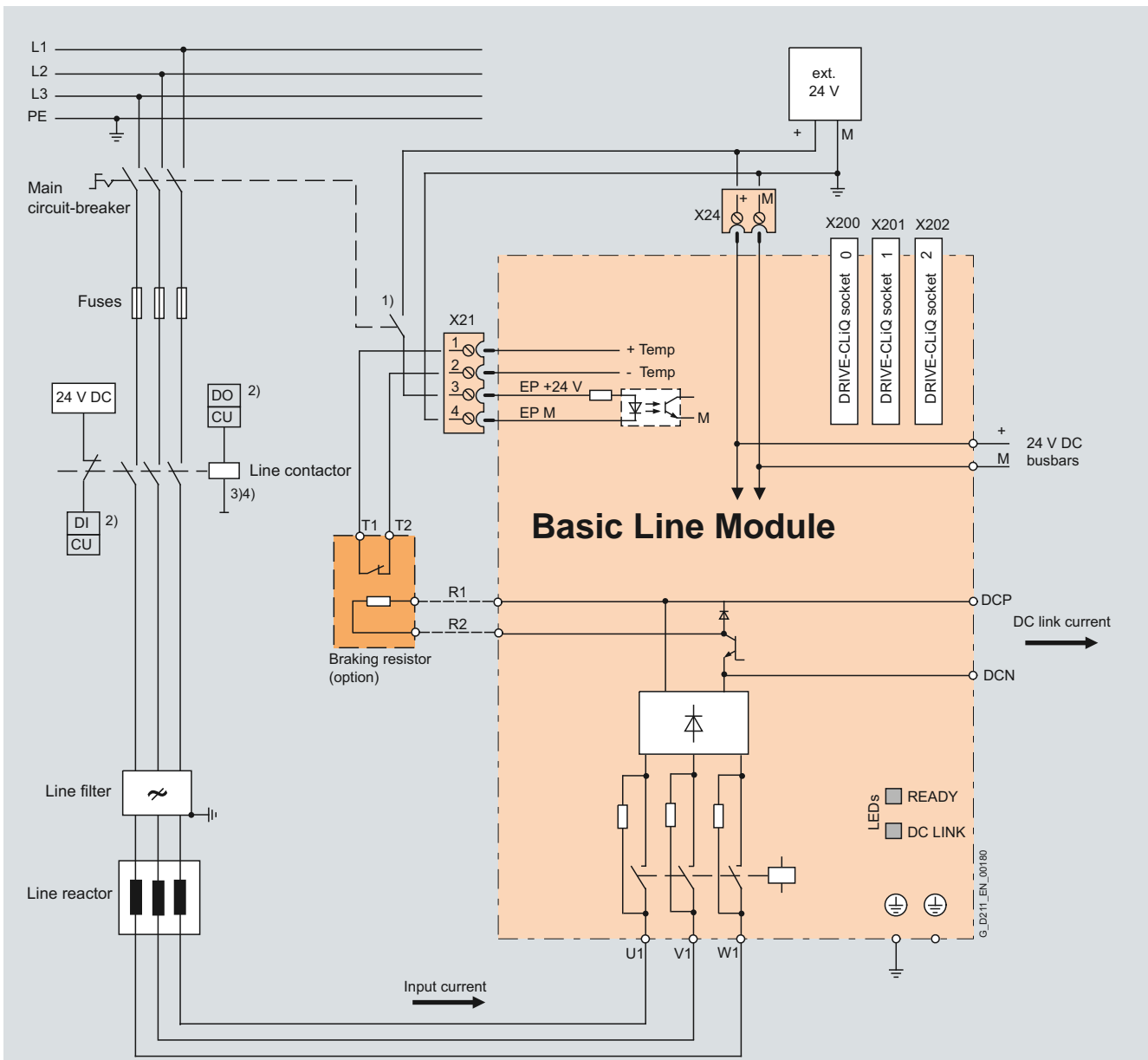
The status of the Basic Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Basic Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
- DRIVE-CLiQ cable (length depends on module width) to connect Basic Line Module to adjacent Motor Module, length = width of Basic Line Module + 0.11 m (4.33 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- 1 set of warning signs in 30 languages
- 1 heat conducting foil (for Basic Line Modules with cold plate cooling only)

### Integration

The Basic Line Module communicates with a CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2 via DRIVE-CLiQ.



- 1) For operation, a 24 V DC voltage must be applied between terminals "EP +24 V" and "EP M"
- 2) Digital input (DI) or digital output (DO), controlled by the Control Unit.
- 3) No additional load permitted downstream of the line contactor.
- 4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.

Connection example for 20 kW and 40 kW Basic Line Modules in booksize format

**Note:** The thermostatic switch built into the braking resistor must be looped into the shutdown chain of the drive to prevent thermal overloading of the system in the event of a fault. If a braking resistor is not connected, a jumper must be connected between X21.1 and X21.2.

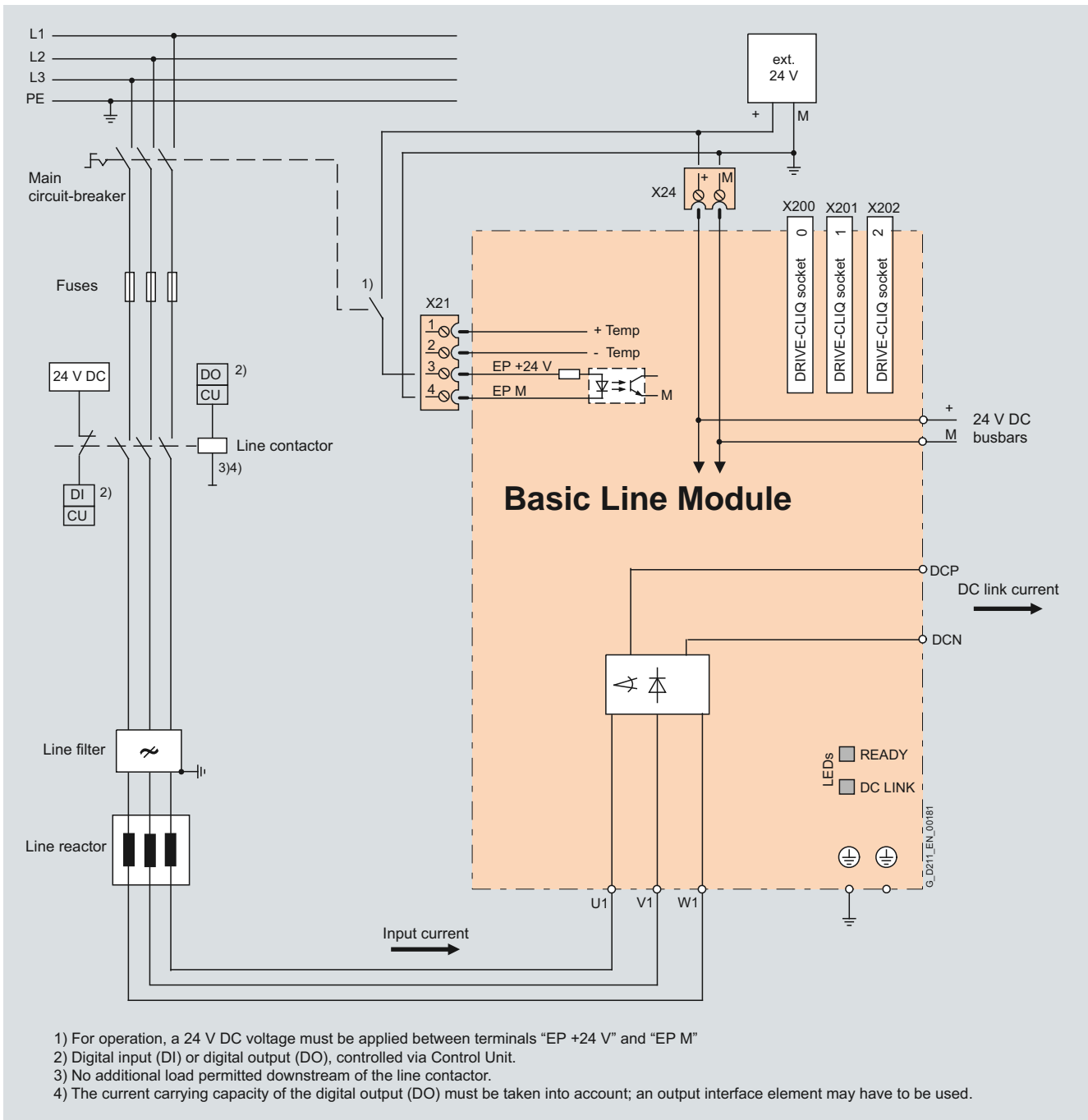
# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format

3

Integration (continued)



Connection example for 100 kW Basic Line Module in booksize format



# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format

#### Technical specifications

<b>Basic Line Module in booksize format</b> 6SL313...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation $-15\% < 1$ min)
<b>Line frequency</b>	47 ... 63 Hz
<b>SCCR (short-circuit current rating)</b>	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 <a href="#">see recommended line-side components</a>
<b>Line power factor</b> at rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	$> 0.96$
• Total ( $\lambda$ )	0.75 ... 0.93
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>DC link voltage, approx.</b>	$1.35 \times$ line voltage <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC, $-15\%/+20\%$
<b>Radio interference suppression</b>	
• Standard	
- 20 kW and 40 kW Basic Line Modules	No radio interference suppression
- 100 kW Basic Line Module	Category C3 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
• With line filter	Category C2 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
<b>Type of cooling</b>	- Internal air cooling, power units with forced air cooling using a built-in fan - Cold plate cooling
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The DC link voltage is unregulated and load-dependent.  
For further information see chapter [System description – Dimensioning](#).

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format

#### Technical specifications (continued)

<b>Line voltage</b> <b>380 ... 480 V 3 AC</b>		<b>Basic Line Module in booksize format</b>			
<ul style="list-style-type: none"> <li>Internal air cooling</li> <li>Cold plate cooling</li> </ul>		6SL3130-1TE22-0AA0	6SL3130-1TE24-0AA0	6SL3130-1TE31-0AA0	
		6SL3136-1TE22-0AA0	6SL3136-1TE24-0AA0	6SL3136-1TE31-0AA0	
<b>Power</b>					
<ul style="list-style-type: none"> <li>Rated power <math>P_{rated}</math></li> <li>- At 380 V 3 AC</li> <li>- At 460 V 3 AC <sup>2)</sup></li> </ul>		kW (HP)	20 (25)	40 (50)	100 (125)
<ul style="list-style-type: none"> <li>For S6 duty (40 %) <math>P_{S6}</math></li> </ul>		kW	26	52	130
<ul style="list-style-type: none"> <li><math>P_{max}</math></li> </ul>		kW	60	120	175
<b>Braking power</b> with external braking resistor					
<ul style="list-style-type: none"> <li><math>P_{Bmax}</math> (<math>= 2 \times P_{rated}</math>)</li> <li>Continuous braking power <math>P_d</math> (<math>= 0.25 \times P_{rated}</math>)</li> </ul>		kW	40	80	–
		kW	5	10	–
<b>DC link current</b>					
<ul style="list-style-type: none"> <li>At 600 V DC</li> <li>For S6 duty (40 %)</li> <li>Maximum</li> </ul>		A	34	67	167
		A	43	87	217
		A	100	200	292
<b>Input current</b>					
<ul style="list-style-type: none"> <li>Rated current at 380 V 3 AC</li> <li>Maximum</li> </ul>		A	35	69	172
		A	113	208	301
<b>Activation threshold</b> Braking chopper		V	774	774	–
<b>Resistance value</b> of the external braking resistor		$\Omega$	$\geq 14.8$	$\geq 7.4$	–
<b>Cable length, max.</b> to braking resistor		m (ft)	15 (50)	15 (50)	–
<b>Connection for braking resistor (X2)</b> <ul style="list-style-type: none"> <li>Conductor cross-section, max.</li> </ul>		mm <sup>2</sup>	Screw-type terminals 0.5 ... 4	Screw-type terminals 0.5 ... 10	–
<b>Current requirement, max.</b> 24 V DC electronics power supply		A	1	1.4	2
<b>Current carrying capacity</b>					
<ul style="list-style-type: none"> <li>24 V DC busbars</li> <li>DC link busbars</li> </ul>		A	20	20	20
		A	100	200	200
<b>DC link capacitance</b>					
<ul style="list-style-type: none"> <li>Basic Line Module</li> <li>Drive line-up, max.</li> </ul>		$\mu$ F $\mu$ F	940 20000	1880 20000	4100 50000
<b>Internal air cooling</b>					
<ul style="list-style-type: none"> <li>Power loss <sup>1)</sup></li> <li>Cooling air requirement</li> <li>Sound pressure level <math>L_{pA}</math> (1 m)</li> </ul>		kW m <sup>3</sup> /s (ft <sup>3</sup> /s) dB	0.144 0.016 (0.565) < 60	0.284 0.031 (1.095) < 65	0.628 0.05 (1.77) < 65
<b>Cold plate cooling</b>					
<ul style="list-style-type: none"> <li>Power loss, int./ext. <sup>1)</sup></li> <li>Thermal resistance <math>R_{th}</math></li> </ul>		kW K/W	0.047/0.095 0.075	0.071/0.205 0.05	0.168/0.45 0.045
<b>Line connection U1, V1, W1</b>					
<ul style="list-style-type: none"> <li>Conductor cross-section, max.</li> </ul>		mm <sup>2</sup>	Screw-type terminals 0.5 ... 16	Screw-type terminals 10 ... 50	M8 screw stud 1 x 35 ... 120 or 2 x 50
<b>Shield connection</b>			Integrated into the power plug	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>
<b>PE connection</b>			M5 screw	M6 screw	M6 screw
<b>Cable length, max.</b> (total of all motor power cables and DC link) <ul style="list-style-type: none"> <li>Shielded/unshielded</li> </ul>		m (ft)	1000/1500 (3281/4921) (above 630/850 m (2067/2789 ft) with Voltage Clamping Module)	1000/1500 (3281/4921) (above 630/850 m (2067/2789 ft) with Voltage Clamping Module)	1000/1500 (3281/4921) (above 630/850 m (2067/2789 ft) with Voltage Clamping Module)
<b>Degree of protection</b>			IP20	IP20	IP20
<b>Dimensions</b>					
<ul style="list-style-type: none"> <li>Width</li> <li>Height</li> <li>Depth</li> <li>- With internal air cooling</li> <li>- With cold plate cooling</li> </ul>		mm (in) mm (in) mm (in) mm (in)	100 (3.94) 380 (15.0) 270 (10.6) 226 (8.90)	150 (5.91) 380 (15.0) 270 (10.6) 226 (8.90)	200 (7.87) 380 (15.0) 270 (10.6) 226 (8.90)
<b>Weight, approx.</b>					
<ul style="list-style-type: none"> <li>With internal air cooling</li> <li>With cold plate cooling</li> </ul>		kg (lb) kg (lb)	6.8 (15) 6.4 (14)	11.3 (25) 10.9 (24)	15.8 (35) 16.4 (36)

<sup>1)</sup> Power loss of Basic Line Module at rated output including losses of 24 V DC electronics power supply.

<sup>2)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format

#### Selection and ordering data

Description	Basic Line Module in booksize format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
<b>Internal air cooling</b>	
Rated supply power:	
20 kW (25 HP)	<b>6SL3130-1TE22-0AA0</b>
40 kW (50 HP)	<b>6SL3130-1TE24-0AA0</b>
100 kW (125 HP)	<b>6SL3130-1TE31-0AA0</b>
<b>Cold plate cooling</b>	
Rated supply power:	
20 kW (25 HP)	<b>6SL3136-1TE22-0AA0</b>
40 kW (50 HP)	<b>6SL3136-1TE24-0AA0</b>
100 kW (125 HP)	<b>6SL3136-1TE31-0AA0</b>

Description	Order No.
<b>Accessories</b>	
<b>Shield connection plate</b>	
For Line Modules and Motor Modules in booksize format	
<ul style="list-style-type: none"> <li>150 mm (5.91 in) wide for internal air cooling</li> </ul>	<b>6SL3162-1AF00-0AA1</b>
<ul style="list-style-type: none"> <li>150 mm (5.91 in) wide for cold plate cooling</li> </ul>	<b>6SL3162-1AF00-0BA1</b>
<ul style="list-style-type: none"> <li>200 mm (7.87 in) wide for internal air cooling</li> </ul>	<b>6SL3162-1AH01-0AA0</b>
<ul style="list-style-type: none"> <li>200 mm (7.87 in) wide for cold plate cooling</li> </ul>	<b>6SL3162-1AH01-0BA0</b>
<b>DC link rectifier adapter</b>	
For direct infeed of DC link voltage	
<ul style="list-style-type: none"> <li>Screw-type terminals 0.5 ... 10 mm<sup>2</sup> for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)</li> </ul>	<b>6SL3162-2BD00-0AA0</b>
<ul style="list-style-type: none"> <li>Screw-type terminals 35 ... 95 mm<sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)</li> </ul>	<b>6SL3162-2BM00-0AA0</b>
<b>DC link adapters</b> (2 units)	<b>6SL3162-2BM01-0AA0</b>
For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	
<b>Accessories for re-ordering</b>	
<b>24 V terminal adapter</b>	<b>6SL3162-2AA00-0AA0</b>
For all Line Modules and Motor Modules in booksize format	
<b>24 V jumper</b>	<b>6SL3162-2AA01-0AA0</b>
For connection of the 24 V busbars (for booksize format)	
<b>Warning labels in 30 languages</b>	<b>6SL3166-3AB00-0AA0</b>
This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	
<b>Accessories pack</b> (plug-in terminals, DRIVE-CLiQ jumper, dust-proof blanking plugs) For DRIVE-CLiQ port	
<ul style="list-style-type: none"> <li>For Basic Line Modules with a width of 100 mm (3.94 in)</li> </ul>	<b>6SL3163-8LD00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

# SINAMICS S120 drive system

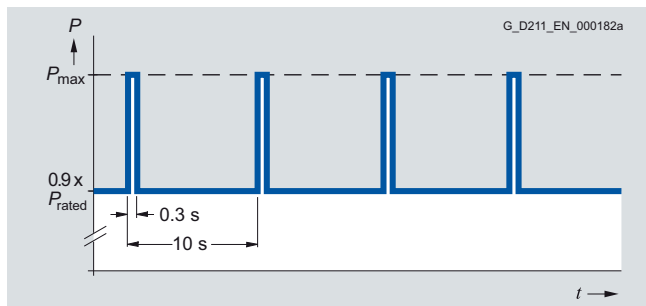
## Line Modules and line-side components

### Basic Line Modules in booksize format

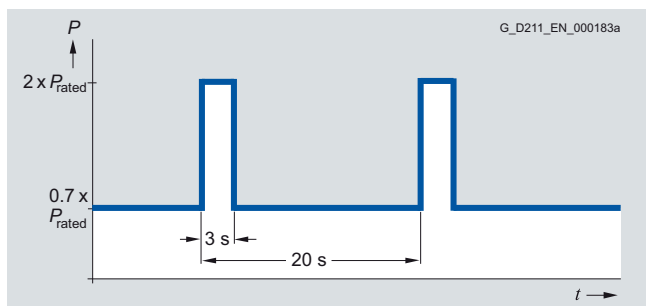
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#### Characteristic curves

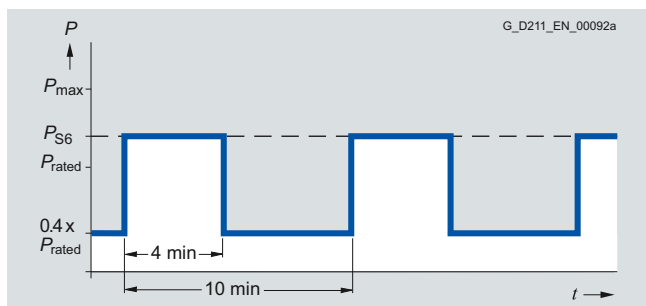
##### Overload capability



Load cycle with previous load

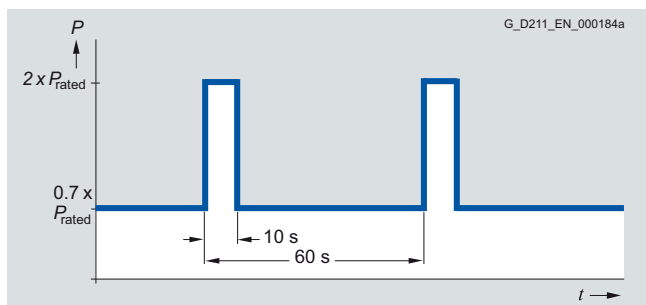


Load cycle with previous load



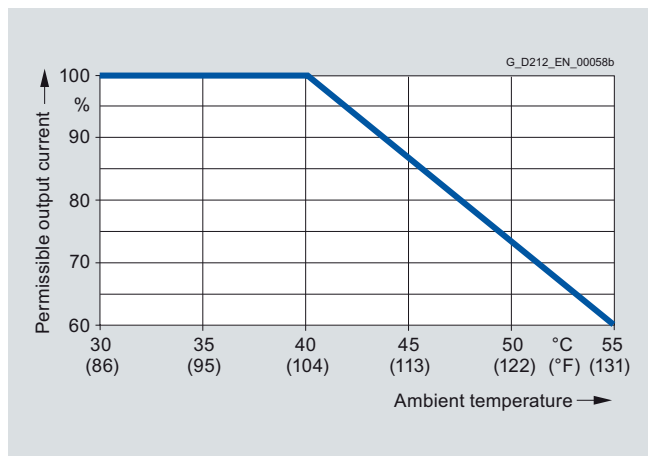
S6 load cycle with previous load

##### 20 kW (26.8 HP) and 40 kW (53.6 HP) Basic Line Modules only

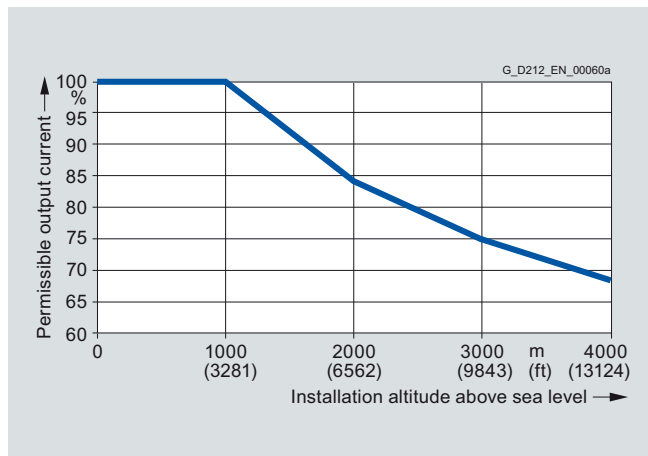


Load cycle with previous load

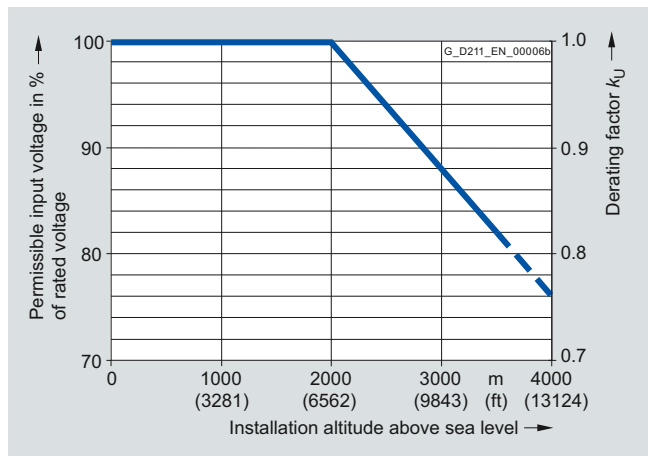
##### Derating characteristics



Output power dependent on ambient temperature



Output power dependent on installation altitude

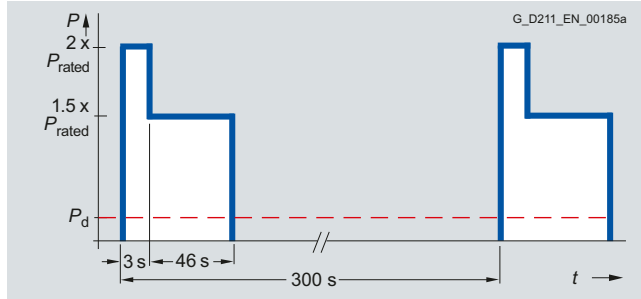


Voltage derating dependent on installation altitude

#### Characteristic curves (continued)

##### Braking power with external braking resistor

The following load cycles are defined for the braking modules of the 20 kW and 40 kW Basic Line Modules:



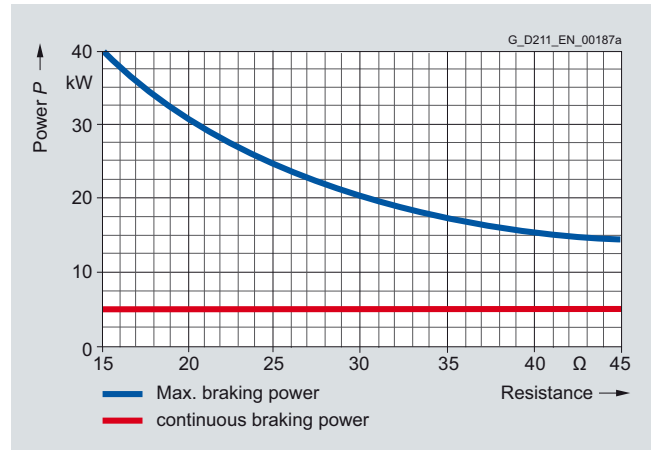
The maximum possible braking power  $P_{\text{max}}$  is calculated using the following formula:

$$P_{\text{max}} = U^2/R$$

$U$  = Activation threshold

$R$  = Resistance value of the external braking resistor

The maximum braking power is achieved with the smallest permissible resistance value. The maximum possible braking power falls at larger resistance values.

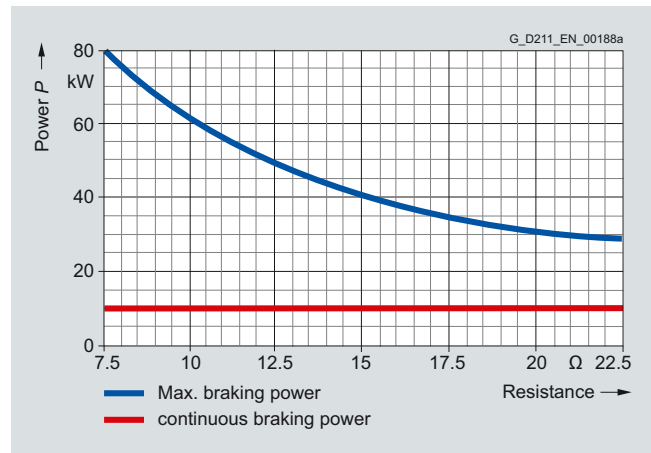


Braking power of the 20 kW Basic Line Modules depending on the connected braking resistor

When the recommended braking resistor is used, the following values result for the maximum braking power or continuous braking power:

Braking resistor 6SE7023-2ES87-2DC0

Resistance value = 20  $\Omega$  → max. braking power = 30 kW;  
continuous braking power = 5 kW



Braking power of the 40 kW Basic Line Modules depending on the connected braking resistor

When the recommended braking resistor is used, the following values result for the maximum braking power or continuous braking power:

Braking resistor 6SE7028-0ES87-2DC0

Resistance value = 8  $\Omega$  → max. braking power = 75 kW;  
continuous braking power = 10 kW (limited by braking module)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format

#### Line reactors

#### Overview



20 kW and 100 kW line reactors

Line reactors limit the low-frequency harmonic effects and reduce the load on the semiconductors of the Basic Line Module.

#### Selection and ordering data

Rated power of the Basic Line Module kW (HP)	Suitable for Basic Line Module in booksize format	Line reactor Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
20 (25)	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	<b>6SL3000-0CE22-0AA0</b>
40 (50)	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	<b>6SL3000-0CE24-0AA0</b>
100 (125)	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0	<b>6SL3000-0CE31-0AA0</b>

#### Technical specifications

<b>Line voltage 380 ... 480 V 3 AC</b>		<b>Line reactor</b>		
		6SL3000-0CE22-0AA0	6SL3000-0CE24-0AA0	6SL3000-0CE31-0AA0
<b>Rated current</b>	A	37	74	185
<b>Power loss at 50/60 Hz</b>	kW	0.13/0.154	0.27/0.32	0.48/0.565
<b>Line/load connection</b>		Screw-type terminals	Screw-type terminals	Flat connector for M8 screw
• Conductor cross-section	mm <sup>2</sup>	0.5 ... 16	2.5 ... 35	–
<b>Degree of protection</b>		IP20	IP20	IP00
<b>Dimensions</b>				
• Width	mm (in)	178 (7.01)	210 (8.27)	261 (10.3)
• Height	mm (in)	165 (6.50)	245 (9.65)	228 (8.98)
• Depth	mm (in)	100 (3.94)	93 (3.66)	137 (5.39)
<b>Weight, approx.</b>	kg (lb)	5.2 (11.5)	11.2 (25)	21.7 (48)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Basic Line Module in booksize format</b>	Type	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0
• Rated power of the Basic Line Module	kW (HP)	20 (25)	40 (50)	100 (125)

# SINAMICS S120 drive system

## Line Modules and line-side components

Basic Line Modules in booksize format  
Line filters

### Overview



In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Class A1 as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems.

### Selection and ordering data

Rated power of the Basic Line Module kW (HP)	Suitable for Basic Line Module in booksize format	Line filter Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
20 (25)	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	<b>6SL3000-0BE21-6DA0</b>
40 (50)	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	<b>6SL3000-0BE23-6DA1</b>
100 (125)	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0	<b>6SL3000-0BE31-2DA0</b>

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### Technical specifications

		Line filter		
		6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA1	6SL3000-0BE31-2DA0
<b>Line voltage</b> 380 ... 480 V 3 AC				
<b>Rated current</b>	A	36	74	192
<b>Power loss</b>	kW	0.016	0.02	0.09
<b>Line/load connection</b> L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	10	35	95
<b>PE connection</b>		M6 screw stud	M6 screw stud	M10 screw stud
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	50 (1.97)	75 (2.95)	150 (5.91)
• Height	mm (in)	429 (16.9)	433 (17.0)	479 (18.9)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>	kg (lb)	5 (11)	7.5 (16.5)	18.8 (41)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Basic Line Module in booksize format</b>	Type	6SL3130-1TE22-0AA0 6SL3136-1TE22-0AA0	6SL3130-1TE24-0AA0 6SL3136-1TE24-0AA0	6SL3130-1TE31-0AA0 6SL3136-1TE31-0AA0
• Rated power of the Basic Line Module	kW (HP)	20 (25)	40 (50)	100 (125)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in booksize format Recommended line-side components

#### Overview

Suitable line-side power components are assigned depending on the power rating of the Basic Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

#### Assignment of line-side power components to Basic Line Modules in booksize format

Rated power	Suitable for Basic Line Module in booksize format	Line contactor	Output coupling device for line contactor	Main switch
kW (HP)	Type 6SL3130- 6SL3136-	Type	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
20 (25)	1TE22-0AA0	<b>3RT1035-...</b>	<b>3TX7004-1LB00</b>	<b>3LD2504-0TK51</b>
40 (50)	1TE24-0AA0	<b>3RT1045-...</b>	<b>3TX7004-1LB00</b>	<b>3LD2704-0TK51</b>
100 (125)	1TE31-0AA0	<b>3RT1056-...</b>	<b>3TX7004-1LB00</b>	<b>3KA5530-1GE01</b>

Rated power	Suitable for Basic Line Module in booksize format	Circuit breaker IEC 60947	Circuit breaker UL489/CSA C22.2 No. 5-02	Fuse switch disconnector
kW (HP)	Type 6SL3130- 6SL3136-	Order No.	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
20 (25)	1TE22-0AA0	<b>3RV1041-4JA10</b>	<b>3VL2106-2KN30-....</b>	<b>3NP1123-1CA20</b>
40 (50)	1TE24-0AA0	<b>3VL2710-1DC33-....</b>	<b>3VL2110-2KN30-....</b>	<b>3NP1123-1CA20</b>
100 (125)	1TE31-0AA0	<b>3VL3725-1DC36-....</b>	<b>3VL3125-2KN30-....</b>	<b>3NP1143-1DA20</b>

Rated power	Suitable for Basic Line Module in booksize format	Switch disconnector with fuse holders	LV HRC fuse (gL/gG)			UL/CSA fuse, Class J <sup>1)</sup>		
			Rated current	Size	Order No.	Rated current	Size mm	Reference No.
kW (HP)	Type 6SL3130- 6SL3136-	Order No.						
<b>Line voltage 380 ... 480 V 3 AC</b>								
20 (25)	1TE22-0AA0	<b>3KL5230-1GB01</b>	63 A	000	<b>3NA3822</b>	60 A	29 × 117	AJT60
40 (50)	1TE24-0AA0	<b>3KL5230-1GB01</b>	100 A	000	<b>3NA3830</b>	100 A	29 × 117	AJT100
100 (125)	1TE31-0AA0	<b>3KL5730-1GB01</b>	250 A	1	<b>3NA3144</b>	250 A	54 × 181	AJT250

<sup>1)</sup> Not suitable for 3NP and 3KL switch disconnectors.



# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Overview



Basic Line Modules are used for applications in which no energy is returned to the supply or where the energy exchange between motor and generator axes takes place in the DC link. The connected Motor Modules are pre-charged via the thyristor gate control. The thyristors are always fired at a delay angle of  $0^\circ$  in operation. Basic Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems.

In a Basic Line Module in chassis format, a Braking Module of the corresponding size can be installed to support generating mode of the drive system in combination with an external braking resistor.

#### Design

The Basic Line Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 temperature sensor input (KTY84-130 or PTC/Pt100)
- 3 DRIVE-CLiQ sockets

The status of the Basic Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Basic Line Modules includes:

- 0.6 m (1.97 ft) DRIVE-CLiQ cable for connection to a CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2
- 1.45 m (4.76 ft) DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module

# SINAMICS S120 drive system

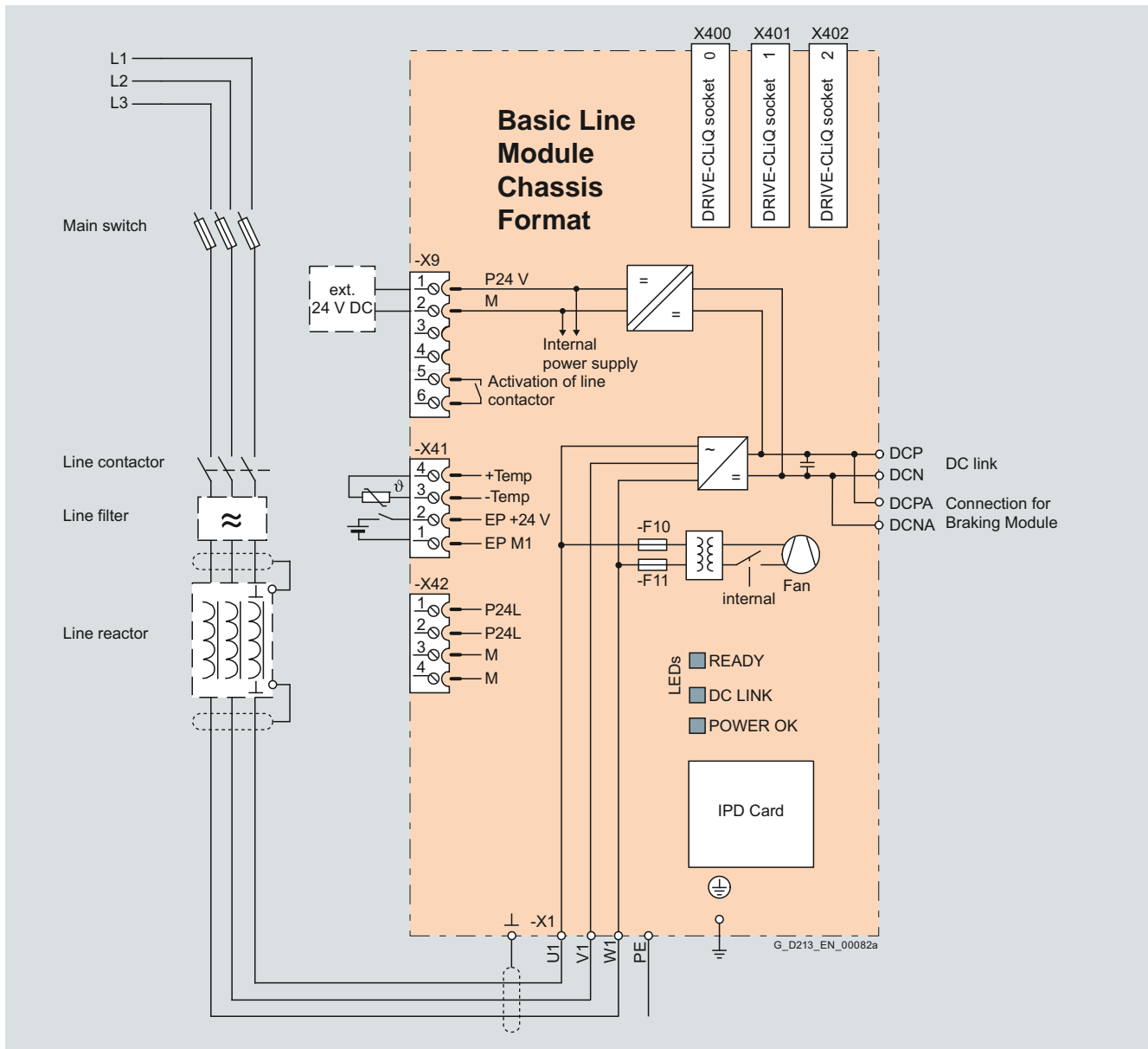
## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Integration

The Basic Line Modules communicate with the higher-level Control Unit via DRIVE-CLiQ. The Control Unit in this case can be a CU320-2 or a SIMOTION D Control Unit. An external 24 V DC power supply is required to operate Basic Line Modules.

3



Connection example of Basic Line Module in chassis format

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Technical specifications

<b>Basic Line Module in chassis format</b> 6SL3330-1T...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min) or 500 ... 690 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min) <sup>1)</sup>
<b>Line frequency</b>	47 ... 63 Hz
<b>SCCR (short-circuit current rating)</b>	In conjunction with the recommended fuses of type 3NE1 <a href="#">see recommended line-side components</a>
<ul style="list-style-type: none"> <li>Rated power 200 ... 400 kW</li> <li>Rated power 560 kW</li> <li>Rated power 710 ... 1100 kW</li> </ul>	65 kA 84 kA 170 kA
<b>Line power factor</b> at rated power	
<ul style="list-style-type: none"> <li>Fundamental power factor (<math>\cos \varphi_1</math>)</li> <li>Total (<math>\lambda</math>)</li> </ul>	> 0.96 0.75 ... 0.93
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>DC link voltage, approx.</b>	1.35 × line voltage <sup>2)</sup>
<b>Electronics power supply</b>	24 V DC, -15 %/+20 %
<b>Main contactor control</b>	
<ul style="list-style-type: none"> <li>Terminal strip X9/5-6</li> </ul>	240 V AC/ max. 8 A 30 V DC/ max. 1A
<b>Radio interference suppression</b>	
<ul style="list-style-type: none"> <li>Standard</li> <li>With line filter</li> </ul>	Category C3 to EN 61800-3 Category C2 to EN 61800-3 up to 900 m (2953 ft) total cable length
<b>Type of cooling</b>	Internal air cooling, power units with forced air cooling using a built-in fan
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 2000 m (6562 ft) above sea level without derating, > 2000 ... 4000 m (6562 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus only for devices on line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC

<sup>1)</sup> TT system with grounded external conductor is not permissible for line voltages > 600 V.

<sup>2)</sup> The DC link voltage is unregulated and load-dependent.  
[For further information see chapter System description – Dimensioning.](#)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Basic Line Module in chassis format				
		6SL3330-1TE34-2AA3	6SL3330-1TE35-3AA3	6SL3330-1TE38-2AA3	6SL3330-1TE41-2AA3	6SL3330-1TE41-5AA3
<b>Infeed power</b>						
• Rated power $P_{\text{rated}}$ - At 380 V 3 AC - At 460 V 3 AC <sup>1)</sup>	kW (HP)	<b>200</b> (300)	<b>250</b> (400)	<b>400</b> (600)	<b>560</b> (800)	<b>710</b> (1000)
• $P_{\text{max}}$	kW (HP)	300 (402)	375 (503)	600 (804)	840 (1126)	1065 (1428)
<b>DC link current</b>						
• Rated current $I_{\text{rated\_DC}}$	A	420	530	820	1200	1500
• Base-load current $I_{\text{H\_DC}}$	A	328	413	640	936	1170
• $I_{\text{max\_DC}}$	A	630	795	1230	1800	2250
<b>Input current</b>						
• At $V_{\text{line}} = 400$ V	A	365	460	710	1010	1265
• Maximum	A	547	690	1065	1515	1897
<b>Current requirement</b> 24 V DC electronics power supply, max.	A	1.1	1.1	1.1	1.1	1.1
<b>DC link capacitance</b>						
• Basic Line Module	μF	7200	9600	14600	23200	29000
• Drive line-up, max.	μF	57600	76800	116800	185600	232000
<b>Power loss, max.</b>	kW	1.9	2.1	3.2	4.6	5.5
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.17 (6.00)	0.17 (6.00)	0.17 (6.00)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level</b> $L_{\text{pA}}$ (1 m) at 50/60 Hz	dB	66/68	66/68	66/68	71/73	71/73
<b>Line connection</b> U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>DC link connection</b> DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>PE connection</b>		M10 screw	M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240
<b>Cable length, max.</b> (total of all motor power cables and DC link)						
• Shielded	m (ft)	2600 (8531)	2600 (8531)	2600 (8531)	4000 (13124)	4000 (13124)
• Unshielded	m (ft)	3900 (12796)	3900 (12796)	3900 (12796)	6000 (19686)	6000 (19686)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	310 (12.2)	310 (12.2)	310 (12.2)	310 (12.2)	310 (12.2)
• Height	mm (in)	1164 (45.8)	1164 (45.8)	1164 (45.8)	1653 (65.1)	1653 (65.1)
• Depth	mm (in)	352 (13.9)	352 (13.9)	352 (13.9)	550 (21.6)	550 (21.6)
<b>Frame size</b>		FB	FB	FB	GB	GB
<b>Weight, approx.</b>	kg (lb)	96 (212)	96 (212)	96 (212)	214 (472)	214 (472)

<sup>1)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

#### Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Basic Line Module in chassis format				
		6SL3330-1TG33-0AA3	6SL3330-1TG34-3AA3	6SL3330-1TG36-8AA3	6SL3330-1TG41-1AA3	6SL3330-1TG41-4AA3
<b>Infeed power</b>						
• Rated power $P_{\text{rated}}$ at 690 V 3 AC <sup>1)</sup>	kW	<b>250</b>	<b>355</b>	<b>560</b>	<b>900</b>	<b>1100</b>
• At 500 V 3 AC	kW	180	250	400	650	800
• $P_{\text{max}}$ at 690 V 3 AC <sup>1)</sup>	kW	375	532.5	840	1350	1650
<b>DC link current</b>						
• Rated current $I_{\text{rated\_DC}}$	A	300	430	680	1100	1400
• $I_{\text{H\_DC}}$	A	234	335	530	858	1092
• $I_{\text{max\_DC}}$	A	450	645	1020	1650	2100
<b>Input current</b>						
• At $V_{\text{line}} = 690$ V	A	260	375	575	925	1180
• Maximum	A	390	562.5	862.5	1387.5	1770
<b>Current requirement</b> 24 V DC electronics power supply, max.	A	1.1	1.1	1.1	1.1	1.1
<b>DC link capacitance</b>						
• Basic Line Module	μF	3200	4800	7300	11600	15470
• Drive line-up, max.	μF	25600	38400	58400	92800	123760
<b>Power loss</b>	kW	1.5	2.1	3.0	5.4	5.8
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.17 (6.00)	0.17 (6.00)	0.17 (6.00)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level</b> $L_{\text{pA}}$ (1 m) at 50/60 Hz	dB	66/68	66/68	66/68	71/73	71/73
<b>Line connection</b> U1, V1, W1		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>DC link connection</b> DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	6 × 185	6 × 185
<b>PE connection</b>		M10 screw	M10 screw	M10 screw	M12 screw	M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	4 × 240	4 × 240
<b>Cable length, max.</b> (total of all motor power cables and DC link)						
• Shielded	m (ft)	1500 (4921)	1500 (4921)	1500 (4921)	2250 (7382)	2250 (7382)
• Unshielded	m (ft)	2250 (7382)	2250 (7382)	2250 (7382)	3375 (11073)	3375 (11073)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	310 (12.2)	310 (12.2)	310 (12.2)	310 (12.2)	310 (12.2)
• Height	mm (in)	1164 (45.8)	1164 (45.8)	1164 (45.8)	1653 (65.1)	1653 (65.1)
• Depth	mm (in)	352 (13.9)	352 (13.9)	352 (13.9)	550 (21.6)	550 (21.6)
<b>Frame size</b>		FB	FB	FB	GB	GB
<b>Weight, approx.</b>	kg (lb)	96 (212)	96 (212)	96 (212)	214 (472)	214 (472)

<sup>1)</sup> The infeed power is proportional to the line voltage. With 500 V 3 AC, the power is reduced by a factor of  $690/500 = 1.38$ .

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Selection and ordering data

Rated power kW (HP)	Basic Line Module in chassis format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
200 (300)	<b>6SL3330-1TE34-2AA3</b>
250 (400)	<b>6SL3330-1TE35-3AA3</b>
400 (600)	<b>6SL3330-1TE38-2AA3</b>
560 (800)	<b>6SL3330-1TE41-2AA3</b>
710 (1000)	<b>6SL3330-1TE41-5AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>	
250	<b>6SL3330-1TG33-0AA3</b>
355	<b>6SL3330-1TG34-3AA3</b>
560	<b>6SL3330-1TG36-8AA3</b>
900	<b>6SL3330-1TG41-1AA3</b>
1100	<b>6SL3330-1TG41-4AA3</b>

#### Accessories

##### Warning labels in 30 languages

This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR

**6SL3166-3AB00-0AA0**

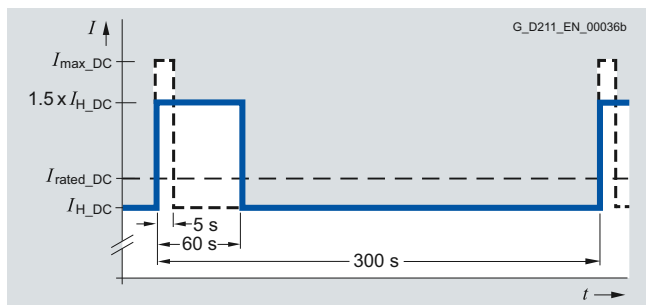
##### SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units)

For DRIVE-CLiQ port

**6SL3066-4CA00-0AA0**

#### Characteristic curves

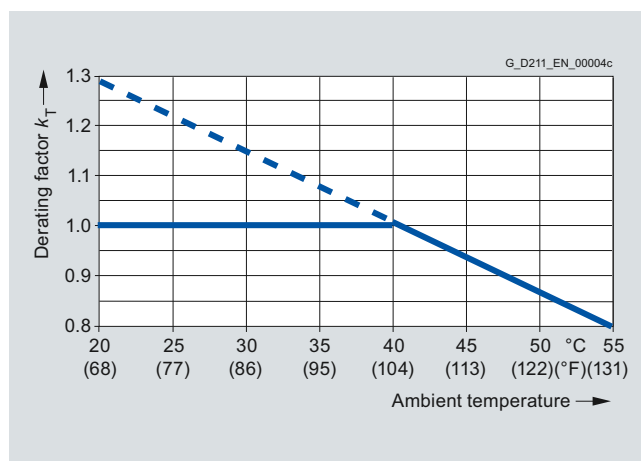
##### Overload capability



High overload

#### Characteristic curves (continued)

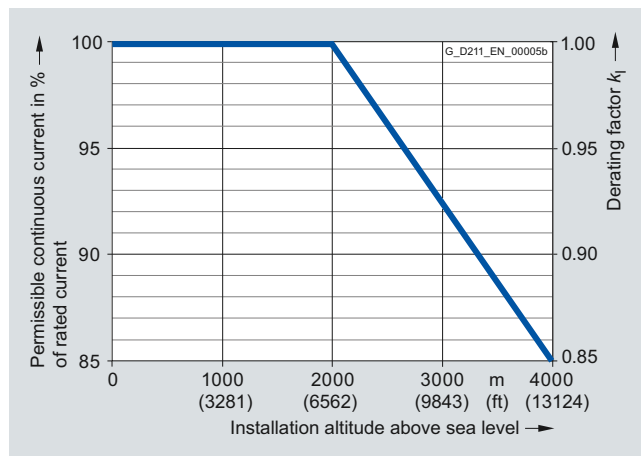
##### Derating characteristics



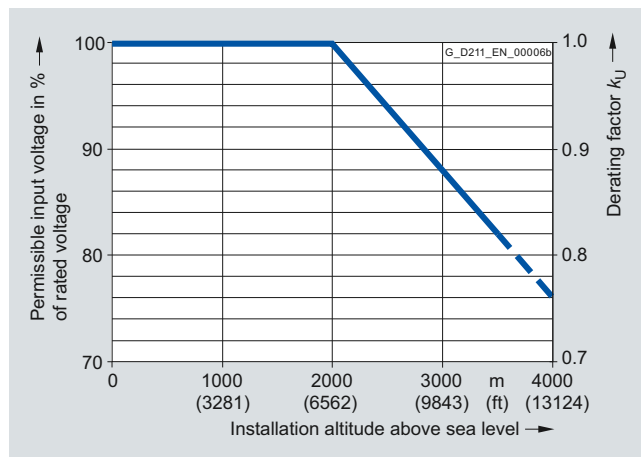
Current derating dependent on ambient temperature

Note: A derating factor  $k_T > 1.0$  is to be taken into account only in conjunction with "current derating dependent on installation altitude".

See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Line reactors

#### Overview



Line reactors reduce harmonic currents on the supply system and limit commutating dips in the Basic Line Module. For this reason, line reactors should always be used.

#### Selection and ordering data

Rated power of the Basic Line Module kW (HP)	Suitable for Basic Line Module in chassis format	Line reactor Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
200 (300)	6SL3330-1TE34-2AA3	<b>6SL3000-0CE35-1AA0</b>
250 (400)	6SL3330-1TE35-3AA3	
400 (600)	6SL3330-1TE38-2AA3	<b>6SL3000-0CE37-7AA0</b>
560 (800)	6SL3330-1TE41-2AA3	<b>6SL3000-0CE41-0AA0</b>
710 (1000)	6SL3330-1TE41-5AA3	<b>6SL3000-0CE41-5AA0</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
250	6SL3330-1TG33-0AA3	<b>6SL3000-0CH32-7AA0</b>
355	6SL3330-1TG34-3AA3	<b>6SL3000-0CH34-8AA0</b>
560	6SL3330-1TG36-8AA3	<b>6SL3000-0CH36-0AA0</b>
900	6SL3330-1TG41-1AA3	<b>6SL3000-0CH41-2AA0</b>
1100	6SL3330-1TG41-4AA3	

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Line reactors

#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Line reactor</b>				
		6SL3000-0CE35-1AA0	6SL3000-0CE37-7AA0	6SL3000-0CE41-0AA0	6SL3000-0CE41-5AA0	
<b>Thermal current</b> $I_{th\ max}$	A	508	508	773	1022	1485
<b>Power loss</b> at 50/60 Hz	kW	0.292/0.328	0.323/0.365	0.310/0.351	0.441/0.498	0.687/0.776
<b>Line/load connection</b>		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	300 (11.8)	300 (11.8)	300 (11.8)	350 (13.8)	460 (18.1)
• Height	mm (in)	269 (10.6)	269 (10.6)	269 (10.6)	321 (12.6)	435 (17.1)
• Depth	mm (in)	212.5 (8.37)	212.5 (8.37)	212.5 (8.37)	211.5 (8.33)	235 (9.25)
<b>Weight, approx.</b>	kg (lb)	38.0 (84)	38.0 (84)	51.3 (113)	69.6 (153)	118 (260)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Basic Line Module in chassis format</b>	Type	6SL3330-1TE34-2AA3	6SL3330-1TE35-3AA3	6SL3330-1TE38-2AA3	6SL3330-1TE41-2AA3	6SL3330-1TE41-5AA3
• Rated power of the Basic Line Module	kW (HP)	200 (300)	250 (400)	400 (600)	560 (800)	710 (1000)

<b>Line voltage</b> 500 ... 690 V 3 AC		<b>Line reactor</b>				
		6SL3000-0CH32-7AA0	6SL3000-0CH34-8AA0	6SL3000-0CH36-0AA0	6SL3000-0CH41-2AA0	
<b>Thermal current</b> $I_{th\ max}$	A	270	482	597	1167	1167
<b>Power loss</b> at 50/60 Hz	kW	0.245/0.277	0.424/0.478	0.430/0.485	0.620/0.697	0.693/0.783
<b>Line/load connection</b>		Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	270 (10.6)	350 (13.8)	350 (13.8)	460 (18.1)	460 (18.1)
• Height	mm (in)	248 (9.76)	321 (12.6)	321 (12.6)	435 (17.1)	435 (17.1)
• Depth	mm (in)	200 (7.87)	232.5 (9.15)	232.5 (9.15)	235 (9.25)	235 (9.25)
<b>Weight, approx.</b>	kg (lb)	27.9 (61.5)	55.6 (123)	63.8 (141)	147 (324)	147 (324)
<b>Approvals, according to</b> <sup>1)</sup>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Basic Line Module in chassis format</b>	Type	6SL3330-1TG33-0AA3	6SL3330-1TG34-3AA3	6SL3330-1TG36-8AA3	6SL3330-1TG41-1AA3	6SL3330-1TG41-4AA3
• Rated power of the Basic Line Module	kW	250	355	560	900	1100

<sup>1)</sup> For supply voltages up to 600 V 3 AC.



# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Line filters

#### Overview



In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the power units to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems with grounded star point.

#### Selection and ordering data

Rated power of the Basic Line Module kW (HP)	Suitable for Basic Line Module in chassis format	Line filter Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
200 (300)	6SL3330-1TE34-2AA3	<b>6SL3000-0BE34-4AA0</b>
250 (400)	6SL3330-1TE35-3AA3	<b>6SL3000-0BE36-0AA0</b>
400 (600)	6SL3330-1TE38-2AA3	<b>6SL3000-0BE41-2AA0</b>
560 (800)	6SL3330-1TE41-2AA3	
710 (1000)	6SL3330-1TE41-5AA3	<b>6SL3000-0BE41-6AA0</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
250	6SL3330-1TG33-0AA3	<b>6SL3000-0BG34-4AA0</b>
355	6SL3330-1TG34-3AA3	
560	6SL3330-1TG36-8AA3	<b>6SL3000-0BG36-0AA0</b>
900	6SL3330-1TG41-1AA3	<b>6SL3000-0BG41-2AA0</b>
1100	6SL3330-1TG41-4AA3	

# SINAMICS S120 drive system

## Line Modules and line-side components

### Basic Line Modules in chassis format

#### Line filters

#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Line filter</b>			
		6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0	6SL3000-0BE41-2AA0	6SL3000-0BE41-6AA0
<b>Rated current</b>	A	440	600	1200	1600
<b>Power loss</b>	kW	0.049	0.055	0.137	0.182
<b>Line/load connection</b> L1, L2, L3 / L1', L2', L3'		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw	Flat connector for M12 screw
<b>PE connection</b>		M8 screw stud	M10 screw stud	M10 screw stud	M10 screw stud
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm (in)	360 (14.2)	400 (15.7)	425 (16.7)	505 (19.9)
• Height	mm (in)	240 (9.45)	265 (10.4)	265 (10.4)	265 (10.4)
• Depth	mm (in)	116 (4.57)	140 (5.51)	145 (5.71)	145 (5.71)
<b>Weight, approx.</b>	kg (lb)	12.3 (27)	19.0 (42)	25.8 (57)	28.8 (63.5)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus
<b>Suitable for Basic Line Module in chassis format</b>	Type (rated output)	6SL3330-1TE34-2AA3 (200 kW)	6SL3330-1TE35-3AA3 (250 kW)	6SL3330-1TE38-2AA3 (400 kW) 6SL3330-1TE41-2AA3 (560 kW)	6SL3330-1TE41-5AA3 (710 kW)

<b>Line voltage</b> 500 ... 690 V 3 AC		<b>Line filter</b>		
		6SL3000-0BG34-4AA0	6SL3000-0BG36-0AA0	6SL3000-0BG41-2AA0
<b>Rated current</b>	A	440	600	1200
<b>Power loss</b>	kW	0.049	0.055	0.137
<b>Line/load connection</b> L1, L2, L3 / L1', L2', L3'		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M12 screw
<b>PE connection</b>		M8 screw stud	M10 screw stud	M10 screw stud
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	360 (14.2)	400 (15.7)	425 (16.7)
• Height	mm (in)	240 (9.45)	265 (10.4)	265 (10.4)
• Depth	mm (in)	116 (4.57)	140 (5.51)	145 (5.71)
<b>Weight, approx.</b>	kg (lb)	12.3 (27)	19.0 (42)	25.2 (56)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Basic Line Module in chassis format</b>	Type (rated output)	6SL3330-1TG33-0AA3 (250 kW) 6SL3330-1TG34-3AA3 (355 kW)	6SL3330-1TG36-8AA3 (560 kW)	6SL3330-1TG41-1AA3 (900 kW) 6SL3330-1TG41-4AA3 (1100 kW)

# SINAMICS S120 drive system

## Line Modules and line-side components

Basic Line Modules in chassis format  
Recommended line-side components

### Overview

Suitable line-side power components are assigned depending on the power rating of the Basic Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

### Assignment of line-side power components to Basic Line Modules in chassis format

Rated power kW (HP)	Input current A	Suitable for Basic Line Module in chassis format Type 6SL3330-	Line contactor	Fixed-mounted circuit breaker	Switch disconnector without handle and shaft	Switch disconnector with handle and shaft		
			Type	Order No.	Order No.	Order No.		
<b>Line voltage 380 ... 480 V 3 AC</b>								
200 (300)	365	1TE34-2AA3	<b>3RT1075-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>		
250 (400)	460	1TE35-3AA3	<b>3RT1076-...</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>		
400 (600)	710	1TE38-2AA3	<b>3RT1066-...</b> (3 units)	–	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>		
560 (800)	1010	1TE41-2AA3	–	<b>3WL1112-2BB34-4AN2-Z C22</b>	–	–		
710 (1000)	1265	1TE41-5AA3	–	<b>3WL1116-2BB34-4AN2-Z C22</b>	–	–		
<b>Line voltage 500 ... 690 V 3 AC</b>								
250	260	1TG33-0AA3	<b>3RT1066-...</b>	–	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b>		
355	375	1TG34-3AA3	<b>3RT1476-6AP36</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>		
560	575	1TG36-8AA3	<b>3RT1476-6AP36</b>	–	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>		
900	925	1TG41-1AA3	–	<b>3WL1210-4BB34-4AN2-Z C22</b>	–	–		
1100	1180	1TG41-4AA3	–	<b>3WL1212-4BB34-4AN2-Z C22</b>	–	–		
Rated power kW (HP)	Input current A	Suitable for Basic Line Module in chassis format Type 6SL3330-	Circuit breaker IEC 60947	Circuit breaker UL489/CSA C22.2 No. 5-02	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
			Order No.	Order No.	Rated current	Order No.	Rated current	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>								
200 (300)	365	1TE34-2AA3	<b>3VL4740-1DC36-0AA0</b>	<b>3VL4140-3KN30-0AA0</b>	400 A	<b>3NA3260</b>	450 A	<b>3NE1333-2</b>
250 (400)	460	1TE35-3AA3	<b>3VL5750-1DC36-0AA0</b>	<b>3VL4550-3KN30-0AA0</b>	500 A	<b>3NA3365</b>	500 A	<b>3NE1334-2</b>
400 (600)	710	1TE38-2AA3	–	–	800 A	<b>3NA3475</b>	800 A	<b>3NE1448-2<sup>*)</sup></b>
560 (800)	1010	1TE41-2AA3	–	–	1250 A	<b>3NA3482</b>	2 × 560 A	<b>3NE1435-2</b> (2 units)
710 (1000)	1265	1TE41-5AA3	–	–	2 × 800 A	<b>3NA3475</b> (2 units)	2 × 710 A	<b>3NE1437-2</b> (2 units)
<b>Line voltage 500 ... 690 V 3 AC</b>								
250	260	1TG33-0AA3	<b>3VL4731-1DC36-0AA0</b>	<b>3VL4130-3KN30-0AA0</b>	315 A	<b>3NA3252-6</b>	315 A	<b>3NE1230-2</b>
355	375	1TG34-3AA3	–	–	500 A	<b>3NA3365-6</b>	450 A	<b>3NE1333-2<sup>*)</sup></b>
560	575	1TG36-8AA3	–	–	2 × 315 A	<b>3NA3252-6</b> (2 units)	630 A	<b>3NE1436-2<sup>*)</sup></b>
900	925	1TG41-1AA3	–	–	2 × 500 A	<b>3NA3365-6</b> (2 units)	2 × 500 A	<b>3NE1334-2</b> (2 units)
1100	1180	1TG41-4AA3	–	–	3 × 500 A	<b>3NA3365-6</b> (3 units)	2 × 630 A	<b>3NE1436-2<sup>*)</sup></b> (2 units)

<sup>\*)</sup> No semiconductor protection.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Module in booksize compact format

#### Overview



Smart Line Modules are non-regulated feed/feedback units (diode bridge for incoming supply; line-commutated feedback via IGBTs) with 100 % continuous regenerative feedback power. The regenerative capability of the modules can be deactivated by means of parameterization. Smart Line Modules are designed for connection to grounded TN/TT systems and non-grounded IT systems. The DC link is pre-charged via integrated pre-charging resistors.

**The associated line reactor is absolutely essential for operating a Smart Line Module.**

#### Design

The Smart Line Modules in booksize compact format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 2 PE (protective earth) connections
- 3 DRIVE-CLiQ sockets

The status of the Smart Line Modules is indicated via two multi-color LEDs.

The signal cable shield can be connected to the Line Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- DRIVE-CLiQ cable for connecting to the adjacent Motor Module, length 0.21 m (8.3 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs/outputs
- 1 set of warning signs in 30 languages
- 1 heat conducting foil

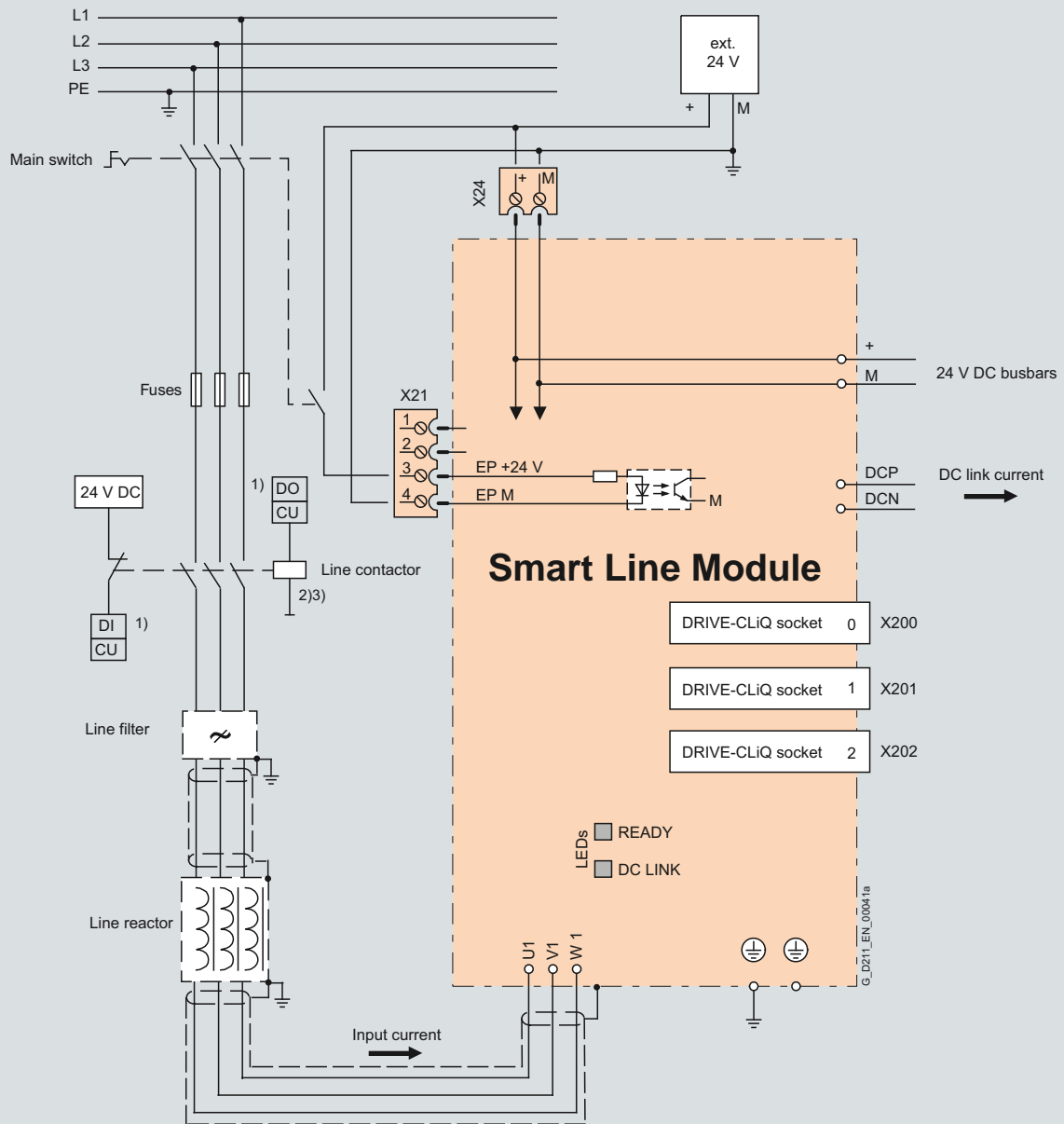
# SINAMICS S120 drive system

## Line Modules and line-side components

Smart Line Module in booksize compact format

### Integration

The Smart Line Module communicates with a CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2 via DRIVE-CLiQ.



- 1) Digital input (DI) or digital output (DO), controlled via the Control Unit.
- 2) No additional load permitted downstream of the line contactor.
- 3) The current carrying capacity of the digital output (DO) must be observed; an output interface may have to be taken into account.

Connection example for Smart Line Module in booksize compact format

3

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Module in booksize compact format

#### Technical specifications

Smart Line Module in booksize compact format 6SL3430-6TE21-6AA1	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min)
<b>Line frequency</b>	47 ... 63 Hz
<b>SCCR (short-circuit current rating)</b>	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 <a href="#">see recommended line-side components</a>
<b>Line power factor</b> at rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.65 ... 0.90
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>DC link voltage, approx.</b>	1.35 × line voltage <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC, -15 %/+20 %
<b>Radio interference suppression</b>	
• Standard	No radio interference suppression
• With line filter	Category C2 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
<b>Type of cooling</b>	internal air cooling (power units with forced air cooling through built-in fans) cold plate cooling
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cURus

<sup>1)</sup> The DC link voltage is controlled to the mean value of the rectified line voltage.  
For further information see chapter [System description – Dimensioning](#).

# SINAMICS S120 drive system

## Line Modules and line-side components

**Smart Line Module in booksize compact format**
**Technical specifications (continued)**

<b>Line voltage</b> <b>380 ... 480 V 3 AC</b>	<b>Smart Line Module</b> <b>in booksize compact format</b>
<ul style="list-style-type: none"> <li>Internal air cooling</li> <li>cold plate cooling</li> </ul>	6SL3430-6TE21-6AA1
<b>Feed/feedback power</b>	
<ul style="list-style-type: none"> <li>Rated power <math>P_{rated}</math> <ul style="list-style-type: none"> <li>- At 380 V 3 AC</li> <li>- At 460 V 3 AC <sup>3)</sup></li> </ul> </li> <li>For S6 duty (40 %) <math>P_{S6}</math></li> <li><math>P_{max}</math></li> </ul>	16 kW (18 HP) 21 kW 35 kW
<b>DC link current</b>	
<ul style="list-style-type: none"> <li>At 600 V DC</li> <li>For S6 duty (40 %)</li> <li>Maximum</li> </ul>	27 A 35 A 59 A
<b>Input current</b>	
<ul style="list-style-type: none"> <li>Rated current at 380 V 3 AC</li> <li>For S6 duty (40 %)</li> <li>Maximum</li> </ul>	26 A 35 A 59 A
<b>Current requirement</b> 24 V DC electronics power supply, max.	1.1 A
<b>Current carrying capacity</b>	
<ul style="list-style-type: none"> <li>24 V DC busbars</li> <li>DC link busbars</li> </ul>	20 A 100 A
<b>DC link capacitance</b>	
<ul style="list-style-type: none"> <li>Smart Line Module</li> <li>Drive line-up, max.</li> </ul>	705 $\mu$ F 6000 $\mu$ F
<b>Power loss</b> <sup>1)</sup>	
<ul style="list-style-type: none"> <li>With internal air cooling</li> <li>With cold plate cooling, int./ext.</li> <li>Thermal resistance <math>R_{th}</math></li> </ul>	0.19 kW 0.06/0.13 kW 0.13 K/W
<b>Cooling air requirement</b>	0.016 m <sup>3</sup> /s (0.57 ft <sup>3</sup> /s)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	< 60 dB
<b>Line connection</b> U1, V1, W1	Screw-type terminals (X1)
<ul style="list-style-type: none"> <li>Conductor cross-section, max.</li> </ul>	2.5 ... 10 mm <sup>2</sup>
<b>Shield connection</b>	Cable shield connection plate integrated into the connector
<b>PE connection</b>	M5 screw
<b>Cable length, max.</b> (total of all motor power cables and DC link) <sup>2)</sup>	
<ul style="list-style-type: none"> <li>Shielded</li> <li>Unshielded</li> </ul>	350 m (1148 ft) 560 m (1837 ft)
<b>Degree of protection</b>	IP20
<b>Dimensions</b>	
<ul style="list-style-type: none"> <li>Width</li> <li>Height</li> <li>Depth</li> </ul>	100 mm (3.94 in) 270 mm (10.6 in) 226 mm (8.90 in)
<b>Weight, approx.</b>	5.3 kg (12 lb)

<sup>1)</sup> Power loss of Smart Line Module at rated power including losses of 24 V DC electronic power supply.

<sup>2)</sup> Max. cable lengths in conjunction with Voltage Clamping Module, see derating characteristics.

**Selection and ordering data**

Description	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
<b>Smart Line Module in booksize compact format</b>	
<b>Internal air cooling</b> <b>Cold plate cooling</b>	
Rated power	
<ul style="list-style-type: none"> <li>16 kW (18 HP)</li> </ul>	<b>6SL3430-6TE21-6AA1</b>
<b>Accessories</b>	
<b>DC link rectifier adapter</b>	
For direct infeed of DC link voltage Screw-type terminals 0.5 ... 10 mm <sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	<b>6SL3162-2BD00-0AA0</b>
<b>DC link adapters</b> (2 units)	<b>6SL3162-2BM01-0AA0</b>
For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	
<b>Accessories for re-ordering</b>	
<b>24 V terminal adapter</b>	<b>6SL3162-2AA00-0AA0</b>
For all Line Modules and Motor Modules in booksize format	
<b>24 V jumper</b>	<b>6SL3162-2AA01-0AA0</b>
For connection of the 24 V busbars (for booksize format)	
<b>Warning labels in 30 languages</b>	<b>6SL3166-3AB00-0AA0</b>
This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

<sup>3)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

# SINAMICS S120 drive system

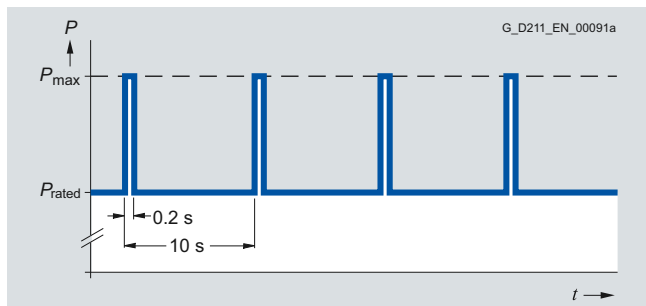
## Line Modules and line-side components

**Smart Line Module in booksize compact format**

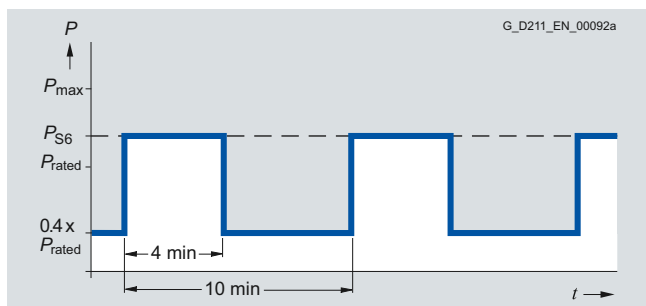
3

### Characteristic curves

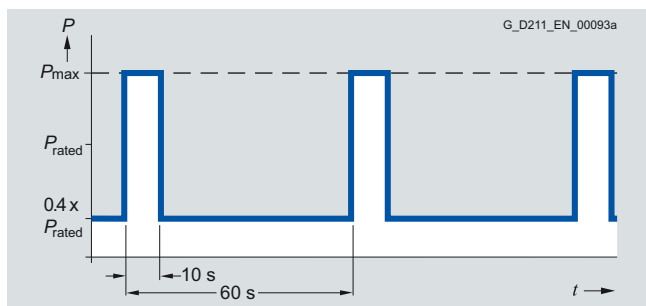
#### Overload capability



Load cycle with previous load

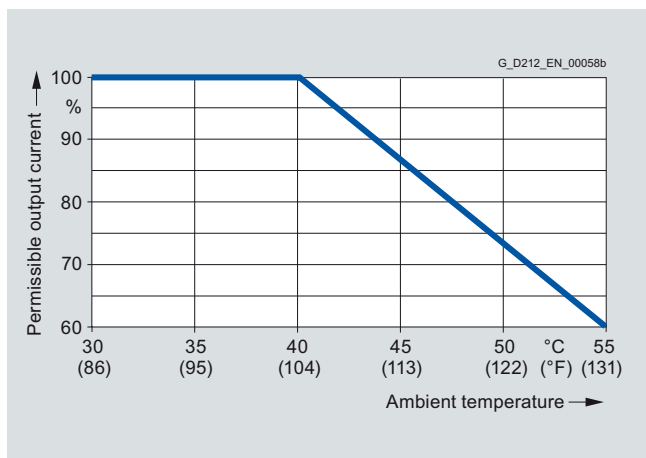


S6 load cycle with previous load

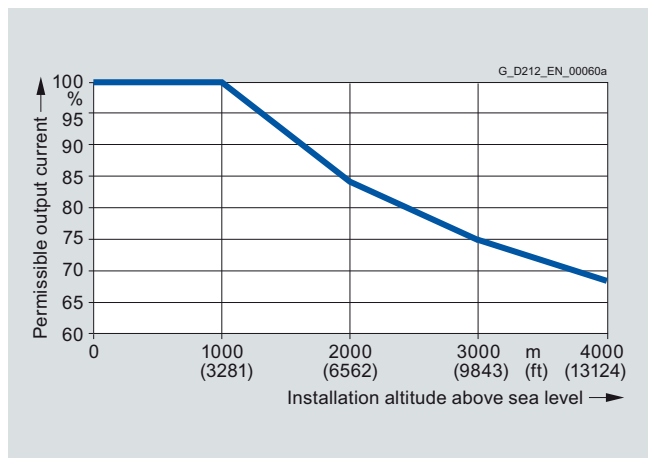


S6 load cycle with previous load

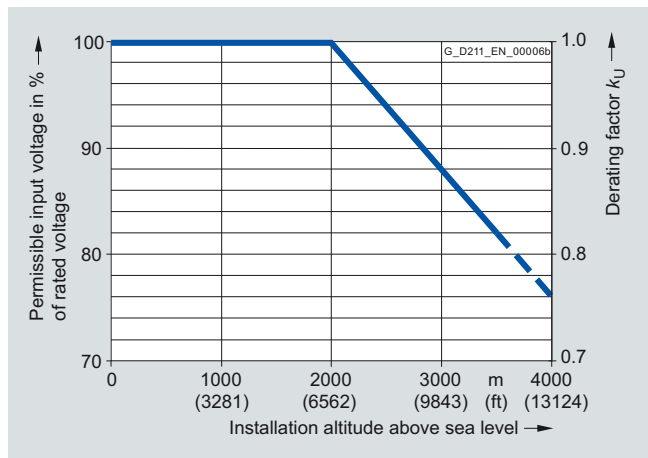
#### Derating characteristics



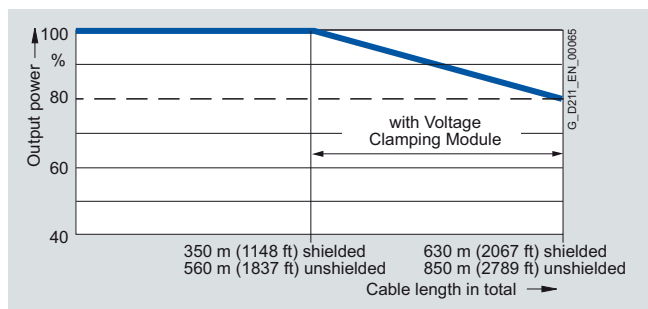
Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude



Output power dependent on total cable length



# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in booksize format

#### Overview



Smart Line Modules are non-regulated, line-commutated feed/feedback units (diode bridge for incoming supply; line-commutated feedback via IGBTs) with 100 % continuous regenerative feedback power. The regenerative feedback capability of the modules can be deactivated by means of a digital input (Smart Line Modules 5 kW and 10 kW) or by means of parameterization (Smart Line Modules 16 kW, 36 kW and 55 kW). Smart Line Modules are designed for connection to grounded TN/TT and non-grounded IT systems.

The DC link is pre-charged via integrated pre-charging resistors.

**The associated line reactor is absolutely essential for operating a Smart Line Module.**

#### Design

Smart Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 2 PE (protective earth) connections
- 2 digital inputs (only on 5 kW and 10 kW Smart Line Modules)
- 1 digital output (only on 5 kW and 10 kW Smart Line Modules)
- 3 DRIVE-CLiQ sockets (only on 16 kW, 36 kW and 55 kW Smart Line Modules)

The status of the Smart Line Modules is indicated via two multi-color LEDs.

The signal cable shield can be connected to the Line Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Smart Line Modules includes:

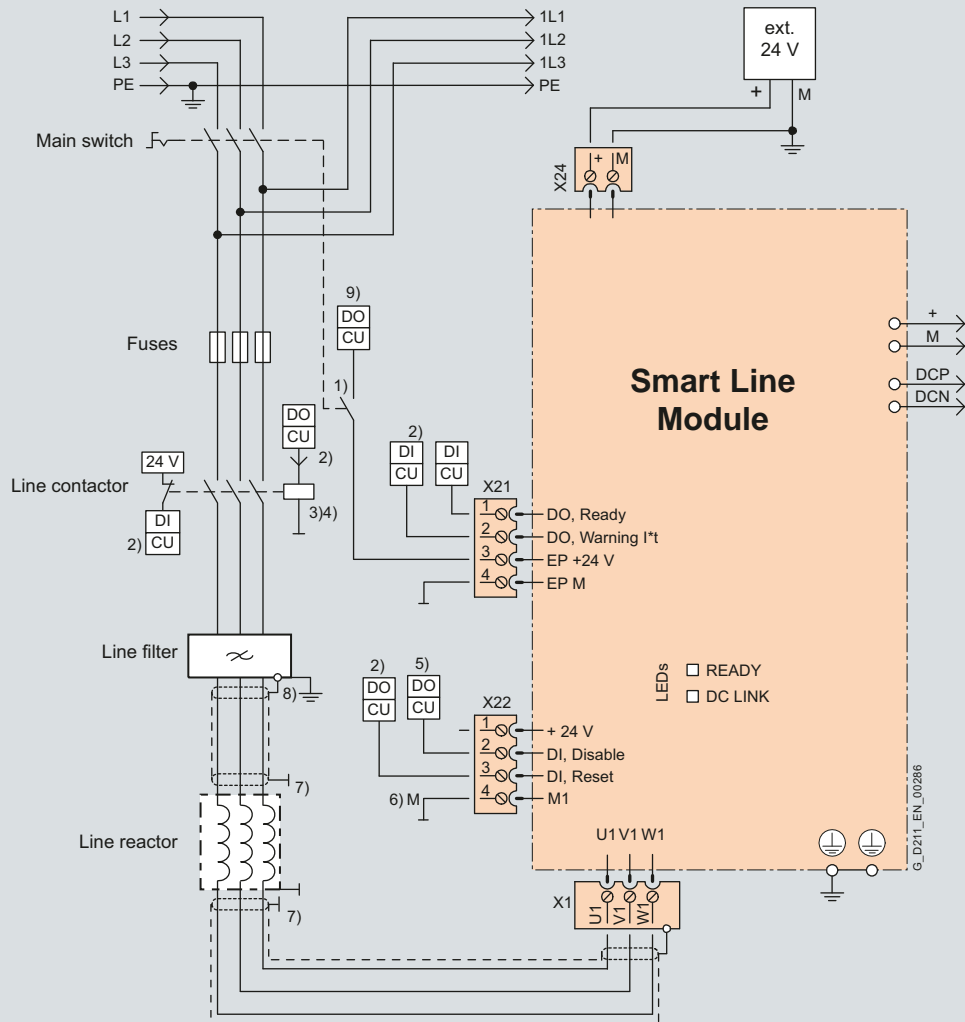
- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in) (on 16 kW, 36 kW and 55 kW Smart Line Modules only)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets (on 16 kW, 36 kW and 55 kW Smart Line Modules only)
- DRIVE-CLiQ cable (length depends on module width) to connect Smart Line Module to adjacent Motor Module, length = width of Smart Line Module + 0.11 m (4.33 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs and outputs
- Connector X22 for digital inputs and outputs (on 5 kW and 10 kW Smart Line Modules only)
- Connector X1 for line supply connection (on 5 kW and 10 kW Smart Line Modules only)
- 1 set of warning signs in 30 languages
- 1 heat conducting foil (for Smart Line Modules with cold plate cooling only)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in booksize format

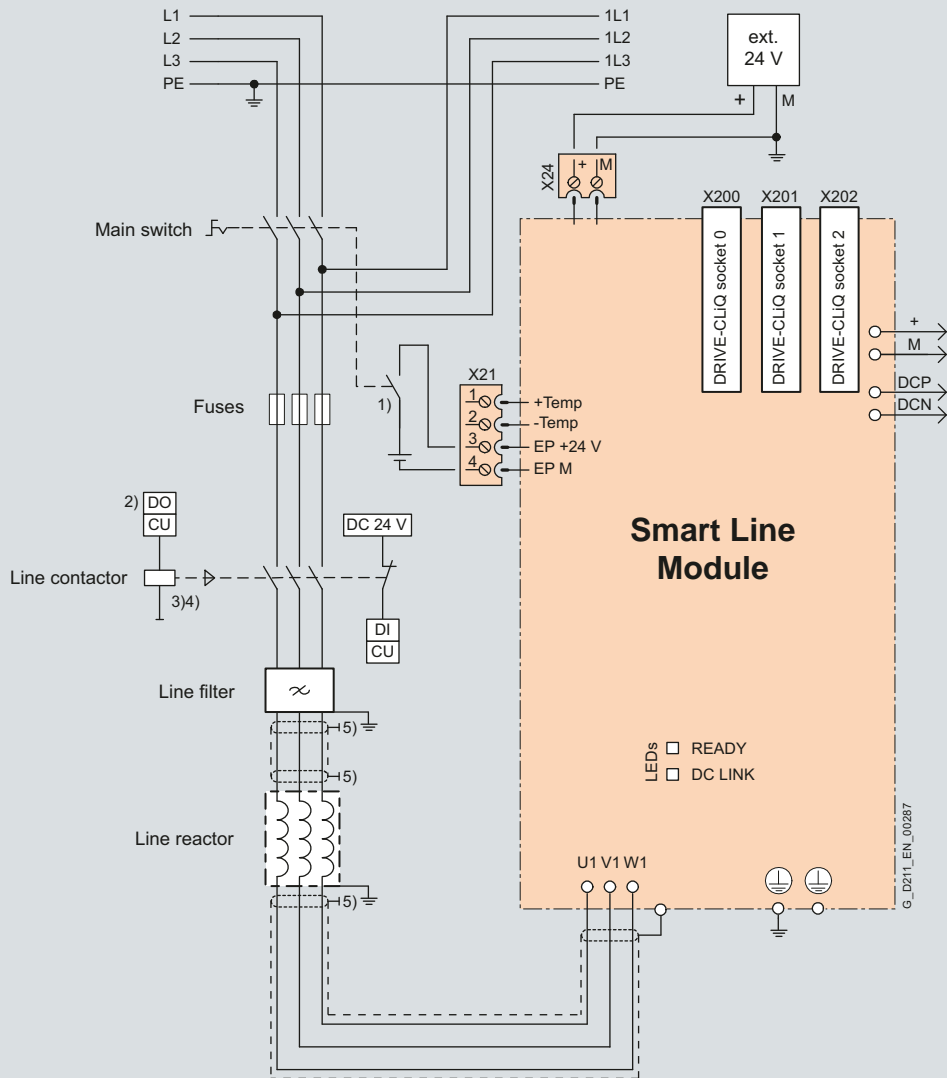
#### Integration



- 1) Leading NC contact  $t > 10$  ms, 24 V DC and ground must be connected for operation.
- 2) DI/DO, controlled by the Control Unit.
- 3) No additional load permitted downstream of the line contactor.
- 4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.
- 5) Digital output (DO) = High means: feedback deactivated (a jumper can be inserted between X22 pins 1 and 2 for permanent deactivation).
- 6) X22 pin 4 must be connected to ground (ext. 24 V).
- 7) Contacting via mounting back panel or shield panels according to EMC Installation Guidelines.
- 8) 5 kW and 10 kW line filters via shield connection
- 9) Signal output to prevent backlash of the DC 24 V supply on the EP terminal.

Connection example of 5 kW and 10 kW Smart Line Modules in booksize format

## Integration (continued)



- 1) Leading NC contact  $t > 10$  ms.
- 2) DI/DO, controlled by the Control Unit.
- 3) No additional load permitted downstream of the line contactor.
- 4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.
- 5) Contacting via mounting back panel or shield panels according to EMC Installation Guidelines.

Connection example of 16 kW, 36 kW and 55 kW Smart Line Modules in booksize format

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in booksize format

#### Technical specifications

<b>Smart Line Module in booksize format</b> 6SL313...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min)
<b>Line frequency</b>	47 ... 63 Hz
<b>SCCR (short-circuit current rating)</b>	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 <a href="#">see recommended line-side components</a>
<b>Line power factor</b> at rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	> 0.96
• Total ( $\lambda$ )	0.65 ... 0.90
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>DC link voltage, approx.</b>	1.35 × line voltage <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC, -15 %/+20 %
<b>Radio interference suppression</b>	
• Standard	No radio interference suppression
• With line filter	Category C2 to EN 61800-3 Total cable length up to 350 m (1148 ft) (shielded)
<b>Type of cooling</b>	Internal air cooling External air cooling, power units with forced air cooling by built-in fans Cold-plate cooling (5 kW/10 kW)
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The DC link voltage is maintained at the mean value of the rectified line voltage.  
For further information see chapter [System description – Dimensioning](#).

### Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Smart Line Module in booksize format				
<b>Internal air cooling</b>	6SL3130-...	6AE15-0AB1	6AE21-0AB1	6TE21-6AA3	6TE23-6AA3	6TE25-5AA3
<b>External air cooling</b>	6SL3131-...	6AE15-0AA1	6AE21-0AA1	6TE21-6AA3	6TE23-6AA3	6TE25-5AA3
<b>Cold plate cooling</b>	6SL3136-...	6AE15-0AA1	6AE21-0AA1	–	–	–
<b>Feed/feedback power</b>						
• Rated power $P_{rated}$ - At 380 V 3 AC - At 460 V 3 AC <sup>3)</sup>	kW (HP)	5 (5)	10 (10)	16 (18)	36 (40)	55 (60)
• For S6 duty $P_{S6}$ (40 %)	kW	6.5	13	21	47	71
• $P_{max}$	kW	10	20	35	70	91
<b>DC link current</b>						
• At 540/600 V DC	A	9.3/8.3	18.5/16.6	30/27	67/60	105/92
• For S6 duty (40 %)	A	11	22	35	79	138
• Maximum	A	16.6	33.2	59	117	178
<b>Input current</b>						
• Rated current at 380/400/480 V 3 AC	A	8.6/8.1/6.7	17/16.2/12.8	26/25/21	58/55/46	94/90/77
• For S6 duty (40 %) at 400 V	A	10.6	21.1	33	72	106
• At 400 V max.	A	15.7	31.2	54	107	130
<b>Current requirement</b> 24 V DC electronics power supply, max.	A	0.8	0.9	0.95	1.5	1.9
<b>Current carrying capacity</b>						
• 24 V DC busbars	A	20	20	20	20	20
• DC link busbars	A	100	100	100	200	200
<b>DC link capacitance</b>						
• Smart Line Module	μF	220	330	710	1410	1880
• Drive line-up, max.	μF	6000	6000	20000	20000	20000
<b>Internal/external air cooling</b>						
• Power loss <sup>1)</sup>						
- Internal air cooling	kW	0.08	0.14	0.19	0.405	0.665
- External air cooling int. <sup>2)</sup> /ext./total	kW	0.04/0.04/0.08	0.065/0.075/0.14	0.065/0.125/0.19	0.115/0.29/0.405	0.185/0.48/0.665
• Cooling air requirement	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.008 (0.283)	0.008 (0.283)	0.016 (0.565)	0.031 (1.095)	0.044 (1.554)
• Sound pressure level $L_{pA}$ (1 m)	dB	< 60	< 60	< 60	< 60	< 60
<b>Cold plate cooling</b>						
• Power loss <sup>1)</sup> int. <sup>2)</sup> /ext.	kW	0.035/0.04	0.055/0.08	–	–	–
• Thermal resistance $R_{th}$	K/W	0.175	0.175	–	–	–
<b>Line connection</b> U1, V1, W1		Screw-type terminals (X1)	Screw-type terminals (X1)	Screw-type terminals (X1)	M6 screw studs (X1)	M6 screw studs (X1)
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 6	2.5 ... 6	2.5 ... 10	2.5 ... 50	2.5 ... 95
<b>Shield connection</b>		Cable shield connection plate integrated into the connector	Cable shield connection plate integrated into the connector	Cable shield connection plate integrated into the connector	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>
<b>PE connection</b>		M5 screw	M5 screw	M5 screw	M6 screw	M6 screw
<b>Cable length, max.</b> Total of all motor cables and DC link						
• Shielded	m (ft)	350 (1148)	350 (1148)	350 (1148)	350 (1148)	350 (1148)
• Unshielded	m (ft)	560 (1837)	560 (1837)	560 (1837)	560 (1837)	560 (1837)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20

<sup>1)</sup> Power loss of Smart Line Module at rated power including losses of 24 V DC electronic power supply.

<sup>2)</sup> Power loss of the power electronics + power loss of the 24 V electronics.

<sup>3)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in booksize format

#### Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Smart Line Module in booksize format				
<b>Internal air cooling</b>	6SL3130-...	6AE15-0AB1	6AE21-0AB1	6TE21-6AA3	6TE23-6AA3	6TE25-5AA3
<b>External air cooling</b>	6SL3131-...	6AE15-0AA1	6AE21-0AA1	6TE21-6AA3	6TE23-6AA3	6TE25-5AA3
<b>Cold plate cooling</b>	6SL3136-...	6AE15-0AA1	6AE21-0AA1	–	–	–
<b>Dimensions</b>						
• Width	mm (in)	50 (1.97)	50 (1.97)	100 (3.94)	150 (5.91)	200 (7.87)
• Height	mm (in)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)
• Depth						
- With internal air cooling	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)
- With external air cooling on/behind mounting surface	mm (in)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/71 (8.90/2.79)	226/92 (8.90/3.62)
- With cold plate cooling	mm (in)	226	226	–	–	–
<b>Weight, approx.</b>						
• With internal air cooling	kg (lb)	4.7 (10)	4.8 (11)	7 (15)	10.3 (23)	17 (37.5)
• With external air cooling	kg (lb)	5.3 (12)	5.4 (12)	8.8 (19)	13.8 (30)	18.5 (41)
• With cold plate cooling	kg (lb)	4 (9)	4 (9)	–	–	–

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# SINAMICS S120 drive system

## Line Modules and line-side components

**Smart Line Modules in booksize format**
**Selection and ordering data**

Description	Smart Line Module in booksize format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
<b>Internal air cooling</b>	
Rated power:	
5 kW (5 HP)	<b>6SL3130-6AE15-0AB1</b>
10 kW (10 HP)	<b>6SL3130-6AE21-0AB1</b>
16 kW (18 HP)	<b>6SL3130-6TE21-6AA3</b>
36 kW (40 HP)	<b>6SL3130-6TE23-6AA3</b>
55 kW (60 HP)	<b>6SL3130-6TE25-5AA3</b>
<b>External air cooling</b>	
Rated power:	
5 kW (5 HP)	<b>6SL3131-6AE15-0AA1</b>
10 kW (10 HP)	<b>6SL3131-6AE21-0AA1</b>
16 kW (18 HP)	<b>6SL3131-6TE21-6AA3</b>
36 kW (40 HP)	<b>6SL3131-6TE23-6AA3</b>
55 kW (60 HP)	<b>6SL3131-6TE25-5AA3</b>
<b>Cold plate cooling</b>	
Rated power:	
5 kW (5 HP)	<b>6SL3136-6AE15-0AA1</b>
10 kW (10 HP)	<b>6SL3136-6AE21-0AA1</b>

Description	Order No.
<b>Accessories</b>	
<b>Shield connection kit</b> For Line/Motor Modules in booksize format with a width of 150 mm (5.91 in)	<b>6SL3162-1AF00-0AA1</b>
<b>DC link rectifier adapter</b> For direct infeed of DC link voltage	
<ul style="list-style-type: none"> <li>Screw-type terminals 0.5 ... 10 mm<sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)</li> </ul>	<b>6SL3162-2BD00-0AA0</b>
<ul style="list-style-type: none"> <li>Screw-type terminals 35 ... 95 mm<sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)</li> </ul>	<b>6SL3162-2BM00-0AA0</b>
<b>DC link adapter (2 units)</b> For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2BM01-0AA0</b>
<b>Accessories for re-ordering</b>	
<b>24 V terminal adapter</b> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2AA00-0AA0</b>
<b>24 V jumper</b> For connection of the 24 V busbars (for booksize format)	<b>6SL3162-2AA01-0AA0</b>
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>Accessories pack</b> (plug-in terminals, DRIVE-CLiQ jumper (length = module width + 60 mm (2.36 in)), dust-proof blanking plugs) For DRIVE-CLiQ port	
<ul style="list-style-type: none"> <li>For modules with a width of 50 mm/100 mm (1.97 in/3.94 in)</li> </ul>	<b>6SL3163-8KB00-0AA0</b>
<ul style="list-style-type: none"> <li>For modules with a width of 100 mm (3.94 in)</li> </ul>	<b>6SL3163-8FD00-0AA0</b>
<ul style="list-style-type: none"> <li>For modules with a width of 150 mm (5.91 in)</li> </ul>	<b>6SL3163-8GF00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

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# SINAMICS S120 drive system

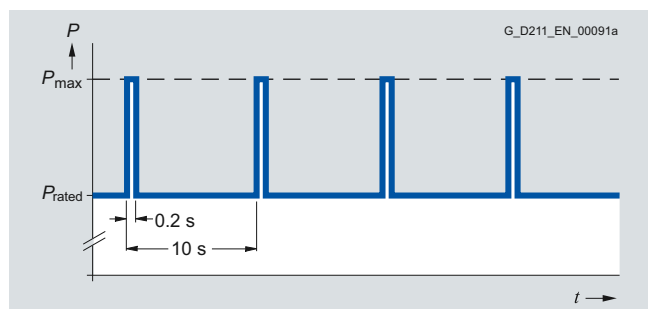
## Line Modules and line-side components

### Smart Line Modules in booksize format

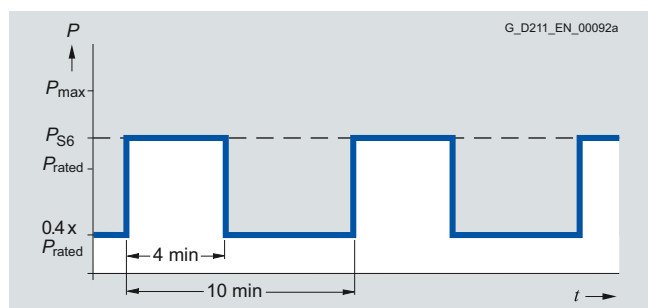
3

#### Characteristic curves

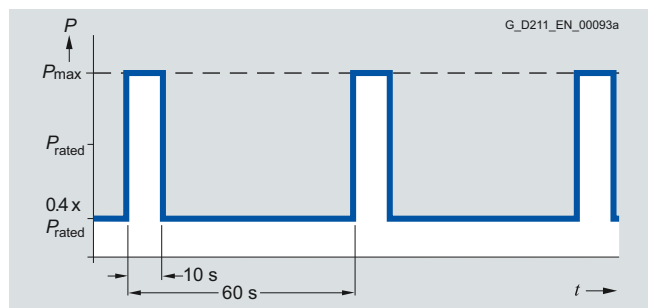
##### Overload capability



Load cycle with previous load

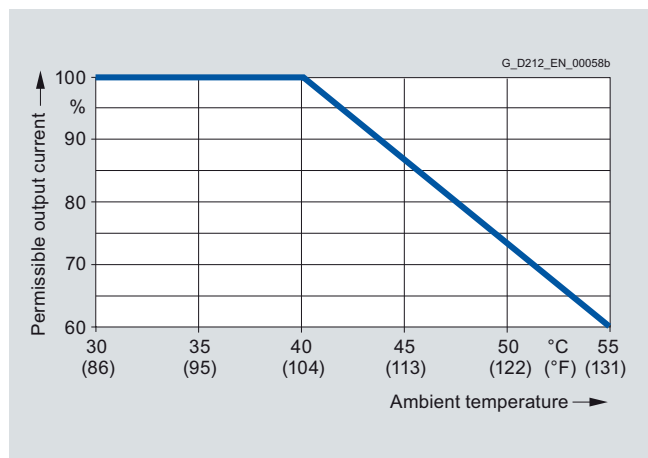


S6 load cycle with previous load

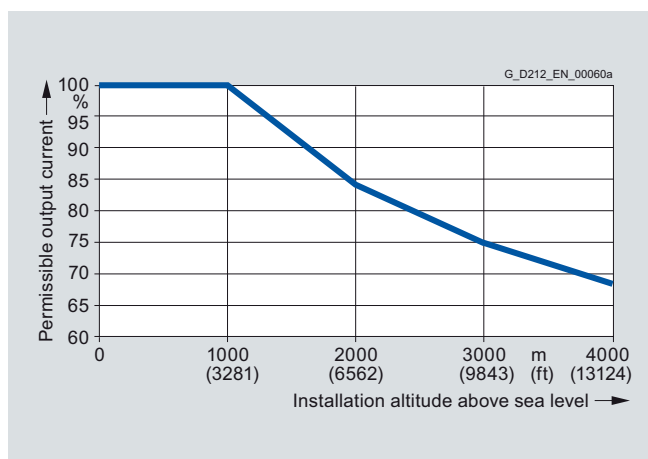


S6 load cycle with previous load

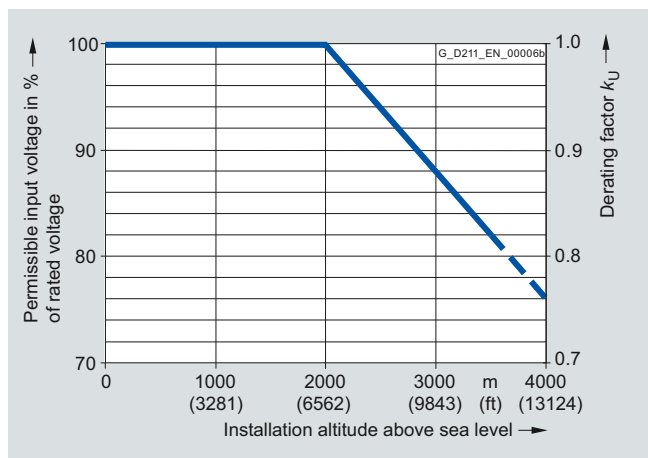
##### Derating characteristics



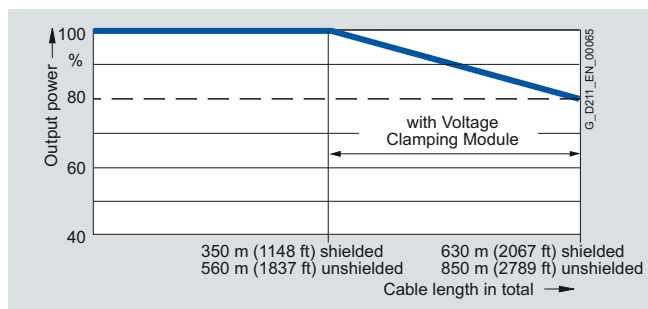
Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude



Output power dependent on total cable length



# SINAMICS S120 drive system

## Line Modules and line-side components

Smart Line Modules in booksize format  
Line reactors

### Overview



Smart Line Modules are not warranted to operate without the specified line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

### Selection and ordering data

Rated power of the Smart Line Module	Suitable for Smart Line Module in booksize or booksize compact format	Line reactor
kW (HP)		Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
5 (5)	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	<b>6SL3000-0CE15-0AA0</b>
10 (10)	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	<b>6SL3000-0CE21-0AA0</b>
16 (18)	6SL3130-6TE21-6AA3 6SL3131-6TE21-6AA3 6SL3430-6TE21-6AA1	<b>6SL3000-0CE21-6AA0</b>
36 (40)	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	<b>6SL3000-0CE23-6AA0</b>
55 (60)	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	<b>6SL3000-0CE25-5AA0</b>

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### Technical specifications

Line voltage 380 ... 480 V 3 AC	Line reactors					
	6SL3000-...	0CE15-0AA0	0CE21-0AA0	0CE21-6AA0	0CE23-6AA0	0CE25-5AA0
<b>Rated current</b>	A	14	28	35	69	103
<b>Power loss</b>	kW	0.062	0.116	0.11	0.17	0.19
<b>Line/load connection</b> 1U1, 1V1, 1W1/ 1U2, 1V2, 1W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	4	10	10	16	70
<b>PE connection</b>		Screw-type terminals	Screw-type terminals	M5 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M8 screw studs according to DIN 46234
• Conductor cross-section	mm <sup>2</sup>	4	10	–	–	–
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	150 (5.91)	177 (6.97)	219 (8.62)	228 (8.98)	270 (10.6)
• Height	mm (in)	175 (6.89)	196 (7.72)	180 (7.09)	235 (9.25)	275 (10.8)
• Depth	mm (in)	70 (2.76)	110 (4.33)	144 (5.67)	224 (8.82)	290 (11.4)
<b>Weight, approx.</b>	kg (lb)	3.7 (8)	7.5 (16.5)	9.5 (21)	17 (37.5)	36 (80)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Smart Line Module in booksize or booksize compact format</b>	Type	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	6SL3130-6TE21-6AA3 6SL3131-6TE21-6AA3 6SL3430-6TE21-6AA1	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3
• Rated power of the Smart Line Module	kW	5	10	16	36	55

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in booksize format

#### Line filters

#### Overview



In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the Power Modules to the limit values of Class A1 as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN-systems.

#### Selection and ordering data

Rated power of the Smart Line Module	Suitable for Smart Line Module in booksize or booksize compact format	Line filter
kW (HP)		Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
5 (5)	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	<b>6SL3000-0HE15-0AA0</b>
10 (10)	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	<b>6SL3000-0HE21-0AA0</b>
16 (18)	6SL3130-6TE21-6AA3 6SL3131-6TE21-6AA3 6SL3430-6TE21-6AA1	<b>6SL3000-0BE21-6DA0</b>
36 (40)	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	<b>6SL3000-0BE23-6DA1</b>
55 (80)	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	<b>6SL3000-0BE25-5DA0</b>

#### Technical specifications

Line voltage 380 ... 480 V 3 AC	Line filter					
	6SL3000-...	0HE15-0AA0	0HE21-0AA0	0BE21-6DA0	0BE23-6DA1	0BE25-5DA0
<b>Rated current</b>	A	12	25	36	74	105
<b>Power loss</b>	kW	0.02	0.02	0.016	0.026	0.043
<b>Line/load connection</b> L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	10	10	10	35	50
<b>PE connection</b>		M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	60 (2.36)	60 (2.36)	50 (1.97)	75 (2.95)	100 (3.94)
• Height	mm (in)	285 (11.2)	285 (11.2)	420 (16.5)	433 (17.0)	466 (18.3)
• Depth	mm (in)	122 (4.80)	122 (4.80)	226 (8.90)	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>	kg (lb)	2.1 (5)	2.3 (5)	5.0 (11)	7.5 (16.5)	11.5 (25)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Smart Line Module in booksize or booksize compact format</b>	Type	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	6SL3130-6TE21-6AA3 6SL3131-6TE21-6AA3 6SL3430-6TE21-6AA1	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3
• Rated power of the Smart Line Module	kW	5	10	16	36	55

# SINAMICS S120 drive system

## Line Modules and line-side components

Smart Line Modules in booksize format  
Recommended line-side components

### Overview

Suitable line-side power components are assigned depending on the power rating of the Smart Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

### Assignment of line-side power components to Smart Line Modules in booksize or booksize compact format

Rated power kW (HP)	Suitable for Smart Line Module in booksize or booksize compact format Type	Line contactor Type	Circuit breaker IEC 60947 Order No.	Circuit breaker UL489/CSA C22.2 No. 5-02 Order No.	Main switch Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>					
5 (5)	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	<b>3RT1023-...</b>	<b>3RV1031-4BA10</b>	<b>3VL1102-2KM30-....</b>	<b>3LD2003-0TK51</b>
10 (10)	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	<b>3RT1026-...</b>	<b>3RV1031-4FA10</b>	<b>3VL1135-2KM30-....</b>	<b>3LD2203-0TK51</b>
16 (18)	6SL3130-6TE21-6AA3 6SL3131-6TE21-6AA3 6SL3430-6TE21-6AA1	<b>3RT1035-...</b>	<b>3RV1031-4FA10</b>	<b>3VL2105-2KN30-....</b>	<b>3LD2504-0TK51</b>
36 (40)	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	<b>3RT1045-...</b>	<b>3RV1041-4LA10</b>	<b>3VL2108-2KN30-....</b>	<b>3LD2704-0TK51</b>
55 (60)	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	<b>3RT1054-...</b>	<b>3VL2712-1DC33-....</b>	<b>3VL2112-2KN30-....</b>	<b>3KA5330-1GE01</b>

Rated power kW (HP)	Suitable for Smart Line Module in booksize or booksize compact format Type	Fuse switch disconnecter Order No.	Switch disconnecter with fuse holders Order No.	LV HRC fuse (gL/gG)			UL/CSA fuse, Class J Available from: Mersen <a href="http://www.ep.mersen.com">www.ep.mersen.com</a>		
				Rated current	Size	Order No.	Rated current	Size mm	Reference No.
<b>Line voltage 380 ... 480 V 3 AC</b>									
5 (5)	6SL3130-6AE15-0AB1 6SL3131-6AE15-0AA1 6SL3136-6AE15-0AA1	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	16 A	000	<b>3NA3805</b>	17.5 A	21 × 57	AJT17-1/2
10 (10)	6SL3130-6AE21-0AB1 6SL3131-6AE21-0AA1 6SL3136-6AE21-0AA1	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	35 A	000	<b>3NA3814</b>	35 A	27 × 60	AJT35
16 (18)	6SL3130-6TE21-6AA3 6SL3131-6TE21-6AA3 6SL3430-6TE21-6AA1	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	35 A	000	<b>3NA3814</b>	35 A	27 × 60	AJT35
36 (40)	6SL3130-6TE23-6AA3 6SL3131-6TE23-6AA3	<b>3NP1123-1CA20</b>	<b>3KL5230-1GB01</b>	80 A	000	<b>3NA3824</b>	80 A	29 × 117	AJT80
55 (60)	6SL3130-6TE25-5AA3 6SL3131-6TE25-5AA3	<b>3NP1143-1DA20</b>	<b>3KL5530-1GB01</b>	125 A	000	<b>3NA3132</b>	125 A	41 × 146	AJT125

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format

#### Overview



Smart Line Modules are non-regulated feed/feedback units with 100 % continuous regenerative feed power. The regenerative feedback capability of the modules can be deactivated by means of parameterization.

Smart Line Modules are designed for connection to grounded TN/TT and non-grounded IT systems.

The DC link is pre-charged via integrated pre-charging resistors.

**The associated line reactor is absolutely essential for operating a Smart Line Module.**

#### Design

The Smart Line Modules have the following interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 3 DRIVE-CLiQ sockets
- 1 PE (protective earth) connection (2 connections for frame sizes HX and JX)

The status of the Smart Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable to connect to a CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2
- DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module (type dependent)

# SINAMICS S120 drive system

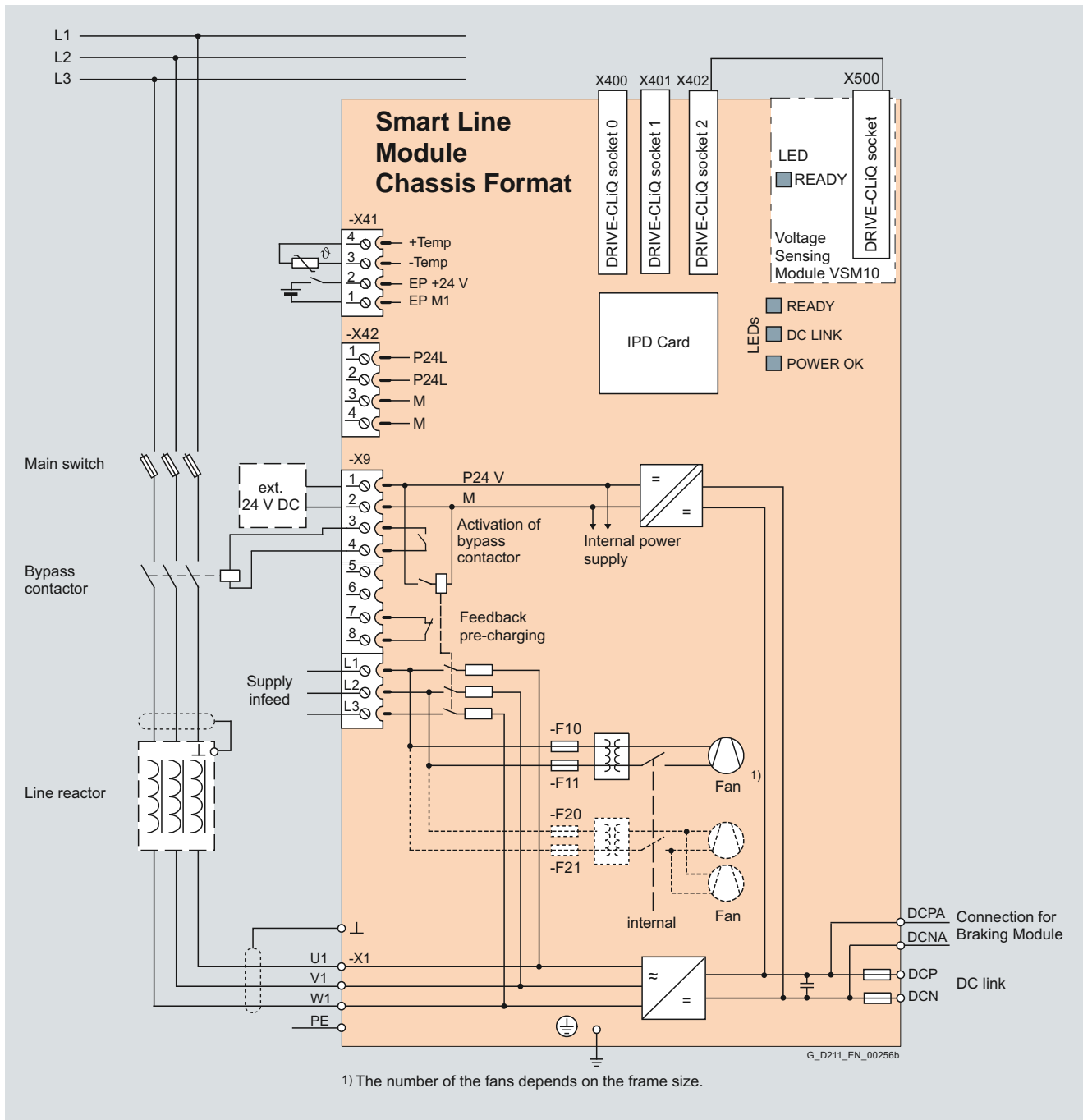
## Line Modules and line-side components

### Smart Line Modules in chassis format

3

#### Integration

The Smart Line Module communicates with the higher-level control module via DRIVE-CLiQ. The Control Unit in this case can be a CU320-2 or a SIMOTION D Control Unit.



Connection example of a Smart Line Module in chassis format

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format

#### Technical specifications

##### Smart Line Module in chassis format 6SL3330-6T...

**Line connection voltage**  
(up to 2000 m (6562 ft) above sea level) 380 ... 480 V 3 AC  $\pm 10\%$  (in operation -15 % < 1 min) or  
500 ... 690 V 3 AC  $\pm 10\%$  (in operation -15 % < 1 min) <sup>1)</sup>

**Line frequency** 47 ... 63 Hz

##### Line power factor at rated output

- Fundamental power factor ( $\cos \varphi_1$ ) > 0.96
- Total ( $\lambda$ ) 0.75 ... 0.93

##### Overvoltage category to EN 60664-1

Class III

##### DC link voltage, approx. <sup>2)</sup>

1.32 × line voltage under partial load  
1.30 × line voltage under full load

##### Main contactor control

- Terminal strip X9/5-6 240 V AC/max. 8 A  
30 V DC/max. 1A

##### Radio interference suppression

- Standard Category C3 to EN 61800-3 up to 300 m (984 ft) total cable length

##### Type of cooling

Forced air cooling by means of built-in fan

##### Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules

0 ... 40 °C (32 ... 104 °F) without derating,  
> 40 ... 55 °C (104 ... 131 °F) [see derating characteristics](#)

##### Installation altitude

Up to 2000 m (6562 ft) above sea level without derating,  
> 2000 ... 4000 m (6562 ... 13124 ft) above sea level,  
[see derating characteristics](#)

##### Conformity

CE (Low Voltage and EMC Directives)

##### Approvals, according to

cULus

<sup>1)</sup> TT system with grounded external conductor is not permissible for line voltages > 600 V.

<sup>2)</sup> The DC link voltage is unregulated and load-dependent.  
[For more information, see SINAMICS Low-Voltage Engineering Manual.](#)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format

#### Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Smart Line Module in chassis format				
		6SL3330-6TE35-5AA3	6SL3330-6TE37-3AA3	6SL3330-6TE41-1AA3	6SL3330-6TE41-3AA3	6SL3330-6TE41-7AA3
<b>Rated power</b>						
• For $I_{rated\ DC}$ (50 Hz 400 V)	kW	250	355	500	630	800
• For $I_{H\ DC}$ (50 Hz 400 V)	kW	235	315	450	555	730
• For $I_{rated\ DC}$ (60 Hz 460 V)	HP	385	545	770	970	1230
• For $I_{H\ DC}$ (60 Hz 460 V)	HP	360	485	695	855	1125
<b>DC link current</b>						
• Rated current $I_{rated\ DC}$	A	550	730	1050	1300	1700
• Base-load current $I_{H\ DC}^{1)}$	A	490	650	934	1157	1513
• Maximum current $I_{max\ DC}$	A	825	1095	1575	1950	2550
<b>Rectifier/regenerative current</b>						
• Rated current $I_{rated\ E}$	A	463	614	883	1093	1430
• Maximum current $I_{max\ E}$	A	694	921	1324	1639	2145
<b>Current requirement</b>						
• 24 V DC auxiliary power supply	A	1.35	1.35	1.4	1.5	1.7
• 400 V AC	A	1.8	1.8	3.6	5.4	5.4
<b>DC link capacitance</b>						
• Smart Line Module	μF	8400	12000	16800	18900	28800
• Drive line-up, max.	μF	42000	60000	67200	75600	115200
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 400 V	kW	3.7	4.7	7.1	11	11.5
• At 60 Hz 460 V	kW	3.7	4.7	7.1	11	11.5
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.36 (12.7)	0.36 (12.7)	0.78 (27.5)	1.08 (38.1)
<b>Sound pressure level</b>		dB	69/73	69/73	70/73	70/73
<b>Line connection</b>						
U1, V1, W1		M10 screw	M10 screw	2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (DIN VDE)	mm <sup>2</sup>	2 × 240	2 × 240	4 × 240	6 × 240	6 × 240
<b>DC link connection</b>						
DCP, DCN		M10 screw	M10 screw	4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (DIN VDE)	mm <sup>2</sup>	2 × 240	2 × 240	Busbar	Busbar	Busbar
<b>PE/GND connection</b>						
• Conductor cross-section, max. (DIN VDE)	mm <sup>2</sup>	Hole for M10 2 × 240	Hole for M10 2 × 240	– –	– –	– –
<b>PE1/GND connection</b>						
• Conductor cross-section, max. (DIN VDE)	mm <sup>2</sup>	–	–	M12 screw 240	M12 screw 240	M12 screw 240
<b>PE2/GND connection</b>						
• Conductor cross-section, max. (DIN VDE)	mm <sup>2</sup>	–	–	2 × M12 screws 2 × 240	2 × M12 screws 2 × 240	2 × M12 screws 2 × 240
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m (ft)	4000 (13124)	4000 (13124)	4800 (15749)	4800 (15749)	4800 (15749)
• Unshielded	m (ft)	6000 (19686)	6000 (19686)	7200 (23623)	7200 (23623)	7200 (23623)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	310 (12.2)	310 (12.2)	503 (19.8)	704 (27.7)	704 (27.7)
• Height	mm (in)	1413 (55.6)	1413 (55.6)	1475 (58.1)	1480 (58.3)	1480 (58.3)
• Depth	mm (in)	550 (21.6)	550 (21.6)	548 (21.6)	550 (21.6)	550 (21.6)
<b>Weight, approx.</b>		kg (lb)	150 (331)	150 (331)	294 (648)	458 (1010)
<b>Frame size</b>		GX	GX	HX	JX	JX

<sup>1)</sup> The base-load current  $I_{H\ DC}$  is based on a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss is the maximum value at 100 % capacity utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Total of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

See also [SINAMICS Low-Voltage Engineering Manual](#).

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format

#### Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Smart Line Module in chassis format				
		6SL3330-6TG35-5AA3	6SL3330-6TG38-8AA3	6SL3330-6TG41-2AA3	6SL3330-6TG41-7AA3	
<b>Rated power</b>						
• For $I_{rated\ DC}$ (50 Hz 690 V)	kW	450	710	1000	1400	
• For $I_{H\ DC}$ (50 Hz 690 V)	kW	405	665	885	1255	
• For $I_{rated\ DC}$ (50 Hz 500 V)	kW	320	525	705	995	
• For $I_{H\ DC}$ (50 Hz 500 V)	kW	295	480	640	910	
• For $I_{rated\ DC}$ (60 Hz 575 V)	HP	500	790	1115	1465	
• For $I_{H\ DC}$ (60 Hz 575 V)	HP	450	740	990	1400	
<b>DC link current</b>						
• Rated current $I_{rated\ DC}$	A	550	900	1200	1700	
• Base-load current $I_{H\ DC}^{1)}$	A	490	800	1068	1513	
• Maximum current $I_{max\ DC}$	A	825	1350	1800	2550	
<b>Rectifier/regenerative current</b>						
• Rated current $I_{rated\ E}$	A	463	757	1009	1430	
• Maximum current $I_{max\ E}$	A	694	1135	1513	2145	
<b>Current requirement</b>						
• 24 V DC auxiliary power supply	A	1.35	1.4	1.5	1.7	
• 500 V AC	A	1.4	2.9	4.3	4.3	
• 690 V AC	A	1.0	2.1	3.1	3.1	
<b>DC link capacitance</b>						
• Smart Line Module	$\mu\text{F}$	5600	7400	11100	14400	
• Drive line-up, max.	$\mu\text{F}$	28000	29600	44400	57600	
<b>Power loss, max. <sup>2)</sup></b>						
• At 50 Hz 690 V	kW	4.3	6.5	12	13.8	
• At 60 Hz 575 V	kW	4.3	6.5	12	13.8	
<b>Cooling air requirement</b>		$\text{m}^3/\text{s}$ (ft <sup>3</sup> /s)	0.36 (12.7)	0.78 (27.5)	1.08 (38.1)	1.08 (38.1)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz		dB	69/73	70/73	70/73	
<b>Line connection</b> U1, V1, W1			M10 screw	2 × M12 screw	3 × M12 screw	3 × M12 screw
• Conductor cross-section, max. (acc. to DIN VDE)	$\text{mm}^2$	2 × 240	4 × 240	6 × 240	6 × 240	
<b>DC link connection</b> DCP, DCN			M10 screw	4 × hole for M12	4 × hole for M12	4 × hole for M12
• Conductor cross-section, max. (acc. to DIN VDE)	$\text{mm}^2$	2 × 240	Busbar	Busbar	Busbar	
<b>PE/GND connection</b>			Hole for M10	–	–	–
• Conductor cross-section, max. (acc. to DIN VDE)	$\text{mm}^2$	2 × 240	–	–	–	
<b>PE1/GND connection</b>			–	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max. (acc. to DIN VDE)	$\text{mm}^2$	–	–	240	240	240
<b>PE2/GND connection</b>			–	2 × M12 screw	2 × M12 screw	2 × M12 screw
• Conductor cross-section, max. (acc. to DIN VDE)	$\text{mm}^2$	–	–	2 × 240	2 × 240	2 × 240
<b>Cable length, max. <sup>3)</sup></b>						
• Shielded	m (ft)	2250 (7382)	2750 (9023)	2750 (9023)	2750 (9023)	
• Unshielded	m (ft)	3375 (11073)	4125 (13534)	4125 (13534)	4125 (13534)	
<b>Degree of protection</b>			IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	310 (12.2)	503 (19.8)	704 (27.7)	704 (27.7)	
• Height	mm (in)	1413 (55.6)	1475 (58.1)	1480 (58.3)	1480 (58.3)	
• Depth	mm (in)	550 (21.6)	548 (21.6)	550 (21.6)	550 (21.6)	
<b>Weight, approx.</b>		kg (lb)	150 (331)	294 (648)	458 (1010)	458 (1010)
<b>Frame size</b>			GX	HX	JX	JX

<sup>1)</sup> The base-load current  $I_{H\ DC}$  is based on a duty cycle of 150 % for 60 s or  $I_{max\ DC}$  for 5 s with a duty cycle duration of 300 s.

<sup>2)</sup> The specified power loss is the maximum value at 100 % capacity utilization. The value is lower under normal operating conditions.

<sup>3)</sup> Total of all motor cables and DC link. Longer cable lengths for specific configurations are available on request.

See also [SINAMICS Low-Voltage Engineering Manual](#).



# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format

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#### Selection and ordering data

Rated power kW (HP)	Smart Line Module in chassis format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
250 (400)	<b>6SL3330-6TE35-5AA3</b>
355 (500)	<b>6SL3330-6TE37-3AA3</b>
500 (700)	<b>6SL3330-6TE41-1AA3</b>
630 (800)	<b>6SL3330-6TE41-3AA3</b>
800 (1000)	<b>6SL3330-6TE41-7AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>	
450	<b>6SL3330-6TG35-5AA3</b>
710	<b>6SL3330-6TG38-8AA3</b>
1000	<b>6SL3330-6TG41-2AA3</b>
1400	<b>6SL3330-6TG41-7AA3</b>

#### Accessories

##### Warning labels in 30 languages

This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR

**6SL3166-3AB00-0AA0**

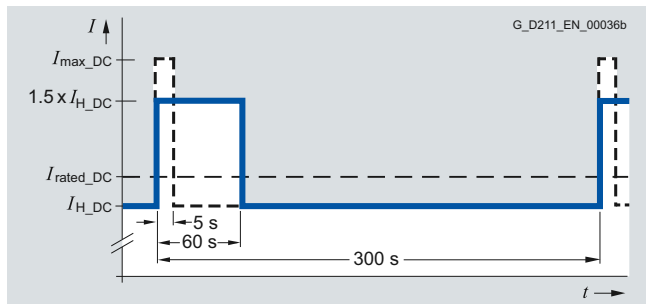
##### SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs

(50 units)  
For DRIVE-CLiQ port

**6SL3066-4CA00-0AA0**

#### Characteristic curves

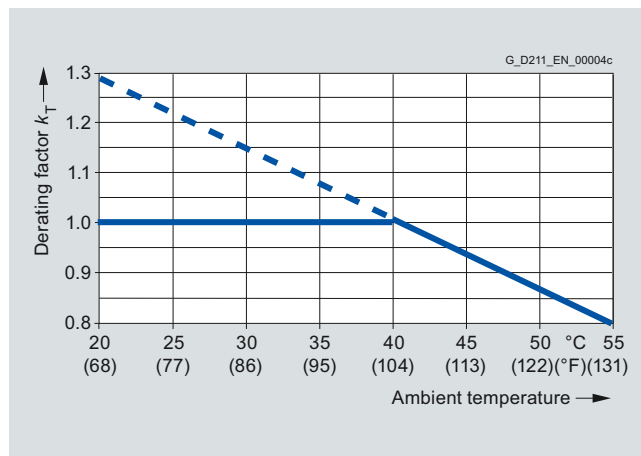
##### Overload capability



High overload

#### Characteristic curves (continued)

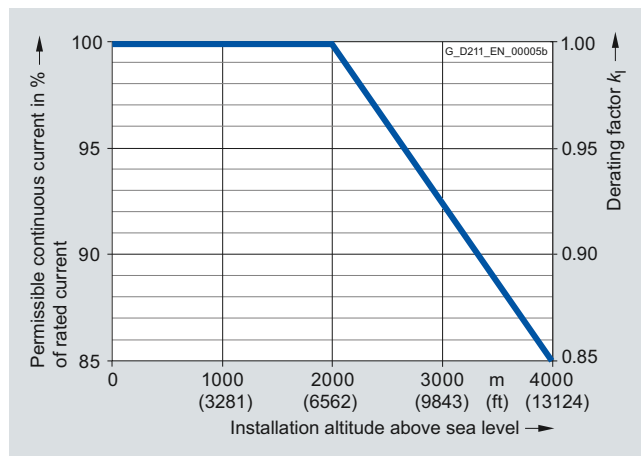
##### Derating characteristics



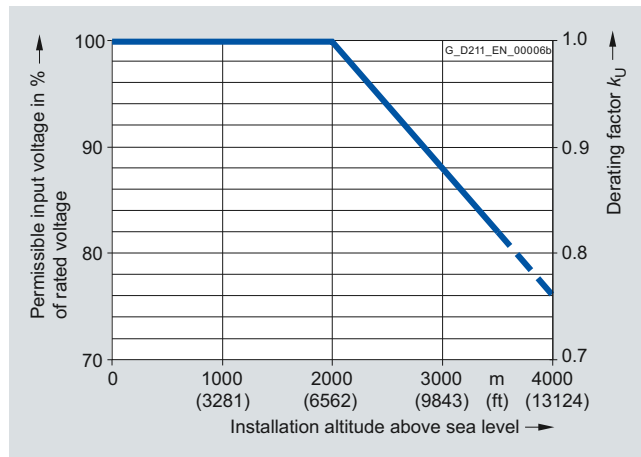
Current derating dependent on ambient temperature

Note: A derating factor  $k_T > 1.0$  is to be taken into account only in conjunction with "current derating dependent on installation altitude".

See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format

#### Line reactors

#### Overview



Smart Line Modules are not warranted to operate without the specified line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

#### Selection and ordering data

Rated power of the Smart Line Module kW (HP)	Suitable for Smart Line Module in chassis format	Line reactor Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
250 (400)	6SL3330-6TE35-5AA3	<b>6SL3000-0EE36-2AA0</b>
355 (500)	6SL3330-6TE37-3AA3	
500 (700)	6SL3330-6TE41-1AA3	<b>6SL3000-0EE38-8AA0</b>
630 (800)	6SL3330-6TE41-3AA3	<b>6SL3000-0EE41-4AA0</b>
800 (1000)	6SL3330-6TE41-7AA3	
<b>Line voltage 500 ... 690 V 3 AC</b>		
450	6SL3330-6TG35-5AA3	<b>6SL3000-0EH34-7AA0</b>
710	6SL3330-6TG38-8AA3	<b>6SL3000-0EH37-6AA0</b>
1000	6SL3330-6TG41-2AA3	<b>6SL3000-0EH41-4AA0</b>
1400	6SL3330-6TG41-7AA3	

# SINAMICS S120 drive system

## Line Modules and line-side components

Smart Line Modules in chassis format  
Line reactors

3

### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Line reactor</b>		
		6SL3000-0EE36-2AA0	6SL3000-0EE38-8AA0	6SL3000-0EE41-4AA0
<b>Rated current</b>	A	615	885	1430
<b>Nominal inductance</b> $L_{rated}$	μH	55	35	25
<b>Power loss</b> at 50/60 Hz	kW	0.56	0.81	1.08
<b>Line/load connection</b>		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection
<b>PE connection</b>		M6 thread	M6 thread	M6 thread
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	300 (11.8)	442 (17.4)	544 (21.4)
• Height	mm (in)	264 (10.4)	376 (14.8)	386 (15.2)
• Depth	mm (in)	203 (7.99)	263 (10.3)	232 (9.13)
<b>Weight, approx.</b>	kg (lb)	57 (126)	85.5 (188)	220 (485)
<b>Conformity</b>		CE	CE	CE
<b>Approvals, according to</b>		–	–	–
<b>Suitable for Smart Line Module in chassis format</b>	Type (rated output)	6SL3330-6TE35-5AA3 (250 kW) 6SL3330-6TE37-3AA3 (355 kW)	6SL3330-6TE41-1AA3 (500 kW)	6SL3330-6TE41-3AA3 (630 kW) 6SL3330-6TE41-7AA3 (800 kW)

<b>Line voltage</b> 500 ... 690 V 3 AC		<b>Line reactor</b>		
		6SL3000-0EH34-7AA0	6SL3000-0EH37-6AA0	6SL3000-0EH41-4AA0
<b>Rated current</b>	A	465	760	1430
<b>Nominal inductance</b> $L_{rated}$	μH	115	70	40
<b>Power loss</b> at 50/60 Hz	kW	0.82	0.95	1.85
<b>Line/load connection</b>		1 × hole for M10 Provided for busbar connection	1 × hole for M10 Provided for busbar connection	2 × hole for M10 Provided for busbar connection
<b>PE connection</b>		M6 nut	M6 nut	M6 nut
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	360 (14.2)	442 (17.4)	655 (25.8)
• Height	mm (in)	325 (12.8)	370 (14.6)	383 (15.1)
• Depth	mm (in)	229 (9.02)	303 (11.9)	288 (11.3)
<b>Weight, approx.</b>	kg (lb)	58 (128)	145 (320)	239 (527)
<b>Conformity</b>		CE	CE	CE
<b>Approvals, according to</b>		–	–	–
<b>Suitable for Smart Line Module in chassis format</b>	Type (rated output)	6SL3330-6TG35-5AA3 (450 kW)	6SL3330-6TG38-8AA3 (710 kW)	6SL3330-6TG41-2AA3 (1000 kW) 6SL3330-6TG41-7AA3 (1400 kW)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Smart Line Modules in chassis format Recommended line-side components

#### Overview

Suitable line-side power components are assigned depending on the power rating of the Smart Line Module.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

#### Assignment of line-side power components to Smart Line Modules in chassis format

Infeed power kW (HP)	Input current A	Suitable for Smart Line Module Type 6SL3330-	Line contactor Order No.	Fixed-mounted circuit breaker Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
250 (400)	463	6TE35-5AA3	<b>3RT1476-6AP36</b>	–
355 (500)	614	6TE37-3AA3	<b>3RT1476-6AP36</b>	–
500 (700)	883	6TE41-1AA3	–	<b>3WL1210-4CB34-4AN2-Z C22</b>
630 (800)	1093	6TE41-3AA3	–	<b>3WL1212-4CB34-4AN2-Z C22</b>
800 (1000)	1430	6TE41-7AA3	–	<b>3WL1216-4CB34-4AN2-Z C22</b>
<b>Line voltage 500 ... 690 V 3 AC</b>				
450	463	6TG35-5AA3	<b>3RT1466-6AP36</b>	–
710	757	6TG38-8AA3	<b>3RT1466-6AP36</b> (3 units)	–
1000	1009	6TG41-2AA3	–	<b>3WL1212-4CB34-4AN2-Z C22</b>
1400	1430	6TG41-7AA3	–	<b>3WL1216-4CB34-4AN2-Z C22</b>

Infeed power kW (HP)	Input current A	Suitable for Smart Line Module Type 6SL3330-	Switch disconnector without handle and shaft	Switch disconnector with handle and shaft	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
			Order No.	Order No.	Rated current	Order No.	Rated current	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>								
250 (400)	463	6TE35-5AA3	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>	500 A	<b>3NA3365</b>	560 A	<b>3NE1435-2</b>
355 (500)	614	6TE37-3AA3	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>	630 A	<b>3NA3372</b>	710 A	<b>3NE1437-2</b>
500 (700)	883	6TE41-1AA3	–	–	1000 A	<b>3NA3480</b>	2 × 500 A	<b>3NE1334-2</b> (2 units)
630 (800)	1093	6TE41-3AA3	–	–	1250 A	<b>3NA3482</b>	2 × 630 A	<b>3NE1436-2</b> (2 units)
800 (1000)	1430	6TE41-7AA3	–	–	2 × 800 A	<b>3NA3475</b> (2 units)	2 × 850 A	<b>3NE1448-2</b> (2 units)
<b>Line voltage 500 ... 690 V 3 AC</b>								
450	463	6TG35-5AA3	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>	500 A	<b>3NA3365-6</b>	560 A	<b>3NE1435-2</b>
710	757	6TG38-8AA3	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>	2 × 400 A	<b>3NA3360-6</b> (2 units)	850 A	<b>3NE1448-2</b>
1000	1009	6TG41-2AA3	–	–	3 × 355 A	<b>3NA3354-6</b> (3 units)	2 × 560 A	<b>3NE1435-2</b> (2 units)
1400	1430	6TG41-7AA3	–	–	3 × 500 A	<b>3NA3365-6</b> (3 units)	2 × 850 A	<b>3NE1448-2</b> (2 units)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format

#### Overview



Active Line Modules are self-commutated feed/feedback units (with IGBTs in infeed and regenerative feedback directions) and generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage. Active Line Modules are designed for connection to grounded, star (TN, TT) and non-grounded, symmetrical IT systems.

The DC link is pre-charged via integrated pre-charging resistors.

**In order to operate an Active Line Module, it is absolutely essential to use the appropriate Active Interface Module.**

#### Design

The Active Line Modules in booksize format feature the following connections and interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 3 DRIVE-CLiQ sockets
- 2 PE (protective earth) connections

The status of the Active Line Modules is indicated via two multi-color LEDs.

On the 100 mm (3.94 in) wide Active Line Module, the shield for the power supply cable can be connected to the integrated shield connection plate via a shield connection terminal or tube clip, e.g. Weidmüller type KLBÜ CO 4. The shield connection terminal must not be used for strain relief. Shield connection plates are available for the 150 mm (5.91 in), 200 mm (7.87 in) and 300 mm (11.81 in) wide modules.

The signal cable shield can be connected to the Line Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Active Line Modules includes:

- DRIVE-CLiQ cable for connection to the adjacent Control Unit on the left for drive control, length 0.11 m (4.33 in)
- DRIVE-CLiQ cable (length depends on module width) to connect Active Line Module to adjacent Motor Module, length = width of Active Line Module + 0.11 m (4.33 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter (X24)
- Connector X21 for digital inputs
- Fan insert for Active Line Modules of 80 kW (107 HP) and 120 kW (161 HP) (the voltage is supplied by the Active Line Module)
- 1 set of warning signs in 30 languages
- 1 heat conducting foil (for Active Line Modules with cold plate cooling only)

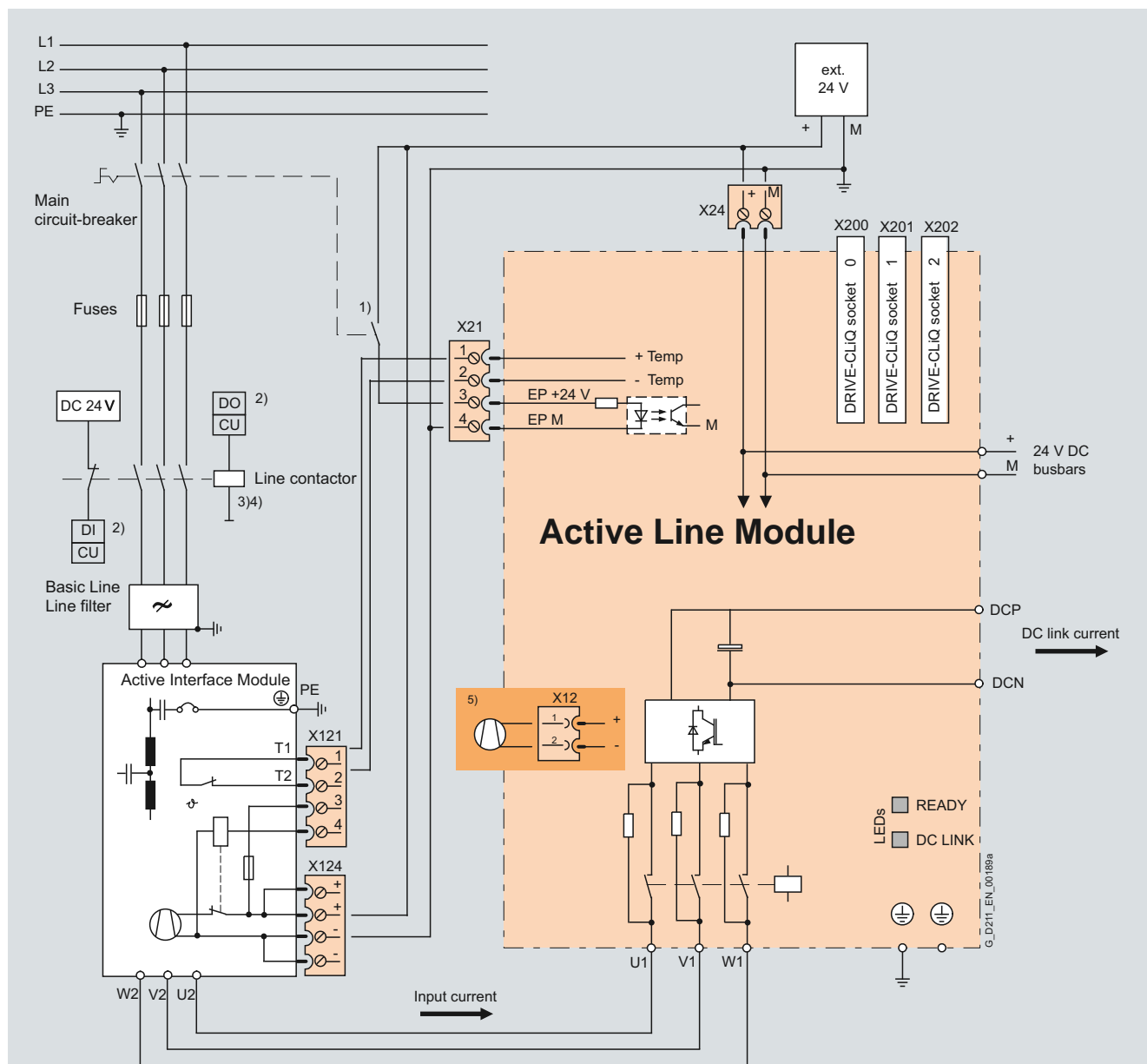
# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format

#### Integration

The Active Line Module communicates with the CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



- 1) Leading NC contact  $t > 10$  ms, 24 V DC and ground must be connected for operation.
- 2) Digital input (DI) or digital output (DO), controlled by the Control Unit.
- 3) No additional load permitted downstream of the line contactor.
- 4) The current carrying capacity of the digital output (DO) must be taken into account; an output interface element may have to be used.
- 5) Fan insert for Active Line Module of 80 kW and 120 kW. The fan insert is supplied with the Active Line Module.

Connection example of Active Line Module in booksize format

### Technical specifications

<b>Active Line Module in booksize format</b> 6SL313...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation $-15\% < 1$ min)
<b>Line frequency</b>	47 ... 63 Hz
<b>SCCR (short-circuit current rating)</b>	65 kA in conjunction with the recommended fuses class J or circuit breakers in accordance with UL489 / CSA 22.2 No. 5-02 <a href="#">see recommended line-side components</a>
<b>Line power factor</b>	
• Active Mode	
- Fundamental power factor ( $\cos \varphi_1$ )	1.0 (factory setting), can be altered by input of a reactive current setpoint
- Total ( $\lambda$ )	1.0 (factory setting)
• Smart Mode	
- Fundamental power factor	> 0.96
- Overall	0.65 ... 0.90
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>DC link voltage <math>V_d</math></b>	In <b>Active Mode</b> the DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. In <b>Smart Mode</b> , the DC link voltage is kept in proportion to the line voltage at the mean rectified line voltage value. Factory setting for DC link voltage: 380 ... 400 V 3 AC: 600 V (Active Mode) 400 ... 415 V 3 AC: 625 V (Active Mode) 416 ... 480 V 3 AC: $1.35 \times$ line voltage (Smart Mode) <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC, $-15\%/+20\%$
<b>Radio interference suppression</b>	
• Standard (Active Line Module + Active Interface Module)	Category C3 to EN 61800-3 up to 350 m (1148 ft) total cable length
• With line filter	Category C2 according to EN 61800-3 up to 350 m (1148 ft) total cable length Category C3 according to EN 61800-3 from 350 m to 1000 m (1148 ... 3281 ft) total cable length
<b>Type of cooling</b>	Internal air cooling (power units with forced air cooling by built-in fans) External air cooling (power units with forced air cooling by built-in fans) Cold plate cooling Liquid cooling
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus

<sup>1)</sup> Active Mode can also be selected if the connected motors are suitable for > 650 V DC.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format

#### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC	<b>Active Line Module in booksize format</b>					
<b>Internal air cooling</b>	6SL3130-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
<b>External air cooling</b>	6SL3131-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
<b>Cold plate cooling</b>	6SL3136-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
<b>Liquid cooling</b>	6SL3135-...	–	–	–	–	7TE31-2AA3
<b>Feed/feedback power</b>						
• Rated power $P_{rated}$ - At 380 V 3 AC - At 460 V 3 AC <sup>5)</sup>	kW (HP)	16 (18)	36 (40)	55 (60)	80 (64 <sup>1)</sup> , (100 (75 <sup>1)</sup> )	120 (84 <sup>1)</sup> , (150 (100 <sup>1)</sup> )
• For S6 duty $P_{S6}$ (40 %)	kW	21	47	71	106 (85 <sup>1)</sup> )	145 (116 <sup>1)</sup> )
• $P_{max}$	kW	35	70	91 (110 <sup>2)</sup> )	131	175
<b>DC link current</b>						
• At 600 V DC	A	27	60	92	134	200
• For S6 duty (40 %)	A	35	79	121	176	244
• Maximum	A	59	117	152 (176 <sup>2)</sup> )	218	292
<b>Input current</b>						
• Rated current at 380/400/480 V 3 AC	A	26/25/21	58/55/46	88/84/70	128/122/102	192/182/152
• For S6 duty (40 %) at 400 V	A	32	71	108	161	220
• At 400 V max.	A	54	107	139 (168 <sup>2)</sup> )	200	267
<b>Current requirement</b> 24 V DC electronics power supply, max.	A	1.1	1.5	1.9	2.0	2.5 (2.1 <sup>3)</sup> )
<b>Current carrying capacity</b>						
• 24 V DC busbars	A	20	20	20	20	20
• DC link busbars	A	100	200	200	200	200
<b>DC link capacitance</b>						
• Active Line Module	μF	710	1410	1880	2820	3995
• Drive line-up, max.	μF	20000	20000	20000	20000	20000
<b>Internal/external air cooling</b>						
• Power loss <sup>4)</sup>						
- Total power loss for cooling types: internal air cooling, external air cooling; cold plate cooling, liquid cooling	kW	0.29	0.67	0.95	1.39	2.26
- With external air cooling, int./ext.	kW	0.09/0.2	0.17/0.5	0.25/0.7	0.3/1.0	0.55/1.71
• Cooling air requirement	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.016 (0.565)	0.031 (1.095)	0.044 (1.554)	0.144 (5.085)	0.144 (5.085)
• Sound pressure level $L_{pA}$ (1 m)	dB	< 60	< 65	< 60	< 75	< 75
<b>Cold plate cooling</b>						
• Power loss, int./ext. <sup>4)</sup>	kW	0.07/0.21	0.13/0.52	0.19/0.74	0.3/1.1	0.46/1.8
• Thermal resistance $R_{th}$	K/W	0.075	0.055	0.05	0.028	0.028

<sup>1)</sup> In the case of cold plate cooling, derating is necessary due to heat transfer to the external heat sink.

<sup>2)</sup> Higher peak power is possible in combination with the Active Interface Module 6SL3100-0BE25-5AB0 (for operating cycle constraints, see SINAMICS S120 Manual).

<sup>3)</sup> For 6SL3135-7TE31-2AA3.

<sup>4)</sup> Power loss of Active Line Module at rated output including losses of 24 V DC electronics power supply.

<sup>5)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.



## Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Active Line Module in booksize format					
<b>Internal air cooling</b>		6SL3130-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
<b>External air cooling</b>		6SL3131-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
<b>Cold plate cooling</b>		6SL3136-...	7TE21-6AA3	7TE23-6AA3	7TE25-5AA3	7TE28-0AA3	7TE31-2AA3
<b>Liquid cooling</b>		6SL3135-...	–	–	–	–	7TE31-2AA3
<b>Feed/feedback power</b>							
• Rated power $P_{rated}$ - At 380 V 3 AC - At 460 V 3 AC <sup>7)</sup>	kW (HP)	16 (18)	36 (40)	55 (60)	80 (64 <sup>1)</sup> ) (100 (75 <sup>1)</sup> )	120 (84 <sup>1)</sup> ) (150 (100 <sup>1)</sup> )	
<b>Liquid cooling <sup>2)</sup></b>							
• Power loss, int./ext. <sup>3)</sup>	kW	–	–	–	–	0.46/1.8	
- Rated volumetric flow for water at 70 kPa pressure drop <sup>4)</sup>	l/min	–	–	–	–	8	
- Volume of liquid, internal	ml	–	–	–	–	100	
- Coolant temperature, max.							
- Without derating	°C (°F)	–	–	–	–	45 (113)	
- With derating	°C (°F)	–	–	–	–	50 (122)	
- Sound pressure level $L_{pA}$ (1 m)	dB	–	–	–	–	< 73	
<b>Line connection</b> U1, V1, W1			Screw-type terminals (X1)	M6 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)
• Conductor cross-section, max.	mm <sup>2</sup>	2.5 ... 10	2.5 ... 50	2.5 ... 95.2 × 35	2.5 ... 120.2 × 50	2.5 ... 120.2 × 50	2.5 ... 120.2 × 50
<b>Shield connection</b>			Integrated in the connector	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>
<b>PE connection</b>			M5 screw	M6 screw	M6 screw	M8 screw	M8 screw
<b>Cable length, max.</b> Total of all motor cables and DC link							
• Shielded	m (ft)	630 (2067) <sup>5)</sup>	630 (2067) <sup>5)</sup>	1000 (3281)	1000 (3281)	1000 (3281)	1000 (3281)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)	100 (3.94)	150 (5.91)	200 (7.87)	300 (11.8)	300 (11.8)	300 (11.8)
• Height	mm (in)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)
- With fan <sup>6)</sup>	mm (in)	–	–	–	629 (24.8)	629 (24.8)	629 (24.8)
- With screwed fitting	mm (in)	–	–	–	629 (24.8)	553 (21.8) <sup>2)</sup>	553 (21.8) <sup>2)</sup>
• Depth							
- With internal air cooling	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)
- With external air cooling on/behind mounting surface	mm (in)	226/66.5 (8.90/2.62)	226/71 (8.90/2.80)	226/92 (8.90/3.62)	226/82 (8.90/3.23)	226/82 (8.90/3.23)	226/82 (8.90/3.23)
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
- With liquid cooling	mm (in)	–	–	–	–	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>							
• With internal air cooling	kg (lb)	7 (15)	10.3 (23)	17 (37.5)	23 (51)	23 (51)	23 (51)
• With external air cooling	kg (lb)	8.8 (19)	13.8 (30)	18.5 (41)	27.7 (61)	30.7 (68)	30.7 (68)
• With cold plate cooling	kg (lb)	6.1 (13)	10.2 (22.5)	13.8 (30)	20.3 (45)	20.4 (45)	20.4 (45)
• With liquid cooling	kg (lb)	–	–	–	–	23 (51)	23 (51)

<sup>1)</sup> In the case of cold plate cooling, derating is necessary due to heat transfer to the external heat sink.

<sup>2)</sup> The coolant connections are located on the lower side of the components. All connection elements can be accessed using an appropriate tool. Thread type of water connections: Pipe thread ISO 228 G ½ B.

<sup>3)</sup> Power loss of Active Line Module at rated power including losses of 24 V DC electronic power supply.

<sup>4)</sup> This value applies to water as coolant; for other coolants, [refer to the SINAMICS S120 Manual](#).

<sup>5)</sup> Max. cable lengths in conjunction with Active Interface Module and Basic Line Filter (Category C3 in accordance with EN 61800-3).

<sup>6)</sup> The fan is supplied with the Active Line Module and must be installed before the Active Line Module is commissioned.

<sup>7)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format

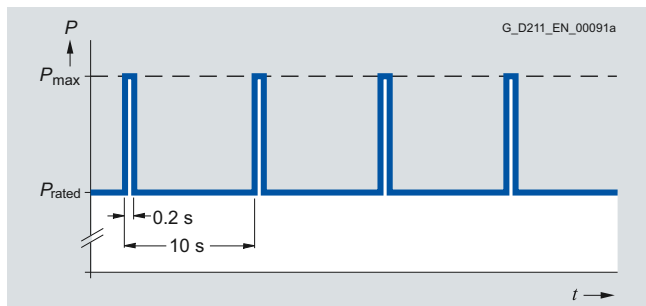
#### Selection and ordering data

Description	Active Line Module in booksize format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
<b>Internal air cooling</b>	
Rated power:	
16 kW (18 HP)	<b>6SL3130-7TE21-6AA3</b>
36 kW (40 HP)	<b>6SL3130-7TE23-6AA3</b>
55 kW (60 HP)	<b>6SL3130-7TE25-5AA3</b>
80 kW (100 HP)	<b>6SL3130-7TE28-0AA3</b>
120 kW (150 HP)	<b>6SL3130-7TE31-2AA3</b>
<b>External air cooling</b>	
Rated power:	
16 kW (18 HP)	<b>6SL3131-7TE21-6AA3</b>
36 kW (40 HP)	<b>6SL3131-7TE23-6AA3</b>
55 kW (60 HP)	<b>6SL3131-7TE25-5AA3</b>
80 kW (100 HP)	<b>6SL3131-7TE28-0AA3</b>
120 kW (150 HP)	<b>6SL3131-7TE31-2AA3</b>
<b>Cold plate cooling</b>	
Rated power:	
16 kW (18 HP)	<b>6SL3136-7TE21-6AA3</b>
36 kW (40 HP)	<b>6SL3136-7TE23-6AA3</b>
55 kW (60 HP)	<b>6SL3136-7TE25-5AA3</b>
80 kW (100 HP)	<b>6SL3136-7TE28-0AA3</b>
120 kW (150 HP)	<b>6SL3136-7TE31-2AA3</b>
<b>Liquid cooling</b>	
Rated power:	
120 kW (150 HP)	<b>6SL3135-7TE31-2AA3</b>

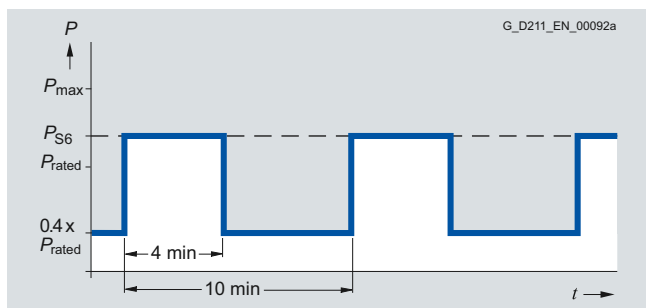
Description	Order No.
<b>Accessories</b>	
<b>Shield connection plate</b> For Line Modules and Motor Modules in booksize format with a width of	
• 150 mm (5.91 in), for internal air cooling	<b>6SL3162-1AF00-0AA1</b>
• 150 mm (5.91 in) for external air cooling and cold plate cooling	<b>6SL3162-1AF00-0BA1</b>
• 200 mm (7.87 in), for internal air cooling	<b>6SL3162-1AH01-0AA0</b>
• 200 mm (7.87 in) for external air cooling and cold plate cooling	<b>6SL3162-1AH01-0BA0</b>
• 300 mm (11.8 in) for all cooling types	<b>6SL3162-1AH00-0AA0</b>
<b>DC link rectifier adapter</b> For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm <sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	<b>6SL3162-2BD00-0AA0</b>
• Screw-type terminals 35 ... 95 mm <sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.81 in)	<b>6SL3162-2BM00-0AA0</b>
<b>DC link adapter (2 units)</b> For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2BM01-0AA0</b>
<b>Accessories for re-ordering</b>	
<b>24 V terminal adapter</b> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2AA00-0AA0</b>
<b>24 V jumper</b> For connection of the 24 V busbars (for booksize format)	<b>6SL3162-2AA01-0AA0</b>
<b>Warning labels in 30 languages</b> This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>Accessories pack</b> (plug-in terminals, DRIVE-CLiQ jumper (length = module width + 60 mm (2.36 in)), dust-proof blanking plugs) For DRIVE-CLiQ port For Active Line Modules with a width of	
• 100 mm (3.94 in), int./ext. air cooling	<b>6SL3163-8FD00-0AA0</b>
• 150 mm (5.91 in), int./ext. air cooling	<b>6SL3163-8GF00-0AA0</b>
• 200 mm (7.87 in), int./ext. air cooling	<b>6SL3163-8HH00-0AA0</b>
• 300 mm (11.8 in), int./ext. air cooling	<b>6SL3163-8JM00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

### Characteristic curves

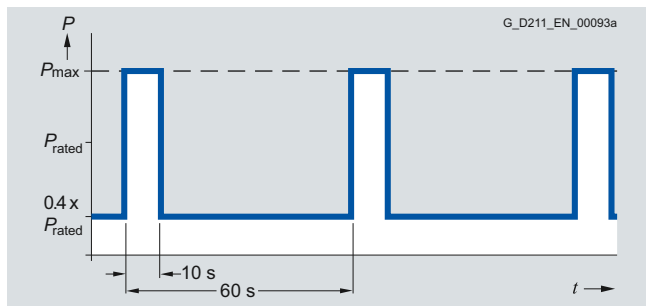
#### Overload capability



Load cycle with previous load

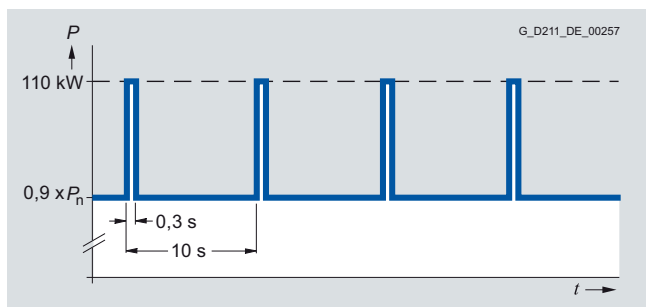


S6 load cycle with previous load



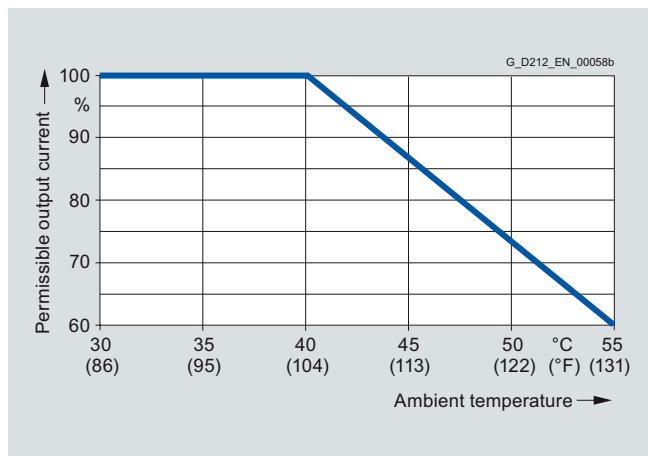
S6 load cycle with previous load

#### 55 kW (73.8 HP) Active Line Module only:

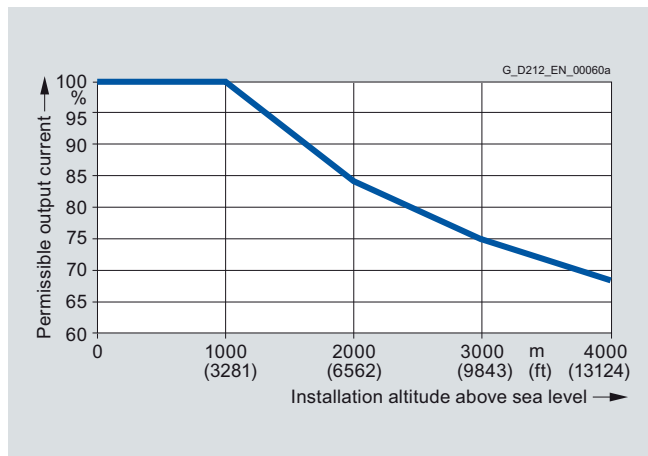


Peak power load duty cycle with previous load

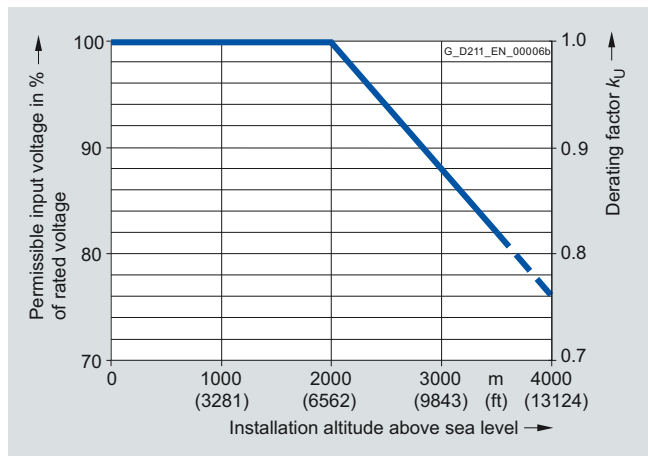
#### Derating characteristics



Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format Active Interface Modules

#### Overview



Active Interface Modules for 16 kW, 36 kW, 55 kW and 80 kW/120 kW

The Active Interface Modules combine with the Active Line Modules to form a functional unit and are essential for operation of the associated Active Line Module. The Active Interface Modules contain a Clean Power Filter, reactor, and basic interference suppression to ensure compliance with Category C3 in accordance with EN 61800-3 regarding emitted interference.

The Clean Power Filter protects the line supply from switching-frequency harmonics. The drive system therefore draws a sinusoidal current from the supply and causes virtually no harmonics.

The Active Line Modules in combination with the Active Interface Module can also be operated with supply systems with an isolated star point (IT systems).

#### Design

The scope of supply of the Active Interface Modules includes:

- Connector X21 for temperature evaluation and fan control
- Connector X24 for connecting the 24 V supply for the integrated fan
- DRIVE-CLiQ cable for connecting the Control Unit to the Active Line Module; length of the DRIVE-CLiQ cable = width of the Active Interface Module + 0.11 m (4.33 in)
- Shield connection plate for Active Interface Module 16 kW
- 1 set of warning signs in 30 languages

#### Selection and ordering data

Rated power of the Active Line Module kW (HP)	Suitable for Active Line Module in booksize format	Active Interface Module in booksize format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
16 (18)	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	<b>6SL3100-0BE21-6AB0</b>
36 (40)	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	<b>6SL3100-0BE23-6AB0</b>
55 (60)	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	<b>6SL3100-0BE25-5AB0</b>
80 (100)	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	<b>6SL3100-0BE28-0AB0</b>
120 (150)	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3	<b>6SL3100-0BE31-2AB0</b>

Description	Order No.
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#### Accessories

Description	Order No.
<b>Shield connection plate <sup>1)</sup></b>	
• For Active Interface Module 36 kW	<b>6SL3163-1AF00-0AA0</b>
• For Active Interface Module 55 kW	<b>6SL3163-1AH00-0AA0</b>
• For Active Interface Modules 80 kW and 120 kW	<b>6SL3163-1AM00-0AA0</b>
<b>DRIVE-CLiQ cable, preassembled</b> Degree of protection of connector IP20/IP20	
• For Active Interface Module 16 kW, 0.31 m (1.02 ft) in length	<b>6SL3060-4AK00-0AA0</b>
• For Active Interface Module 36 kW, 0.41 m (1.35 ft) in length	<b>6SL3060-4AP00-0AA0</b>
• For Active Interface Module 55 kW, 0.6 m (1.97 ft) in length	<b>6SL3060-4AU00-0AA0</b>
• For Active Interface Module 80 kW and 120 kW, 0.95 m (3.12 ft) in length	<b>6SL3060-4AA10-0AA0</b>

#### Accessories for re-ordering

Description	Order No.
<b>Accessories pack</b> (plug-in terminals, DRIVE-CLiQ jumper)	
• For Active Interface Module 16 kW	<b>6SL3160-8CD10-0AA0</b>
• For Active Interface Module 36 kW	<b>6SL3160-8DF10-0AA0</b>
• For Active Interface Module 55 kW	<b>6SL3160-8EH10-0AA0</b>
• For Active Interface Modules 80 kW and 120 kW	<b>6SL3160-8FM10-0AA0</b>

Description	Order No.
<b>Warning labels in 30 languages</b>	<b>6SL3166-3AB00-0AA0</b>

This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR

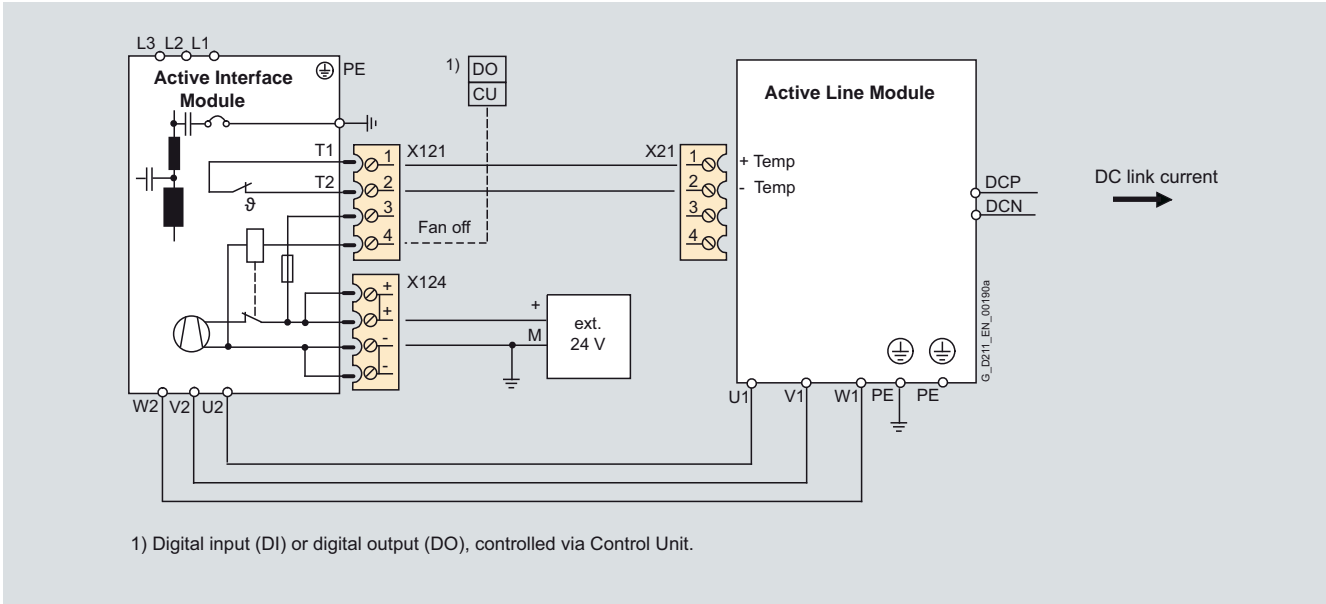
<sup>1)</sup> For Active Interface Module 16 kW, included in scope of supply.

# SINAMICS S120 drive system

## Line Modules and line-side components

Active Line Modules in booksize format  
Active Interface Modules

### Integration



Connection example for Active Interface Module

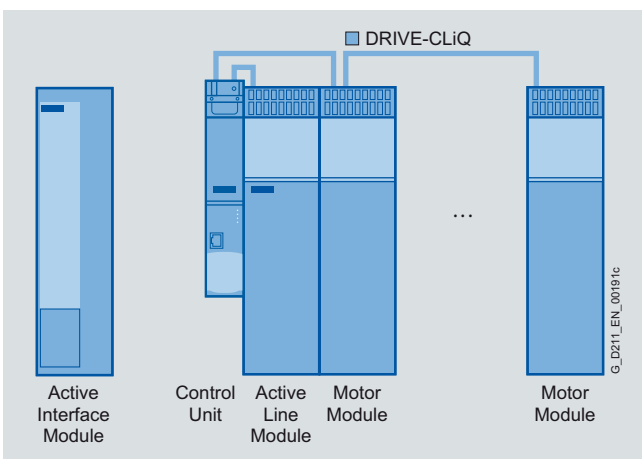
The Active Interface Module requires a 24 V DC supply for operation of the integral fan. The fan rotates after the 24 V DC supply is applied and can, if necessary (service life, noise), be shut off from the Control Unit over the "Fan off" input. It is only permitted to switch off the fan when the infeed of the drive system is not operating, otherwise the Active Interface Module will overheat.

The thermostatic switch installed in the Active Interface Module is evaluated over the connected Active Line Module.

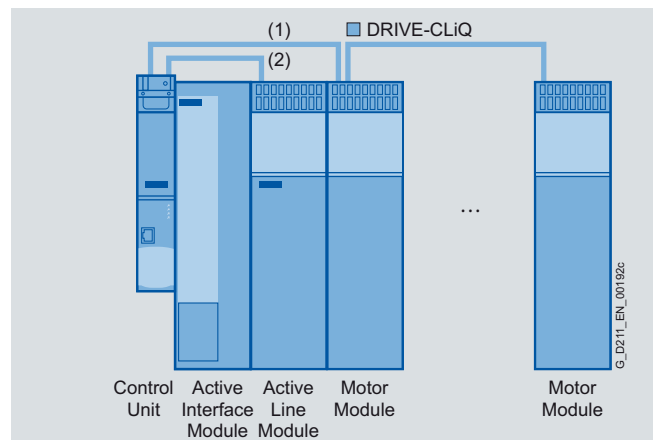
The power cables between the Active Interface Module and Active Line Module must be shielded if limit values for interference suppression are to be complied with. The cable shield can be routed over the shield connection plate (option) to the Active Interface Module or Active Line Module.

Depending on the position of the Active Interface Module in the drive system, additional DRIVE-CLiQ cables may be required. If it is separately installed next to the left side of the Control Unit and Active Line Module, no additional DRIVE-CLiQ cables are required. If the Active Interface Module is placed between the Control Unit and Active Line Module, the DRIVE-CLiQ cables supplied with the Active Line Modules are suitable for setting up a line topology, i.e. Active Line Module and all Motor Modules in series on one DRIVE-CLiQ line. If the Active Line Module is connected over a separate DRIVE-CLiQ line, the DRIVE-CLiQ cable marked with (1) must be ordered. A DRIVE-CLiQ cable suitable for connection (2) is included in the scope of supply of the Active Line Module.

For DRIVE-CLiQ cables for different configurations, see chapter MOTION-CONNECT connection systems).



Separate Active Interface Module



- (1) DRIVE-CLiQ cable between Control Unit and Motor Module
  - Active Interface Module 16 kW: 0.31 m (see Accessories)
  - Active Interface Module 36 kW: 0.41 m (see Accessories)
  - Active Interface Module 55 kW: 0.60 m (see Accessories)
  - Active Interface Module 80 kW and 120 kW: 0.95 m (see Accessories)
- (2) Included in scope of supply of Active Line Modules

Active Interface Module integrated in the drive line-up

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format Active Interface Modules

#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Active Interface Module in booksize format</b>				
• Internal air cooling		6SL3100-0BE21-6AB0	6SL3100-0BE23-6AB0	6SL3100-0BE25-5AB0	6SL3100-0BE28-0AB0	6SL3100-0BE31-2AB0
<b>Rated current</b>	A	27	60	88	132	200
<b>Current requirement</b> 24 V DC electronics power supply, max.	A	0.25	0.5	0.6	1.2	1.2
<b>Internal resistance</b> Digital input "Fan off" (X21/Pin 4)	Ω	1440 ±10 %	1440 ±10 %	1440 ±10 %	1440 ±10 %	1440 ±10 %
<b>Power loss</b>	kW	0.3	0.39	0.45	0.575	0.8
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.03 (1.06)	0.04 (1.41)	0.075 (2.65)	0.15 (5.30)	0.15 (5.30)
<b>Sound pressure level L<sub>pA</sub> (1 m)</b>	dB	57	60	66	68	68
<b>Line/load connection</b> L1, L2, L3/U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	M8 screw stud	M8 screw stud
• Conductor cross-section	mm <sup>2</sup>	16	50	50	2.5 ... 120 or 2 × 50	2.5 ... 120 or 2 × 50
<b>Thermostatic switch</b> (NC contact)						
• Switching capacity		250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A	250 V AC/1.6 A 60 V DC/0.75 A
<b>PE connection</b>		M5 screw	M5 screw	M6 screw	M8 screw	M8 screw
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	100 (3.94)	150 (5.90)	200 (7.87)	300 (11.8)	300 (11.8)
• Height	mm (in)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)
• Depth	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)
<b>Weight, approx.</b>	kg (lb)	11 (24)	18.5 (41)	21 (46)	29 (64)	36 (79)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Active Line Module in booksize format</b>	Type	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3
• Rated power of the Active Line Module	kW	16	36	55	80	120

#### Characteristic curves

Refer to Active Line Modules in booksize format.

## Overview



In plants with strict EMC requirements, line filters work together with Active Interface Modules to restrict the conducted interference emanating from the power modules to the limit values of Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN systems.

Note: According to product standard IEC 61800-3, RFI suppression commensurate with the relevant rated conditions must be provided and is a legal requirement in the EU (EMC Directive). Line filters and line reactors are required for this purpose. The use of line filters of other makes can lead to limit value violations, resonance, overvoltages and irreparable damage to motors or other equipment. The machine manufacturer must provide verification that the machinery to be operated with the drive products and the installed suppression elements, e.g. line filters, are CE-EMC-compliant.

Optional Basic Line Filters that are coordinated with the power ranges in booksize format are available for the SINAMICS S120 drive system.

With the Basic Line Filters in combination with the Active Interface Modules, the limits for the interference voltages can be extended to Category C2 (IEC 61800-3) or, retaining Category C3, longer total cable lengths are possible for the configuration.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in booksize format

#### Basic Line Filters

#### Overview



Basic Line Filters are used on machines on which conducted interference emissions in the frequency range between 150 kHz and 30 MHz need to be damped in accordance with the requirements of CE-EMC legislation.

#### Selection and ordering data

Rated power of the Active Line Module kW (HP)	Suitable for Active Line Module in booksize format	Basic Line Filter Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
16 (18)	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	<b>6SL3000-0BE21-6DA0</b>
36 (40)	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	<b>6SL3000-0BE23-6DA1</b>
55 (60)	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	<b>6SL3000-0BE25-5DA0</b>
80 (100)	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	<b>6SL3000-0BE28-0DA0</b>
120 (150)	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3	<b>6SL3000-0BE31-2DA0</b>

#### Technical specifications

Line voltage 380 ... 480 V 3 AC	Basic Line Filter					
	6SL3000-...	0BE21-6DA0	0BE23-6DA1	0BE25-5DA0	0BE28-0DA0	0BE31-2DA0
<b>Rated current</b>	A	36	74	105	132	192
<b>Power loss</b>	kW	0.016	0.028	0.041	0.048	0.086
<b>Line/load connection</b> L1, L2, L3 / U, V, W		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	10	35	50	95	95
<b>PE connection</b>		M6 screw studs according to DIN 46234	M6 screw studs according to DIN 46234	M8 screw studs according to DIN 46234	M10 screw studs according to DIN 46234	M10 screw studs according to DIN 46234
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	50 (1.97)	75 (2.95)	100 (3.94)	150 (5.90)	150 (5.90)
• Height	mm (in)	429 (16.9)	433 (17.0)	466 (18.3)	479 (18.9)	479 (18.9)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>	kg (lb)	5 (11)	7.5 (16.5)	11.5 (25)	18.2 (40)	18.8 (41)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Active Line Module in booksize format</b>	Type	6SL3130-7TE21-6AA3 6SL3131-7TE21-6AA3 6SL3136-7TE21-6AA3	6SL3130-7TE23-6AA3 6SL3131-7TE23-6AA3 6SL3136-7TE23-6AA3	6SL3130-7TE25-5AA3 6SL3131-7TE25-5AA3 6SL3136-7TE25-5AA3	6SL3130-7TE28-0AA3 6SL3131-7TE28-0AA3 6SL3136-7TE28-0AA3	6SL3130-7TE31-2AA3 6SL3131-7TE31-2AA3 6SL3136-7TE31-2AA3 6SL3135-7TE31-2AA3
• Rated power of the Active Line Module	kW	16	36	55	80	120



# SINAMICS S120 drive system

## Line Modules and line-side components

Active Line Modules in booksize format  
Recommended line-side components

### Overview

Suitable line-side power components are assigned depending on the power rating of the Active Line Modules.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

### Assignment of line-side power components to Active Line Modules in booksize format

Rated power kW (HP)	Suitable for Active Line Module in booksize format Type 6SL3130- 6SL3131-	Line contactor			Output coupling device for line contactor			Main switch			Leading auxiliary switch for main switch						
		Type			Order No.			Order No.			Order No.						
<b>Line voltage 380 ... 480 V 3 AC</b>																	
16 (18)	7TE21-6AA3	<b>3RT1035-...</b>			<b>3TX7004-1LB00</b>			<b>3LD2504-0TK51</b>			<b>3LD9200-5B</b>						
36 (40)	7TE23-6AA3	<b>3RT1045-...</b>			<b>3TX7004-1LB00</b>			<b>3LD2704-0TK51</b>			<b>3LD9200-5B</b>						
55 (60)	7TE25-5AA3	<b>3RT1054-...</b>			<b>3TX7004-1LB00</b>			<b>3KA5330-1GE01</b>			<b>3KX3552-3EA01</b>						
80 (100)	7TE28-0AA3	<b>3RT1056-...</b>			<b>3TX7004-1LB00</b>			<b>3KA5330-1GE01</b>			<b>3KX3552-3EA01</b>						
120 (150)	7TE31-2AA3	<b>3RT1065-...</b>			<b>3TX7004-1LB00</b>			<b>3KA5730-1GE01</b>			<b>3KX3552-3EA01</b>						
Rated power kW (HP)	Suitable for Active Line Module in booksize format Type 6SL3130- 6SL3131- 6SL3136- 6SL3135-	Circuit breaker IEC 60947			Circuit breaker UL489/ CSA C22.2 No. 5-02			Fuse switch disconnecter			Switch disconnecter with fuse holders			Leading auxiliary switch for switch disconnecter with fuse holders			
		Order No.			Order No.			Order No.			Order No.			Order No.			
<b>Line voltage 380 ... 480 V 3 AC</b>																	
16 (18)	7TE21-6AA3	<b>3RV1031-4FA10</b>			<b>3VL2105-2KN30-....</b>			<b>3NP1123-1CA20</b>			<b>3KL5030-1GB01</b>			<b>3KX3552-3EA01</b>			
36 (40)	7TE23-6AA3	<b>3RV1041-4LA10</b>			<b>3VL2108-2KN30-....</b>			<b>3NP1123-1CA20</b>			<b>3KL5230-1GB01</b>			<b>3KX3552-3EA01</b>			
55 (60)	7TE25-5AA3	<b>3VL2712-1DC33-....</b>			<b>3VL2112-2KN30-....</b>			<b>3NP1143-1DA20</b>			<b>3KL5530-1GB01</b>			<b>3KX3552-3EA01</b>			
80 (100)	7TE28-0AA3	<b>3VL3720-1DC33-....</b>			<b>3VL3117-2KN30-....</b>			<b>3NP1143-1DA20</b>			<b>3KL5530-1GB01</b>			<b>3KX3552-3EA01</b>			
120 (150)	7TE31-2AA3	<b>3VL3725-1DC36-....</b>			<b>3VL3125-2KN30-....</b>			<b>3NP1153-1DA20</b>			<b>3KL5730-1GB01</b>			<b>3KX3552-3EA01</b>			
Rated power kW (HP)	Suitable for Active Line Module in booksize format Type 6SL3130- 6SL3131- 6SL3136- 6SL3135-	NEOZED fuse (gL/gG)			DIAZED fuse (gL/gG)			LV HRC fuse (gL/gG)			UL/CSA fuse, Class J <sup>1)</sup> Available from: Mersen <a href="http://www.ep.mersen.com">www.ep.mersen.com</a>						
		Rated current	Size	Order No.	Rated current	Size	Order No.	Rated current	Size	Order No.	Rated current	Size	Reference No.				
<b>Line voltage 380 ... 480 V 3 AC</b>																	
16 (18)	7TE21-6AA3	35 A	D02	<b>5SE2335</b>	35 A	DIII	<b>5SB411</b>	35 A	000	<b>3NA3814</b>	35 A	27 × 60	AJT35				
36 (40)	7TE23-6AA3	–	–	–	80 A	DIV	<b>5SC211</b>	80 A	000	<b>3NA3824</b>	80 A	29 × 117	AJT80				
55 (60)	7TE25-5AA3	–	–	–	–	–	–	125 A	1	<b>3NA3132</b>	125 A	41 × 146	AJT125				
80 (100)	7TE28-0AA3	–	–	–	–	–	–	160 A	1	<b>3NA3136</b>	175 A	41 × 146	AJT175				
120 (150)	7TE31-2AA3	–	–	–	–	–	–	250 A	1	<b>3NA3144</b>	250 A	54 × 181	AJT250				

<sup>1)</sup> Not suitable for 3NP and 3KL switch disconnectors.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format

#### Overview



The self-commutated feed/feedback units (with IGBTs in infeed and regenerative feedback directions) generate a regulated DC link voltage. This means that the connected Motor Modules are decoupled from the line voltage. Line voltage fluctuations within the permissible supply tolerances have no effect on the motor voltage.

Active Line Modules can if necessary feed a prespecified fundamental reactive current (capacitive or inductive) to the supply system so as to support simple compensation tasks.

Active Line Modules are designed for connection to grounded TN/TT and non-grounded IT systems.

**In order to operate an Active Line Module, it is absolutely essential to use the appropriate Active Interface Module.**

#### Design

The Active Line Modules in chassis format feature the following connections and interfaces as standard:

- 1 power connection
- 1 connection for the 24 V DC electronics power supply
- 1 DC link connection (DCP, DCN) for supplying the connected Motor Modules
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 temperature sensor input (KTY84-130 or PTC/Pt100)
- 3 DRIVE-CLiQ sockets
- 2 PE (protective earth) connections

The status of the Active Line Modules is indicated via two multi-color LEDs.

The scope of supply of the Active Line Modules includes:

- Frame sizes FX and GX:
  - 0.60 m (23.6 in) DRIVE-CLiQ cable for connection to the CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2
- Frame sizes HX and JX
  - 0.35 m (13.8 in) DRIVE-CLiQ cable for connection to the CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2
  - 2.10 m (6.89 ft) DRIVE-CLiQ cable for connection to the first Motor Module

# SINAMICS S120 drive system

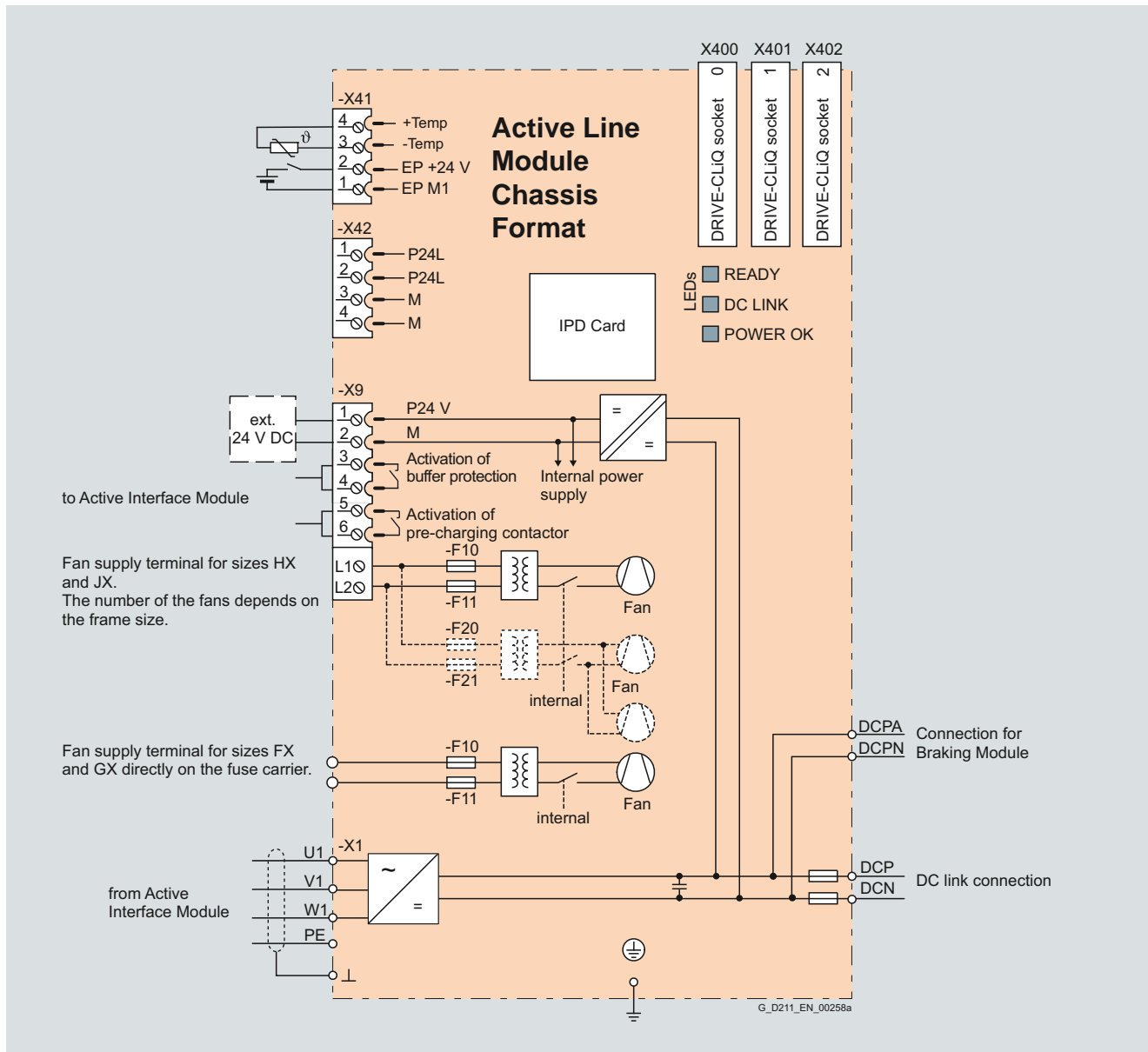
## Line Modules and line-side components

### Active Line Modules in chassis format

3

#### Integration

The Active Line Module communicates with a CU320-2 or SIMOTION D4x5-2 Control Unit, or Controller Extension CX32-2 via DRIVE-CLIQ.



Connection example of Active Line Module in chassis format

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format

#### Technical specifications

<b>Active Line Module in chassis format</b> 6SL3330-7T...	
<b>Line connection voltage</b> (up to 2000 m (6562 ft) above sea level)	380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min) or 500 ... 690 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min) <sup>1)</sup>
<b>Line frequency</b>	47 ... 63 Hz
<b>SCCR (short-circuit current rating)</b>	In conjunction with the recommended fuses of type 3NE1 <a href="#">see recommended line-side components</a>
<ul style="list-style-type: none"> <li>Rated power 132 ... 380 kW</li> <li>Rated power 500 ... 630 kW</li> <li>Rated power 800 ... 1100 kW</li> <li>Rated power 1400 kW</li> </ul>	65 kA 84 kA 170 kA 200 kA
<b>Line power factor</b>	
<ul style="list-style-type: none"> <li>Fundamental power factor (<math>\cos \varphi_1</math>)</li> <li>Total (<math>\lambda</math>)</li> </ul>	1.0 (factory setting), can be altered by input of a reactive current setpoint  1.0 (factory setting)
<b>Overvoltage category</b> to EN 60664-1	Class III
<b>DC link voltage <math>V_d</math></b>	The DC link voltage is regulated and can be adjusted as a voltage decoupled from the line voltage. Factory setting for DC link voltage: 1.5 × line voltage
<b>Electronics power supply</b>	24 V DC, -15 %/+20 %
<b>Radio interference suppression</b>	
<ul style="list-style-type: none"> <li>Standard (with Active Interface Module)</li> </ul>	Category C3 to EN 61800-3
<b>Type of cooling</b>	Forced air cooling by means of built-in fan
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 2000 m (6562 ft) above sea level without derating, > 2000 ... 4000 m (6562 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus only for devices on line voltages 380 ... 480 V 3 AC and 500 ... 600 V 3 AC

<sup>1)</sup> TT system with grounded external conductor is not permissible for line voltages > 600 V.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format

#### Technical specifications (continued)

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Active Line Module in chassis format</b>				
		6SL3330-7TE32-1AA3	6SL3330-7TE32-6AA3	6SL3330-7TE33-8AA3	6SL3330-7TE35-0AA3	
<b>Feed/feedback power</b>						
• Rated power $P_{\text{rated}}$ - At 400 V 3 AC - At 460 V 3 AC <sup>2)</sup>	kW (HP)	<b>132</b> <b>(200)</b>	<b>160</b> <b>(225)</b>	<b>235</b> <b>(350)</b>	<b>300</b> <b>(450)</b>	
• $P_{\text{max}}$	kW	198	240	352.5	450	
<b>DC link current <sup>1)</sup></b>						
• Rated current $I_{\text{rated\_DC}}$	A	235	291	425	549	
• $I_{\text{H\_DC}}$	A	209	259	378	489	
• $I_{\text{max\_DC}}$	A	352	436	637	823	
<b>Input current</b>						
• Rated current at 400 V 3 AC	A	210	260	380	490	
• Maximum	A	315	390	570	735	
<b>Current requirement</b>						
• 24 V DC electronics power supply, max.	A	1.1	1.1	1.35	1.35	
• Fan supply with 400 V 2 AC, 50/60 Hz, max.	A	0.63/0.95	1.13/1.7	1.8/2.7	1.8/2.7	
<b>DC link capacitance</b>		μF	4200	5200	7800	9600
<b>Power loss, max.</b>		kW	2.3	2.9	4.2	5.1
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.17 (6.00)	0.23 (8.12)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level</b> $L_{\text{pA}}$ (1 m) at 50/60 Hz		dB	64/67	64/67	69/73	69/73
<b>Line connection</b> U1, V1, W1			Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	
<b>DC link connection</b> DCP, DCN			Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	
<b>PE connection</b>			M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.						
- PE1/GND	mm <sup>2</sup>	1 × 185	1 × 185	1 × 240	1 × 240	
- PE2/GND	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	
<b>Cable length, max.</b> (total of all motor power cables and DC link)						
• Shielded	m (ft)	2700 (8859)	2700 (8859)	2700 (8859)	2700 (8859)	
• Unshielded	m (ft)	4050 (13288)	4050 (13288)	4050 (13288)	4050 (13288)	
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)	
• Height	mm (in)	1400 (55.1)	1400 (55.1)	1533 (60.3)	1533 (60.3)	
• Depth	mm (in)	356 (14.1)	356 (14.1)	545 (21.5)	545 (21.5)	
<b>Frame size</b>			FX	FX	GX	GX
<b>Weight, approx.</b>		kg (lb)	95 (209)	95 (209)	136 (300)	136 (300)

<sup>1)</sup> With a rated DC link voltage =  $1.5 \times V_{\text{line rated}}$  (example: 600 V =  $1.5 \times 400$  V).

<sup>2)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format

#### Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Active Line Module in chassis format						
		6SL3330-7TE36-1AA3	6SL3330-7TE37-5AA3	6SL3330-7TE38-4AA3	6SL3330-7TE41-0AA3	6SL3330-7TE41-2AA3	6SL3330-7TE41-4AA3	
<b>Feed/feedback power</b>								
• Rated power $P_{rated}$ - At 400 V 3 AC - At 460 V 3 AC <sup>2)</sup>	kW (HP)	<b>380</b> <b>(550)</b>	<b>450</b> <b>(600)</b>	<b>500</b> <b>(700)</b>	<b>630</b> <b>(800)</b>	<b>800</b> <b>(1000)</b>	<b>900</b> <b>(1150)</b>	
• $P_{max}$	kW	570	675	750	945	1200	1350	
<b>DC link current <sup>1)</sup></b>								
• Rated current $I_{rated\_DC}$	A	678	835	940	1103	1412	1574	
• $I_{H\_DC}$	A	603	700	837	982	1255	1401	
• $I_{max\_DC}$	A	1017	1252	1410	1654	2120	2361	
<b>Input current</b>								
• At 400 V 3 AC	A	605	745	840	985	1260	1405	
• Maximum	A	907	1117	1260	1477	1890	2107	
<b>Current requirement</b>								
• 24 V DC electronics power supply, max.	A	1.4	1.4	1.4	1.5	1.7	1.7	
• Fan supply with 400 V 2 AC, max.	A	3.6	3.6	3.6	5.4	5.4	7.8	
<b>DC link capacitance</b>		μF	12600	15600	16800	18900	26100	28800
<b>Power loss, max.</b>		kW	6.6	7.7	8.2	10.8	13	14.2
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.78 (27.5)	0.78 (27.5)	0.78 (27.5)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz		dB	70/73	70/73	70/73	71/73	71/73	71/73
<b>Line connection</b> U1, V1, W1			Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240	6 × 240	6 × 240	6 × 240	
<b>DC link connection</b> DCP, DCN			Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
<b>PE connection</b>			M12 screw	M12 screw	M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.								
- PE1/GND	mm <sup>2</sup>	1 × 240	1 × 240	1 × 240	1 × 240	1 × 240	1 × 240	
- PE2/GND	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240	2 × 240	2 × 240	
<b>Cable length, max.</b> (total of all motor power cables and DC link)								
• Shielded	m (ft)	3900 (12796)	3900 (12796)	3900 (12796)	3900 (12796)	3900 (12796)	3900 (12796)	
• Unshielded	m (ft)	5850 (19194)	5850 (19194)	5850 (19194)	5850 (19194)	5850 (19194)	5850 (19194)	
<b>Degree of protection</b>			IP00	IP00	IP00	IP00	IP00	
<b>Dimensions</b>								
• Width	mm (in)	503 (19.8)	503 (19.8)	503 (19.8)	704 (27.7)	704 (27.7)	704 (27.7)	
• Height	mm (in)	1475 (58.1)	1475 (58.1)	1475 (58.1)	1475 (58.1)	1475 (58.1)	1475 (58.1)	
• Depth	mm (in)	540 (21.3)	540 (21.3)	540 (21.3)	540 (21.3)	540 (21.3)	540 (21.3)	
<b>Frame size</b>			HX	HX	HX	JX	JX	
<b>Weight, approx.</b>		kg (lb)	290 (639)	290 (639)	290 (639)	450 (992)	450 (992)	450 (992)

<sup>1)</sup> With a rated DC link voltage =  $1.5 \times V_{line\ rated}$  (example: 600 V =  $1.5 \times 400$  V).

<sup>2)</sup> Nominal HP ratings are provided for ease of assigning components only. The Line Module outputs are dependent on the Motor Module loading and are to be dimensioned accordingly.

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format

#### Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC		Active Line Module in chassis format				
		6SL3330-7TG35-8AA3	6SL3330-7TG37-4AA3	6SL3330-7TG41-0AA3	6SL3330-7TG41-3AA3	
<b>Feed/feedback power</b>						
• Rated power $P_{\text{rated}}$ at 690 V 3 AC	kW	<b>560</b>	<b>800</b>	<b>1100</b>	<b>1400</b>	
• At 500 V 3 AC <sup>2)</sup>	kW	400	560	800	1000	
• $P_{\text{max}}$ with 690 V 3 AC <sup>2)</sup>	kW	840	1200	1650	2100	
<b>DC link current <sup>1)</sup></b>						
• Rated current $I_{\text{rated\_DC}}$	A	644	823	1148	1422	
• $I_{\text{H\_DC}}$	A	573	732	1022	1266	
• $I_{\text{max\_DC}}$	A	966	1234	1722	2133	
<b>Input current</b>						
• At 690 V 3 AC	A	575	735	1025	1270	
• Maximum	A	862	1102	1537	1905	
<b>Current requirement</b>						
• 24 V DC electronics power supply, max.	A	1.4	1.5	1.7	1.7	
• Fan supply with 500 V/690 V 2 AC, max.	A	3/2.1	4.4/3.1	4.4/3.1	4.4/3.1	
<b>DC link capacitance</b>		μF	7400	11100	14400	19200
<b>Power loss, max.</b>		kW	6.8	10.2	13.6	16.5
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.78 (27.5)	1.1 (38.8)	1.1 (38.8)	1.1 (38.8)
<b>Sound pressure level</b> $L_{\text{pA}}$ (1 m) at 50/60 Hz		dB	70/73	71/73	71/73	71/73
<b>Line connection</b> U1, V1, W1			Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	4 × 240	6 × 240	6 × 240	6 × 240	
<b>DC link connection</b> DCP, DCN			Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
<b>PE connection</b>			M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.						
- PE1/GND	mm <sup>2</sup>	1 × 240	1 × 240	1 × 240	1 × 240	
- PE2/GND	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240	
<b>Cable length, max.</b> (total of all motor power cables and DC link)						
• Shielded	m (ft)	2250 (7382)	2250 (7382)	2250 (7382)	2250 (7382)	
• Unshielded	m (ft)	3375 (11073)	3375 (11073)	3375 (11073)	3375 (11073)	
<b>Degree of protection</b>			IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	503 (19.8)	704 (27.7)	704 (27.7)	704 (27.7)	
• Height	mm (in)	1475 (58.1)	1475 (58.1)	1475 (58.1)	1475 (58.1)	
• Depth	mm (in)	540 (21.3)	540 (21.3)	540 (21.3)	540 (21.3)	
<b>Frame size</b>			HX	JX	JX	JX
<b>Weight, approx.</b>		kg (lb)	290 (639)	450 (992)	450 (992)	450 (992)

<sup>1)</sup> With a rated DC link voltage =  $1.5 \times V_{\text{line rated}}$  (example: 600 V =  $1.5 \times 400$  V).

<sup>2)</sup> The infeed power is proportional to the line voltage. With 500 V 3 AC, the power is reduced by a factor of  $690/500 = 1.38$ .

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format

#### Selection and ordering data

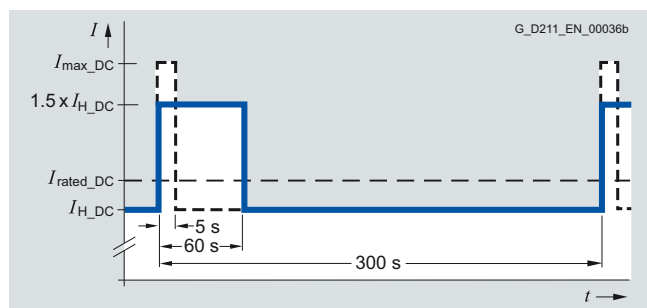
Rated power kW (HP)	Active Line Module in chassis format Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
132 (200)	<b>6SL3330-7TE32-1AA3</b>
160 (225)	<b>6SL3330-7TE32-6AA3</b>
235 (350)	<b>6SL3330-7TE33-8AA3</b>
300 (450)	<b>6SL3330-7TE35-0AA3</b>
380 (550)	<b>6SL3330-7TE36-1AA3</b>
450 (600)	<b>6SL3330-7TE37-5AA3</b>
500 (700)	<b>6SL3330-7TE38-4AA3</b>
630 (800)	<b>6SL3330-7TE41-0AA3</b>
800 (1000)	<b>6SL3330-7TE41-2AA3</b>
900 (1150)	<b>6SL3330-7TE41-4AA3</b>
<b>Line voltage 500 ... 690 V 3 AC</b>	
560	<b>6SL3330-7TG35-8AA3</b>
800	<b>6SL3330-7TG37-4AA3</b>
1100	<b>6SL3330-7TG41-0AA3</b>
1400	<b>6SL3330-7TG41-3AA3</b>

#### Accessories

<b>Warning labels in 30 languages</b> This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

#### Characteristic curves

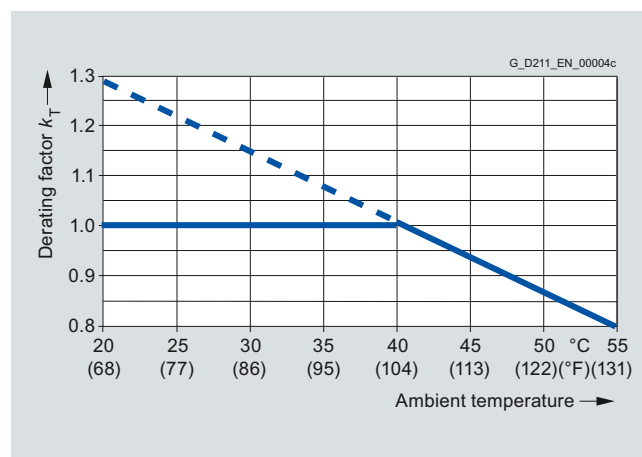
##### Overload capability



High overload

#### Characteristic curves (continued)

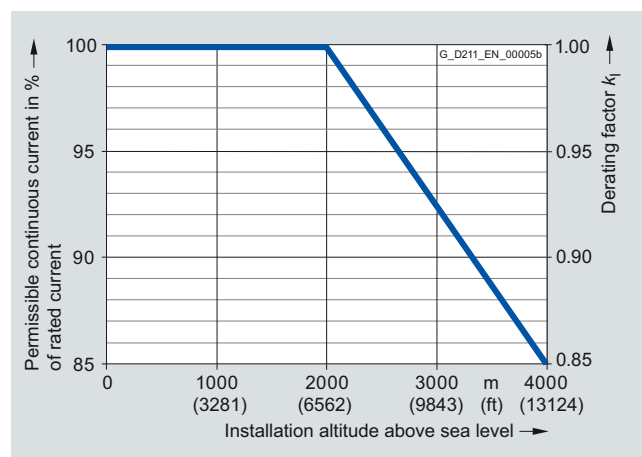
##### Derating characteristics



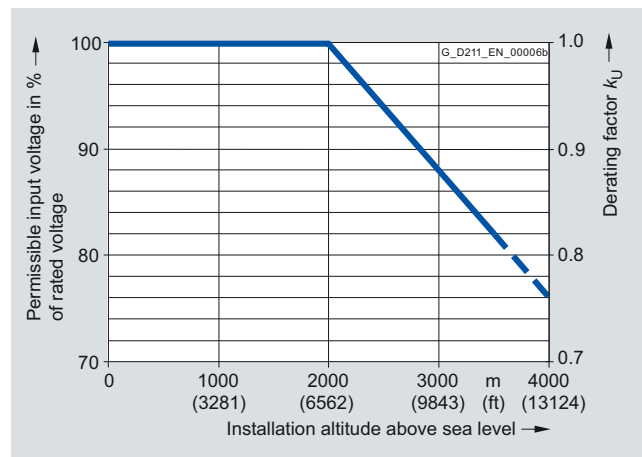
Current derating dependent on ambient temperature

Note: A derating factor  $k_T > 1.0$  is to be taken into account only in conjunction with "current derating dependent on installation altitude".

See also chapter System description – Dimensioning.



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude



# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format Active Interface Modules

#### Overview



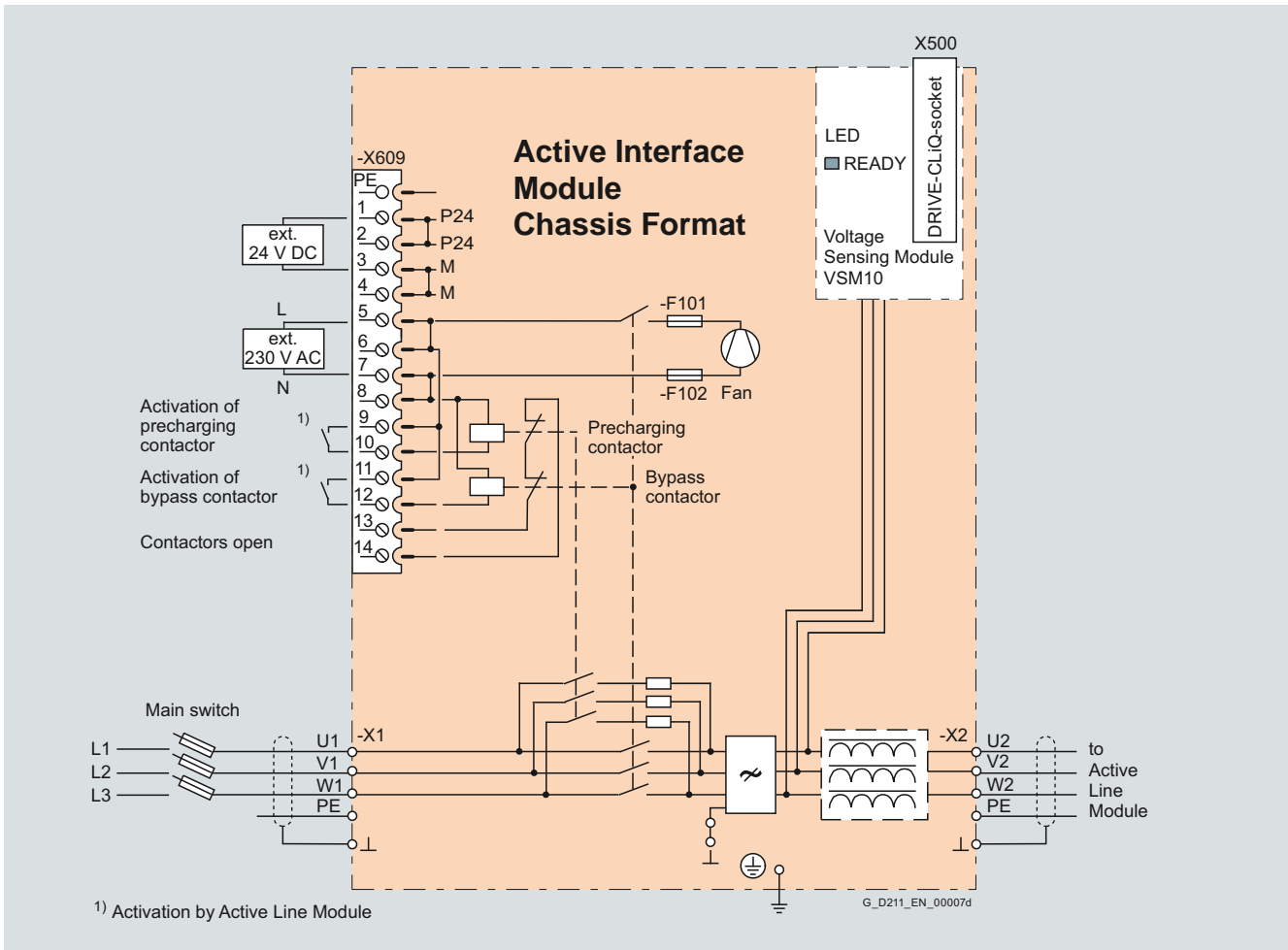
Active Interface Modules are used in combination with Active Line Modules in chassis format. Active Interface Modules contain a Clean Power Filter with basic RI suppression reactor, the pre-charging circuit for the Active Line Module, the line voltage sensing circuit and monitoring sensors. The bypass connector is an integral component in types FI and GI, thereby making the module very compact. The bypass contactor must be provided separately for frame sizes HI and JI.

The vast majority of line harmonics are suppressed by the Clean Power Filter.

The scope of supply of the Active Interface Modules includes:

- Frame size FI:
  - 0.60 m (1.97 ft) DRIVE-CLiQ cable for connection between Active Interface Module and Active Line Module
  - 1.45 m (4.76 ft) DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module
- Frame size GI:
  - 0.95 m (3.12 ft) DRIVE-CLiQ cable for connection between Active Interface Module and Active Line Module
  - 1.45 m (4.76 ft) DRIVE-CLiQ cable for connection between the Control Unit and first Motor Module
- Frame size HI and JI:
  - 2.40 m (7.87 ft) DRIVE-CLiQ cable for connection between Active Interface Module and Active Line Module

#### Integration



Connection example of Active Interface Module in chassis format with integrated bypass contactor (frame sizes FI and GI)

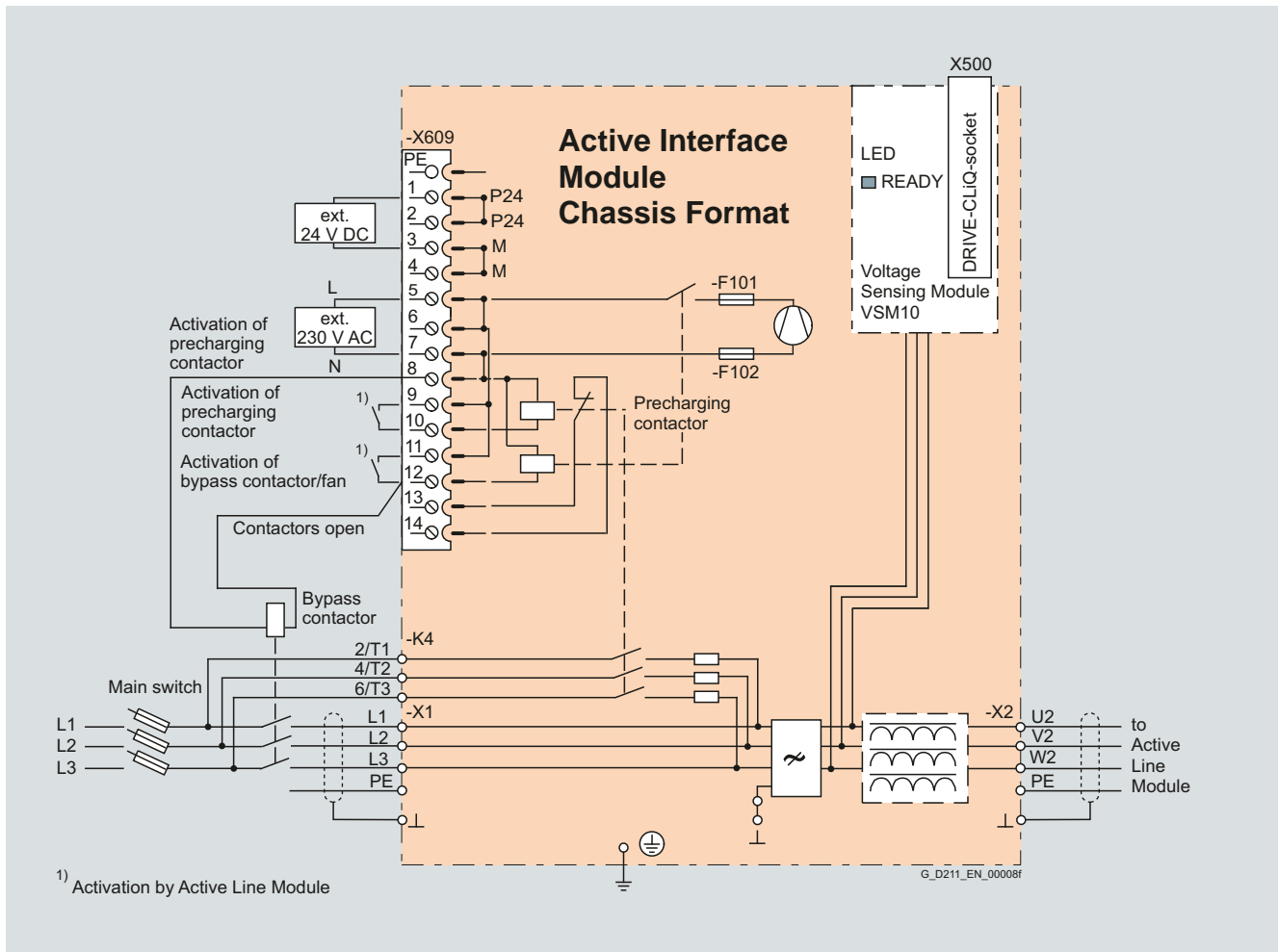
# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format Active Interface Modules

#### Integration (continued)

3



Connection example of Active Interface Module in chassis format with externally mounted bypass contactor (frame sizes HI and JI)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format Active Interface Modules

#### Technical specifications

<b>Line voltage</b> 380 ... 480 V 3 AC		<b>Active Interface Module in chassis format</b>			
		6SL3300-7TE32-6AA0	6SL3300-7TE33-8AA0	6SL3300-7TE35-0AA0	
<b>Rated current</b>	A	210	260	380	490
<b>Bypass contactor</b>		Included	Included	Included	Included
<b>DC link capacitance</b> of the drive line-up, max.	μF	41600	41600	76800	76800
<b>Current requirement</b>					
• 24 V DC electronics power supply, max.	A	0.17	0.17	0.17	0.17
• Fan supply with 230 V 2 AC, 50/60 Hz, max.	A	0.45/0.6	0.45/0.6	0.9/1.2	0.9/1.2
<b>Power loss, max.</b>	kW	2.1	2.2	3.0	3.9
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.24 (8.48)	0.24 (8.48)	0.47 (16.6)	0.47 (16.6)
<b>Sound pressure level</b> L <sub>pA</sub> (1 m) at 50/60 Hz	dB	71/73	71/73	71/73	71/73
<b>Line/load connection</b> L1, L2, L3/U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>PE connection</b>		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm (in)	325 (12.8)	325 (12.8)	325 (12.8)	325 (12.8)
• Height	mm (in)	1400 (55.1)	1400 (55.1)	1533 (60.3)	1533 (60.3)
• Depth	mm (in)	355 (14.0)	355 (14.0)	544 (21.4)	544 (21.4)
<b>Frame size</b>		FI	FI	GI	GI
<b>Weight, approx.</b>	kg (lb)	135 (298)	135 (298)	190 (419)	190 (419)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus
<b>Suitable for Active Line Module in chassis format</b>	Type	6SL3330-7TE32-1AA3	6SL3330-7TE32-6AA3	6SL3330-7TE33-8AA3	6SL3330-7TE35-0AA3
• Rated power of the Active Line Module	kW (HP)	132 (200)	160 (225)	235 (350)	300 (450)

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format Active Interface Modules

#### Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Active Interface Module in chassis format			
		6SL3300-7TE38-4AA0	840	6SL3300-7TE41-4AA0	1405
<b>Rated current</b>	A	605	840	985	1405
<b>Bypass contactor</b>		3RT1476-6AP36	3WL1110-2BB34-4AN2-Z C22	3WL1112-2BB34-4AN2-Z C22	3WL1116-2BB34-4AN2-Z C22
<b>DC link capacitance</b> of the drive line-up, max.	μF	134400	134400	230400	230400
<b>Current requirement</b>					
• 24 V DC electronics power supply, max.	A	0.17	0.17	0.17	0.17
• Fan supply with 230 V 2 AC, 50/60 Hz, max.	A	3.6/4.6	3.6/4.6	3.8/4.9	3.8/4.9
<b>Power loss, max.</b>	kW	5.5	6.1	7.5	8.5
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)
<b>Sound pressure level</b> <i>L</i> <sub>pA</sub> (1 m) at 50/60 Hz	dB	71/73	71/73	71/73	71/73
<b>Line/load connection</b> L1, L2, L3/U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	4 × 240	4 × 240	6 × 240	6 × 240
<b>PE connection</b>		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	2 × 240	4 × 240	4 × 240
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm (in)	305 (12.0)	305 (12.0)	505 (19.9)	505 (19.9)
• Height	mm (in)	1750 (68.9)	1750 (68.9)	1750 (68.9)	1750 (68.9)
• Depth	mm (in)	544 (21.4)	544 (21.4)	544 (21.4)	544 (21.4)
<b>Frame size</b>		HI	HI	JI	JI
<b>Weight, approx.</b>	kg (lb)	390 (860)	390 (860)	620 (1367)	620 (1367)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus
<b>Suitable for Active Line Module in chassis format</b>	Type	6SL3330-7TE36-1AA3	6SL3330-7TE37-5AA3 6SL3330-7TE38-4AA3	6SL3330-7TE41-0AA3	6SL3330-7TE41-2AA3 6SL3330-7TE41-4AA3
• Rated power of the Active Line Module	kW (HP)	380 (550)	450/500 (600/700)	630 (800)	800/900 (1000/1150)

# SINAMICS S120 drive system

## Line Modules and line-side components

Active Line Modules in chassis format  
Active Interface Modules

### Technical specifications (continued)

Line voltage 500 ... 690 V 3 AC	Active Interface Module in chassis format				
		6SL3300-7TG35-8AA0	6SL3300-7TG37-4AA0	6SL3300-7TG41-3AA0	
Rated current	A	575	735	1025	1270
Bypass contactor		3RT1476-6AP36	3RT1476-6AP36 (3 x)	3WL1212-4BB34-4AN2-Z C22	3WL1216-4BB34-4AN2-Z C22
DC link capacitance of the drive line-up, max.	μF	59200	153600	153600	153600
Current requirement					
• 24 V DC electronics power supply, max.	A	0.17	0.17	0.17	0.17
• Fan supply with 230 V 2 AC, max.	A	4.6	4.9	4.9	4.9
Power loss, max.	kW	6.8	9.0	9.2	9.6
Cooling air requirement	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)	0.4 (14.1)
Sound pressure level L <sub>pA</sub> (1 m) at 50/60 Hz	dB	71/73	71/73	71/73	71/73
Line/load connection L1, L2, L3/U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	4 × 240 per connection	6 × 240 per connection	6 × 240 per connection	6 × 240 per connection
PE connection		M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 240	4 × 240	4 × 240	4 × 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
• Width	mm (in)	305 (12.0)	505 (19.9)	505 (19.9)	505 (19.9)
• Height	mm (in)	1750 (68.9)	1750 (68.9)	1750 (68.9)	1750 (68.9)
• Depth	mm (in)	544 (21.4)	544 (21.4)	544 (21.4)	544 (21.4)
Frame size		HI	JI	JI	JI
Weight, approx.	kg (lb)	390 (860)	620 (1367)	620 (1367)	620 (1367)
Suitable for Active Line Module in chassis format	Type	6SL3330-7TG35-8AA3	6SL3330-7TG37-4AA3	6SL3330-7TG41-0AA3	6SL3330-7TG41-3AA3
• Rated power of the Active Line Module	kW	560	800	1100	1400

### Selection and ordering data

Rated power of the Active Line Module kW (HP)	Suitable for Active Line Module in chassis format	Active Interface Module Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>		
132 (200)	6SL3330-7TE32-1AA3	<b>6SL3300-7TE32-6AA0</b>
160 (225)	6SL3330-7TE32-6AA3	<b>6SL3300-7TE32-6AA0</b>
235 (350)	6SL3330-7TE33-8AA3	<b>6SL3300-7TE33-8AA0</b>
300 (450)	6SL3330-7TE35-0AA3	<b>6SL3300-7TE35-0AA0</b>
380 (550)	6SL3330-7TE36-1AA3	<b>6SL3300-7TE38-4AA0</b>
450 (600)	6SL3330-7TE37-5AA3	<b>6SL3300-7TE38-4AA0</b>
500 (700)	6SL3330-7TE38-4AA3	<b>6SL3300-7TE38-4AA0</b>
630 (800)	6SL3330-7TE41-0AA3	<b>6SL3300-7TE41-4AA0</b>
800 (1000)	6SL3330-7TE41-2AA3	<b>6SL3300-7TE41-4AA0</b>
900 (1150)	6SL3330-7TE41-4AA3	<b>6SL3300-7TE41-4AA0</b>
<b>Line voltage 500 ... 690 V 3 AC</b>		
560	6SL3330-7TG35-8AA3	<b>6SL3300-7TG35-8AA0</b>
800	6SL3330-7TG37-4AA3	<b>6SL3300-7TG37-4AA0</b>
1100	6SL3330-7TG41-0AA3	<b>6SL3300-7TG41-3AA0</b>
1400	6SL3330-7TG41-3AA3	<b>6SL3300-7TG41-3AA0</b>

# SINAMICS S120 drive system

## Line Modules and line-side components

### Active Line Modules in chassis format Recommended line-side components

#### Overview

Suitable line-side power components are assigned depending on the power rating of the Active Line Modules.

The tables below list recommended components.

Further information about the line contactors, switch disconnectors, circuit breakers and fuses specified in the table can be found in Catalogs LV 10.1 and IC 10.

#### Assignment of line-side power components to Active Line Modules in chassis format

Rated power	Input current	Suitable for Active Interface Module	Suitable for Active Line Module	Bypass contactor	Fixed-mounted circuit breaker
kW (HP)	A	Type 6SL3300-	Type 6SL3330-	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>					
132 (200)	210	7TE32-6AA0	7TE32-1AA3	included in Active Interface Module	–
160 (225)	260	7TE32-6AA0	7TE32-6AA3	included in Active Interface Module	–
235 (350)	380	7TE33-8AA0	7TE33-8AA3	included in Active Interface Module	–
300 (450)	490	7TE35-0AA0	7TE35-0AA3	included in Active Interface Module	–
380 (550)	605	7TE38-4AA0	7TE36-1AA3	<b>3RT1476-6AP36</b>	–
500 (700)	840	7TE38-4AA0	7TE38-4AA3	<b>3WL1110-2BB34-4AN2</b>	<b>3WL1110-2BB34-4AN2-Z C22</b>
630 (800)	985	7TE41-4AA0	7TE41-0AA3	<b>3WL1112-2BB34-4AN2</b>	<b>3WL1112-2BB34-4AN2-Z C22</b>
900 (1150)	1405	7TE41-4AA0	7TE41-4AA3	<b>3WL1116-2BB34-4AN2</b>	<b>3WL1116-2BB34-4AN2-Z C22</b>
<b>Line voltage 500 ... 690 V 3 AC</b>					
560	575	7TG35-8AA0	7TG35-8AA3	<b>3RT1476-6AP36</b>	–
800	735	7TG37-4AA0	7TG37-4AA3	<b>3WL1210-4BB34-4AN2</b>	<b>3WL1210-4BB34-4AN2-Z C22</b>
1100	1025	7TG41-3AA0	7TG41-0AA3	<b>3WL1212-4BB34-4AN2</b>	<b>3WL1212-4BB34-4AN2-Z C22</b>
1400	1270	7TG41-3AA0	7TG41-3AA3	<b>3WL1216-4BB34-4AN2</b>	<b>3WL1216-4BB34-4AN2-Z C22</b>

Rated power	Input current	Suitable for Active Interface Module	Switch disconnector without handle and shaft	Switch disconnector with handle and shaft	Cable protection fuse		Cable protection fuse incl. semiconductor protection	
					Rated current	Order No.	Rated current	Order No.
kW (HP)	A	Type 6SL3300-	Order No.	Order No.				
<b>Line voltage 380 ... 480 V 3 AC</b>								
132 (200)	210	7TE32-6AA0	<b>3KL5530-1AB01</b>	<b>3KL5530-1GB01</b>	250 A	<b>3NA3144</b>	315 A	<b>3NE1230-2</b>
160 (225)	260	7TE32-6AA0	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b>	315 A	<b>3NA3252</b>	350 A	<b>3NE1331-2</b>
235 (350)	380	7TE33-8AA0	<b>3KL5730-1AB01</b>	<b>3KL5730-1GB01</b> (for fuse 3NE1334-2) <b>3KL6130-1GB02</b> (for fuse 3NA3365)	500 A	<b>3NA3365</b>	500 A	<b>3NE1334-2</b>
300 (450)	490	7TE35-0AA0	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>	630 A	<b>3NA3372</b>	630 A	<b>3NE1436-2</b>
380 (550)	605	7TE38-4AA0	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>	630 A	<b>3NA3372</b>	800 A	<b>3NE1438-2</b>
500 (700)	840	7TE38-4AA0	–	–	2 × 425 A	<b>3NA3362</b> (2 units)	2 × 500 A	<b>3NE1334-2</b> (2 units)
630 (800)	985	7TE41-4AA0	–	–	2 × 500 A	<b>3NA3365</b> (2 units)	2 × 630 A	<b>3NE1436-2</b> (2 units)
900 (1150)	1405	7TE41-4AA0	–	–	3 × 500 A	<b>3NA3365</b> (3 units)	2 × 850 A	<b>3NE1448-2</b> (2 units)
<b>Line voltage 500 ... 690 V 3 AC</b>								
560	575	7TG35-8AA0	<b>3KL6130-1AB02</b>	<b>3KL6130-1GB02</b>	2 × 315 A	<b>3NA3352-6</b> (2 units)	670 A	<b>3NE1447-2</b>
800	735	7TG37-4AA0	<b>3KL6230-1AB02</b>	<b>3KL6230-1GB02</b>	2 × 400 A	<b>3NA3360-6</b> (2 units)	850 A	<b>3NE1448-2</b>
1100	1025	7TG41-3AA0	–	–	3 × 355 A	<b>3NA3354-6</b> (3 units)	2 × 630 A	<b>3NE1436-2</b> (2 units)
1400	1270	7TG41-3AA0	–	–	3 × 500 A	<b>3NA3365-6</b> (3 units)	2 × 800 A	<b>3NE1438-2</b> (2 units)

#### Overview

In principle, all Single and Double Motor Modules can be operated on Basic Line Modules, Smart Line Modules or Active Line Modules for the appropriate voltage range.

A wide range of single-axis and two-axis Motor Modules with graded current/power ratings can be supplied:

- **Single Motor Modules:** Single-axis variant
  - Booksize compact format with rated output currents of 3 A to 18 A
  - Booksize format with rated output currents of 3 A to 200 A
  - Chassis format with rated output currents of 85 A to 1405 A
- **Double Motor Modules:** Two-axis variant
  - Booksize compact format with rated output currents of 1.7 A to 5 A
  - Booksize format with rated output currents of 3 A to 18 A

#### Examples for Motor Modules



Single Motor Modules in booksize compact format



Double Motor Module in booksize compact format



Single Motor Module in booksize format  
Internal cooling, external cooling, cold plate cooling



Double Motor Module in booksize format



Single Motor Module in chassis format, frame sizes FX/GX and HX/JX

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize compact format

#### Design



Single Motor Modules in booksize compact format

The Single Motor Modules in booksize compact format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 electronics power supply connection via integrated 24 V DC busbars
- 3 DRIVE-CLiQ sockets
- 1 motor connection via connector
- 1 safe standstill input (enable pulses)
- 1 safe motor brake control
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The shield of the motor cable is routed over the connector to the motor connection.

The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

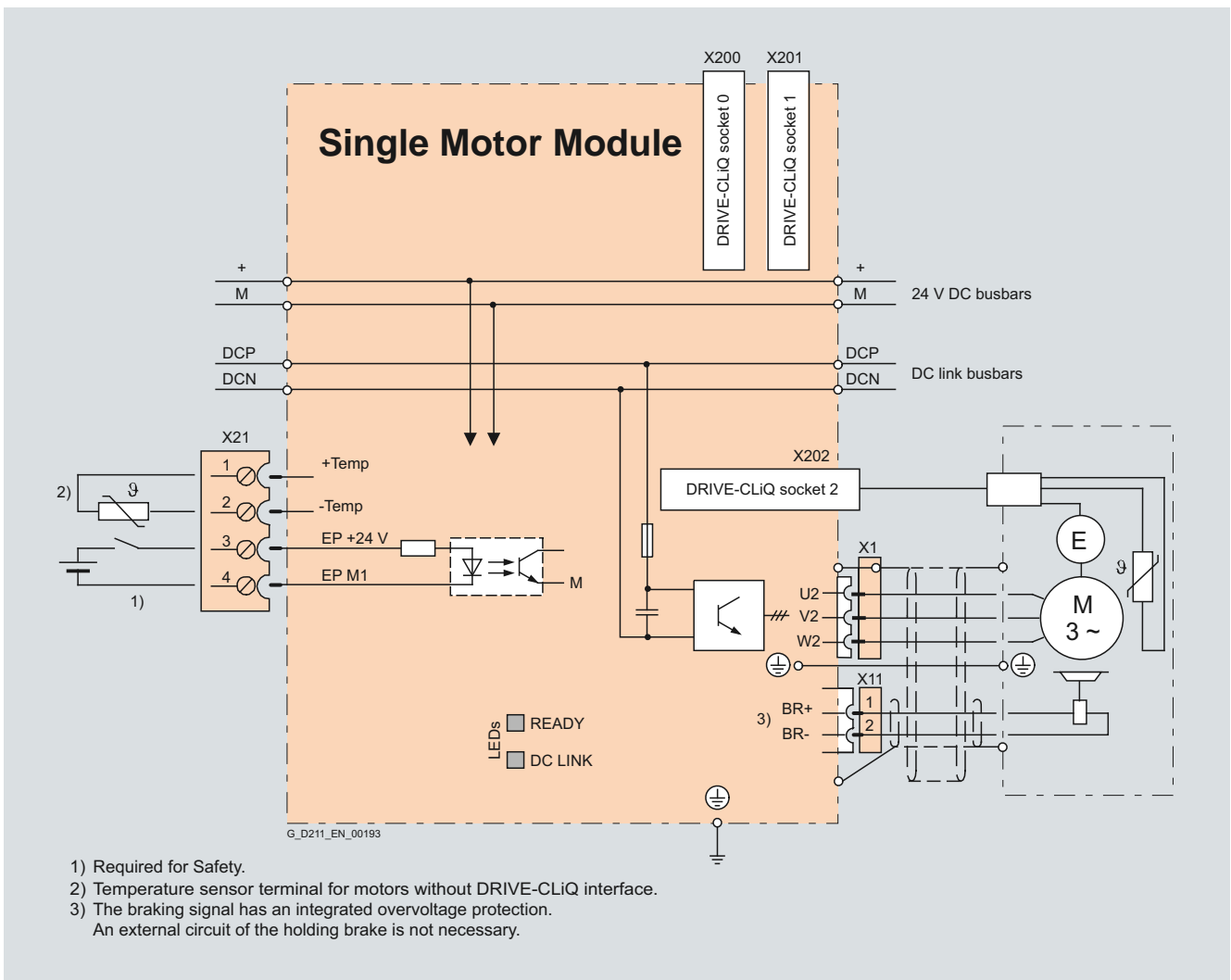
The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable (length depends on module width) to connect Motor Module to adjacent Motor Module, length 0.11 m (4.33 in) for 50 mm (1.97 in) wide Motor Modules or length 0.16 m (6.3 in) for 75 mm (2.95 in) wide Motor Modules.
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connector X21
- Connector X11 for motor brake connection
- Connector X1 for motor connection
- 1 set of warning signs in 30 languages
- 1 heat conducting foil



#### Integration

Single Motor Modules communicate with the Control Unit via DRIVE-CLiQ.



Connection example for Single Motor Module in booksize compact format

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize compact format

#### Technical specifications

##### Single Motor Module in booksize compact format 6SL3420-1TE...

<b>DC link voltage</b> (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 600 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Type of cooling</b>	Internal air cooling (power units with forced air cooling through built-in fans) cold plate cooling
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	UL-recognized
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. <a href="#">For further information, see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating.  
[For further information see chapter System description – Dimensioning.](#)

#### Technical specifications

DC link voltage 510 ... 720 V DC		Single Motor Module in booksize compact format			
		6SL3420-1TE13-0AA1	6SL3420-1TE15-0AA1	6SL3420-1TE21-0AA1	6SL3420-1TE21-8AA1
• Internal air cooling/ cold plate cooling					
<b>Output current</b>					
• Rated current $I_{rated}$	A	3	5	9	18
• Base-load current $I_H$	A	2.6	4.3	7.7	15.3
• For S6 duty (40 %) $I_{S6}$	A	3.5	6	10	24
• $I_{max}$	A	9	15	27	54
<b>Type rating <sup>1)</sup></b>					
• Based on $I_{rated}$	kW (HP)	1.6 (1.5)	2.7 (3)	4.8 (5)	9.7 (10)
• Based on $I_H$	kW (HP)	1.4 (1)	2.3 (2.5)	4.1 (5)	8.2 (10)
<b>Rated pulse frequency</b>	kHz	8	8	4	4
<b>DC link current <math>I_d</math> <sup>2)</sup></b>	A	3.6	6	11	22
<b>Current carrying capacity</b>					
• DC link busbars	A	100	100	100	100
• 24 V DC busbars <sup>3)</sup>	A	20	20	20	20
<b>DC link capacitance</b>	μF	110	110	110	235
<b>Current requirement at 24 V DC, max.</b>	A	0.85	0.85	0.85	0.85
<b>Power loss</b>					
• With internal air cooling in control cabinet <sup>4)</sup>	kW	0.07	0.1	0.1	0.18
• With cold plate cooling int./ext.	kW	0.026/0.04	0.031/0.065	0.031/0.065	0.051/0.095
• Thermal resistance $R_{th}$	K/W	0.265	0.265	0.265	0.23
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.008 (0.283)	0.008 (0.283)	0.008 (0.283)	0.008 (0.283)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	< 60	< 60	< 60	< 60
<b>Motor connection U2, V2, W2</b>		Connector (X1) with screw-type terminals	Connector (X1) with screw-type terminals	Connector (X1) with screw-type terminals	Connector (X1) with screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	0.2 ... 6	0.2 ... 6	0.2 ... 6	0.2 ... 6
<b>Shield connection</b>		Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)
<b>PE connection</b>		M5 screw	M5 screw	M5 screw	M5 screw
<b>Motor brake connection</b>		Connector (X11), 24 V DC, 2 A	Connector (X11), 24 V DC, 2 A	Connector (X11), 24 V DC, 2 A	Connector (X11), 24 V DC, 2 A
<b>Motor cable length, max.</b>					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	70 (230)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	100 (328)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	75 (2.95)
• Height	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>	kg (lb)	2.7 (6)	2.7 (6)	2.7 (6)	3.4 (7.50)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

<sup>3)</sup> If, due to a number of Line Modules and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, connection using a 24 V terminal adapter is required (max. cross-section 6 mm<sup>2</sup>, max. fuse protection 20 A).

<sup>4)</sup> Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize compact format

#### Selection and ordering data

Rated output current	Type rating	Single Motor Module in booksize compact format (Internal air cooling)
A	kW (HP) <sup>1)</sup>	Order No.
<b>DC link voltage 510 ... 720 V DC</b>		
3	1.6 (1.5)	<b>6SL3420-1TE13-0AA1</b>
5	2.7 (3)	<b>6SL3420-1TE15-0AA1</b>
9	4.8 (5)	<b>6SL3420-1TE21-0AA1</b>
18	9.7 (10)	<b>6SL3420-1TE21-8AA1</b>

Description	Order No.
-------------	-----------

#### Accessories

##### DC link rectifier adapter

For direct infeed of DC link voltage

- Screw-type terminals 0.5 ... 10 mm<sup>2</sup>  
For Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)

**6SL3162-2BD00-0AA0**

##### DC link adapter

(2 units)

For multi-tier configuration

Screw-type terminals 35 ... 95 mm<sup>2</sup>

For all Line Modules and Motor Modules in booksize format

**6SL3162-2BM01-0AA0**

##### 24 V terminal adapter

For all Line Modules and Motor Modules in booksize format

**6SL3162-2AA00-0AA0**

##### Spacing bolt

(4 units)

The mounting depth of modules in booksize compact format is increased when it is mounted on these spacing bolts by such an amount that it can be integrated into a drive line-up in booksize format. 2 spacing bolts are required to mount 50 mm (1.97 in) wide modules, and 4 spacing bolts for 75 mm (2.95 in) modules.

**6SL3462-1CC00-0AA0**

#### Accessories for re-ordering

##### 24 V jumper

For connection of the 24 V busbars (for booksize format)

**6SL3162-2AA01-0AA0**

##### Warning labels in 30 languages

This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR

**6SL3166-3AB00-0AA0**

##### SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs

(50 units)

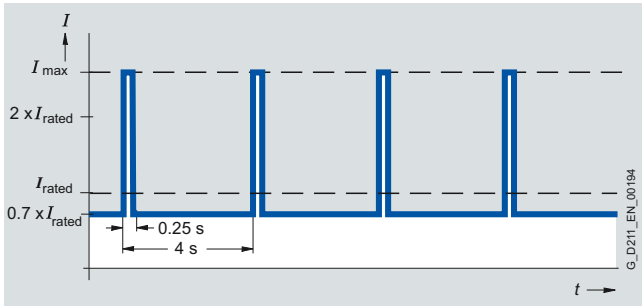
For DRIVE-CLiQ port

**6SL3066-4CA00-0AA0**

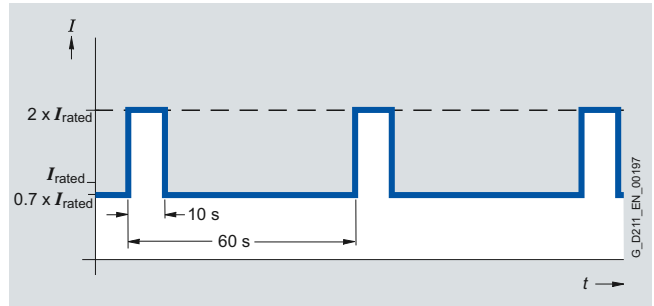
<sup>1)</sup> Nominal HP ratings based on asynchronous (induction) motors. Match the motor nameplate current for specific sizing.

### Characteristic curves

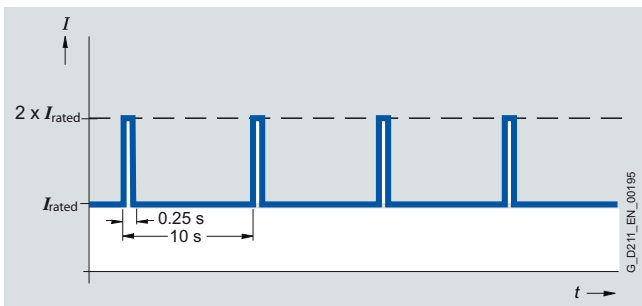
#### Overload capability



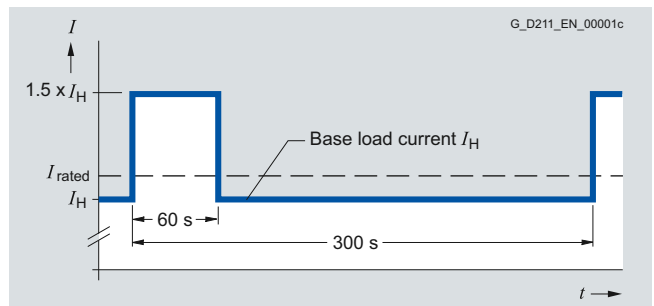
Maximum current duty cycle with previous load



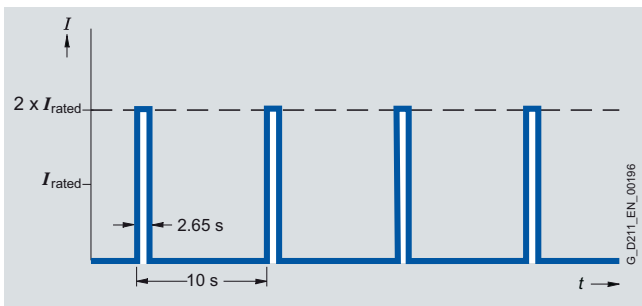
S6 load cycle with previous load with a load cycle period of 60 s



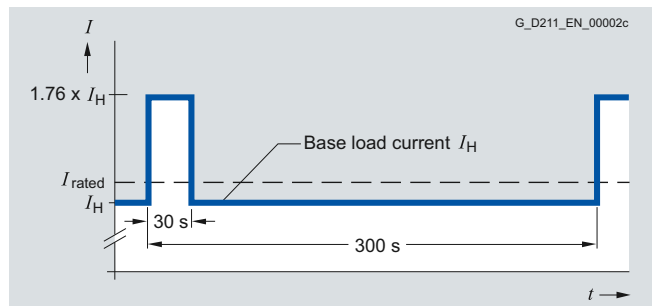
Load cycle with previous load



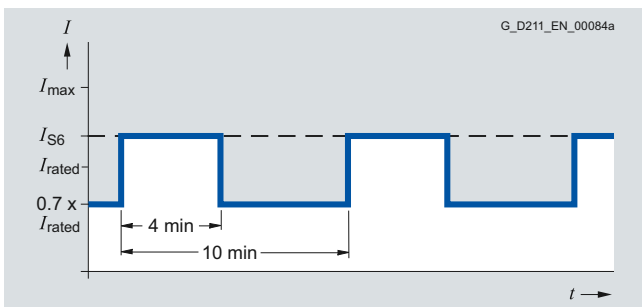
Load cycle with 60 s overload with a load cycle period of 300 s



Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



S6 load cycle with previous load with a load cycle period of 600 s

# SINAMICS S120 drive system

## Motor Modules

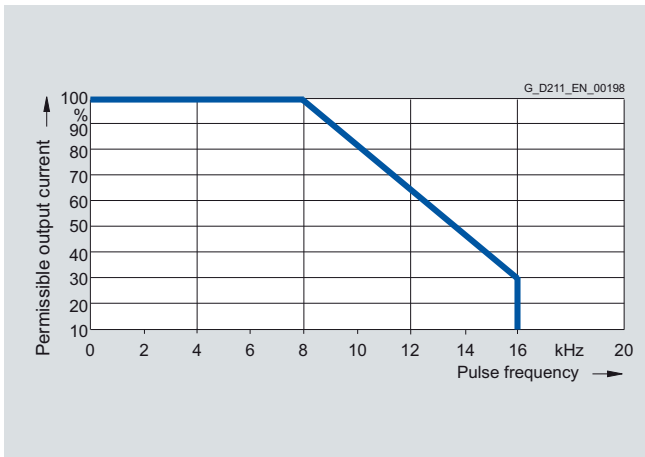
### Single Motor Modules in booksize compact format

#### Characteristic curves (continued)

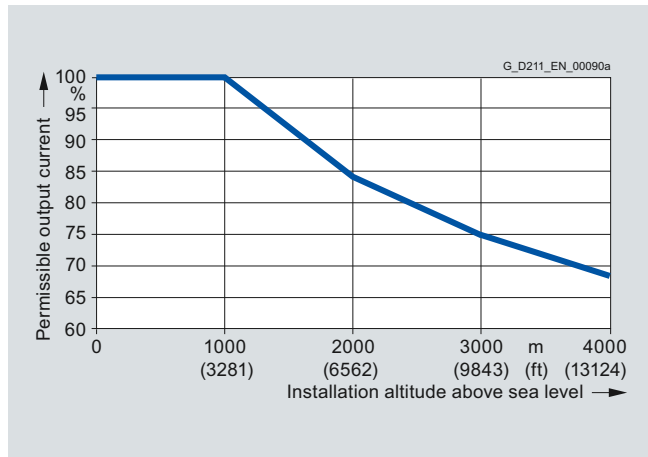
##### Derating characteristics

3 A and 5 A Single Motor Modules in booksize compact format

3

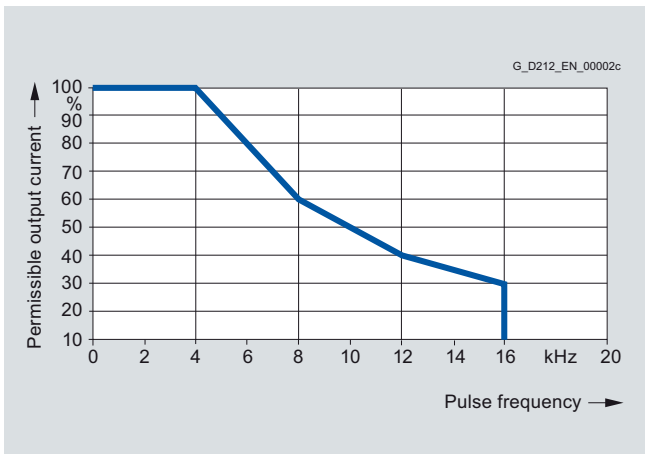


Output current dependent on pulse frequency

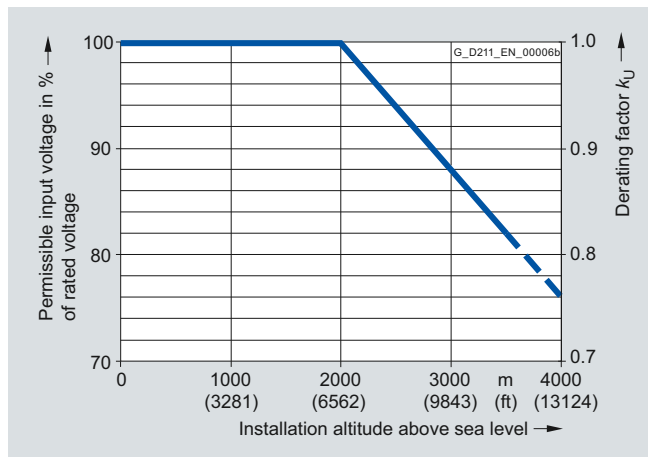


Output current dependent on installation altitude

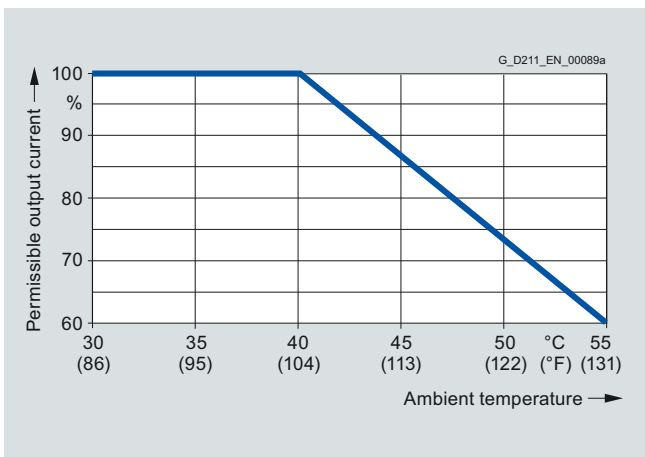
9 A and 18 A Single Motor Modules in booksize compact format



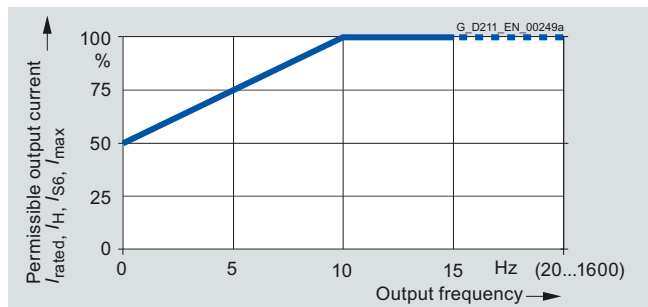
Output current dependent on pulse frequency



Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Output current dependent on output frequency

#### Design



Single Motor Module in booksize format

The Single Motor Modules in booksize format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 electronics power supply connection via integrated 24 V DC busbars
- 3 DRIVE-CLiQ sockets
- 1 motor connection, plug-in (not included in scope of supply) or screw-stud depending on rated output current
- 1 safe standstill input (enable pulses)
- 1 safe motor brake control
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The motor cable shield is inside the connector on 50 mm (1.97 in) and 100 mm (3.94 in) wide Motor Modules. A shield connection plate can be supplied for 150 mm (5.91 in), 200 mm (7.87 in) and 300 mm (11.8 in) wide Motor Modules. On these modules, the motor cable shield can be connected using a tube clip.

The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable appropriate to the width of the Motor Module for connection to the adjacent Motor Module, length = width of Motor Module + 0.06 m (2.4 in)
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connector X21
- Connector X11 for the motor brake connection (for Motor Modules with a rated output current of 45 A to 200 A)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Fan insert for the 132 A and 200 A Motor Modules (the voltage for the fan insert is supplied by the Motor Module)
- 1 set of warning signs in 30 languages
- 1 heat conducting foil (for Motor Modules with cold plate cooling only)

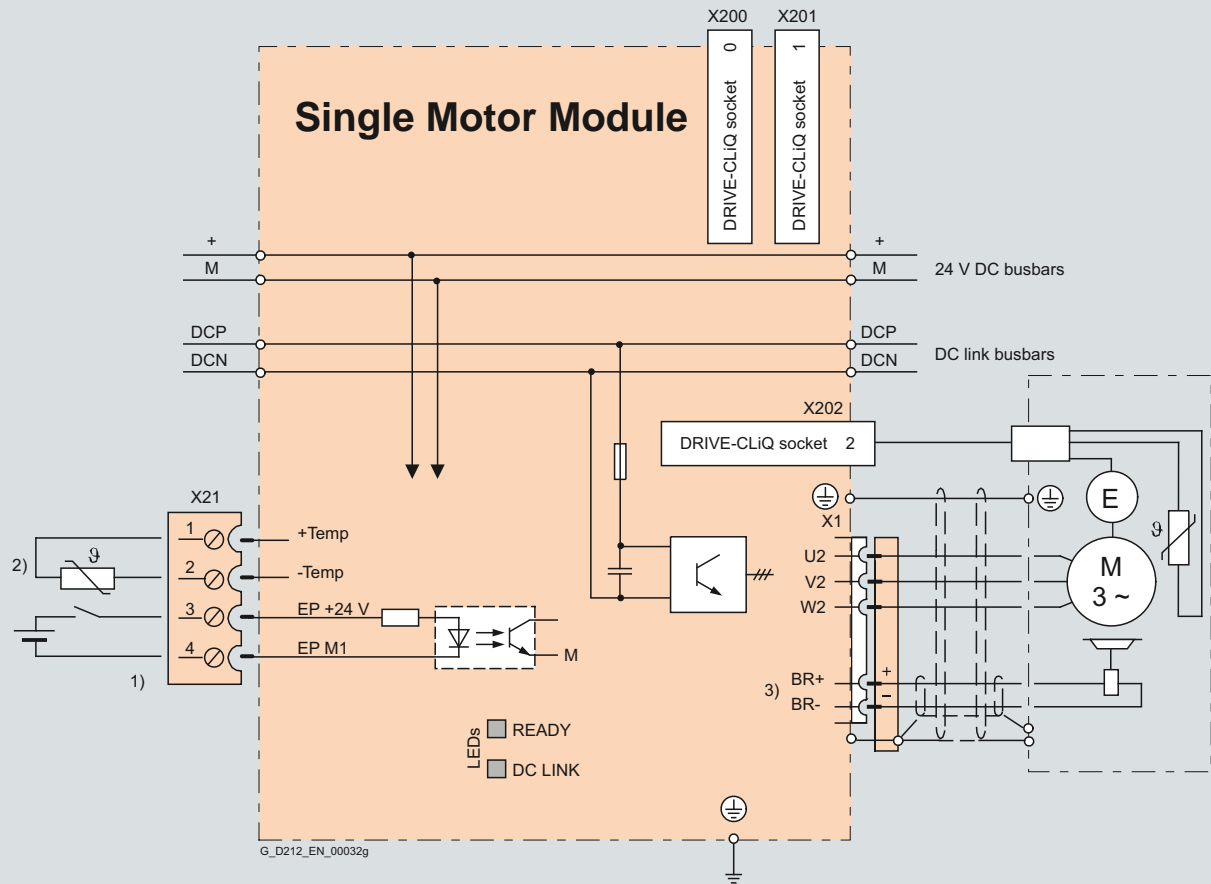
# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize format

#### Integration

Single Motor Modules communicate with the Control Unit via DRIVE-CLiQ.



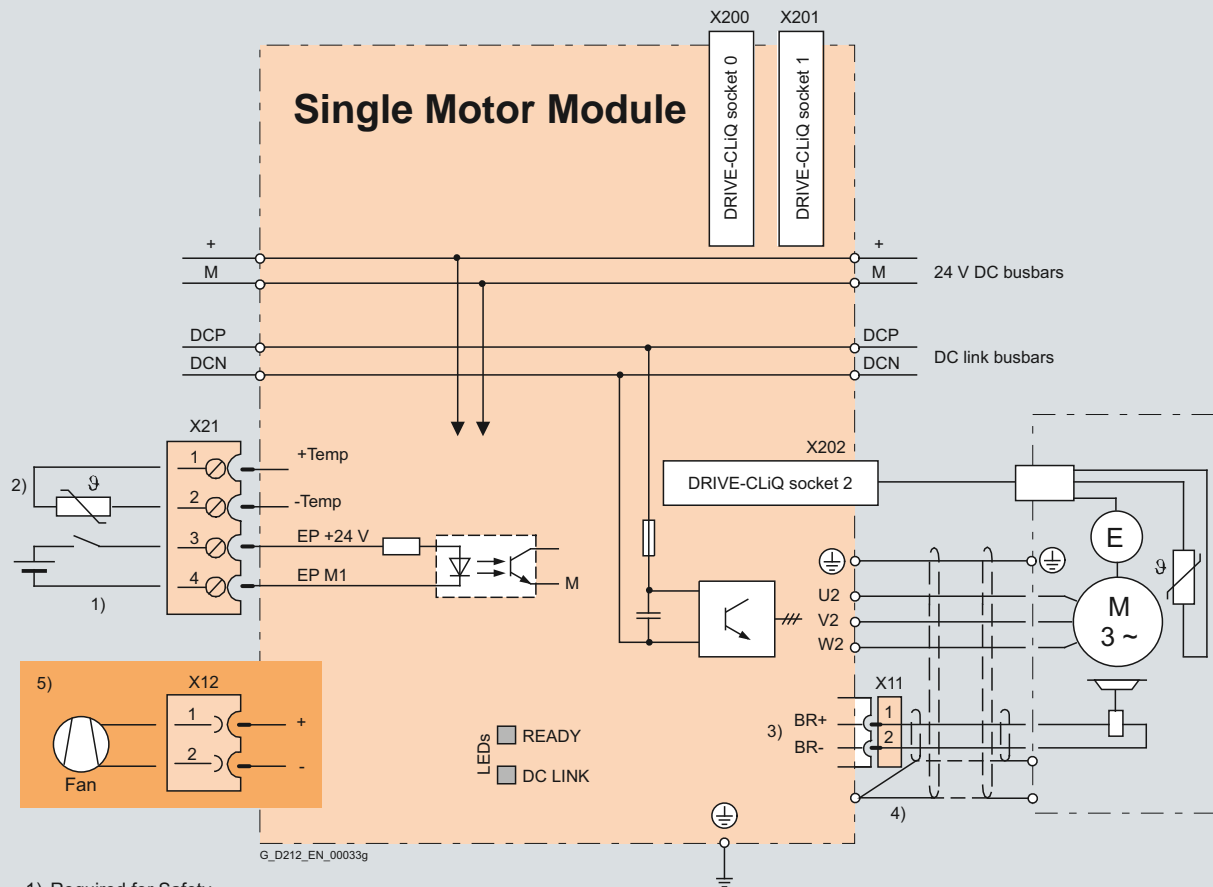
- 1) Required for Safety.
- 2) Temperature sensor terminal for motors without DRIVE-CLiQ interface.
- 3) The braking signal has an integrated overvoltage protection.  
An external circuit of the holding brake is not necessary.

Connection example of Single Motor Modules in booksize format 3 A to 30 A



#### Integration (continued)

3



Connection example of Single Motor Modules in booksize format 45 A to 200 A

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize format

#### Technical specifications

Single Motor Module in booksize format		Single Motor Module in booksize format	
6SL312...-1TE...		6SL312...-1TE...	
<b>DC link voltage</b> Up to 2000 m (6562 ft) above sea level	510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)	<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Output frequency</b>	0 ... 650 Hz <sup>1)</sup>	<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Electronics power supply</b>	24 V DC -15 %/+20 %	<b>Approvals, according to</b>	cULus
<b>Type of cooling</b>	Internal air cooling, external air cooling Power units with forced air cooling by built-in fans Cold plate cooling Liquid cooling	<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL 2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 Control category 3 acc. to ISO 13849-1
<b>Permissible ambient or coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>		

<b>DC link voltage</b> 510 ... 720 V DC	Single Motor Module in booksize format					
<b>Internal air cooling</b>	6SL3120-...	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
<b>External air cooling</b>	6SL3121-...	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
<b>Cold plate cooling</b>	6SL3126-...	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
<b>Liquid cooling</b>	6SL3125-...	–	–	–	–	–
<b>Output current</b>						
• Rated current $I_{rated}$	A	<b>3</b>	<b>5</b>	<b>9</b>	<b>18</b>	<b>30</b>
• Base-load current $I_H$	A	2.6	4.3	7.7	15.3	25.5
• For S6 duty $I_{S6}$ (40 %)	A	3.5	6	10	24	40
• $I_{max}$	A	6	10	18	36	56
<b>Type rating <sup>2)</sup></b>						
• Based on $I_{rated}$	kW (HP)	1.6 (1.5)	2.7 (3)	4.8 (5)	9.7 (10)	16.0 (20)
• Based on $I_H$	kW (HP)	1.4 (1)	2.3 (2.5)	4.1 (5)	8.2 (10)	13.7 (18)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>DC link current <math>I_d</math> <sup>3)</sup></b>	A	3.6	6	11	22	36
<b>Current carrying capacity</b>						
• DC link busbars	A	100 <sup>4)</sup>	100 <sup>4)</sup>	100 <sup>4)</sup>	100 <sup>4)</sup>	100 <sup>4)</sup>
• 24 V DC busbars	A	20	20	20	20	20
		If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24 V DC connection using a 24 V terminal adapter is required (max. cross-section 6 mm <sup>2</sup> , max. fuse protection 20 A).				
<b>DC link capacitance</b>	µF	110	110	110	220	710
<b>Current requirement</b> At 24 V DC, max.	A	0.85	0.85	0.85	0.85	0.9

<sup>1)</sup> At rated output current (max. output frequency 1300 Hz for 62.5 µs current control cycle, 8 kHz pulse frequency, 60 % permissible output current). Note the correlation between max. output frequency, pulse frequency and current derating.

<sup>2)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>3)</sup> Rated DC link current for dimensioning an external DC connection.

<sup>4)</sup> With reinforced DC link busbar set, 150 A is possible (accessories).

#### Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Single Motor Module in booksize format					
<b>Internal air cooling</b>		6SL3120-...	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
<b>External air cooling</b>		6SL3121-...	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
<b>Cold plate cooling</b>		6SL3126-...	1TE13-0AA3	1TE15-0AA3	1TE21-0AA3	1TE21-8AA3	1TE23-0AA3
<b>Liquid cooling</b>		6SL3125-...	–	–	–	–	–
<b>Internal/external air cooling</b>							
• Power loss <sup>1)</sup>							
- Maximum losses with internal air cooling in control cabinet	kW		0.05	0.07	0.1	0.19	0.31
- Typical losses with internal air cooling in control cabinet <sup>2)</sup>	kW		0.03	0.04	0.06	0.14	0.26
- With external air cooling, int./ext. <sup>1)</sup>	kW		0.035/0.015	0.04/0.03	0.055/0.045	0.1/0.09	0.1/0.21
• Cooling air requirement	m <sup>3</sup> /s (ft <sup>3</sup> /s)		0.008 (0.283)	0.008 (0.283)	0.008 (0.283)	0.008 (0.283)	0.016 (0.565)
• Sound pressure level L <sub>pA</sub> (1 m)	dB		< 60	< 60	< 60	< 60	< 60
<b>Cold plate cooling</b>							
• Power loss, int./ext. <sup>1)</sup>	kW		0.025/0.02	0.035/0.035	0.045/0.05	0.08/0.1	0.085/0.22
• Thermal resistance R <sub>th</sub>	K/W		0.175	0.175	0.175	0.175	0.075
<b>Motor connection</b> U2, V2, W2			Connector (X1) <sup>3)</sup> , max. 30 A	Connector (X1) <sup>3)</sup> , max. 30 A	Connector (X1) <sup>3)</sup> , max. 30 A	Connector (X1) <sup>3)</sup> , max. 30 A	Connector (X1) <sup>3)</sup> , max. 30 A
<b>Shield connection</b>			Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)	Integrated in connector (X1)
<b>PE connection</b>			M5 screw	M5 screw	M5 screw	M5 screw	M5 screw
<b>Motor brake connection</b>			Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1), 24 V DC, 2 A
<b>Motor cable length, max.</b>							
• Shielded	m (ft)		50 (164)	50 (164)	50 (164)	70 (230)	100 (328)
• Unshielded	m (ft)		75 (246)	75 (246)	75 (246)	100 (328)	150 (492)
<b>Degree of protection</b>			IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)		50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	100 (3.94)
• Height	mm (in)		380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)
• Depth							
- With internal air cooling	mm (in)		270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)
- With external air cooling, on/behind mounting surface	mm (in)		226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)
- With cold plate cooling	mm (in)		226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>							
• With internal air cooling	kg (lb)		5.0 (11)	5.0 (11)	5.0 (11)	5.0 (11)	6.9 (15)
• With external air cooling	kg (lb)		5.7 (13)	5.7 (13)	5.7 (13)	5.7 (13)	8.5 (19)
• With cold plate cooling	kg (lb)		4.2 (9)	4.2 (9)	4.5 (10)	4.5 (10)	6.1 (13)

<sup>1)</sup> Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

<sup>2)</sup> At max. motor cable length 30 m (98.4 ft), pulse frequency 4 kHz and DC link voltage 540 ... 600 V.

<sup>3)</sup> Connector not included in scope of supply, see [Accessories](#).

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize format

#### Technical specifications (continued)

DC link voltage 510 ... 720 V DC	Single Motor Module in booksize format					
<b>Internal air cooling</b>	6SL3120-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
<b>External air cooling</b>	6SL3121-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
<b>Cold plate cooling</b>	6SL3126-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
<b>Liquid cooling</b>	6SL3125-...	–	–	–	–	1TE32-0AA4
<b>Output current</b>						
• Rated current $I_{rated}$	A	<b>45</b>	<b>60</b>	<b>85</b>	<b>132 (105<sup>1)</sup>)</b>	<b>200 (140<sup>1)</sup>)</b>
• Base-load current $I_H$	A	38	52	68	105 (84)	141 (99)
• For S6 duty $I_{S6}$ (40 %)	A	60	80	110	150 (120)	230 (161)
• $I_{max}$	A	85	113	141	210	282
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>• Type rating<sup>2)</sup></b>						
• Based on $I_{rated}$	kW (HP)	24 (30)	32 (40)	46 (60)	71 (100)	107 (150)
• Based on $I_H$	kW (HP)	21 (25)	28 (40)	37 (50)	57 (75)	76 (100)
<b>DC link current <math>I_d</math><sup>3)</sup></b>	A	54	72	102	158	200
<b>Current carrying capacity</b>						
• DC link busbars	A	200	200	200	200	200
• 24 V DC busbars	A	20	20	20	20	20
		If, due to a number of Line and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24 V DC connection using a 24 V terminal adapter is required (max. cross-section 6 mm <sup>2</sup> , max. fuse protection 20 A).				
<b>DC link capacitance</b>	µF	1175	1410	1880	2820	3995
<b>Current requirement</b> At 24 V DC, max.	A	1.2	1.2	1.5	1.5	1.5
<b>Internal/external air cooling</b>						
• Power loss <sup>4)</sup>						
- Maximum power loss with internal air cooling in control cabinet	kW	0.46	0.62	0.79	1.29	2.09
- Typical losses with internal air cooling in control cabinet <sup>5)</sup>	kW	0.38	0.55	0.77	1.26	2.03
- With external air cooling, int./ext. <sup>4)</sup>	kW	0.14/0.32	0.16/0.46	0.2/0.59	0.29/1.0	0.47/1.62
• Cooling air requirement	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.031 (1.095)	0.031 (1.095)	0.044 (1.554)	0.144 (5.085)	0.144 (5.085)
• Sound pressure level $L_{pA}$ (1 m)	dB	< 65	< 65	< 60	< 73	< 73
<b>Cold plate cooling</b>						
• Power loss, int./ext. <sup>4)</sup>	kW	0.11/0.34	0.13/0.48	0.15/0.62	0.24/1.05	0.39/1.7
• Thermal resistance $R_{th}$	K/W	0.055	0.055	0.05	0.028	0.028

<sup>1)</sup> In the case of cold plate cooling, derating is necessary due to heat transfer to the external heat sink.

<sup>2)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>3)</sup> Rated DC link current for dimensioning an external DC connection.

<sup>4)</sup> Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

<sup>5)</sup> At max. motor cable length 30 m (98.4 ft), pulse frequency 4 kHz and DC link voltage 540 ... 600 V.

#### Technical specifications (continued)

<b>DC link voltage</b> 510 ... 720 V DC		<b>Single Motor Module in booksize format</b>					
<b>Internal air cooling</b>		6SL3120-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
<b>External air cooling</b>		6SL3121-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
<b>Cold plate cooling</b>		6SL3126-...	1TE24-5AA3	1TE26-0AA3	1TE28-5AA3	1TE31-3AA3	1TE32-0AA4
<b>Liquid cooling</b>		6SL3125-...	–	–	–	–	1TE32-0AA4
<b>Liquid cooling</b> <sup>1)</sup>							
• Power loss, int./ext.	kW	–	–	–	–	–	0.39/1.7
- Rated volumetric flow for water at 70 kPa pressure drop <sup>3)</sup>	l/min	–	–	–	–	–	8
- Volume of liquid, internal	ml	–	–	–	–	–	100
- Coolant temperature, max.							
- Without derating	°C (°F)	–	–	–	–	–	45 (113)
- With derating	°C (°F)	–	–	–	–	–	50 (122)
- Sound pressure level L <sub>pA</sub> (1 m)	dB	–	–	–	–	–	< 73
<b>Motor connection</b> U2, V2, W2			M6 screw studs (X1)	M6 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)	M8 screw studs (X1)
• Conductor cross-section, max.	mm <sup>2</sup>		2.5 ... 50	2.5 ... 50	2.5 ... 95.2 × 35	2.5 ... 120.2 × 50	2.5 ... 120.2 × 50
<b>Shield connection</b>			<a href="#">See Accessories</a>	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>	<a href="#">See Accessories</a>
<b>PE connection</b>			M6 screw	M6 screw	M6 screw	M8 screw	M8 screw
<b>Motor brake connection</b>			Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A	Plug-in connector (X11), 24 V DC, 2 A
<b>Motor cable length, max.</b>							
• Shielded	m (ft)		100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
• Unshielded	m (ft)		150 (492)	150 (492)	150 (492)	150 (492)	150 (492)
<b>Degree of protection</b>			IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)		150 (5.90)	150 (5.90)	200 (7.87)	300 (11.8)	300 (11.8)
• Height	mm (in)		380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)
- With fan <sup>2)</sup>	mm (in)		–	–	–	629 (24.8)	629 (24.8)
- With screwed fitting	mm (in)		–	–	–	–	553 (21.8) <sup>1)</sup>
• Depth							
- With internal air cooling	mm (in)		270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)
- With external air cooling, on/behind mounting surface	mm (in)		226/71 (8.90/2.79)	226/71 (8.90/2.79)	226/92 (8.90/3.62)	226/82 (8.90/3.23)	226/82 (8.90/3.23)
- With cold plate cooling	mm (in)		226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)
- With liquid cooling	mm (in)		–	–	–	–	226 (8.90)
<b>Weight, approx.</b>							
• With internal air cooling	kg (lb)		9 (20)	9 (20)	15 (33)	21 (46)	21 (46)
• With external air cooling	kg (lb)		13.2 (29)	13.4 (29.5)	17.2 (38)	27.2 (60)	30 (66)
• With cold plate cooling	kg (lb)		9.1 (20)	9.1 (20)	12.5 (28)	18 (40)	18 (40)
• With liquid cooling	kg (lb)		–	–	–	–	21 (46)

<sup>1)</sup> The coolant connections are located on the lower side of the components. All connection elements can be accessed using an appropriate tool. Thread type of water connections: Pipe thread ISO 228 G ½ B.

<sup>2)</sup> The fan is supplied with the Motor Module and must be installed before the Motor Module is commissioned.

<sup>3)</sup> This value applies to water as coolant; for other coolants, refer to the [01/2012 Manual](#).

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in booksize format

#### Selection and ordering data

Rated output current	Type rating kW (HP) <sup>1)</sup>	Single Motor Module in booksize format			
		Internal air cooling Order No.	External air cooling Order No.	Cold plate cooling Order No.	Liquid cooling Order No.
DC link voltage 510 ... 720 V DC					
3	1.6 (1.5)	6SL3120-1TE13-0AA3	6SL3121-1TE13-0AA3	6SL3126-1TE13-0AA3	–
5	2.7 (3)	6SL3120-1TE15-0AA3	6SL3121-1TE15-0AA3	6SL3126-1TE15-0AA3	–
9	4.8 (5)	6SL3120-1TE21-0AA3	6SL3121-1TE21-0AA3	6SL3126-1TE21-0AA3	–
18	9.7 (10)	6SL3120-1TE21-8AA3	6SL3121-1TE21-8AA3	6SL3126-1TE21-8AA3	–
30	16 (20)	6SL3120-1TE23-0AA3	6SL3121-1TE23-0AA3	6SL3126-1TE23-0AA3	–
45	24 (30)	6SL3120-1TE24-5AA3	6SL3121-1TE24-5AA3	6SL3126-1TE24-5AA3	–
60	32 (40)	6SL3120-1TE26-0AA3	6SL3121-1TE26-0AA3	6SL3126-1TE26-0AA3	–
85	46 (60)	6SL3120-1TE28-5AA3	6SL3121-1TE28-5AA3	6SL3126-1TE28-5AA3	–
132	71 (100)	6SL3120-1TE31-3AA3	6SL3121-1TE31-3AA3	6SL3126-1TE31-3AA3	–
200	107 (150)	6SL3120-1TE32-0AA4	6SL3121-1TE32-0AA4	6SL3126-1TE32-0AA4	6SL3125-1TE32-0AA4

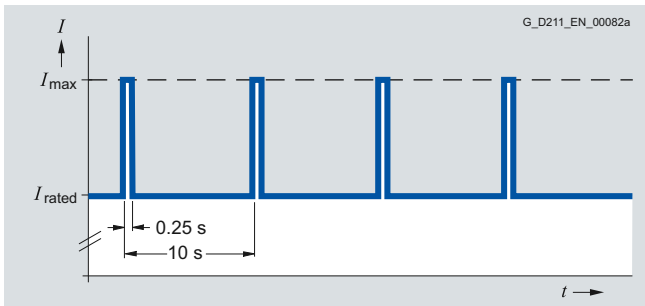
Description	Order No.
<b>Accessories</b>	
<b>Power connector (X1)</b> At Motor Module end, with screw-type terminals 1.5 ... 10 mm <sup>2</sup> , For Motor Modules with rated output current of 3 ... 30 A	<b>6SL3162-2MA00-0AA0</b>
<b>Shield connection plate</b> For Line Modules and Motor Modules in booksize format	
• 150 mm (5.90 in) wide for internal air cooling	<b>6SL3162-1AF00-0AA1</b>
• 150 mm (5.90 in) wide for external air cooling and cold plate cooling	<b>6SL3162-1AF00-0BA1</b>
• 200 mm (7.87 in) wide for internal air cooling	<b>6SL3162-1AH01-0AA0</b>
• 200 mm (7.87 in) wide for external air cooling and cold plate cooling	<b>6SL3162-1AH01-0BA0</b>
• 300 mm (11.8 in) wide for all cooling types	<b>6SL3162-1AH00-0AA0</b>
<b>DC link rectifier adapter</b> For direct infeed of DC link voltage	
• Screw-type terminals 0.5 ... 10 mm <sup>2</sup> for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	<b>6SL3162-2BD00-0AA0</b>
• Screw-type terminals 35 ... 95 mm <sup>2</sup> for Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.90 in, 7.87 in and 11.8 in)	<b>6SL3162-2BM00-0AA0</b>
<b>DC link adapter (2 units)</b> For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2BM01-0AA0</b>
<b>24 V terminal adapter</b> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2AA00-0AA0</b>

Description	Order No.
<b>Reinforced DC link busbar set</b> For replacement of DC link busbars for 5 modules in booksize format	
• 50 mm (1.97 in) wide	<b>6SL3162-2DB00-0AA0</b>
• 100 mm (3.94 in) wide	<b>6SL3162-2DD00-0AA0</b>
<b>Accessories for re-ordering</b>	
<b>24 V jumper</b> For connection of the 24 V busbars (for booksize format)	<b>6SL3162-2AA01-0AA0</b>
<b>Accessories pack</b> (plug-in terminals, DRIVE-CLiQ jumper (length = module width + 60 mm (2.36 in)), dust-proof blanking plugs) For DRIVE-CLiQ port	
• For Motor Modules 50 mm (1.97 in) wide, int./ext. air cooling	<b>6SL3162-8AB00-0AA0</b>
• For Motor Modules 100 mm (3.94 in) wide, int./ext. air cooling	<b>6SL3162-8BD00-0AA0</b>
• For Motor Modules 150 mm (5.90 in) wide, int./ext. air cooling	<b>6SL3162-8CF00-0AA0</b>
• For Motor Modules 200 mm (7.87 in) wide, int./ext. air cooling	<b>6SL3162-8DH00-0AA0</b>
• For Motor Modules 300 mm (11.8 in) wide, int./ext. air cooling	<b>6SL3162-8EM00-0AA0</b>
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

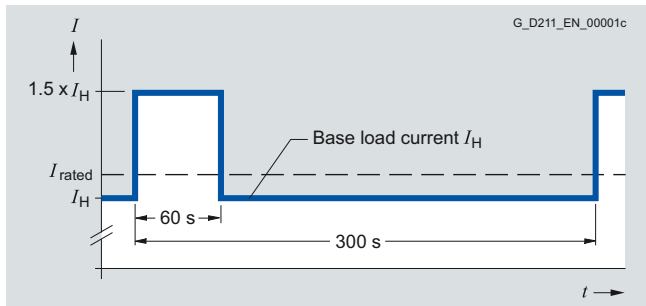
<sup>1)</sup> Nominal HP ratings based on asynchronous (induction) motors. Match the motor nameplate current for specific sizing.

**Characteristic curves**

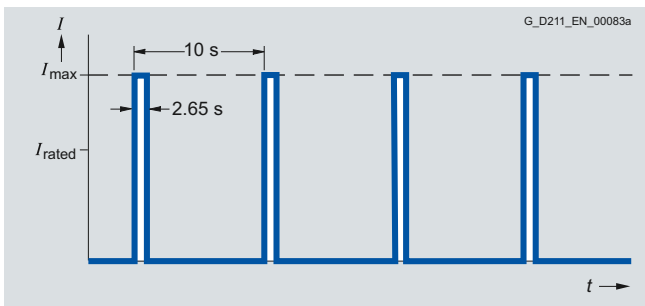
**Overload capability**



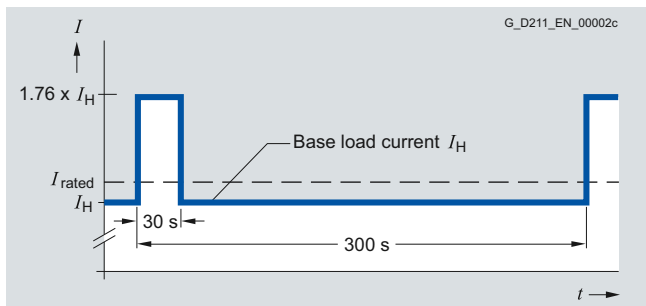
Load cycle with previous load



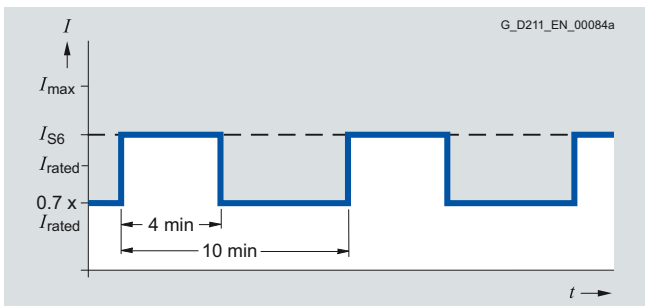
Load cycle with 60 s overload with a load cycle period of 300 s



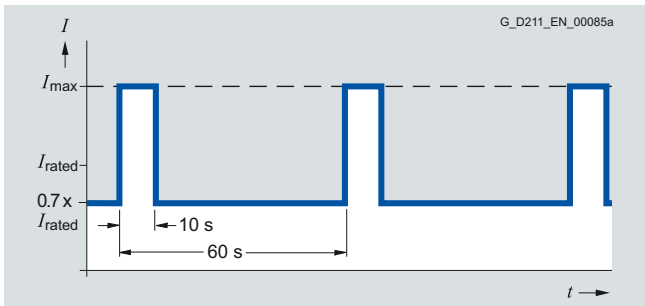
Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



S6 load cycle with previous load with a load cycle period of 600 s



S6 load cycle with previous load with a load cycle period of 60 s

# SINAMICS S120 drive system

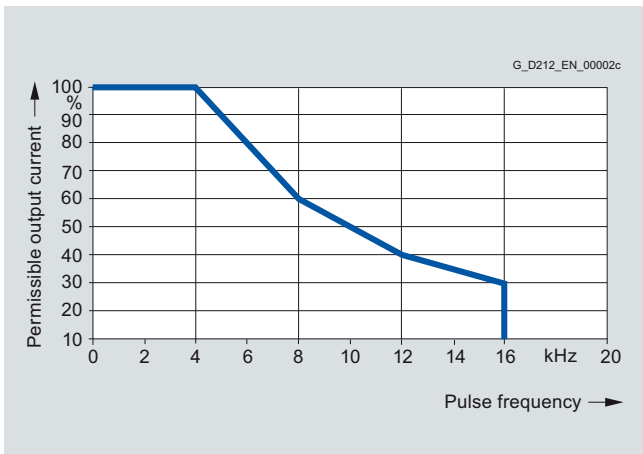
## Motor Modules

### Single Motor Modules in booksize format

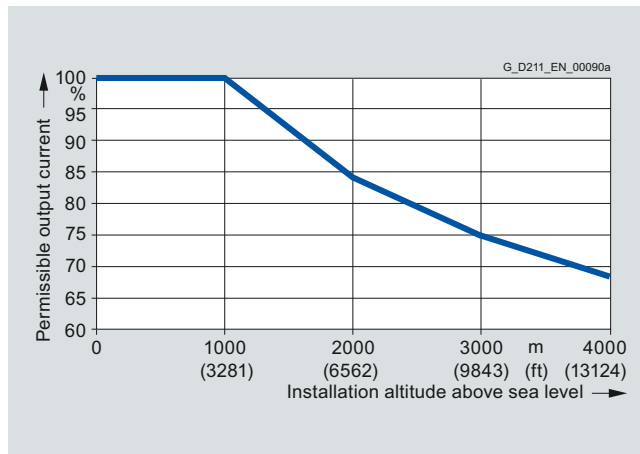
#### Characteristic curves (continued)

#### Derating characteristics

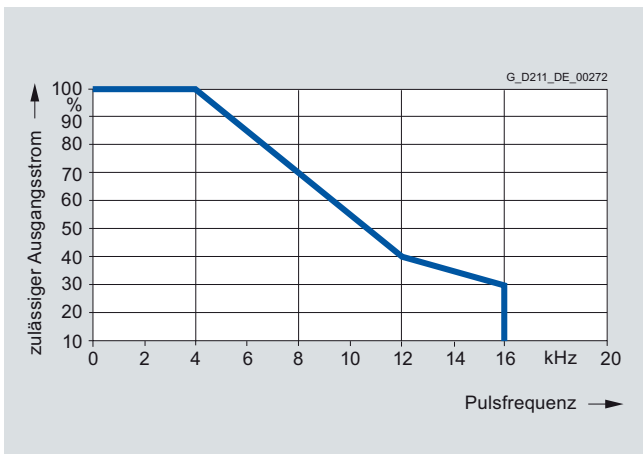
3



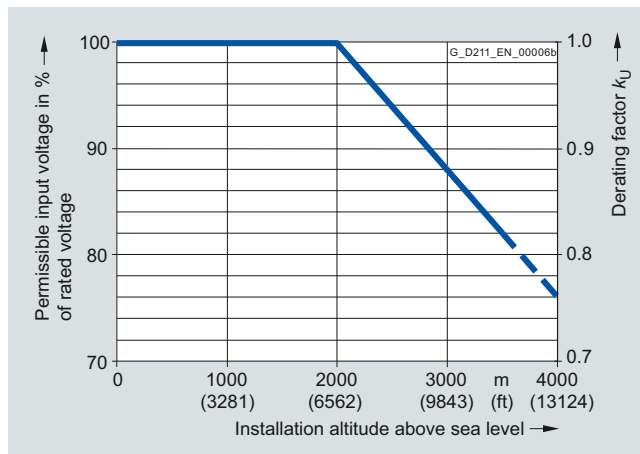
Output current dependent on pulse frequency (rated current up to 132 A for Single Motor Modules in booksize format)



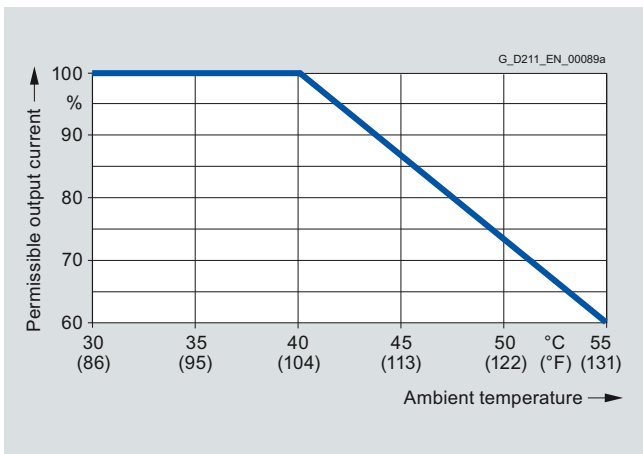
Output current as a function of installation altitude



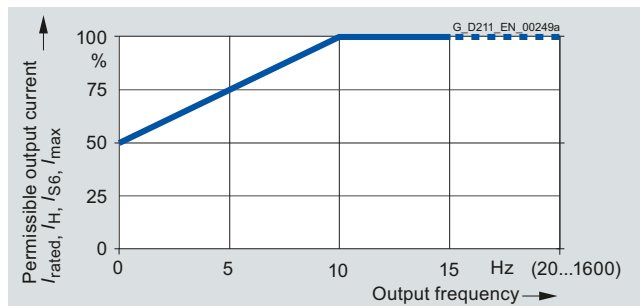
Output current dependent on pulse frequency (rated current up to 200 A for Single Motor Modules in booksize format)



Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Current derating dependent on output frequency



# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in chassis format

#### Design



Single Motor Modules in chassis format

The Single Motor Modules in chassis format feature the following connections and interfaces as standard:

- 1 DC link connection (DCP, DCN) for connecting to the supply DC busbar
- 1 DC link connection (DCPA, DCNA) for connecting a Braking Module
- 1 electronics power supply connection
- 3 DRIVE-CLiQ sockets
- 1 motor connection
- 1 safe standstill input (enable pulses)
- 1 temperature sensor input (KTY84-130 or Pt100 two-wire, or PTC)
- 1 connection for Safe Brake Adapter
- 1 PE (protective earth) connection

The status of the Motor Modules is indicated via two multi-color LEDs.

The scope of supply of the Motor Modules includes:

- Frame sizes FX and GX:
  - 0.60 m (1.97 ft) DRIVE-CLiQ cable for connection to the adjacent Motor Module
- Frame sizes HX and JX:
  - 0.35 m (13.8 in) DRIVE-CLiQ cable for connection to the CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2
  - 2.10 m (6.89 ft) DRIVE-CLiQ cable for connection to the adjacent Motor Module

#### Selection and ordering data

Rated output current A	Type rating kW (HP) <sup>1)</sup>	Single Motor Module in chassis format Order No.
<b>DC link voltage 510 ... 720 V DC</b>		
210	110 (150)	<b>6SL3320-1TE32-1AA3</b>
260	132 (200)	<b>6SL3320-1TE32-6AA3</b>
310	160 (250)	<b>6SL3320-1TE33-1AA3</b>
380	200 (300)	<b>6SL3320-1TE33-8AA3</b>
490	250 (400)	<b>6SL3320-1TE35-0AA3</b>
605	315 (500)	<b>6SL3320-1TE36-1AA3</b>
745	400 (600)	<b>6SL3320-1TE37-5AA3</b>
840	450 (700)	<b>6SL3320-1TE38-4AA3</b>
985	560 (800)	<b>6SL3320-1TE41-0AA3</b>
1260	710 (1000)	<b>6SL3320-1TE41-2AA3</b>
1405	800 (1150)	<b>6SL3320-1TE41-4AA3</b>
<b>DC link voltage 675 ... 1035 V DC</b>		
85	75	<b>6SL3320-1TG28-5AA3</b>
100	90	<b>6SL3320-1TG31-0AA3</b>
120	110	<b>6SL3320-1TG31-2AA3</b>
150	132	<b>6SL3320-1TG31-5AA3</b>
175	160	<b>6SL3320-1TG31-8AA3</b>
215	200	<b>6SL3320-1TG32-2AA3</b>
260	250	<b>6SL3320-1TG32-6AA3</b>
330	315	<b>6SL3320-1TG33-3AA3</b>
410	400	<b>6SL3320-1TG34-1AA3</b>
465	450	<b>6SL3320-1TG34-7AA3</b>
575	560	<b>6SL3320-1TG35-8AA3</b>
735	710	<b>6SL3320-1TG37-4AA3</b>
810	800	<b>6SL3320-1TG38-1AA3</b>
910	900	<b>6SL3320-1TG38-8AA3</b>
1025	1000	<b>6SL3320-1TG41-0AA3</b>
1270	1200	<b>6SL3320-1TG41-3AA3</b>

#### Accessories for re-ordering

##### Warning labels in 30 languages

This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR

**6SL3166-3AB00-0AA0**

##### SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs (50 units)

For DRIVE-CLiQ port

**6SL3066-4CA00-0AA0**

<sup>1)</sup> Nominal HP ratings based on asynchronous (induction) motors. Match the motor nameplate current for specific sizing.

# SINAMICS S120 drive system

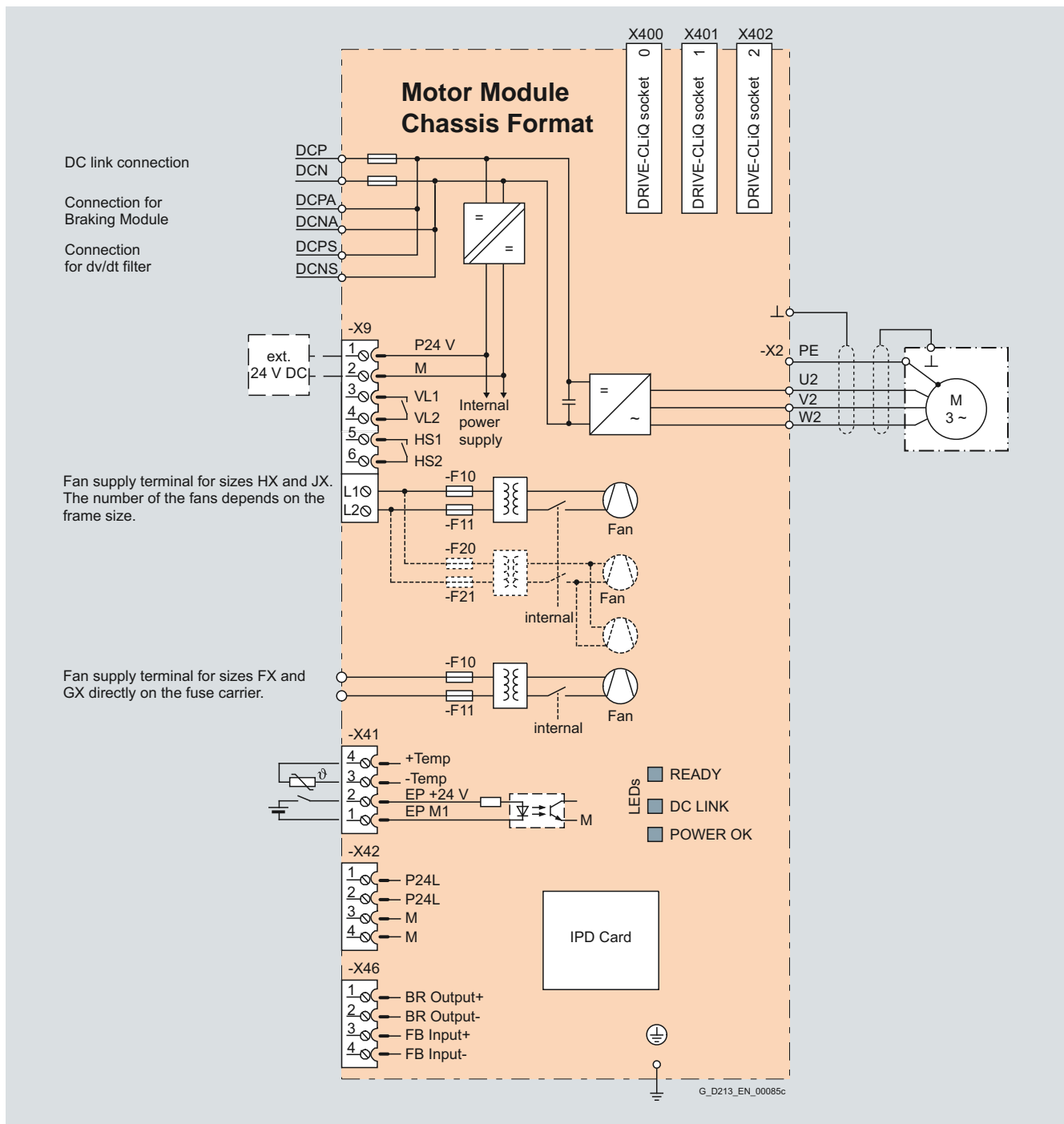
## Motor Modules

### Single Motor Modules in chassis format

#### Integration

The Single Motor Module communicates with the Control Unit via DRIVE-CLiQ.

3



Connection example of Single Motor Module in chassis format

#### Technical specifications

Single Motor Module in chassis format 6SL3320-1T...	
<b>DC link voltage</b> (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line supply voltage 380 ... 480 V 3 AC) or 675 ... 1035 V DC (line supply voltage 500 ... 690 V 3 AC)
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 300 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Type of cooling</b>	Internal air cooling, power units with forced air cooling using a built-in fan
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 2000 m (6562 ft) above sea level without derating, > 2000 ... 4000 m (6562 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus (510 ... 720 V DC Motor Modules only)
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. <a href="#">For further information see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating. ([current controller clock cycle 250 µs](#); [pulse frequency 4 kHz](#), [see characteristic curves for current derating](#)).  
For further information, see chapter System description – Dimensioning.

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in chassis format

#### Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Single Motor Module in chassis format				
		6SL3320-1TE32-1AA3	6SL3320-1TE32-6AA3	6SL3320-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3
<b>Output current</b>						
• Rated current $I_{rated}$	A	210	260	310	380	490
• Base-load current $I_L$	A	205	250	302	370	477
• Base-load current $I_H$	A	178	233	277	340	438
• For S6 duty (40 %) $I_{S6}$	A	230	285	340	430	540
• $I_{max}$	A	307	375	453	555	715
<b>Type rating <sup>1)</sup></b>						
• Based on $I_{rated}$	kW (HP)	110 (150)	132 (200)	160 (250)	200 (300)	250 (400)
• Based on $I_H$	kW (HP)	90 (125)	110 (150)	132 (200)	160 (250)	200 (350)
<b>Rated pulse frequency</b>	kHz	2	2	2	2	2
<b>Rated DC link current <math>I_d</math> <sup>2)</sup></b> when supplied via						
• Basic/Smart Line Module	A	252	312	372	456	588
• Active Line Module	A	227	281	335	411	529
<b>DC link capacitance</b>	μF	4200	5200	6300	7800	9600
<b>Current requirement</b>						
• At 24 V DC, max.	A	0.8	0.8	0.9	0.9	0.9
• Fan supply with 400 V 2 AC, 50/60 Hz, max.	A	0.63/0.95	1.13/1.7	1.8/2.7	1.8/2.7	1.8/2.7
<b>Power loss, max.</b>	kW	1.94	2.6	3.1	3.8	4.5
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.17 (6.00)	0.23 (8.12)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz	dB	64/67	64/67	69/73	69/73	69/73
<b>DC link connection</b> DCP, DCN		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Motor connection</b> U2, V2, W2		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>PE connection</b>		M10 screw	M10 screw	M10 screw	M10 screw	M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 240	2 × 240	2 × 240
<b>Motor brake connection</b>		–	–	–	–	–
<b>Motor cable length, max.</b> (without external options)						
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)
• Height	mm (in)	1400 (55.1)	1400 (55.1)	1533 (60.3)	1533 (60.3)	1533 (60.3)
• Depth	mm (in)	356 (14.0)	356 (14.0)	545 (21.5)	545 (21.5)	545 (21.5)
<b>Frame size</b>		FX	FX	GX	GX	GX
<b>Weight, approx.</b>	kg (lb)	95 (210)	95 (210)	136 (300)	136 (300)	136 (300)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

#### Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Single Motor Module in chassis format		
		6SL3320-1TE36-1AA3	6SL3320-1TE37-5AA3	6SL3320-1TE38-4AA3
<b>Output current</b>				
• Rated current $I_{rated}$	A	605	745	840
• Base-load current $I_L$	A	590	725	820
• Base-load current $I_H$	A	460	570	700
• $I_{max}$	A	885	1087	1230
<b>Type rating</b> <sup>1)</sup>				
• Based on $I_{rated}$	kW (HP)	315 (500)	400 (600)	450 (700)
• Based on $I_H$	kW (HP)	250 (350)	315 (450)	400 (500)
<b>Rated pulse frequency</b>	kHz	1.25	1.25	1.25
<b>Rated DC link current <math>I_d</math></b> <sup>2)</sup> when supplied via				
• Basic/Smart Line Module	A	726	894	1008
• Active Line Module	A	653	805	907
<b>DC link capacitance</b>	μF	12600	15600	16800
<b>Current requirement</b>				
• At 24 V DC, max.	A	1.0	1.0	1.0
• Fan supply with 400 V 2 AC, 50/60 Hz, max.	A	3.6/5.4	3.6/5.4	3.6/5.4
<b>Power loss, max.</b>	kW	6.3	7.3	7.8
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.78 (27.5)	0.78 (27.5)	0.78 (27.5)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz	dB	70/73	70/73	70/73
<b>DC link connection</b> DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
<b>Motor connection</b> U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240
<b>PE connection</b>		M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.				
- PE1/GND	mm <sup>2</sup>	1 × 240	1 × 240	1 × 240
- PE2/GND	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240
<b>Motor brake connection</b>		–	–	–
<b>Motor cable length, max.</b> (without external options)				
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	503 (19.8)	503 (19.8)	503 (19.8)
• Height	mm (in)	1475 (58.1)	1475 (58.1)	1475 (58.1)
• Depth	mm (in)	540 (21.3)	540 (21.3)	540 (21.3)
<b>Frame size</b>		HX	HX	HX
<b>Weight, approx.</b>	kg (lb)	290 (639)	290 (639)	290 (639)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in chassis format

#### Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Single Motor Module in chassis format		
		6SL3320-1TE41-0AA3	6SL3320-1TE41-2AA3	6SL3320-1TE41-4AA3
<b>Output current</b>				
• Rated current $I_{rated}$	A	985	1260	1405
• Base-load current $I_L$	A	960	1230	1370
• Base-load current $I_H$	A	860	1127	1257
• $I_{max}$	A	1440	1845	2055
<b>Type rating <sup>1)</sup></b>				
• Based on $I_{rated}$	kW (HP)	560 (800)	710 (1000)	800 (1150)
• Based on $I_H$	kW (HP)	450 (700)	560 (900)	710 (1000)
<b>Rated pulse frequency</b>				
	kHz	1.25	1.25	1.25
<b>Rated DC link current <math>I_d</math> <sup>2)</sup></b> when supplied via				
• Basic/Smart Line Module	A	1182	1512	1686
• Active Line Module	A	1064	1361	1517
<b>DC link capacitance</b>				
	μF	18900	26100	28800
<b>Current requirement</b>				
• At 24 V DC, max.	A	1.25	1.40	1.40
• Fan supply with 400 V 2 AC, 50/60 Hz, max.	A	5.4/8.1	5.4/8.1	5.4/8.1
<b>Power loss, max.</b>				
	kW	10.2	12	13
<b>Cooling air requirement</b>				
	m <sup>3</sup> /s (ft <sup>3</sup> /s)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz				
	dB	71/73	71/73	71/73
<b>DC link connection</b> DCP, DCN				
		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
<b>Motor connection</b> U2, V2, W2				
• Conductor cross-section, max.	mm <sup>2</sup>	6 × 240	6 × 240	6 × 240
<b>PE connection</b>				
• Conductor cross-section, max.		M12 screw	M12 screw	M12 screw
- PE1/GND	mm <sup>2</sup>	1 × 240	1 × 240	1 × 240
- PE2/GND	mm <sup>2</sup>	3 × 240	3 × 240	3 × 240
<b>Motor brake connection</b>				
		–	–	–
<b>Motor cable length, max.</b> (without external options)				
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>				
		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	704 (27.7)	704 (27.7)	704 (27.7)
• Height	mm (in)	1475 (58.1)	1475 (58.1)	1475 (58.1)
• Depth	mm (in)	540 (21.3)	540 (21.3)	540 (21.3)
<b>Frame size</b>				
		JX	JX	JX
<b>Weight, approx.</b>				
	kg (lb)	450 (992)	450 (992)	450 (992)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

#### Technical specifications (continued)

DC link voltage 675 ... 1035 V DC		Single Motor Module in chassis format				
		6SL3320-1TG28-5AA3	6SL3320-1TG31-0AA3	6SL3320-1TG31-2AA3	6SL3320-1TG31-5AA3	
<b>Output current</b>						
• Rated current $I_{rated}$	A	85	100	120	150	
• Base-load current $I_L$	A	80	95	115	142	
• Base-load current $I_H$	A	76	89	107	134	
• $I_{max}$	A	120	142	172	213	
<b>Type rating <sup>1)</sup></b>						
• Based on $I_{rated}$	kW	75	90	110	132	
• Based on $I_H$	kW	55	75	90	110	
<b>Rated pulse frequency</b>		kHz	1.25	1.25	1.25	1.25
<b>Rated DC link current <math>I_d</math> <sup>2)</sup></b> when supplied via						
• Basic/Smart Line Module	A	102	120	144	180	
• Active Line Module	A	92	108	130	162	
<b>DC link capacitance</b>		μF	1200	1200	1600	2800
<b>Current requirement</b>						
• At 24 V DC, max.	A	0.8	0.8	0.8	0.8	
• Fan supply with 690 V 2 AC, 50/60 Hz, max.	A	0.4/0.6	0.4/0.6	0.4/0.6	0.4/0.6	
<b>Power loss, max.</b>		kW	1.17	1.43	1.89	1.80
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.17 (6.00)	0.17 (6.00)	0.17 (6.00)	0.17 (6.00)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz		dB	64/67	64/67	64/67	64/67
<b>DC link connection</b> DCP, DCN			Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	
<b>Motor connection</b> U2, V2, W2			Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	
<b>PE connection</b>			M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.						
- PE1/GND	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	
- PE2/GND	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	
<b>Motor brake connection</b>			–	–	–	–
<b>Motor cable length, max.</b> (without external options)						
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)	
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)	
• Height	mm (in)	1400 (55.1)	1400 (55.1)	1400 (55.1)	1400 (55.1)	
• Depth	mm (in)	356 (14.0)	356 (14.0)	356 (14.0)	356 (14.0)	
<b>Frame size</b>			FX	FX	FX	FX
<b>Weight, approx.</b>		kg (lb)	95 (209)	95 (209)	95 (209)	95 (209)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in chassis format

#### Technical specifications (continued)

DC link voltage 675 ... 1035 V DC		Single Motor Module in chassis format				
		6SL3320-1TG31-8AA3	6SL3320-1TG32-2AA3	6SL3320-1TG32-6AA3	6SL3320-1TG33-3AA3	
<b>Output current</b>						
• Rated current $I_{rated}$	A	175	215	260	330	
• Base-load current $I_L$	A	170	208	250	320	
• Base-load current $I_H$	A	157	192	233	280	
• $I_{max}$	A	255	312	375	480	
<b>Type rating <sup>1)</sup></b>						
• Based on $I_{rated}$	kW	160	200	250	315	
• Based on $I_H$	kW	132	160	200	250	
<b>Rated pulse frequency</b>		kHz	1.25	1.25	1.25	1.25
<b>Rated DC link current <math>I_d</math> <sup>2)</sup></b> when supplied via						
• Basic/Smart Line Module	A	210	258	312	396	
• Active Line Module	A	189	232	281	356	
<b>DC link capacitance</b>		μF	2800	2800	3900	4200
<b>Current requirement</b>						
• At 24 V DC, max.	A	0.9	0.9	0.9	0.9	
• Fan supply with 690 V 2 AC, 50/60 Hz, max.	A	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	
<b>Power loss, max.</b>		kW	2.67	3.09	3.62	4.34
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz		dB	69/73	69/73	69/73	69/73
<b>DC link connection</b> DCP, DCN			Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	
<b>Motor connection</b> U2, V2, W2			Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section, max.	mm <sup>2</sup>	2 × 185	2 × 185	2 × 185	2 × 185	
<b>PE connection</b>			M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.						
- PE1/GND	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240	
- PE2/GND	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	2 × 240	
<b>Motor brake connection</b>			–	–	–	–
<b>Motor cable length, max.</b> (without external options)						
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)	
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	326 (12.8)	326 (12.8)	326 (12.8)	326 (12.8)	
• Height	mm (in)	1533 (60.3)	1533 (60.3)	1533 (60.3)	1533 (60.3)	
• Depth	mm (in)	545 (21.5)	545 (21.5)	545 (21.5)	545 (21.5)	
<b>Frame size</b>			GX	GX	GX	GX
<b>Weight, approx.</b>		kg (lb)	136 (300)	136 (300)	136 (300)	136 (300)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.



#### Technical specifications (continued)

DC link voltage 675 ... 1035 V DC		Single Motor Module in chassis format			
		6SL3320-1TG34-1AA3	6SL3320-1TG34-7AA3	6SL3320-1TG35-8AA3	6SL3320-1TG37-4AA3
<b>Output current</b>					
• Rated current $I_{rated}$	A	410	465	575	735
• Base-load current $I_L$	A	400	452	560	710
• Base-load current $I_H$	A	367	416	514	675
• $I_{max}$	A	600	678	840	1065
<b>Type rating</b> <sup>1)</sup>					
• Based on $I_{rated}$	kW	400	450	560	710
• Based on $I_H$	kW	315	400	450	630
<b>Rated pulse frequency</b>		kHz	1.25	1.25	1.25
<b>Rated DC link current <math>I_d</math></b> <sup>2)</sup> when supplied via					
• Basic/Smart Line Module	A	492	558	690	882
• Active Line Module	A	443	502	621	794
<b>DC link capacitance</b>		μF	7400	7400	7400
<b>Current requirement</b>					
• At 24 V DC, max.	A	1.0	1.0	1.0	1.25
• Fan supply with 690 V 2 AC, 50/60 Hz, max.	A	2.1/3.1	2.1/3.1	2.1/3.1	3.1/4.6
<b>Power loss, max.</b>		kW	6.13	6.80	10.3
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.78	0.78	0.78
<b>Sound pressure level</b> $L_{pA}$ (1 m) at 50/60 Hz		dB	70/73	70/73	70/73
<b>DC link connection</b> DCP, DCN			Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
<b>Motor connection</b> U2, V2, W2			Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	4 × 240	4 × 240	4 × 240	6 × 240
<b>PE connection</b>			M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm <sup>2</sup>	1 × 240	1 × 240	1 × 240	1 × 240
- PE2/GND	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240	3 × 240
<b>Motor brake connection</b>			–	–	–
<b>Motor cable length, max.</b> (without external options)					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>			IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm (in)	503 (19.8)	503 (19.8)	503 (19.8)	704 (27.7)
• Height	mm (in)	1475 (58.1)	1475 (58.1)	1475 (58.1)	1475 (58.1)
• Depth	mm (in)	540 (21.3)	540 (21.3)	540 (21.3)	540 (21.3)
<b>Frame size</b>			HX	HX	JX
<b>Weight, approx.</b>		kg (lb)	290 (639)	290 (639)	290 (639)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in chassis format

#### Technical specifications (continued)

DC link voltage 675 ... 1035 V DC		Single Motor Module in chassis format			
		6SL3320-1TG38-1AA3	6SL3320-1TG38-8AA3	6SL3320-1TG41-0AA3	6SL3320-1TG41-3AA3
<b>Output current</b>					
• Rated current $I_{rated}$	A	810	910	1025	1270
• Base-load current $I_L$	A	790	880	1000	1230
• Base-load current $I_H$	A	724	814	917	1136
• $I_{max}$	A	1185	1320	1500	1845
<b>Type rating <sup>1)</sup></b>					
• Based on $I_{rated}$	kW	800	900	1000	1200
• Based on $I_H$	kW	710	800	900	1000
<b>Rated pulse frequency</b>	kHz	1.25	1.25	1.25	1.25
<b>Rated DC link current <math>I_d</math> <sup>2)</sup></b> when supplied via					
• Basic/Smart Line Module	A	972	1092	1230	1524
• Active Line Module	A	875	983	1107	1372
<b>DC link capacitance</b>	μF	11100	14400	14400	19200
<b>Current requirement</b>					
• At 24 V DC, max.	A	1.25	1.4	1.4	1.4
• Fan supply with 690 V 2 AC, 50/60 Hz, max.	A	3.1/4.6	3.1/4.6	3.1/4.6	3.1/4.6
<b>Power loss, max.</b>	kW	11.5	11.7	13.2	16.0
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)	1.08 (38.1)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b> at 50/60 Hz	dB	71/73	71/73	71/73	71/73
<b>DC link connection</b> DCP, DCN		Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection	Flat connector for busbar connection
<b>Motor connection</b> U2, V2, W2		Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw	Flat connector for M12 screw
• Conductor cross-section, max.	mm <sup>2</sup>	6 × 240	6 × 240	6 × 240	6 × 240
<b>PE connection</b>		M12 screw	M12 screw	M12 screw	M12 screw
• Conductor cross-section, max.					
- PE1/GND	mm <sup>2</sup>	1 × 240	1 × 240	1 × 240	1 × 240
- PE2/GND	mm <sup>2</sup>	3 × 240	3 × 240	3 × 240	3 × 240
<b>Motor brake connection</b>		-	-	-	-
<b>Motor cable length, max.</b> (without external options)					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm (in)	704 (27.7)	704 (27.7)	704 (27.7)	704 (27.7)
• Height	mm (in)	1475 (58.1)	1475 (58.1)	1475 (58.1)	1475 (58.1)
• Depth	mm (in)	540 (21.3)	540 (21.3)	540 (21.3)	540 (21.3)
<b>Frame size</b>		JX	JX	JX	JX
<b>Weight, approx.</b>	kg (lb)	450 (992)	450 (992)	450 (992)	450 (992)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 690 V 3 AC.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

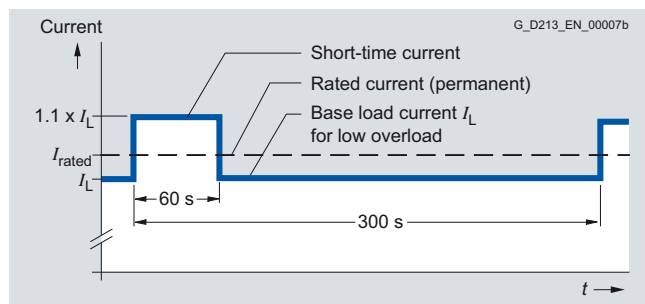
For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

#### Characteristic curves

##### Overload capability

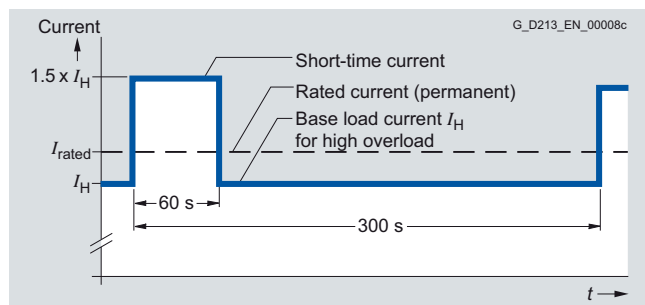
###### Load cycle data for Single Motor Modules in chassis format

The base-load current  $I_L$  is based on a load cycle of 110 % for 60 s with a load cycle period of 300 s.

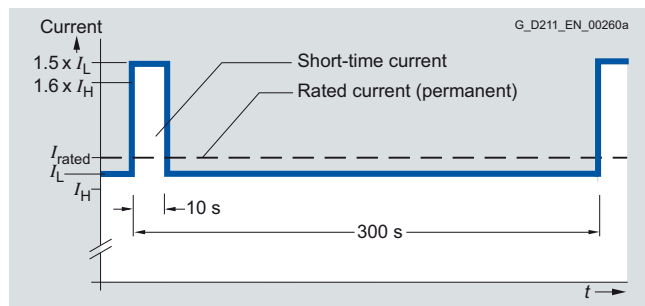


Low overload

The base-load current  $I_H$  is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.



High overload with 60 s peak load



High overload with 10 s peak load

##### Derating factors

When the pulse frequency is increased, the derating factor of the output current must be taken into account.

This derating factor must be applied to the currents specified in the technical data.

##### Derating factor of the output current dependent on pulse frequency for devices with a rated pulse frequency of 2 kHz

Single Motor Module in chassis format	Type rating	Output current	Derating factor		
Type			for a pulse frequency of 2 kHz	for a pulse frequency of 2.5 kHz	for a pulse frequency of 4 kHz
6SL3320-...	kW (HP)	A			
<b>DC link voltage 510 ... 720 V DC</b>					
1TE32-1AA3	110 (150)	210	<b>0.95</b>	<b>0.82</b>	
1TE32-6AA3	132 (200)	260	<b>0.95</b>	<b>0.83</b>	
1TE33-1AA3	160 (250)	310	<b>0.97</b>	<b>0.88</b>	
1TE33-8AA3	200 (300)	380	<b>0.96</b>	<b>0.87</b>	
1TE35-0AA3	250 (400)	490	<b>0.94</b>	<b>0.78</b>	

##### Derating factor of the output current dependent on pulse frequency for devices with a rated pulse frequency of 1.25 kHz

Single Motor Module in chassis format	Type rating	Output current	Derating factor	
Type			for a pulse frequency of 1.25 kHz	for a pulse frequency of 2.5 kHz
6SL3320-...	kW (HP)	A		
<b>DC link voltage 510 ... 720 V DC</b>				
1TE36-1AA3	315 (500)	605	<b>0.72</b>	
1TE37-5AA3	400 (600)	745	<b>0.72</b>	
1TE38-4AA3	450 (700)	840	<b>0.79</b>	
1TE41-0AA3	560 (800)	985	<b>0.87</b>	
1TE41-2AA3	710 (1000)	1260	<b>0.87</b>	
1TE41-4AA3	800 (1150)	1405	<b>0.95</b>	
<b>DC link voltage 675 ... 1035 V DC</b>				
1TG28-5AA3	75	85	<b>0.89</b>	
1TG31-0AA3	90	100	<b>0.88</b>	
1TG31-2AA3	110	120	<b>0.88</b>	
1TG31-5AA3	132	150	<b>0.84</b>	
1TG31-8AA3	160	175	<b>0.87</b>	
1TG32-2AA3	200	215	<b>0.87</b>	
1TG32-6AA3	250	260	<b>0.88</b>	
1TG33-3AA3	315	330	<b>0.82</b>	
1TG34-1AA3	400	410	<b>0.82</b>	
1TG34-7AA3	450	465	<b>0.87</b>	
1TG35-8AA3	560	575	<b>0.85</b>	
1TG37-4AA3	710	735	<b>0.79</b>	
1TG38-1AA3	800	810	<b>0.95</b>	
1TG38-8AA3	900	910	<b>0.87</b>	
1TG41-0AA3	1000	1025	<b>0.86</b>	
1TG41-3AA3	1200	1270	<b>0.79</b>	

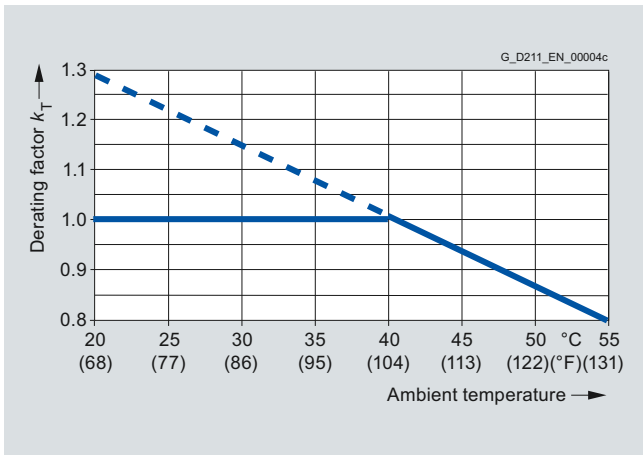
# SINAMICS S120 drive system

## Motor Modules

### Single Motor Modules in chassis format

3

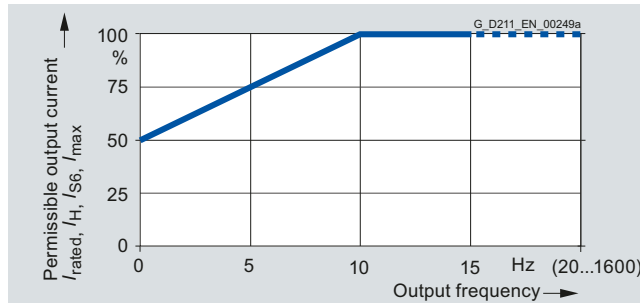
#### Characteristic curves (continued)



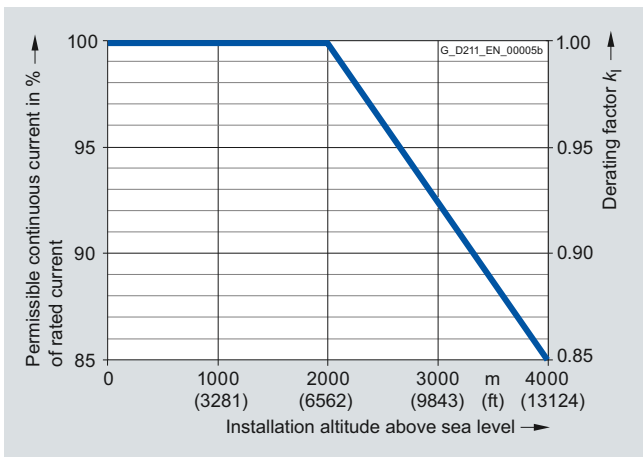
Current derating dependent on ambient temperature

Note: A derating factor  $k_T > 1.0$  is to be taken into account only in conjunction with "current derating dependent on installation altitude".

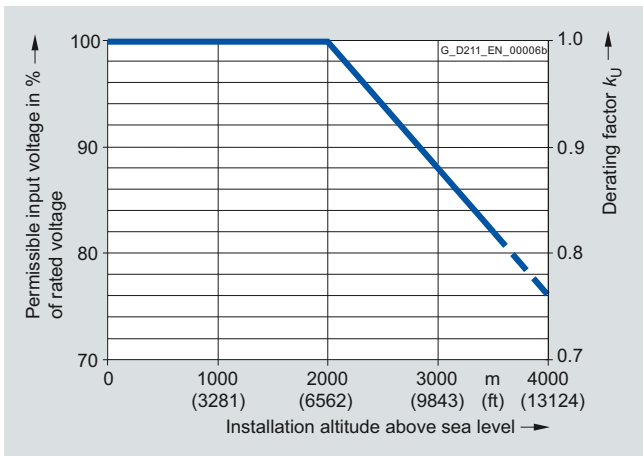
See also chapter [System description – Dimensioning](#).



Current derating dependent on output frequency



Current derating dependent on installation altitude



Voltage derating dependent on installation altitude

# SINAMICS S120 drive system

## Motor Modules

**Double Motor Modules  
in booksize compact format**

### Design



Double Motor Module in booksize compact format

The Double Motor Modules in booksize compact format feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 4 DRIVE-CLiQ sockets
- 2 motor connections via connector
- 2 safe standstill inputs (1 input per axis)
- 2 safe motor brake controls
- 2 temperature sensor inputs (KTY84-130 or PTC)
- 3 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

The shield of the motor cables is routed over the connectors to the motor connection.

The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable for connecting to the adjacent Motor Module, length 0.16 m (6.3 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connectors X21 and X22
- Connectors X1 and X2 for motor connection
- 1 set of warning signs in 30 languages
- Heat-conducting foil

### Selection and ordering data

Rated output current	Type rating	Double Motor Module in booksize compact format (Internal air cooling)
A	kW (HP) <sup>1)</sup>	Order No.
<b>DC link voltage 510 ... 720 V DC</b>		
2 × 1.7	2 × 0.9 kW (2 × 0.75 HP)	<b>6SL3420-2TE11-7AA1</b>
2 × 3	2 × 1.6 kW (2 × 1.5 HP)	<b>6SL3420-2TE13-0AA1</b>
2 × 5	2 × 2.7 kW (2 × 3 HP)	<b>6SL3420-2TE15-0AA1</b>

#### Accessories

<b>DC link rectifier adapter</b> For direct infeed of DC link voltage Screw-type terminals 0.5 ... 10 mm <sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	<b>6SL3162-2BD00-0AA0</b>
<b>DC link adapter</b> (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2BM01-0AA0</b>
<b>24 V terminal adapter</b> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2AA00-0AA0</b>
<b>Spacing bolt</b> (4 units) The mounting depth of modules in booksize compact format is increased when it is mounted on these spacing bolts by such an amount that it can be integrated into a drive line-up in booksize format. 2 spacing bolts are required to mount 50 mm (1.97 in) wide modules, and 4 spacing bolts for 75 mm (2.95 in) modules.	<b>6SL3462-1CC00-0AA0</b>

#### Accessories for re-ordering

<b>24 V jumper</b> For connection of the 24 V busbars (for booksize format)	<b>6SL3162-2AA01-0AA0</b>
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

<sup>1)</sup> Nominal HP ratings based on asynchronous (induction) motors. Match the motor nameplate current for specific sizing.

# SINAMICS S120 drive system

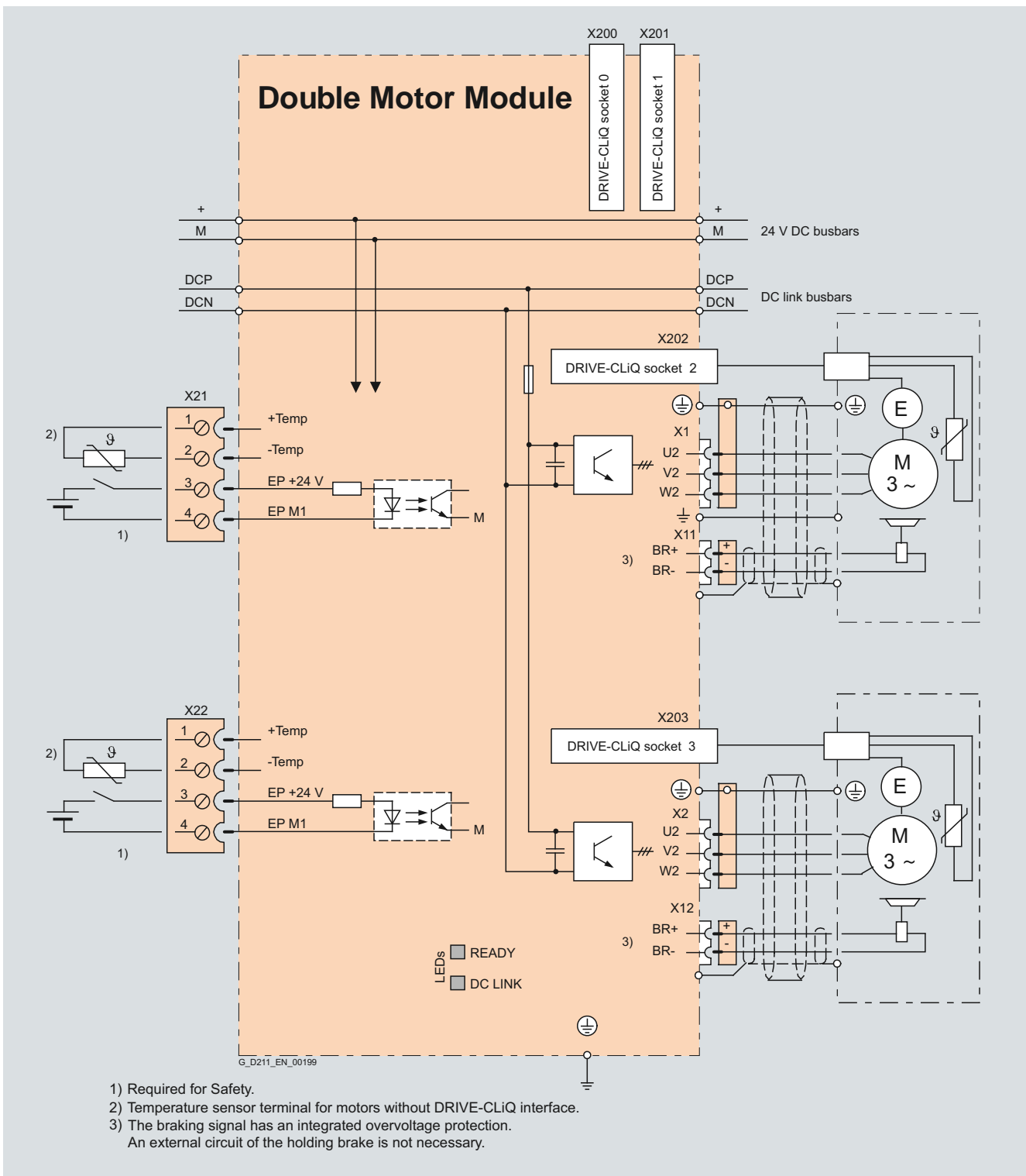
## Motor Modules

**Double Motor Modules  
in booksize compact format**

### Integration

The Double Motor Module communicates with the Control Unit via DRIVE-CLiQ.

3



Connection example of Double Motor Modules in booksize compact format 2 × 3 A to 2 × 18 A

#### Technical specifications

##### Double Motor Module in booksize compact format

6SL3420-2TE1...

<b>DC link voltage</b> (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line connection voltage 380 ... 480 V 3 AC)
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 600 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Type of cooling</b>	The devices are designed so that <ul style="list-style-type: none"> <li>- Internal air cooling (power units with forced air cooling through built-in fans) or</li> <li>- cold plate cooling is possible.</li> </ul>
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	UL-recognized
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. <a href="#">For further information see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating.  
[For further information see chapter System description – Dimensioning.](#)

# SINAMICS S120 drive system

## Motor Modules

Double Motor Modules  
in booksize compact format

### Technical specifications

DC link voltage 510 ... 720 V DC		Double Motor Module in booksize compact format		
Internal air cooling/ cold plate cooling		6SL3420-2TE11-7AA1	6SL3420-2TE13-0AA1	6SL3420-2TE15-0AA1
<b>Output current</b>				
• Rated current $I_{rated}$	A	2 × 1.7	2 × 3	2 × 5
• For S6 duty (40 %) $I_{S6}$	A	2 × 2	2 × 3.5	2 × 6
• Base-load current $I_H$	A	2 × 1.5	2 × 2.6	2 × 4.3
• $I_{max}$	A	2 × 5.1	2 × 9	2 × 15
<b>Type rating <sup>1)</sup></b>				
• Based on $I_{rated}$	kW (HP)	2 × 0.9 (0.75)	2 × 1.6 (1.5)	2 × 2.7 (3)
• Based on $I_H$	kW (HP)	2 × 0.8 (0.5)	2 × 1.4 (1)	2 × 2.3 (2.5)
<b>Rated pulse frequency</b>	kHz	8	8	8
<b>DC link current <math>I_d</math> <sup>2)</sup></b>	A	4.1	7.2	12
<b>Current carrying capacity</b>				
• DC link busbars	A	100	100	100
• 24 V DC busbars <sup>3)</sup>	A	20	20	20
<b>DC link capacitance</b>	μF	110	110	220
<b>Current requirement at 24 V DC, max.</b>	A	1	1	1
<b>Power loss <sup>4)</sup></b>				
• With internal air cooling in control cabinet	kW	0.11	0.13	0.19
• With cold plate cooling int./ext.	kW	0.04/0.07	0.04/0.09	0.06/0.135
• Thermal resistance $R_{th}$	K/W	0.22	0.22	0.22
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.008 (0.283)	0.008 (0.283)	0.008 (0.283)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	< 60	< 60	< 60
<b>Motor connection</b> U2, V2, W2				
		2 × connectors (X1, X2) with screw-type terminals	2 × connectors (X1, X2) with screw-type terminals	2 × connectors (X1, X2) with screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	0.2 ... 6	0.2 ... 6	0.2 ... 6
<b>Shield connection</b>		Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)
<b>PE connection</b>		M5 screw	M5 screw	M5 screw
<b>Motor brake connection</b>		Connector (X11, X12), 24 V DC, 2 A	Connector (X11, X12), 24 V DC, 2 A	Connector (X11, X12), 24 V DC, 2 A
<b>Motor cable length, max.</b>				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	75 (2.95)	75 (2.95)	75 (2.95)
• Height	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)
• Depth	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)
<b>Weight, approx.</b>	kg (lb)	3.4 (7.50)	3.4 (7.50)	3.4 (7.50)

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

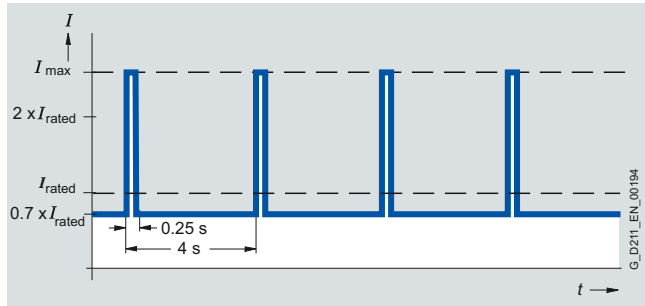
<sup>3)</sup> If, due to a number of Line Modules and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24 V DC connection using a 24 V terminal adapter is required (max. cross-section 6 mm<sup>2</sup>, max. fuse protection 20 A).

<sup>4)</sup> Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

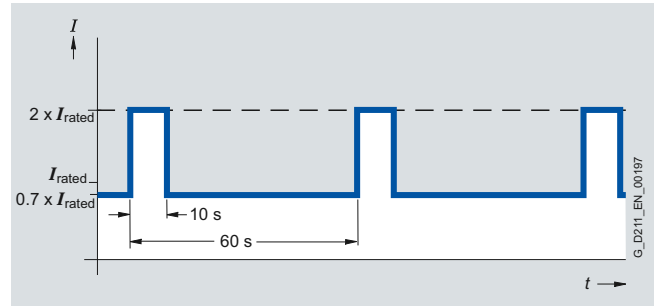


### Characteristic curves

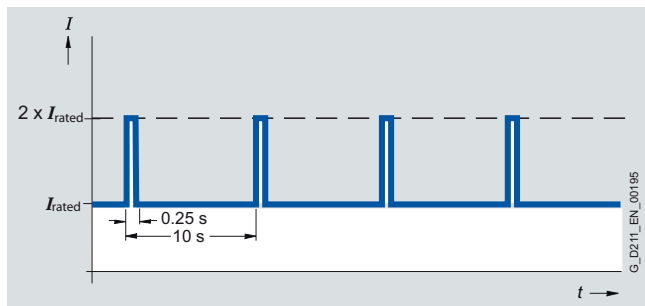
#### Overload capability



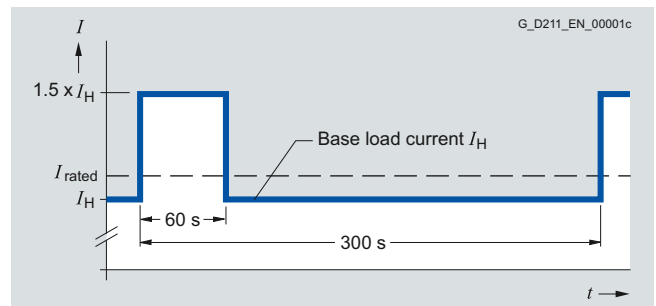
Maximum current duty cycle with previous load



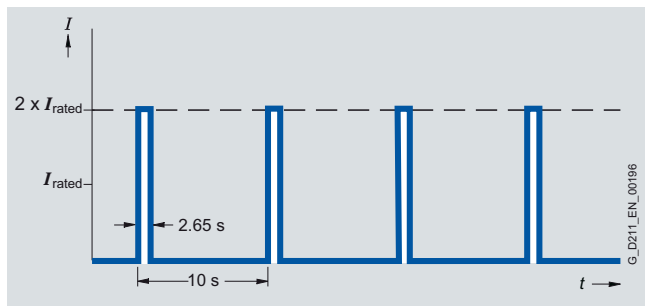
S6 load cycle with previous load with a load cycle period of 60 s



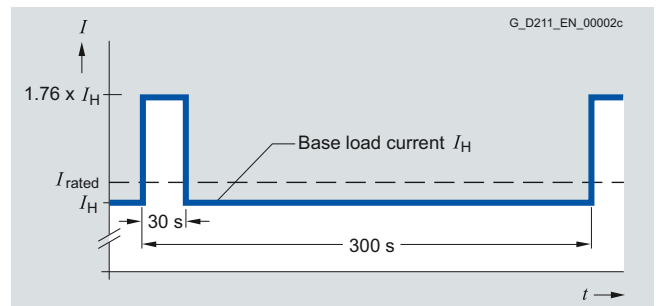
Load cycle with previous load



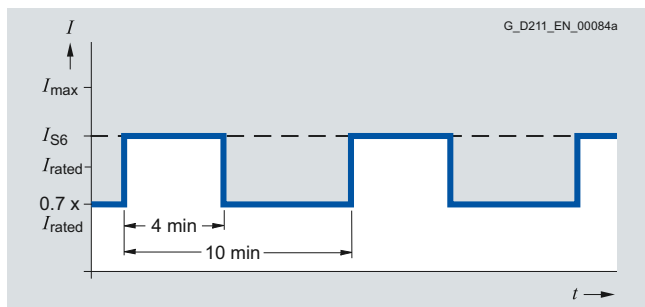
Load cycle with 60 s overload with a load cycle period of 300 s



Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



S6 load cycle with previous load with a load cycle period of 600 s

# SINAMICS S120 drive system

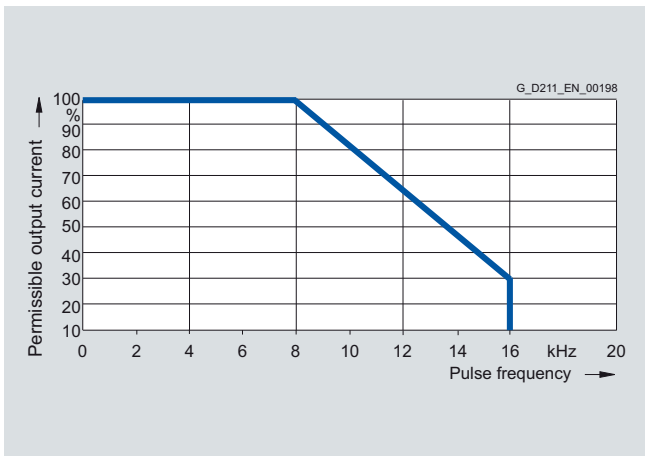
## Motor Modules

### Double Motor Modules in booksize compact format

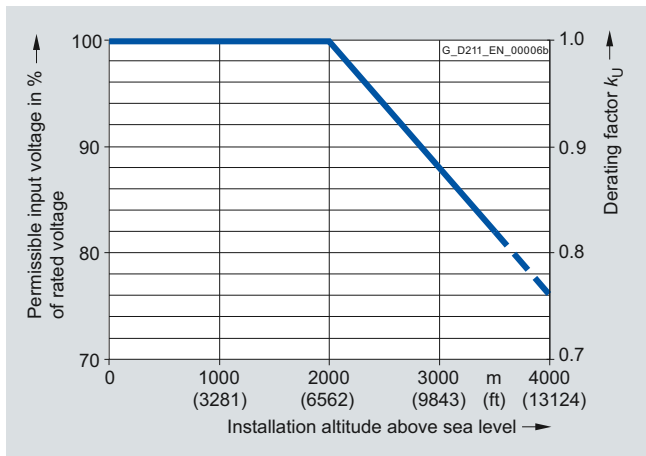
3

#### Characteristic curves (continued)

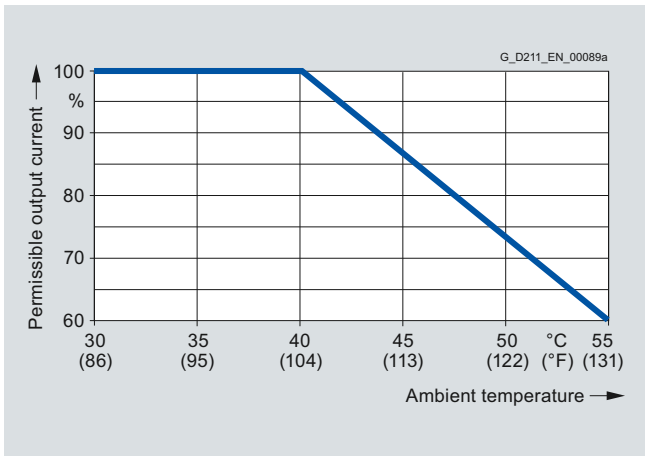
##### Derating characteristics



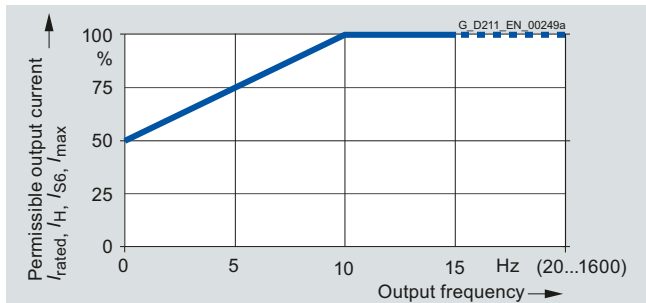
Output current dependent on pulse frequency



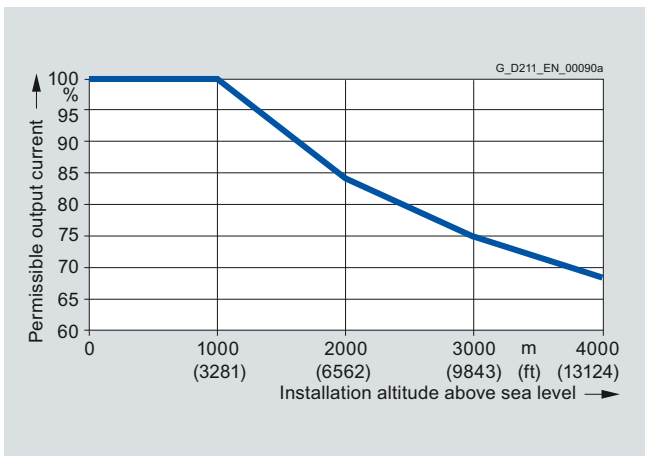
Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Current derating dependent on output frequency



Output current dependent on installation altitude

#### Design



Double Motor Module in booksize format

Double Motor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 4 DRIVE-CLiQ sockets
- 2 plug-in motor connections (not included in scope of supply)
- 2 safe standstill inputs (1 input per axis)
- 2 safe motor brake controls
- 2 temperature sensor inputs (KTY84-130 or PTC)
- 3 PE (protective earth) connections

The status of the Motor Modules is indicated via two multi-color LEDs.

On Double Motor Modules, the motor cable shield can be connected in the connector.

The signal cable shield can be connected to the Motor Module by means of a shield connection terminal, e.g. Weidmüller type KLBÜ 3-8 SC.

The scope of supply of the Motor Modules includes:

- DRIVE-CLiQ cable appropriate to the width of the Motor Module for connection to the adjacent Motor Module, length = width of Motor Module + 0.06 m (2.36 in)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets
- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- Connectors X21 and X22
- Device fans for cooling power units on modules with internal and external air cooling supplied from the internal voltage levels
- 1 set of warning signs in 30 languages
- 1 heat conducting foil (for Double Motor Modules with cold plate cooling only)

# SINAMICS S120 drive system

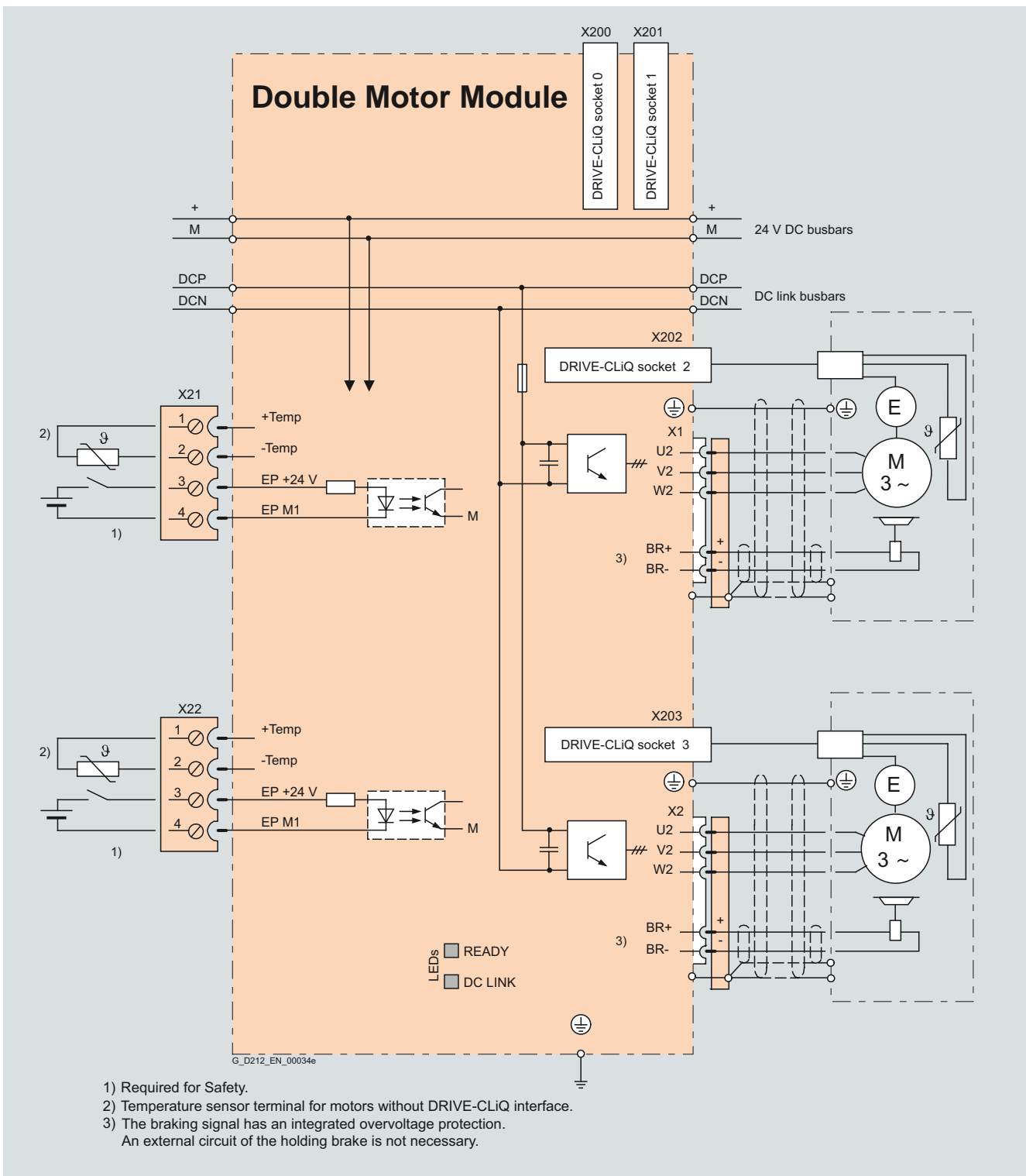
## Motor Modules

### Double Motor Modules in booksize format

#### Integration

The Double Motor Module communicates with the Control Unit via DRIVE-CLiQ.

3



Connection example of Double Motor Modules in booksize format 2 × 3 A to 2 × 18 A

#### Technical specifications

##### Double Motor Module in booksize format

6SL312...

<b>DC link voltage</b> (up to 2000 m (6562 ft) above sea level)	510 ... 720 V DC (line connection voltage 380 ... 480 V 3 AC)
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
• Control type Vector	0 ... 300 Hz <sup>1)</sup>
• Control type V/f	0 ... 600 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Type of cooling</b>	Internal air cooling, external air cooling, Power units with forced air cooling by built-in fans Cold plate cooling
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (Low Voltage and EMC Directives)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1. <a href="#">For further information see chapter Safety Integrated.</a>

<sup>1)</sup> Note the correlation between max. output frequency, pulse frequency and current derating.  
[For further information see chapter System description – Dimensioning.](#)

# SINAMICS S120 drive system

## Motor Modules

### Double Motor Modules in booksize format

#### Technical specifications (continued)

DC link voltage 510 ... 720 V DC		Double Motor Module in booksize format				
<b>Internal air cooling</b>	6SL3120-	2TE13-0AA3	2TE15-0AA3	2TE21-0AA3	2TE21-8AA3	
<b>External air cooling</b>	6SL3121-	2TE13-0AA3	2TE15-0AA3	2TE21-0AA3	2TE21-8AA3	
<b>Cold plate cooling</b>	6SL3126-	2TE13-0AA3	2TE15-0AA3	2TE21-0AA3	2TE21-8AA3	
<b>Output current</b>						
• Rated current $I_{rated}$	A	2 × 3	2 × 5	2 × 9	2 × 18	
• For S6 duty (40 %) $I_{S6}$	A	2 × 3.5	2 × 6	2 × 10	2 × 24	
• Base-load current $I_H$	A	2 × 2.6	2 × 4.3	2 × 7.7	2 × 15.3	
• $I_{max}$	A	2 × 6	2 × 10	2 × 18	2 × 36	
<b>Type rating <sup>1)</sup></b>						
• Based on $I_{rated}$	kW (HP)	2 × 1.6 (1.5)	2 × 2.7 (3)	2 × 4.8 (5)	2 × 9.7 (10)	
• Based on $I_H$	kW (HP)	2 × 1.4 (1)	2 × 2.3 (2.5)	2 × 4.1 (5)	2 × 8.2 (10)	
<b>DC link current <math>I_d</math> <sup>2)</sup></b>	A	7.2	12	22	43	
<b>Current carrying capacity</b>						
• DC link busbars	A	100	100	100	100	
• 24 V DC busbars <sup>3)</sup>	A	20	20	20	20	
<b>DC link capacitance</b>	μF	110	220	220	705	
<b>Current requirement at 24 V DC, max.</b>	A	1.0	1.0	1.0	1.0	
<b>Internal/external air cooling</b>						
• Power loss <sup>4)</sup>						
- Maximum losses with internal air cooling in control cabinet	kW	0.1	0.13	0.19	0.35	
- Typical losses with internal air cooling in control cabinet <sup>6)</sup>	kW	0.05	0.08	0.15	0.28	
- With external air cooling, int./ext. <sup>4)</sup>	kW	0.06/0.035	0.07/0.06	0.09/0.095	0.105/0.24	
• Cooling air requirement	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.008 (0.283)	0.008 (0.283)	0.008 (0.283)	0.016 (0.565)	
• Sound pressure level $L_{pA}$ (1 m)	dB	< 60	< 60	< 60	< 60	
<b>Cold plate cooling</b>						
• Power loss, int./ext. <sup>4)</sup>	kW	0.055/0.035	0.06/0.065	0.08/0.1	0.095/0.25	
• Thermal resistance $R_{th}$	K/W	0.185	0.185	0.185	0.075	
<b>Motor connection</b> U2, V2, W2		2 × connectors (X1, X2) <sup>5)</sup> , max. 30 A	2 × connectors (X1, X2) <sup>5)</sup> , max. 30 A	2 × connectors (X1, X2) <sup>5)</sup> , max. 30 A	2 × connectors (X1, X2) <sup>5)</sup> , max. 30 A	
<b>Shield connection</b>		Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	Integrated in connector (X1, X2)	
<b>PE connection</b>		M5 screw	M5 screw	M5 screw	M5 screw	
<b>Motor brake connection</b>		Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	Integrated into the plug-in motor connector (X1, X2), 24 V DC, 2 A	
<b>Motor cable length, max.</b>						
• Shielded/unshielded	m (ft)	50/75 (164/246)	50/75 (164/246)	50/75 (164/246)	70/100 (230/328)	
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	
<b>Dimensions</b>						
• Width	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	100 (3.94)	
• Height	mm (in)	380 (15.0)	380 (15.0)	380 (15.0)	380 (15.0)	
• Depth						
- With internal air cooling	mm (in)	270 (10.6)	270 (10.6)	270 (10.6)	270 (10.6)	
- With external air cooling, on/behind mounting surface	mm (in)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	226/66.5 (8.90/2.62)	
- With cold plate cooling	mm (in)	226 (8.90)	226 (8.90)	226 (8.90)	226 (8.90)	
<b>Weight, approx.</b>						
• With internal air cooling	kg (lb)	5.3 (12)	5.3 (12)	5.3 (12)	6.8 (15)	
• With external air cooling	kg (lb)	5.8 (13)	5.8 (13)	5.8 (13)	8.6 (19)	
• With cold plate cooling	kg (lb)	4.5 (10)	4.5 (10)	4.5 (10)	5.9 (13)	

<sup>1)</sup> Rated power of a standard asynchronous (induction) motor at 600 V DC link voltage.

<sup>2)</sup> Rated DC link current for dimensioning an external DC connection.

For DC link current calculation for dimensioning the Line Module, see chapter System description – Dimensioning.

<sup>3)</sup> If, due to a number of Line Modules and Motor Modules being mounted side-by-side, the current carrying capacity exceeds 20 A, an additional 24 V DC connection using a 24 V terminal adapter is required (max. cross-section 6 mm<sup>2</sup>, max. fuse protection 20 A).

<sup>4)</sup> Power loss of Motor Module at rated power including losses of 24 V DC electronics power supply.

<sup>5)</sup> Connector not included in scope of supply, see Accessories.

<sup>6)</sup> At max. motor cable length 30 m (98.4 ft), pulse frequency 4 kHz and DC link voltage 540 ... 600 V.

#### Selection and ordering data

Rated output current	Type rating	Double Motor Module in booksize format		
		Internal air cooling	External air cooling	Cold plate cooling
A	kW (HP) <sup>1)</sup>	Order No.	Order No.	Order No.
<b>DC link voltage 510 ... 720 V DC</b>				
2 × 3	2 × 1.6 (2 × 1.5)	<b>6SL3120-2TE13-0AA3</b>	<b>6SL3121-2TE13-0AA3</b>	<b>6SL3126-2TE13-0AA3</b>
2 × 5	2 × 2.7 (2 × 3)	<b>6SL3120-2TE15-0AA3</b>	<b>6SL3121-2TE15-0AA3</b>	<b>6SL3126-2TE15-0AA3</b>
2 × 9	2 × 4.8 (2 × 5)	<b>6SL3120-2TE21-0AA3</b>	<b>6SL3121-2TE21-0AA3</b>	<b>6SL3126-2TE21-0AA3</b>
2 × 18	2 × 9.7 (2 × 10)	<b>6SL3120-2TE21-8AA3</b>	<b>6SL3121-2TE21-8AA3</b>	<b>6SL3126-2TE21-8AA3</b>

Description	Order No.
<b>Accessories</b>	
<b>Power connector (X1/X2)</b> At Motor Module end, with screw-type terminals 1.5 ... 10 mm <sup>2</sup> , For Motor Modules with a rated output current of 3 ... 30 A	<b>6SL3162-2MA00-0AA0</b>
<b>DC link rectifier adapter</b> For direct infeed of DC link voltage Screw-type terminals 0.5 ... 10 mm <sup>2</sup> For Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)	<b>6SL3162-2BD00-0AA0</b>
<b>DC link adapter (2 units)</b> For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2BM01-0AA0</b>
<b>24 V terminal adapter</b> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2AA00-0AA0</b>
<b>DC link busbar kit (reinforced)</b> For replacement of DC link busbars for 5 modules in booksize format	<b>6SL3162-2DB00-0AA0</b> <b>6SL3162-2DD00-0AA0</b>
<ul style="list-style-type: none"> <li>• 50 mm (1.97 in) wide</li> <li>• 100 mm (3.94 in) wide</li> </ul>	

Description	Order No.
<b>Accessories for re-ordering</b>	
<b>24 V jumper</b> For connection of the 24 V busbars (for booksize format)	<b>6SL3162-2AA01-0AA0</b>
<b>Accessories pack</b> (plug-in terminals, DRIVE-CLiQ jumper (length = module width + 60 mm (2.36 in)), dust-proof blanking plugs) For DRIVE-CLiQ port	
<ul style="list-style-type: none"> <li>• For Motor Modules 50 mm (1.97 in) wide, int./ext. air cooling</li> <li>• For Motor Modules 100 mm (3.94 in) wide, int./ext. air cooling</li> </ul>	<b>6SL3162-8AB00-0AA0</b> <b>6SL3162-8BD00-0AA0</b>
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

<sup>1)</sup> Nominal HP ratings based on asynchronous (induction) motors. Match the motor nameplate current for specific sizing.

# SINAMICS S120 drive system

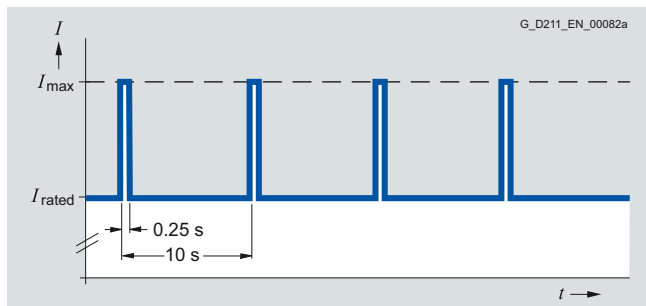
## Motor Modules

### Double Motor Modules in booksize format

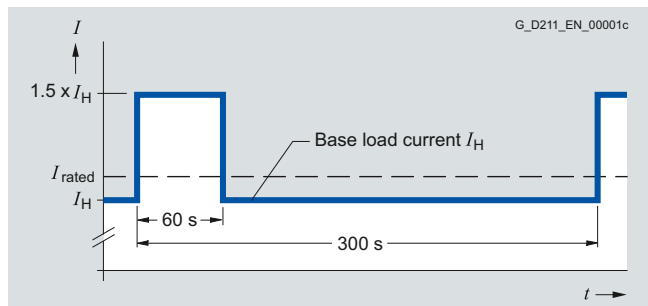
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#### Characteristic curves

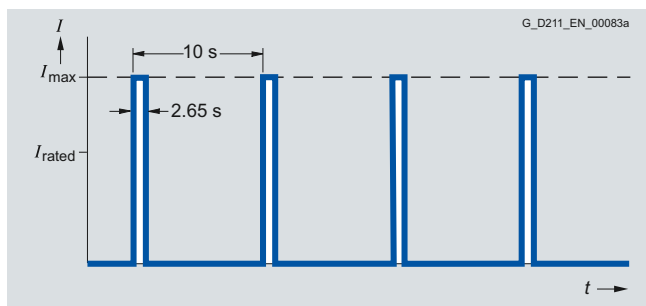
##### Overload capability



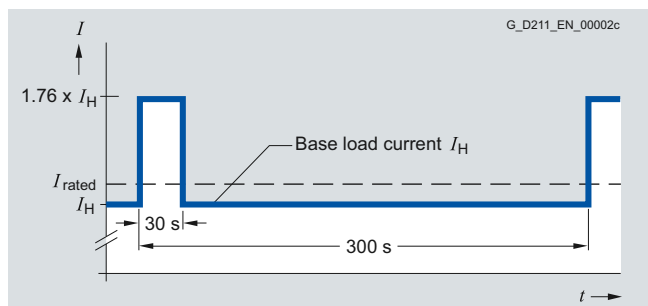
Load cycle with previous load



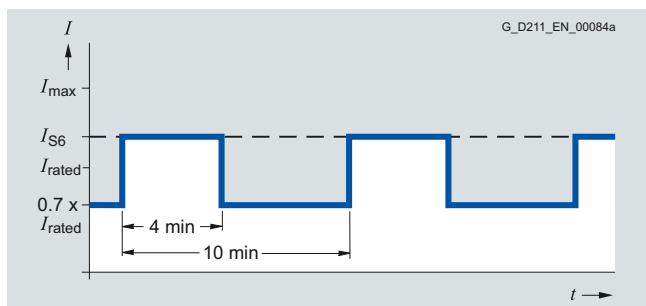
Load cycle with 60 s overload with a load cycle period of 300 s



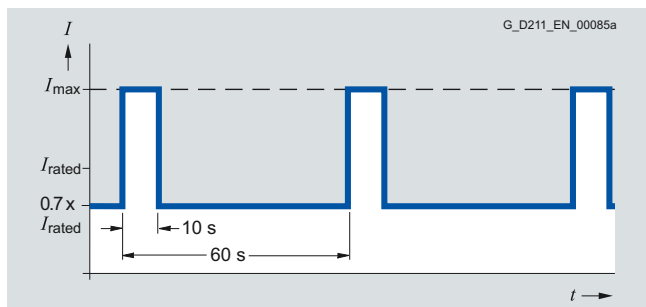
Load cycle without previous load



Load cycle with 30 s overload with a load cycle period of 300 s



S6 load cycle with previous load with a load cycle period of 600 s

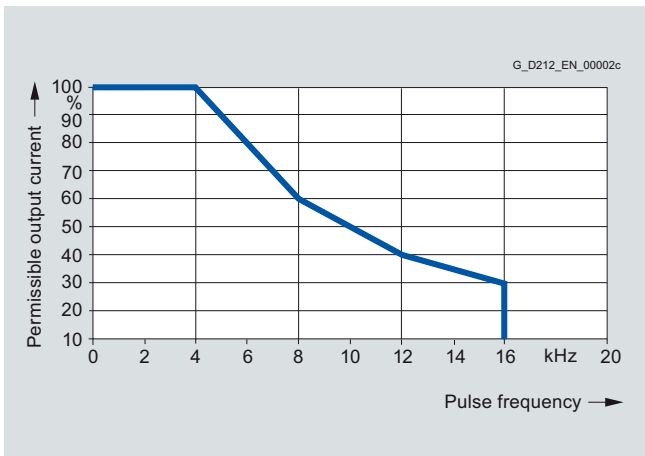


S6 load cycle with previous load with a load cycle period of 60 s

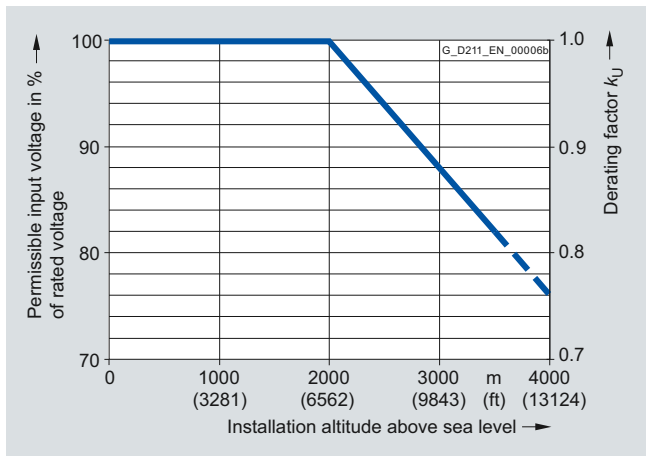


**Characteristic curves (continued)**

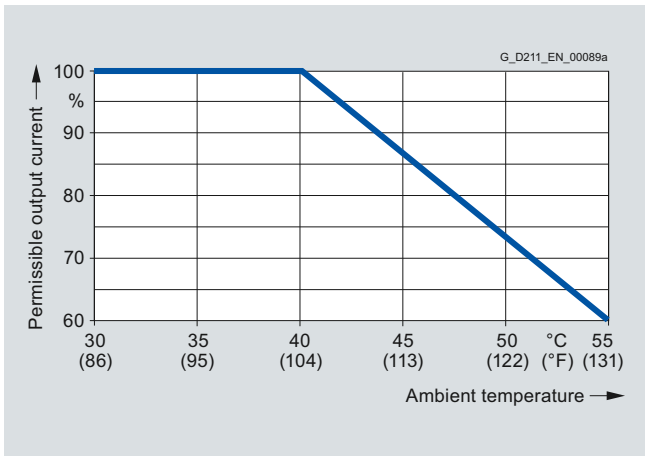
*Derating characteristics*



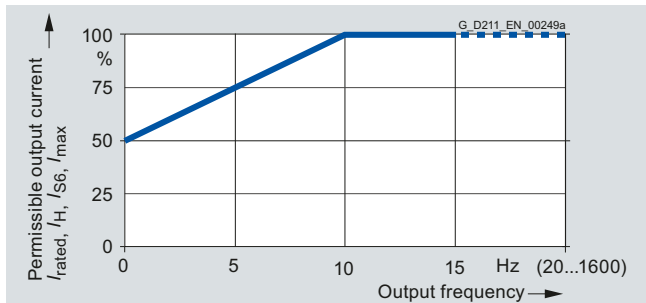
Output current dependent on pulse frequency



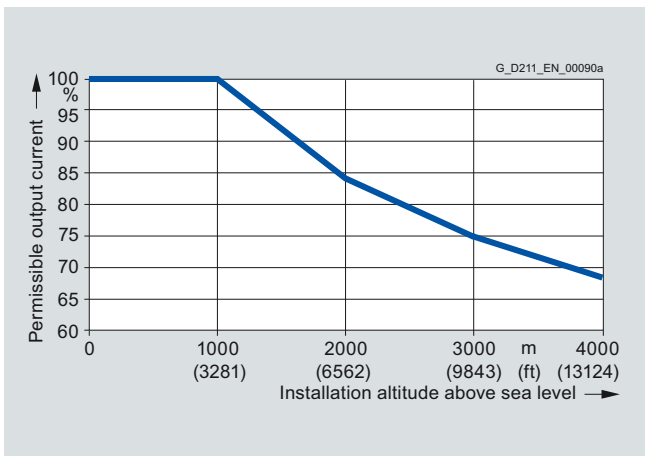
Voltage derating dependent on installation altitude



Output current dependent on ambient temperature



Current derating dependent on output frequency



Output current dependent on installation altitude

# SINAMICS S120 drive system

## DC link components

### Braking Module in booksize compact format

#### Overview



Braking Module in booksize compact format

A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP category 1) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link power is converted into heat loss in an external braking resistor. Braking Modules function autonomously. A number of Braking Modules in booksize compact format can be operated in parallel. In this case, each Braking Module must have its own braking resistor. Braking Modules in booksize compact format can also be used for rapid discharge of the DC link.

#### Design

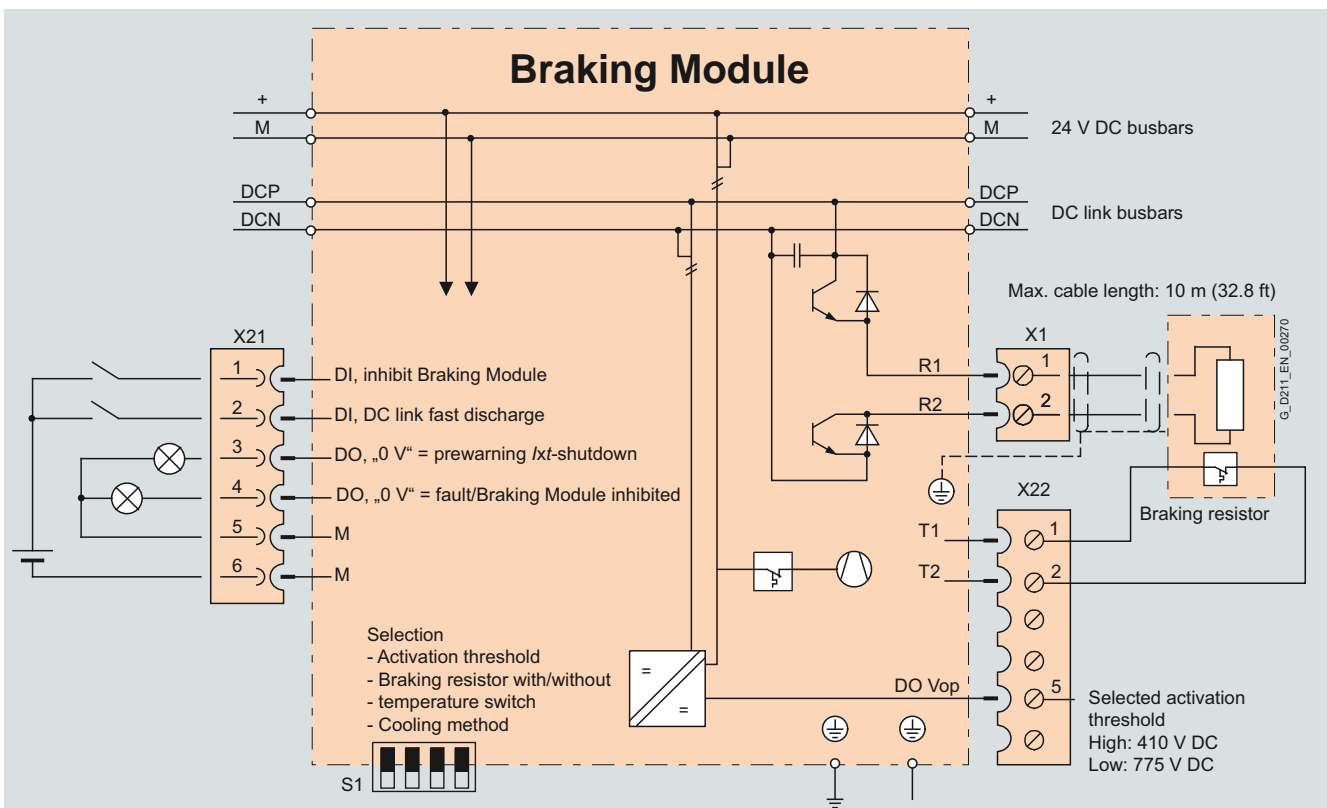
The Braking Modules in booksize compact format can be integrated in drive line-ups in booksize and booksize compact formats with internal air cooling and cold plate cooling.

The Braking Module in booksize compact format features the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- Connector X1 for connecting the braking resistor
- Connection for thermostatic switch for monitoring the braking resistor
- 4 DIP switches for setting the operating threshold, selecting the braking resistor and the cooling method for the Braking Module
- 2 digital inputs (disable Braking Module/acknowledge faults and rapid discharge of DC link)
- 3 digital outputs (Braking Module disabled, prewarning from  $I \times t$  monitor and set activation threshold)
- 2 PE (protective earth) connections

The status of the Braking Module is indicated via two 2-color LEDs.

#### Integration



Connection example of Braking Module in booksize compact format

# SINAMICS S120 drive system

## DC link components

### Braking Module in booksize compact format

#### Technical specifications

<b>DC link voltage</b> 510 ... 720 V DC	<b>Braking Module in booksize compact format</b> (Internal air cooling) 6SL3400-1AE31-0AA0
<b>Rated power <math>P_{DB}</math></b>	5 kW (2.5 kW) <sup>1) 2)</sup>
<b>Peak power <math>P_{max}</math></b>	100 kW (50 kW) <sup>1) 2)</sup>
<b>Activation threshold</b>	775 V (410 V) <sup>1)</sup>
<b>Cable length</b> to braking resistor, max.	10 m (32.8 ft)
<b>DC link capacitance</b>	6 $\mu$ F
<b>Current requirement</b> at 24 V DC, max.	0.5 A
<b>Digital inputs</b> in accordance with IEC 61131-2 Type 1	
• Voltage	-3 V ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 V ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b> (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Current carrying capacity</b>	
• 24 V DC busbars	20 A
• DC link busbars	100 A
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	270 mm (10.6 in)
• Depth	226 mm (8.90 in)
<b>Weight, approx.</b>	5 kg (11 lb)
<b>Approvals, according to</b>	cURus

#### Selection and ordering data

Description	Order No.
<b>DC link voltage 510 ... 720 V DC</b>	
<b>Braking Module in booksize compact format</b>	<b>6SL3400-1AE31-0AA0</b>
<b>Accessories</b>	
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>
<b>Spacing bolt</b> (4 units) The mounting depth of modules in booksize compact format is increased when it is mounted on these spacing bolts by such an amount that it can be integrated into a drive line-up in booksize format. 2 spacing bolts are needed to mount 50 mm (1.97 in) wide modules	<b>6SL3462-1CC00-0AA0</b>

<sup>1)</sup> The activation threshold of the Braking Module in booksize compact format can be set on a DIP switch. The higher values for peak or rated braking power apply in operation at the upper activation threshold 775 V DC (factory setting). The outputs specified in parentheses are possible at the lower activation threshold 410 V DC.

<sup>2)</sup> Several Braking Modules can be operated in parallel, typically up to 4 Modules.

# SINAMICS S120 drive system

## DC link components

### Braking Module in booksize format

#### Overview



Braking Module in booksize format

A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP category 1) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link power is converted into heat loss in an external braking resistor. Braking Modules function autonomously.

Braking Modules in booksize format can also be used for rapid discharge of the DC link.

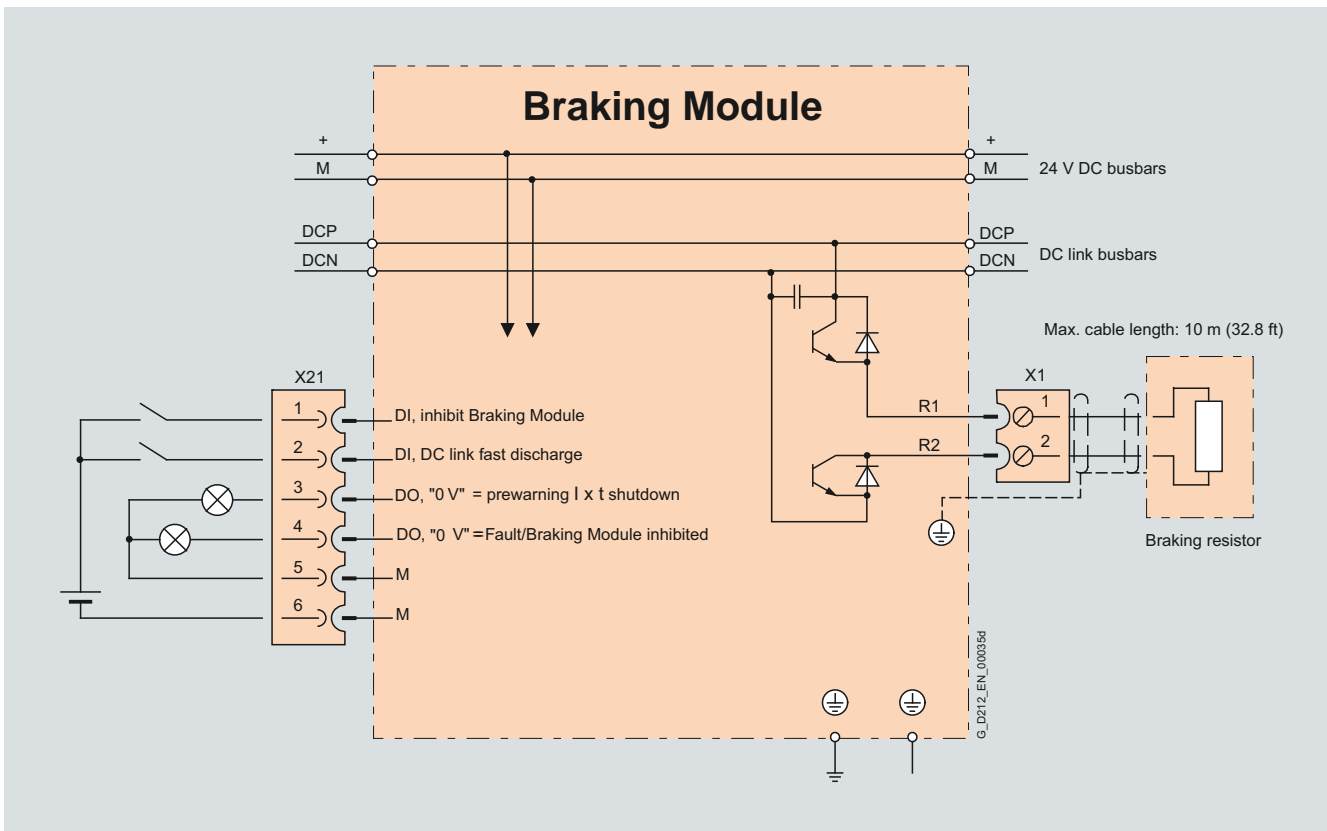
#### Design

The Braking Module in booksize format features the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- Terminals for connecting the braking resistor
- 2 digital inputs (disable Braking Module/acknowledge faults and rapid discharge of DC link)
- 2 digital outputs (Braking Module disabled and prewarning –  $I \times t$  monitoring)
- 2 PE (protective earth) connections

The status of the Braking Module is indicated via two 2-color LEDs.

#### Integration



Connection example of Braking Module in booksize format

# SINAMICS S120 drive system

## DC link components

### Braking Module in booksize format

#### Technical specifications

<b>DC link voltage</b> 510 ... 720 V DC	<b>Braking Module in booksize format</b> (Internal air cooling) 6SL3100-1AE31-0AB0
<b>Rated power</b> $P_{DB}$	1.5 kW <sup>1)</sup>
<b>Peak power</b> $P_{max}$	100 kW <sup>1)</sup>
<b>Activation threshold</b>	770 V
<b>Cable length</b> to braking resistor, max.	10 m (32.8 ft)
<b>DC link capacitance</b>	110 $\mu$ F
<b>Current requirement</b> at 24 V DC, max.	0.5 A
<b>Digital inputs</b> in accordance with IEC 61131-2 Type 1	
• Voltage	-3 V ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 V ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b> (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Current carrying capacity</b>	
• 24 V DC busbars	20 A
• DC link busbars	100 A
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	380 mm (15.0 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.6 in)
<b>Weight, approx.</b>	4.1 kg (9 lb)
<b>Approvals, according to</b>	cURus

#### Selection and ordering data

Description	Order No.
<b>DC link voltage 510 ... 720 V DC</b>	
<b>Braking Module in booksize format</b> 1.5 kW/100 kW	<b>6SL3100-1AE31-0AB0</b>
<b>Accessories</b>	
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>

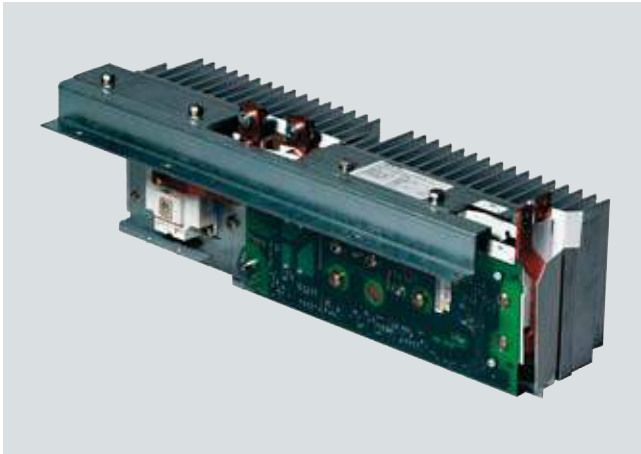
<sup>1)</sup> Several Braking Modules can be operated in parallel, typically up to 4 Modules.

# SINAMICS S120 drive system

## DC link components

### Braking Modules in chassis format

#### Overview



A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP) or limit the DC link voltage for brief periods of generator operation, e.g. when the regenerative feedback capability of the Line Module is deactivated. The Braking Module includes the power electronics and the associated control circuit. During operation,

the DC link power is converted into heat loss in an external braking resistor. Braking Modules function autonomously. A number of Braking Modules can be operated in parallel. In this case, each Braking Module must have its own braking resistor.

Braking Modules are designed to be built into Motor Modules, Line Modules or Power Modules in chassis format and are cooled by the fans on these modules. The supply voltage for the electronics is taken from the DC link. The Braking Modules are connected to the DC link by means of the busbar sets included in the scope of supply or flexible cables and, in the case of the Basic Line Module of frame size GB, by means of a separate molded cable set (see [Accessories](#)).

The activation threshold of the Braking Module can be adjusted by means of a DIP switch. The braking power values specified in the technical data apply to the upper activation threshold.

#### Design

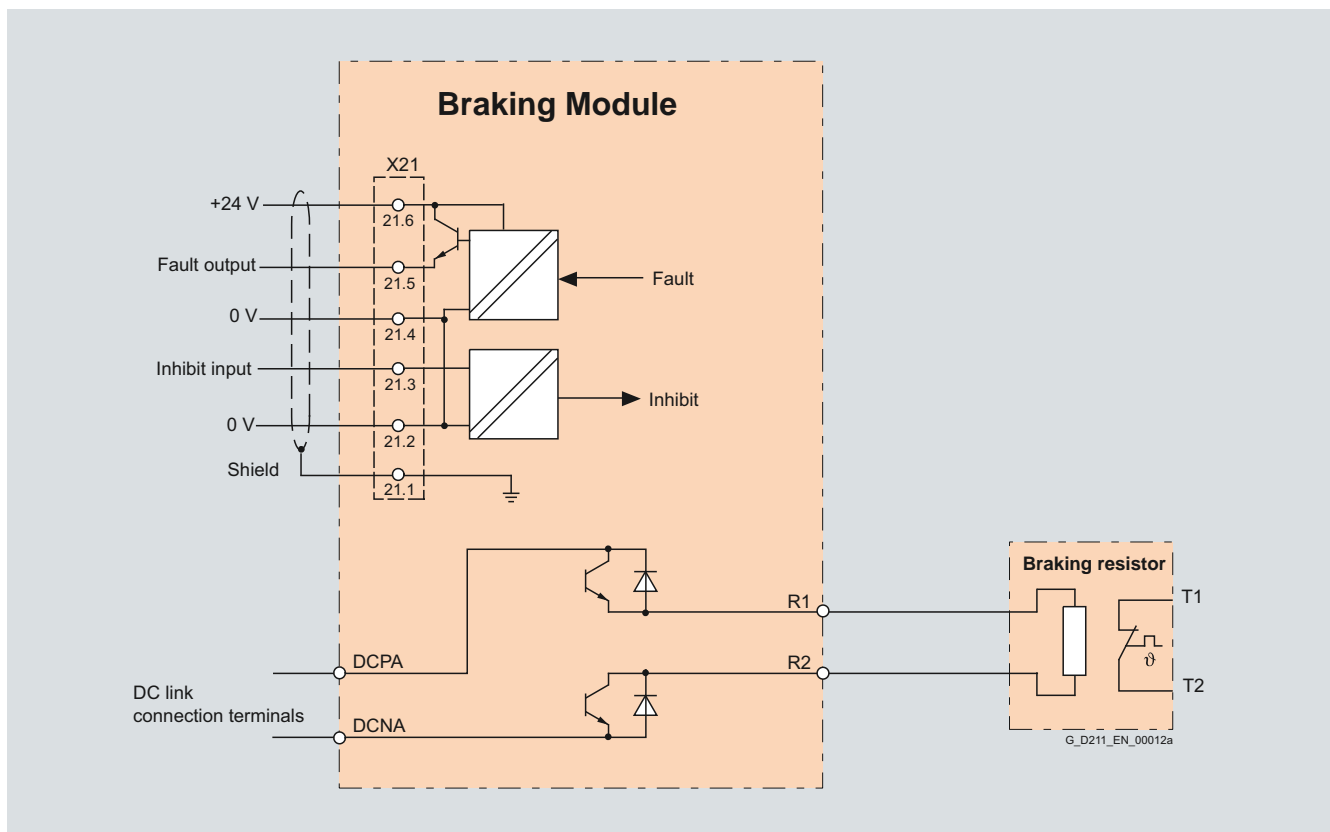
The Braking Modules in chassis format feature the following connections and interfaces as standard:

- 1 DC link connection
- 1 braking resistor connection
- 1 digital input (inhibit Braking Module/acknowledge fault)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the activation threshold

#### Integration

Braking Modules in chassis format are designed for mounting in air-cooled units in chassis format. The fan of the Line Module, Motor Module or Power Module in which the Braking Module is

mounted also cools the Braking Module. Braking Modules cannot operate autonomously because they are not equipped with cooling fans.



Connection example of chassis format Braking Module

#### Technical specifications

DC link voltage 510 ... 720 V DC		Braking Module in chassis format		
		6SL3300-1AE31-3AA0	6SL3300-1AE32-5AA0	6SL3300-1AE32-5BA0
<b>Power</b>				
• Rated power $P_{DB}$	kW	25	50	50
• Peak power $P_{15}$	kW	125	250	250
• Power $P_{20}$	kW	100	200	200
• Power $P_{40}$	kW	50	100	100
<b>Activation thresholds</b> (adjustable via DIP switch)	V	774 (factory setting) or 673	774 (factory setting) or 673	774 (factory setting) or 673
<b>Cable length</b> to braking resistor, max.	m (ft)	100 (328)	100 (328)	100 (328)
<b>Digital inputs</b> in accordance with IEC 61131-2 Type 1				
• Voltage	V	-3 ... +30	-3 ... +30	-3 ... +30
• Low level (an open digital input is interpreted as "low")	V	-3 ... +5	-3 ... +5	-3 ... +5
• High level	V	15 ... 30	15 ... 30	15 ... 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Digital outputs</b> (sustained short-circuit strength)				
• Voltage	V	DC 24	DC 24	DC 24
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Connection</b> R1/R2		M8 screw	M8 screw	M8 screw
• Conductor cross-section, max.	mm <sup>2</sup>	35	50	50
<b>Weight, approx.</b>	kg (lb)	3.6 (8)	7.3 (16)	7.5 (16.5)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for installation in an air-cooled Motor Module, Power Module or Line Module</b>	Frame size	FX/FB	GX/GB <sup>1)</sup>	HX/JX

<sup>1)</sup> Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

# SINAMICS S120 drive system

## DC link components

### Braking Modules in chassis format

#### Technical specifications (continued)

DC link voltage 675 ... 900 V DC		Braking Module in chassis format		
		6SL3300-1AF31-3AA0	6SL3300-1AF32-5AA0	6SL3300-1AF32-5BA0
<b>Power</b>				
• Rated power $P_{DB}$	kW	25	50	50
• Peak power $P_{15}$	kW	125	250	250
• Power $P_{20}$	kW	100	200	200
• Power $P_{40}$	kW	50	100	100
<b>Activation thresholds</b> (adjustable via DIP switch)	V	967 (factory setting) or 841	967 (factory setting) or 841	967 (factory setting) or 841
<b>Cable length</b> to braking resistor, max.	m (ft)	100 (328)	100 (328)	100 (328)
<b>Digital inputs</b> in accordance with IEC 61131-2 Type 1				
• Voltage	V	-3 ... +30	-3 ... +30	-3 ... +30
• Low level (an open digital input is interpreted as "low")	V	-3 ... +5	-3 ... +5	-3 ... +5
• High level	V	15 ... 30	15 ... 30	15 ... 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Digital outputs</b> (sustained short-circuit strength)				
• Voltage	V	DC 24	DC 24	DC 24
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Connection</b> R1/R2		M8 screw	M8 screw	M8 screw
• Conductor cross-section, max.	mm <sup>2</sup>	35	50	50
<b>Weight, approx.</b>	kg (lb)	3.6 (8)	7.3 (16)	7.5 (16.5)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for installation in an air-cooled Motor Module or Line Module</b>	Frame size	FX/FB	GX/GB <sup>1)</sup>	HX/JX

<sup>1)</sup> Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.



#### Technical specifications (continued)

DC link voltage 890 ... 1035 V DC	Braking Module in chassis format			
		6SL3300-1AH31-3AA0	6SL3300-1AH32-5AA0	6SL3300-1AH32-5BA0
<b>Power</b>				
• Rated power $P_{DB}$	kW	25	50	50
• Peak power $P_{15}$	kW	125	250	250
• Power $P_{20}$	kW	100	200	200
• Power $P_{40}$	kW	50	100	100
<b>Activation thresholds</b> (adjustable via DIP switch)	V	1153 (factory setting) or 1070	1153 (factory setting) or 1070	1153 (factory setting) or 1070
<b>Cable length</b> to braking resistor, max.	m (ft)	100 (328)	100 (328)	100 (328)
<b>Digital inputs</b> in accordance with IEC 61131-2 Type 1				
• Voltage	V	-3 ... +30	-3 ... +30	-3 ... +30
• Low level (an open digital input is interpreted as "low")	V	-3 ... +5	-3 ... +5	-3 ... +5
• High level	V	15 ... 30	15 ... 30	15 ... 30
• Current consumption at 24 V DC, typ.	mA	10	10	10
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Digital outputs</b> (sustained short-circuit strength)				
• Voltage	V	DC 24	DC 24	DC 24
• Load current per digital output, max.	mA	500	500	500
• Conductor cross-section, max.	mm <sup>2</sup>	1.5	1.5	1.5
<b>Connection</b> R1/R2		M8 screw	M8 screw	M8 screw
• Conductor cross-section, max.	mm <sup>2</sup>	35	50	50
<b>Weight, approx.</b>	kg (lb)	3.6 (8)	7.3 (16)	7.5 (16.5)
<b>Approvals, according to</b>		–	–	–
<b>Suitable for installation in an air-cooled Motor Module or Line Module</b>	Frame size	FX/FB	GX/GB <sup>1)</sup>	HX/JX

#### Selection and ordering data

Description	Braking Module in chassis format Order No.
<b>DC link voltage 510 ... 720 V DC</b>	
Frame size FX, 25 kW/125 kW	<b>6SL3300-1AE31-3AA0</b>
Frame size GX, 50 kW/250 kW	<b>6SL3300-1AE32-5AA0</b>
Frame sizes HX and JX, 50 kW/250 kW	<b>6SL3300-1AE32-5BA0</b>
<b>DC link voltage 675 ... 900 V DC</b>	
Frame size FX, 25 kW/125 kW	<b>6SL3300-1AF31-3AA0</b>
Frame size GX, 50 kW/250 kW	<b>6SL3300-1AF32-5AA0</b>
Frame sizes HX and JX, 50 kW/250 kW	<b>6SL3300-1AF32-5BA0</b>
<b>DC link voltage 890 ... 1035 V DC</b>	
Frame size FX, 25 kW/125 kW	<b>6SL3300-1AH31-3AA0</b>
Frame size GX, 50 kW/250 kW	<b>6SL3300-1AH32-5AA0</b>
Frame sizes HX and JX, 50 kW/250 kW	<b>6SL3300-1AH32-5BA0</b>

Description	Order No.
<b>Accessories</b>	
<b>Cable harness set</b> For mounting a Braking Module of frame size GX into a Basic Line Module of frame size GB	<b>6SL3366-2NG00-0AA0</b>
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>

<sup>1)</sup> Cable harness set 6SL3366-2NG00-0AA0 is required to connect the Braking Module to a Basic Line Module of frame size GB.

# SINAMICS S120 drive system

## DC link components

### Braking resistors for blocksize format

#### Overview



Braking resistor for blocksize format, frame sizes FSA and FSC

The PM340 Power Modules cannot regenerate into the line supply. For regenerative operation, e.g. the braking of a rotating mass, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistor is connected at terminals DCP/R1 and R2.

The braking resistors can be installed at the side next to the PM340 Power Modules. The braking resistors for the FSA and FSB frame sizes are designed as base components. If the PM340 Power Modules of the FSA or FSB frame size are operated without line reactor, the braking resistors can also be installed under the Power Modules.

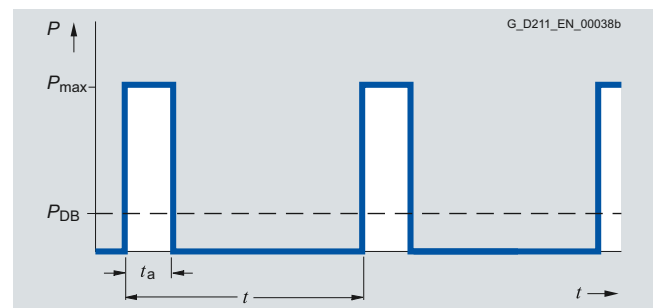
The braking resistors for the Power Modules of the FSC to FSF frame sizes should be placed outside the control cabinet or the switchgear room in order to lead the resulting heat loss away from the Power Modules, thereby allowing a reduction in the level of air conditioning required.

The braking resistors are designed with a temperature switch. The temperature switch must be evaluated to prevent consequential damage if the braking resistor overheats.

#### Selection and ordering data

Description	Suitable for Power Module in blocksize format	Braking resistor Order No.
<b>DC link voltage 240 ... 360 V DC (line voltage 200 ... 240 V 1 AC)</b>		
180 Ω	Frame size FSA	<b>6SE6400-4BC05-0AA0</b>
<b>DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)</b>		
390 Ω	Frame size FSA	<b>6SE6400-4BD11-0AA0</b>
160 Ω	Frame size FSB	<b>6SL3201-0BE12-0AA0</b>
56 Ω	Frame size FSC	<b>6SE6400-4BD16-5CA0</b>
27 Ω	Frame size FSD	<b>6SE6400-4BD21-2DA0</b>
15 Ω	Frame size FSE	<b>6SE6400-4BD22-2EA1</b>
8.2 Ω	Frame size FSF	<b>6SE6400-4BD24-0FA0</b>

#### Characteristic curves



Load diagram for braking resistors for blocksize format

$$t_a = 12 \text{ s}$$

$$t = 240 \text{ s}$$

#### Technical specifications

DC link voltage 240 ... 360 V DC	Braking resistor
	6SE6400-4BC05-0AA0
<b>Resistance</b>	180 Ω
<b>Rated power <math>P_{DB}</math></b>	0.05 kW
<b>Peak power <math>P_{max}</math></b>	1 kW
<b>Degree of protection <sup>1)</sup></b>	IP20
<b>Power connections</b>	3 × 1.5 mm <sup>2</sup> (shielded)
• Length	0.5 m (1.64 ft)
<b>Thermostatic switch (NC contact)</b>	
• Switching capacity	250 V AC/max. 2.5 A
• Conductor cross-section	0.5 ... 2.5 mm <sup>2</sup>
<b>Dimensions</b>	
• Width	72 mm (2.83 in)
• Height	230 mm (9.05 in)
• Depth	43.5 mm (1.71 in)
<b>Weight, approx.</b>	1.0 kg (2 lb)
<b>Approvals, according to</b>	cURus
<b>Suitable for Power Module in blocksize format</b>	Frame size FSA

DC link voltage 510 ... 720 V DC		Braking resistor					
		6SE6400-4BD11-0AA0	6SL3201-0BE12-0AA0	6SE6400-4BD16-5CA0	6SE6400-4BD21-2DA0	6SE6400-4BD22-2EA1	6SE6400-4BD24-0FA0
<b>Resistance</b>	Ω	390	160	56	27	15	8.2
<b>Rated power <math>P_{DB}</math></b>	kW	0.1	0.2	0.65	1.2	2.2	4.0
<b>Peak power <math>P_{max}</math></b>	kW	1.7	4.1	12	24	44	80
<b>Degree of protection <sup>1)</sup></b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Power connections</b>		3 × 1.5 mm <sup>2</sup> (shielded)	3 × 1.5 mm <sup>2</sup> (shielded)	3 × 1.5 mm <sup>2</sup> (shielded)	M6 screw stud	M6 screw stud	M6 screw stud
• Length	m (ft)	0.5 (1.64)	0.5 (1.64)	0.9 (2.95)	-	-	-
<b>Thermostatic switch (NC contact)</b>							
• Switching capacity		250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A
• Conductor cross-section	mm <sup>2</sup>	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5
<b>Dimensions</b>							
• Width	mm (in)	72 (2.83)	153 (6.02)	185 (7.28)	270 (10.6)	301 (11.8)	400 (15.7)
• Height	mm (in)	230 (9.05)	329 (12.9)	285 (11.2)	515 (20.3)	484 (19.0)	650 (25.6)
• Depth	mm (in)	43.5 (1.71)	43.5 (1.71)	150 (5.90)	175 (6.89)	326 (12.8)	315 (12.4)
<b>Weight, approx.</b>	kg (lb)	1.0 (2)	1.6 (3.5)	3.8 (8)	7.4 (16)	10.6 (23)	16.7 (37)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Frame size	FSA	FSB	FSC	FSD	FSE	FSF

<sup>1)</sup> With correctly connected load connection cable.

# SINAMICS S120 drive system

## DC link components

### Braking resistors for booksize format

#### Overview



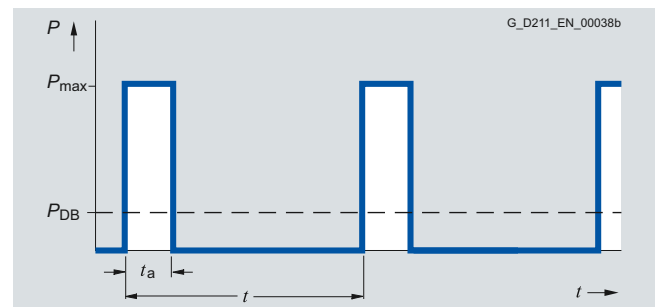
The excess energy of the DC link is dissipated via the braking resistor.

The corresponding braking resistor is connected to a Braking Module or Basic Line Module. The braking resistor is positioned outside the cabinet or switchgear room. This arrangement enables the resulting heat losses to be dissipated, thereby allowing a reduction in the level of air conditioning required.

#### Selection and ordering data

Power $P_{DB}/P_{max}$	Suitable for	Braking resistor Order No.
<b>DC link voltage 510 ... 720 V DC</b>		
0.3 kW/25 kW	Braking Module 6SL3100-1AE31-0AB0	<b>6SN1113-1AA00-0DA0</b>
1.5 kW/100 kW	Braking Module 6SL3100-1AE31-0AB0	<b>6SL3100-1BE31-0AA0</b>
5 kW/30 kW	Basic Line Module 20 kW (26.8 HP) 6SL3130-1TE22-0AA0	<b>6SE7023-2ES87-2DC0</b>
12.5 kW/75 kW	Basic Line Module 40 kW (53.6 HP) 6SL3130-1TE24-0AA0	<b>6SE7028-0ES87-2DC0</b>

#### Characteristic curves



Load diagram for Braking Module in booksize format and braking resistors for booksize format

#### Technical specifications

DC link voltage 510 ... 720 V DC		Braking resistor for Braking Module in booksize and booksize compact format			
		6SN1113-1AA00-0DA0		6SL3100-1BE31-0AA0	
Resistance	Ω	17		5.7	
Rated power $P_{DB}$	kW	0.3		1.5	
Peak power $P_{max}$	kW	25		100	
Load duration for peak power $t_a$	s	0.1	0.4	1	2
Cycle duration of braking duty cycle $t$	s	11.5	210	68	460
Degree of protection		IP54 Braking resistor with connected 1.5 mm <sup>2</sup> cable (shielded), 3 m (9.84 ft) long			IP20
<b>Dimensions</b>					
• Width	mm (in)	80 (3.15)		193 (7.60)	
• Height	mm (in)	210 (8.27)		410 (16.1)	
• Depth	mm (in)	53 (2.09)		240 (9.45)	
Weight, approx.	kg (lb)	3.4 (7.5)		5.6 (12)	
Approvals, according to		cULus		–	

DC link voltage 510 ... 720 V DC		Braking resistor			
		6SE7023-2ES87-2DC0		6SE7028-0ES87-2DC0	
Resistance	Ω	20		8	
Rated power $P_{DB}$	kW	5		12.5	
Peak power $P_{max}$	kW	30		75	
Load duration for peak power $t_a$	s	15		15	
Cycle duration of braking duty cycle $t$	s	90		90	
Degree of protection		IP20		IP20	
Power connections		M6 screw stud		M6 screw stud	
PE connection		M6 screw stud		M8 screw stud	
<b>Thermostatic switch (NC contact)</b>		Screw-type terminals		Screw-type terminals	
• Switching capacity		250 V AC/max. 10 A 42 V DC/0.2 A		250 V AC/max. 10 A 42 V DC/0.2 A	
• Conductor cross-section	mm <sup>2</sup>	2.5		2.5	
<b>Dimensions</b>					
• Width	mm (in)	430 (16.9)		740 (29.1)	
• Height	mm (in)	485 (19.1)		485 (19.1)	
• Depth	mm (in)	305 (12.0)		305 (12.0)	
Weight, approx.	kg (lb)	14 (31)		22 (48.5)	
Approvals, according to		cULus, CSA		cULus, CSA	
<b>Suitable for</b>					
<b>Basic Line Module in booksize format</b>	Type	6SL3130-1TE22-0AA0		6SL3130-1TE24-0AA0	
<b>Braking Module in booksize compact format</b>	Type	6SL3100-1AE23-5AA0		–	

# SINAMICS S120 drive system

## DC link components

### Braking resistors for chassis format

#### Overview



The excess energy of the DC link is dissipated via the braking resistor.

The braking resistor is connected to a Braking Module. The braking resistor is positioned outside the cabinet or switch-gear room. This arrangement enables the resulting heat losses to be dissipated, thereby allowing a reduction in the level of air conditioning required.

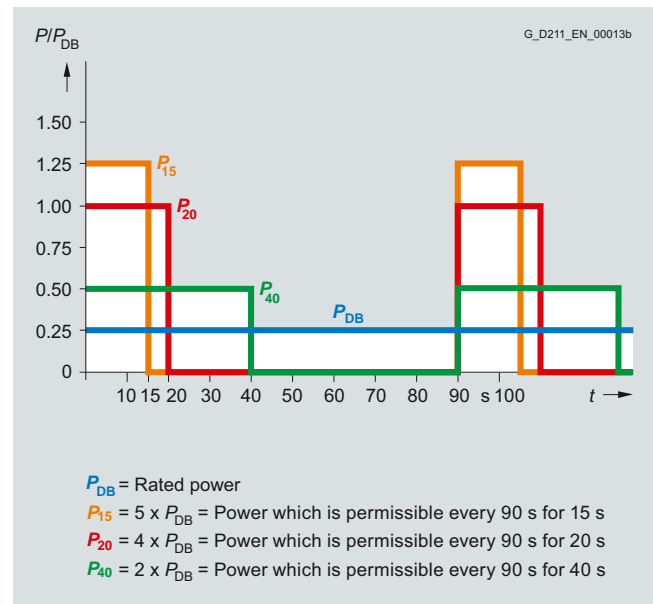
2 braking resistors with different rated and peak power values are available for chassis format units.

The braking resistor is monitored on the basis of the mark-space ratio. A temperature switch (NC contact) is also fitted. This responds when the maximum permissible temperature is exceeded and can be evaluated by a controller.

#### Selection and ordering data

Power $P_{DB}/P_{max}$	Suitable for Braking Module in chassis format	Braking resistor Order No.
<b>DC link voltage 510 ... 720 V DC</b>		
25 kW/125 kW	6SL3300-1AE31-3AA0	<b>6SL3000-1BE31-3AA0</b>
50 kW/250 kW	6SL3300-1AE32-5 . A0	<b>6SL3000-1BE32-5AA0</b>
<b>DC link voltage 675 ... 900 V DC</b>		
25 kW/125 kW	6SL3300-1AF31-3AA0	<b>6SL3000-1BF31-3AA0</b>
50 kW/250 kW	6SL3300-1AF32-5 . A0	<b>6SL3000-1BF32-5AA0</b>
<b>DC link voltage 890 ... 1035 V DC</b>		
25 kW/125 kW	6SL3300-1AH31-3AA0	<b>6SL3000-1BH31-3AA0</b>
50 kW/250 kW	6SL3300-1AH32-5 . A0	<b>6SL3000-1BH32-5AA0</b>

#### Characteristic curves



Load diagram for Braking Module and braking resistor in chassis format

#### Technical specifications

DC link voltage 510 ... 720 V DC		Braking resistor	
		6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
Resistance	Ω	4.4	2.2
Rated power $P_{DB}$	kW	25	50
Peak power $P_{max}$	kW	125	250
Load duration for peak power	s	15	15
Cycle duration of braking duty cycle	s	90	90
Current, max.	A	189	378
Cable entry		Via M50 cable gland	Via M50 cable gland
Power connection		Via M10 stud	Via M10 stud
• Conductor cross-section, max.	mm <sup>2</sup>	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	740 (29.1)	810 (31.9)
• Height	mm (in)	605 (23.8)	1325 (52.2)
• Depth	mm (in)	485 (19.1)	485 (19.1)
Weight, approx.	kg (lb)	50 (110)	120 (265)
Approvals, according to		cURus	cURus
Suitable for Braking Module in chassis format	Type	6SL3300-1AE31-3AA0	6SL3300-1AE32-5 . A0

DC link voltage 675 ... 900 V DC		Braking resistor	
		6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
Resistance	Ω	6.8	3.4
Rated power $P_{DB}$	kW	25	50
Peak power $P_{max}$	kW	125	250
Load duration for peak power	s	15	15
Cycle duration of braking duty cycle	s	90	90
Current, max.	A	153	306
Cable entry		Via M50 cable gland	Via M50 cable gland
Power connection		Via M10 stud	Via M10 stud
• Conductor cross-section, max.	mm <sup>2</sup>	50	70
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	740 (29.1)	810 (31.9)
• Height	mm (in)	605 (23.8)	1325 (52.2)
• Depth	mm (in)	485 (19.1)	485 (19.1)
Weight, approx.	kg (lb)	50 (110)	120 (265)
Approvals, according to		cURus	cURus
Suitable for Braking Module in chassis format	Type	6SL3300-1AF31-3AA0	6SL3300-1AF32-5 . A0

# SINAMICS S120 drive system

## DC link components

### Braking resistors for chassis format

#### Technical specifications (continued)

<b>DC link voltage</b> 890 ... 1035 V DC		<b>Braking resistor</b>	
		6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
<b>Resistance</b>	Ω	9.8	4.9
<b>Rated power <math>P_{DB}</math></b>	kW	25	50
<b>Peak power <math>P_{max}</math></b>	kW	125	250
<b>Load duration</b> for peak power	s	15	15
<b>Cycle duration</b> of braking duty cycle	s	90	90
<b>Current, max.</b>	A	125	255
<b>Cable entry</b>		Via M50 cable gland	Via M50 cable gland
<b>Power connection</b>		Via M10 stud	Via M10 stud
• Conductor cross-section, max.	mm <sup>2</sup>	50	70
<b>Degree of protection</b>		IP20	IP20
<b>Dimensions</b>			
• Width	mm (in)	740 (29.1)	810 (31.9)
• Height	mm (in)	605 (23.8)	1325 (52.2)
• Depth	mm (in)	485 (19.1)	485 (19.1)
<b>Weight, approx.</b>	kg (lb)	50 (110)	120 (265)
<b>Approvals, according to</b>		–	–
<b>Suitable for Braking Module in chassis format</b>	Type	6SL3300-1AH31-3AA0	6SL3300-1AH32-5 . A0



# SINAMICS S120 drive system

## DC link components

### Capacitor Module in booksize format

#### Overview



Capacitor Module in booksize format

Capacitor Modules are used to increase the DC link capacitance to bridge momentary power losses.

Capacitor Modules are connected to the DC link voltage via the integrated DC link busbars. Capacitor Modules function autonomously.

Several Capacitor Modules can be operated in parallel.

#### Design

Capacitor Modules feature the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 2 PE (protective earth) connections

#### Technical specifications

<b>DC link voltage</b> 510 ... 720 V DC	<b>Capacitor Module</b> (Internal air cooling) 6SL3100-1CE14-0AA0
<b>Capacitance</b>	4000 µF
<b>Current carrying capacity</b>	
• 24 V DC busbars	20 A
• DC link busbars	100 A
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	100 mm (3.94 in)
• Height	380 mm (15.0 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.6 in)
<b>Weight, approx.</b>	7.2 kg (16 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>Capacitor Module</b>	<b>6SL3100-1CE14-0AA0</b>
<b>Accessories</b>	
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>

# SINAMICS S120 drive system

## DC link components

### Control Supply Module in booksize format

#### Overview



Control Supply Module in booksize format

The Control Supply Module in booksize format provides a 24 V to 28.8 V DC power supply that can be set using an integrated potentiometer via the line or DC link. The Control Supply Module can either be operated individually or in a parallel connection with a maximum of 10 devices. A DIP switch on the top of the module is used to change over in the de-energized state (details of connection for parallel operation are given in the manual for booksize modules).

Using the Control Supply Module, it is possible for example to make specific emergency retraction movements in the event of a power failure, provided that the DC link voltage is available.

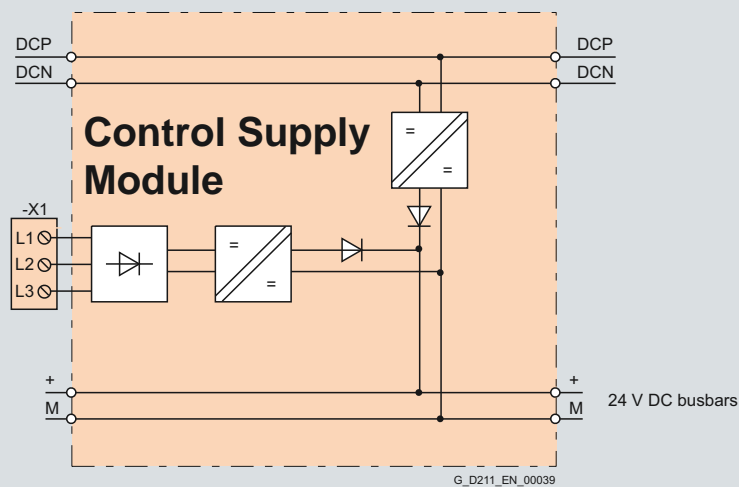
#### Design

Control Supply Modules feature the following connections and interfaces as standard:

- 1 power connection
- 2 DC link connections via integrated DC link busbars
- 2 electronics power supply connections via integrated 24 V DC bars
- 1 connection for the electronics power supply for Control Units, Terminal Modules, Sensor Modules, etc., via the 24 V terminal adapter provided in the scope of supply (max. cross-section 6 mm<sup>2</sup>, max. fuse protection 20 A)
- 1 integrated potentiometer for setting the output voltage
- 1 digital output to signal the error-free state
- 1 DIP switch to change over between single and parallel mode
- 2 PE (protective earth) connections

The status of the Control Supply Modules is indicated via two multi-color LEDs.

#### Integration



Connection example of Control Supply Module

# SINAMICS S120 drive system

## DC link components

### Control Supply Module in booksize format

#### Technical specifications

<b>DC link voltage</b> <b>510 ... 720 V DC</b> <b>Line voltage</b> <b>380 ... 480 V 3 AC</b>	<b>Control Supply Module in booksize format</b> (Internal air cooling)  6SL3100-1DE22-0AA1
<b>Rated input current</b> <ul style="list-style-type: none"> <li>At 400 V 3 AC</li> <li>At 600 V DC</li> </ul>	$\leq 2$ A 1.1 A
<b>DC link voltage range</b>	300 ... 882 V DC (operation in 300 ... 430 V DC range is permitted temporarily for < 1 min)
<b>Radio interference suppression (standard)</b>	Category C2 to EN 61800-3
<b>Rated output voltage</b>	24 V ... 28.8 V DC (adjustable via potentiometer)
<b>Rated output current</b>	20 A
<b>Current carrying capacity</b> <ul style="list-style-type: none"> <li>24 V DC busbars</li> <li>DC link busbars</li> </ul>	20 A 100 A
<b>Line connection</b> L1, L2, L3 (X1) <ul style="list-style-type: none"> <li>Conductor cross-section</li> </ul>	Screw-type terminals  0.2 ... 4.0 mm <sup>2</sup>
<b>PE connection</b>	M5 screw
<b>Dimensions</b> <ul style="list-style-type: none"> <li>Width</li> <li>Height</li> <li>Depth, with spacer (included in scope of supply)</li> </ul>	50 mm (1.97 in) 380 mm (15.0 in) 270 mm (10.6 in)
<b>Weight, approx.</b>	4.8 kg (11 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>Control Supply Module in booksize format</b>	<b>6SL3100-1DE22-0AA1</b>
<b>Accessories</b>	
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>

# SINAMICS S120 drive system

## DC link components

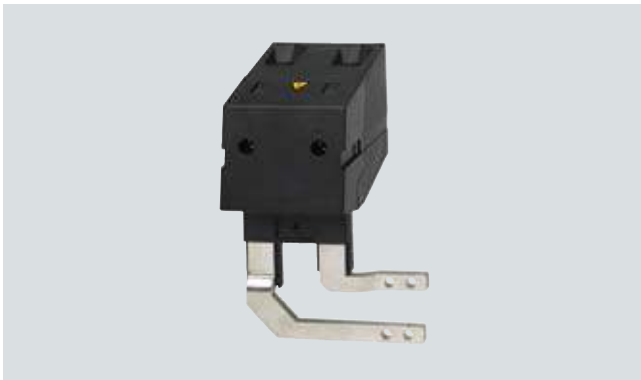
### DC link rectifier adapter and DC link adapter for booksize format

#### Overview

##### DC link rectifier adapter



DC link rectifier adapter for unit widths of 50 mm ... 100 mm (1.97 in ... 3.94 in)



DC link rectifier adapter for unit widths of 150 mm ... 300 mm (5.90 in ... 11.8 in)

If the internal DC link busbars of the Motor Modules are not used, the DC link voltage must be supplied externally through a DC link rectifier adapter, e.g. when devices of booksize format are coupled with devices of chassis format over an external DC busbar. The DC link rectifier adapter is mounted on the DC link busbars of the Motor Module. The DC link cables are routed from above.

##### DC link adapter



DC link adapter (multi-tier) for all unit widths

If a multi-tier Motor Module configuration is used, a DC link adapter can be provided for linking the DC links of two drive line-ups. The DC link adapter is mounted sideways on the DC link busbars of the Motor Module. It can be mounted on the right or left side of the Motor Module. The identification of the poles (DCN and DCP) on the DC link adapter changes in accordance with the mounting position. The DC link cables are routed from behind. The DC link adapter (multi-tier) cannot be used in combination with the reinforced DC link rails for the Motor Modules  $\leq 100$  mm (3.94 in) in width. DC link adapters are supplied in sets of 2 units.

#### Technical specifications

		DC link rectifier adapter		DC link adapter
		6SL3162-2BD00-0AA0	6SL3162-2BM00-0AA0	6SL3162-2BM01-0AA0
<b>Connection</b>		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	0.5 ... 10	35 ... 95	35 ... 95
<b>Current carrying capacity</b>	A	43	240	240
<b>Weight, approx.</b>	kg (lb)	0.06 (0.13)	0.48 (1.06)	0.76 (1.68)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Line Modules and Motor Modules</b>	Formats	Booksize and booksize compact	Booksize and booksize compact	Booksize and booksize compact

#### Selection and ordering data

Description	Order No.
<b>DC link rectifier adapter</b>	
For direct infeed of DC link voltage	
For Line Modules and Motor Modules in booksize and booksize compact format	
• 50 mm (1.97 in), 75 mm (2.95 in) and 100 mm (3.94 in) wide	<b>6SL3162-2BD00-0AA0</b>
• 150 mm (5.90 in), 200 mm (7.87 in) and 300 mm (11.8 in) wide	<b>6SL3162-2BM00-0AA0</b>
<b>DC link adapter set (2 units)</b>	<b>6SL3162-2BM01-0AA0</b>
For multi-tier configuration	
For all Line Modules and Motor Modules in booksize and booksize compact format	

# SINAMICS S120 drive system

## DC link components

### Voltage Clamping Module in booksize format

#### Overview



Voltage Clamping Module in booksize format

Oscillations to ground potential can occur in drive line-ups with total cable lengths (sum of all motor and DC link cables) of > 350 m (1148 ft) (shielded) or 560 m (1837 ft) (unshielded). The Voltage Clamping Module damps these oscillations, thereby allowing a total cable length of 630/850 m (2067/2789 ft) (shielded/unshielded) to be used in booksize format drive line-ups in combination with a Smart Line Module with application of derating, [see derating characteristics](#) for Smart Line Modules, or 1000/1500 m (3281/4921 ft) (shielded/unshielded) in combination with a Basic Line Module.

With total cable lengths of > 350 m (1148 ft), the limit values of Category C2 defined in EN 61800-3 can be exceeded.

VCM Voltage Clamping Modules may be operated only in networks with grounded neutral (TN system).

Where possible, the Voltage Clamping Module should be mounted next to the Line Module and connected to the voltage-source DC link via the integrated DC busbar.

#### Design

The Voltage Clamping Module features the following connections and interfaces as standard:

- 2 DC link connections via integrated DC link busbars
- 1 connection for functional ground
- 2 PE (protective earth) connections

The scope of supply of the Voltage Clamping Modules includes:

- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 1 set of warning signs in 30 languages

#### Technical specifications

<b>DC link voltage</b> 510 ... 720 V DC	<b>Voltage Clamping Module in booksize format</b> (Internal air cooling) 6SL3100-1VE00-0AA0
<b>Current carrying capacity</b>	
• 24 V DC busbars	20 A
• DC link busbars	100 A
<b>PE connection</b>	M5 screw
<b>Grounding</b>	Screw terminal
• Conductor cross-section	4 ... 16 mm <sup>2</sup>
<b>Power loss, approx.</b>	50 W
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	380 mm (15.0 in)
• Depth, with spacer (included in scope of supply)	270 mm (10.6 in)
<b>Weight, approx.</b>	3.1 kg (7 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>Voltage Clamping Module in booksize format</b>	<b>6SL3100-1VE00-0AA0</b>
<b>Accessories for re-ordering</b>	
<b>Warning labels in 30 languages</b> This set of foreign language warning labels can be placed on top of the standard German or English signs. A set of labels is supplied with the units. One sign in each of the following languages is provided in each set: BG, CN, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, JP, KR, LT, LV, MT, NL, NO, PL, PT, RO, RU, SE, SI, SK, TR	<b>6SL3166-3AB00-0AA0</b>

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for blocksize format

#### Overview



Motor reactors for blocksize format

Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactors are designed for a pulse frequency of 4 kHz. Higher pulse frequencies are not permissible.

The motor reactor must be installed as close as possible to the Power Module.

#### Technical specifications

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)		
		6SE6400-3TC00-4AD2	6SL3202-0AE21-0CA0	6SL3202-0AJ23-2CA0
<b>Rated current</b>	A	4.5	10	32
<b>Rated inductance</b>	mH	2	1.24	0.33
<b>Power loss</b>	kW	0.005	0.02	0.06
<b>Connection to the Power Module</b>		Cable 4 × AWG16 (1.5 mm <sup>2</sup> )	Cable 4 × AWG14 (1.5 mm <sup>2</sup> )	Cable 4 × 6 mm <sup>2</sup>
• Length, approx.	m (ft)	0.3 (0.98)	0.4 (1.31)	0.35 (1.15)
<b>Motor connection</b>		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6
<b>PE connection</b>		M5 screw stud	M5 screw stud	M5 screw stud
<b>Max. cable length</b> between motor reactor and motor				
• Shielded	m (ft)	100 (328)	100 (328)	100 (328)
• Unshielded	m (ft)	150 (492)	150 (492)	150 (492)
<b>Degree of protection</b> <sup>1)</sup>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	75.5 (2.97)	153 (6.02)	189 (7.44)
• Height	mm (in)	201 (7.91)	285 (11.2)	351 (13.8)
• Depth	mm (in)	110 (4.33)	70 (2.76)	80 (3.15)
<b>Weight, approx.</b>	kg (lb)	2 (4)	4.5 (10)	9 (20)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated current)	6SL3210-1SE11-3UA0 (1.3 A) 6SL3210-1SE11-7UA0 (1.7 A) 6SL3210-1SE12-2UA0 (2.2 A) 6SL3210-1SE13-1UA0 (3.1 A) 6SL3210-1SE14-1UA0 (4.1 A)	6SL3210-1SE16-0 . A0 (5.9 A) 6SL3210-1SE17-7 . A0 (7.7 A) 6SL3210-1SE21-0 . A0 (10 A)	6SL3210-1SE21-8 . A0 (18 A) 6SL3210-1SE22-5 . A0 (25 A) 6SL3210-1SE23-2 . A0 (32 A)
• Frame size		FSA	FSB	FSC

<sup>1)</sup> With correctly connected connection cable to the Power Module.

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for blocksize format

#### Technical specifications (continued)

<b>DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC</b>		<b>Motor reactor (for a 4 kHz pulse frequency)</b>				
		6SE6400-3TC05-4DD0	6SE6400-3TC03-8DD0	6SE6400-3TC05-4DD0	6SE6400-3TC08-0ED0	6SE6400-3TC07-5ED0
<b>Rated current</b>	A	68	45	68	104	90
<b>Rated inductance</b>	mH	0.232	0.82	0.232	0.111	0.3
<b>Power loss</b>	kW	0.2	0.2	0.2	0.17	0.27
<b>Connection to the Power Module</b>		Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw
<b>Motor connection</b>		Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Max. cable length</b> between motor reactor and motor						
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	225	225	225	225	270
• Height	mm (in)	210	210	210	210	248
• Depth	mm (in)	140	140	140	140	189
<b>Weight, approx.</b>	kg (lb)	11.5 (25)	19 (42)	11.5 (25)	12 (26.5)	27 (60)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated current)	6SL3210-1SE23-8 . A0 (38 A)	6SL3210-1SE24-5 . A0 (45 A)	6SL3210-1SE26-0 . A0 (60 A)	6SL3210-1SE27-5 . A0 (75 A)	6SL3210-1SE31-0 . A0 (90 A)
• Frame size		FSD	FSD	FSD	FSE	FSE

<b>DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC</b>		<b>Motor reactor (for a 4 kHz pulse frequency)</b>		
		6SE6400-3TC14-5FD0	6SE6400-3TC15-4FD0	6SE6400-3TC14-5FD0
<b>Rated current</b>	A	178	178	178
<b>Rated inductance</b>	mH	0.2	0.033	0.2
<b>Power loss</b>	kW	0.47	0.25	0.47
<b>Connection to the Power Module</b>		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
<b>Motor connection</b>		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
<b>PE connection</b>		M8 screw	M8 screw	M8 screw
<b>Max. cable length</b> between motor reactor and motor				
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	357 (14.0)	270 (10.6)	357 (14.0)
• Height	mm (in)	321 (12.6)	248 (9.76)	321 (12.6)
• Depth	mm (in)	221 (8.70)	189 (7.44)	221 (8.70)
<b>Weight, approx.</b>	kg (lb)	57 (126)	24 (52.9)	57 (126)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated current)	6SL3210-1SE31-1 . A0 (110 A)	6SL3210-1SE31-5 . A0 (145 A)	6SL3210-1SE31-8 . A0 (178 A)
• Frame size		FSF	FSF	FSF

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for blocksize format

#### Selection and ordering data

Rated output current of the Power Module A	Type rating of the Power Module kW (HP)	Suitable for Power Module in blocksize format		Motor reactor
		Type	Frame size	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
1.3	0.37 (0.50)	6SL3210-1SE11-3UA0	FSA	<b>6SE6400-3TC00-4AD2</b>
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1)	6SL3210-1SE12-2UA0		
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2)	6SL3210-1SE14-1UA0		
5.9	2.2 (3)	6SL3210-1SE16-0...	FSB	<b>6SL3202-0AE21-0CA0</b>
7.7	3 (5)	6SL3210-1SE17-7...		
10	4 (5)	6SL3210-1SE21-0...		
18	7.5 (10)	6SL3210-1SE21-8...	FSC	<b>6SL3202-0AJ23-2CA0</b>
25	11 (15)	6SL3210-1SE22-5...		
32	15 (20)	6SL3210-1SE23-2...		
38	18.5 (25)	6SL3210-1SE23-8...	FCD	
45	22 (30)	6SL3210-1SE24-5...		<b>6SE6400-3TC03-8DD0</b>
60	30 (40)	6SL3210-1SE26-0...		<b>6SE6400-3TC05-4DD0</b>
75	37 (50)	6SL3210-1SE27-5...	FSE	<b>6SE6400-3TC08-0ED0</b>
90	45 (60)	6SL3210-1SE31-0...		<b>6SE6400-3TC07-5ED0</b>
110	55 (75)	6SL3210-1SE31-1...	FSF	<b>6SE6400-3TC14-5FD0</b>
145	75 (100)	6SL3210-1SE31-5...		<b>6SE6400-3TC15-4FD0</b>
178	90 (125)	6SL3210-1SE31-8...		<b>6SE6400-3TC14-5FD0</b>

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# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for booksize format

#### Overview



Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 120 Hz.

The motor reactors are designed for a pulse frequency of 4 kHz. Higher pulse frequencies are not permissible.

The motor reactor must be installed as close as possible to the Motor Module.

#### Selection and ordering data

Rated output current of Motor Module	Suitable for Motor Module in booksize format	Motor reactor
		Order No.
3 A and 2 × 3 A	6SL3120-1TE13-0AA3	<b>6SE7021-0ES87-1FE0</b>
	6SL3121-1TE13-0AA3	
	6SL3120-2TE13-0AA3	
	6SL3121-2TE13-0AA3	
	6SL3126-2TE13-0AA3	
5 A and 2 × 5 A	6SL3120-1TE15-0AA3	<b>6SE7021-0ES87-1FE0</b>
	6SL3121-1TE15-0AA3	
	6SL3120-2TE15-0AA3	
	6SL3121-2TE15-0AA3	
	6SL3126-2TE15-0AA3	
9 A and 2 × 9 A	6SL3120-1TE21-0AA3	<b>6SL3000-2BE21-0AA0</b>
	6SL3121-1TE21-0AA3	
	6SL3120-2TE21-0AA3	
	6SL3121-2TE21-0AA3	
	6SL3126-2TE21-0AA3	
18 A and 2 × 18 A	6SL3120-1TE21-8AA3	<b>6SE7022-6ES87-1FE0</b>
	6SL3121-1TE21-8AA3	
	6SL3120-2TE21-8AA3	
	6SL3121-2TE21-8AA3	
	6SL3126-2TE21-8AA3	
30 A	6SL3120-1TE23-0AA3	<b>6SE7024-7ES87-1FE0</b>
	6SL3121-1TE23-0AA3	
	6SL3126-1TE23-0AA3	
45 A	6SL3120-1TE24-5AA3	<b>6SE7027-2ES87-1FE0</b>
	6SL3121-1TE24-5AA3	
	6SL3126-1TE24-5AA3	
60 A	6SL3120-1TE26-0AA3	<b>6SL3000-2BE26-0AA0</b>
	6SL3121-1TE26-0AA3	
	6SL3126-1TE26-0AA3	
85 A	6SL3120-1TE28-5AA3	<b>6SE7031-5ES87-1FE0</b>
	6SL3121-1TE28-5AA3	
	6SL3126-1TE28-5AA3	
132 A	6SL3120-1TE31-3AA3	<b>6SE7031-8ES87-1FE0</b>
	6SL3121-1TE31-3AA3	
	6SL3126-1TE31-3AA3	
200 A	6SL3120-1TE32-0AA4	<b>6SE7032-6ES87-1FE0</b>
	6SL3121-1TE32-0AA4	
	6SL3126-1TE32-0AA4	

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for booksize format

#### Technical specifications

<b>DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC</b>		<b>Motor reactor (for a 4 kHz pulse frequency)</b>							
		6SE7021-0ES87-1FE0		6SL3000-2BE21-0AA0		6SE7022-6ES87-1FE0		6SE7024-7ES87-1FE0	
<b>Rated current</b>	A	9.2		9		23		42	
<b>Rated inductance</b>	μH	1243		1000		332		180	
<b>Power loss</b>	kW	0.08		0.07		0.11		0.19	
<b>Connection Motor Module/Motor</b>		Screw-type terminals 4 mm <sup>2</sup>		Screw-type terminals 4 mm <sup>2</sup>		Screw-type terminals 10 mm <sup>2</sup>		Flat connector for M8 screw	
<b>PE connection</b>		M6 screw stud		M6 screw stud		M6 screw stud		M6 screw	
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)		(1)		(1)		(1)		(2)	
• Shielded	m (ft)	100 (328)		135 (443)		160 (525)		320 (1050)	
• Unshielded	m (ft)	150 (492)		200 (656)		240 (787)		480 (1575)	
<b>Degree of protection</b>		IP00		IP00		IP00		IP00	
<b>Dimensions</b>									
• Width	mm (in)	178 (7.01)		178 (7.01)		219 (8.62)		197 (7.76)	
• Height	mm (in)	97 (3.82)		159 (6.26)		180 (7.09)		220 (8.66)	
• Depth	mm (in)	88 (3.46)		111 (4.37)		132 (5.20)		121 (4.76)	
<b>Weight, approx.</b>	kg (lb)	6 (13)		5 (11)		9.5 (21)		20 (44)	
<b>Approvals, according to</b>		cURus		cURus		cURus		cURus	
<b>Suitable for Motor Module in booksize format</b>	Type	6SL3120-1TE13-0AA3		6SL3120-1TE15-0AA3		6SL3120-1TE21-0AA3		6SL3120-1TE21-8AA3	
		6SL3121-1TE13-0AA3		6SL3121-1TE15-0AA3		6SL3121-1TE21-0AA3		6SL3121-1TE21-8AA3	
		6SL3120-2TE13-0AA3		6SL3120-2TE15-0AA3		6SL3120-2TE21-0AA3		6SL3120-2TE21-8AA3	
		6SL3121-2TE13-0AA3		6SL3121-2TE15-0AA3		6SL3121-2TE21-0AA3		6SL3121-2TE21-8AA3	
• Rated current of the Motor Module	A	3		5		9		18	
		30							

<b>DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC</b>		<b>Motor reactor (for a 4 kHz pulse frequency)</b>											
		6SE7027-2ES87-1FE0			6SL3000-2BE26-0AA0			6SE7031-5ES87-1FE0			6SE7032-6ES87-1FE0		
<b>Rated current</b>	A	65			60			131			167		
<b>Rated inductance</b>	μH	59			62			29			23		
<b>Power loss</b>	kW	0.2			0.1			0.22			0.29		
<b>Connection Motor Module/Motor</b>		Flat connector for M8 screw			Flat connector for M8 screw			Flat connector for M8 screw			Flat connector for M8 screw		
<b>PE connection</b>		M6 screw stud			M6 screw stud			M6 screw			M6 screw		
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)		(1) (2) (3)			(1) (2) (3)			(1) (2) (3)			(1) (2) (3)		
• Shielded	m (ft)	200 (656)			400 (1312)			600 (1969)			200 (656)		
• Unshielded	m (ft)	300 (984)			600 (1969)			900 (2953)			300 (984)		
<b>Degree of protection</b>		IP00			IP00			IP00			IP00		
<b>Dimensions</b>													
• Width	mm (in)	267 (10.5)			267 (10.5)			219 (8.62)			281 (11.1)		
• Height	mm (in)	221 (8.70)			220 (8.66)			220 (8.66)			250 (9.84)		
• Depth	mm (in)	131 (5.16)			126 (4.96)			145 (5.71)			171 (6.73)		
<b>Weight, approx.</b>	kg (lb)	11 (24)			10.5 (23)			25 (55)			30 (66)		
<b>Approvals, according to</b>		cURus			cURus			cURus			cURus		
<b>Suitable for Motor Module in booksize format</b>	Type	6SL3120-1TE24-5AA3			6SL3120-1TE26-0AA3			6SL3120-1TE28-5AA3			6SL3120-1TE31-3AA3		
		6SL3121-1TE24-5AA3			6SL3121-1TE26-0AA3			6SL3121-1TE28-5AA3			6SL3121-1TE31-3AA3		
• Rated current of the Motor Module	A	45			60			85			132		
		200											

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for chassis format

#### Overview



Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactor must be installed as close as possible to the Motor Module or Power Module. Up to 2 motor reactors can be connected in series.

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#### Technical specifications

DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC		Motor reactor (for pulse frequencies of 2 kHz to 4 kHz)									
		6SL3000-2BE32-1AA0		6SL3000-2BE32-6AA0		6SL3000-2BE33-2AA0		6SL3000-2BE33-8AA0		6SL3000-2BE35-0AA0	
<b>Rated current</b>	A	210		260		310		380		490	
<b>Rated inductance</b>	μH	53		40		24		21		19	
<b>Power loss</b>	kW	0.486		0.5		0.47		0.5		0.5	
<b>Line/load connection</b>		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M12 screw	
<b>PE connection</b>		M8 screw		M8 screw		M8 screw		M8 screw		M8 screw	
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)											
• Shielded	m (ft)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)
• Unshielded	m (ft)	(1) 450 (1476)	(2) 787 (2582)	(1) 450 (1476)	(2) 787 (2582)	(1) 450 (1476)	(2) 787 (2582)	(1) 450 (1476)	(2) 787 (2582)	(1) 450 (1476)	(2) 787 (2582)
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>											
• Width	mm (in)	300 (11.8)		300 (11.8)		300 (11.8)		300 (11.8)		300 (11.8)	
• Height	mm (in)	285 (11.2)		315 (12.4)		285 (11.2)		285 (11.2)		365 (14.4)	
• Depth	mm (in)	257 (10.1)		277 (10.9)		257 (10.1)		277 (10.9)		277 (10.9)	
<b>Weight, approx.</b>	kg (lb)	66 (145)		66 (145)		66 (145)		73 (161)		100 (220)	
<b>Approvals, according to</b>		cURus		cURus		cURus		cURus		cURus	
<b>Suitable for Single Motor Module chassis format</b>	Type	6SL3320-1TE32-1AA3		6SL3320-1TE32-6AA3		6SL3320-1TE33-1AA3		6SL3320-1TE33-8AA3		6SL3320-1TE35-0AA3	
<b>Suitable for Power Module in chassis format</b>	Type	6SL3310-1TE32-1AA3		6SL3310-1TE32-6AA3		6SL3310-1TE33-1AA3		6SL3310-1TE33-8AA3		6SL3310-1TE35-0AA3	
• Rated current of Motor Module or Power Module	A	210		260		310		380		490	
• Type rating of Motor Module or Power Module	kW (HP)	110 (150)		132 (200)		160 (250)		200 (300)		250 (400)	

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for chassis format

#### Technical specifications (continued)

<b>DC link voltage 510 ... 720 V DC or line voltage 380 ... 480 V 3 AC</b>		<b>Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)</b>											
		6SL3000-2AE36-1AA0		6SL3000-2AE38-4AA0				6SL3000-2AE41-0AA0		6SL3000-2AE41-4AA0			
<b>Rated current</b>	A	605	840	840	985	1405	1405						
<b>Rated inductance</b>	μH	18	13	13	10	5.1	5.1						
<b>Power loss</b>	kW	0.9	0.84	0.943	1.062	0.9	1.054						
<b>Line/load connection</b>		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw (2 ×)		Flat connector for M12 screw (2 ×)	
<b>PE connection</b>		M10 screw		M10 screw		M10 screw		M10 screw		M10 screw		M10 screw	
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>													
• Width	mm (in)	410 (16.1)		410 (16.1)		410 (16.1)		410 (16.1)		460 (18.1)		460 (18.1)	
• Height	mm (in)	392 (15.4)		392 (15.4)		392 (15.4)		392 (15.4)		392 (15.4)		392 (15.4)	
• Depth	mm (in)	292 (11.5)		292 (11.5)		292 (11.5)		302 (11.9)		326 (12.8)		326 (12.8)	
<b>Weight, approx.</b>	kg (lb)	130 (287)		140 (309)		140 (309)		146 (322)		179 (395)		179 (395)	
<b>Approvals, according to</b>		cURus		cURus		cURus		cURus		cURus		cURus	
<b>Suitable for Single Motor Module in chassis format</b>	Type	6SL3320-1TE36-1AA3		6SL3320-1TE37-5AA3		6SL3320-1TE38-4AA3		6SL3320-1TE41-0AA3		6SL3320-1TE41-2AA3		6SL3320-1TE41-4AA3	
• Rated current of the Motor Module	A	605		745		840		985		1260		1405	
• Type of rating of the Motor Module	kW (HP)	315 (500)		400 (600)		450 (700)		560 (800)		710 (1000)		800 (1150)	

<b>DC link voltage 675 ... 1035 V DC or line voltage 500 ... 690 V 3 AC</b>		<b>Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)</b>											
		6SL3000-2AH31-0AA0				6SL3000-2AH31-5AA0				6SL3000-2AH31-8AA0		6SL3000-2AH32-4AA0	
<b>Rated current</b>	A	100	100	150	150	175	215						
<b>Rated inductance</b>	μH	160	160	110	110	80	53						
<b>Power loss</b>	kW	0.257	0.3	0.318	0.335	0.4	0.425						
<b>Line/load connection</b>		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M10 screw	
<b>PE connection</b>		M6 screw		M6 screw		M6 screw		M6 screw		M6 screw		M6 screw	
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
• Shielded	m (ft)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)	300 (984)	525 (1722)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>													
• Width	mm (in)	270 (10.6)		270 (10.6)		270 (10.6)		270 (10.6)		300 (11.8)		300 (11.8)	
• Height	mm (in)	248 (9.76)		248 (9.76)		248 (9.76)		248 (9.76)		285 (11.2)		285 (11.2)	
• Depth	mm (in)	200 (7.87)		200 (7.87)		200 (7.87)		200 (7.87)		212 (8.35)		212 (8.35)	
<b>Weight, approx.</b>	kg (lb)	25 (55)		25 (55)		25.8 (57)		25.8 (57)		34 (75)		34 (75)	
<b>Approvals, according to</b>		–		–		–		–		–		–	
<b>Suitable for Single Motor Module in chassis format</b>	Type	6SL3320-1TG28-5AA3		6SL3320-1TG31-0AA3		6SL3320-1TG31-2AA3		6SL3320-1TG31-5AA3		6SL3320-1TG31-8AA3		6SL3320-1TG32-2AA3	
• Rated current of the Motor Module	A	85		100		120		150		175		215	
• Type of rating of the Motor Module	kW	75		90		110		132		160		200	

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for chassis format

#### Technical specifications (continued)

DC link voltage 675 ... 1035 V DC or line voltage 500 ... 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)									
		6SL3000-2AH32-6AA0		6SL3000-2AH33-6AA0		6SL3000-2AH34-5AA0		6SL3000-2AH34-7AA0		6SL3000-2AH35-8AA0	
<b>Rated current</b>	A	260		330		410		465		575	
<b>Rated inductance</b>	μH	40		24		21		19		19	
<b>Power loss</b>	kW	0.44		0.45		0.545		0.72		0.8	
<b>Line/load connection</b>		Flat connector for M10 screw		Flat connector for M10 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw	
<b>PE connection</b>		M6 screw		M6 screw		M8 screw		M8 screw		M8 screw	
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)											
• Shielded	m (ft)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>											
• Width	mm (in)	300 (11.8)		300 (11.8)		350 (13.8)		410 (16.1)		410 (16.1)	
• Height	mm (in)	285 (11.2)		285 (11.2)		330 (13.0)		392 (15.4)		392 (15.4)	
• Depth	mm (in)	212 (8.35)		212 (8.35)		215 (8.46)		292 (11.5)		292 (11.5)	
<b>Weight, approx.</b>	kg (lb)	40 (88)		46 (101)		68 (150)		80 (176)		80 (176)	
<b>Approvals, according to</b>		-		-		-		-		-	
<b>Suitable for Single Motor Module in chassis format</b>	Type	6SL3320-1TG32-6AA3		6SL3320-1TG33-3AA3		6SL3320-1TG34-1AA3		6SL3320-1TG34-7AA3		6SL3320-1TG35-8AA3	
• Rated current of the Motor Module	A	260		330		410		465		575	
• Type of rating of the Motor Module	kW	250		315		400		450		560	

DC link voltage 675 ... 1035 V DC or line voltage 500 ... 690 V 3 AC		Motor reactor (for pulse frequencies of 1.25 kHz to 2.5 kHz)									
		6SL3000-2AH38-1AA0		6SL3000-2AH41-0AA0		6SL3000-2AH41-1AA0		6SL3000-2AH41-3AA0			
<b>Rated current</b>	A	810		910		1025		1270			
<b>Rated inductance</b>	μH	18		13		10		5.1			
<b>Power loss</b>	kW	0.96		1.0		0.97		1.05		0.95	
<b>Line/load connection</b>		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw		Flat connector for M12 screw	
<b>PE connection</b>		M8 screw		M8 screw		M8 screw		M8 screw		M8 screw	
<b>Max. cable length</b> between motor reactor and motor (number of reactors in series)											
• Shielded	m (ft)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)	(1) 300 (984)	(2) 525 (1722)
• Unshielded	m (ft)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)	450 (1476)	787 (2582)
<b>Degree of protection</b>		IP00		IP00		IP00		IP00		IP00	
<b>Dimensions</b>											
• Width	mm (in)	410 (16.1)		410 (16.1)		410 (16.1)		410 (16.1)		460 (18.1)	
• Height	mm (in)	392 (15.4)		392 (15.4)		392 (15.4)		392 (15.4)		392 (15.4)	
• Depth	mm (in)	279 (11.0)		279 (11.0)		279 (11.0)		317 (12.5)		296 (11.6)	
<b>Weight, approx.</b>	kg (lb)	146 (322)		146 (322)		150 (331)		163 (359)		153 (337)	
<b>Approvals, according to</b>		-		-		-		-		-	
<b>Suitable for Single Motor Module in chassis format</b>	Type	6SL3320-1TG37-4AA3		6SL3320-1TG38-1AA3		6SL3320-1TG38-8AA3		6SL3320-1TG41-0AA3		6SL3320-1TG41-3AA3	
• Rated current of the Motor Module	A	735		810		910		1025		1270	
• Type of rating of the Motor Module	kW	710		800		900		1000		1200	

# SINAMICS S120 drive system

## Load-side power components

### Motor reactors for chassis format

#### Selection and ordering data

Rated current of the Single Motor Module or Power Module	Type rating of the Single Motor Module or Power Module	Suitable for Single Motor Module or Power Module in chassis format	Motor reactor
A	kW (HP)	Type	Order No.
<b>DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)</b>			
210	110 (150)	6SL33 . 0-1TE32-1AA3	<b>6SL3000-2BE32-1AA0 *)</b>
260	132 (200)	6SL33 . 0-1TE32-6AA3	<b>6SL3000-2BE32-6AA0 *)</b>
310	160 (250)	6SL33 . 0-1TE33-1AA3	<b>6SL3000-2BE33-2AA0 *)</b>
380	200 (300)	6SL33 . 0-1TE33-8AA3	<b>6SL3000-2BE33-8AA0 *)</b>
490	250 (400)	6SL33 . 0-1TE35-0AA3	<b>6SL3000-2BE35-0AA0 *)</b>
605	315 (500)	6SL3320-1TE36-1AA3	<b>6SL3000-2AE36-1AA0 *)</b>
745	400 (600)	6SL3320-1TE37-5AA3	<b>6SL3000-2AE38-4AA0 *)</b>
840	450 (700)	6SL3320-1TE38-4AA3	
985	560 (800)	6SL3320-1TE41-0AA3	<b>6SL3000-2AE41-0AA0</b>
1260	710 (1000)	6SL3320-1TE41-2AA3	<b>6SL3000-2AE41-4AA0</b>
1405	800 (1150)	6SL3320-1TE41-4AA3	
<b>DC link voltage 675 ... 1035 V DC (line voltage 500 ... 690 V 3 AC)</b>			
85	75	6SL3320-1TG28-5AA3	<b>6SL3000-2AH31-0AA0</b>
100	90	6SL3320-1TG31-0AA3	
120	110	6SL3320-1TG31-2AA3	<b>6SL3000-2AH31-5AA0</b>
150	132	6SL3320-1TG31-5AA3	
175	160	6SL3320-1TG31-8AA3	<b>6SL3000-2AH31-8AA0</b>
215	200	6SL3320-1TG32-2AA3	<b>6SL3000-2AH32-4AA0</b>
260	250	6SL3320-1TG32-6AA3	<b>6SL3000-2AH32-6AA0</b>
330	315	6SL3320-1TG33-3AA3	<b>6SL3000-2AH33-6AA0</b>
410	400	6SL3320-1TG34-1AA3	<b>6SL3000-2AH34-5AA0</b>
465	450	6SL3320-1TG34-7AA3	<b>6SL3000-2AH34-7AA0</b>
575	560	6SL3320-1TG35-8AA3	<b>6SL3000-2AH35-8AA0</b>
735	710	6SL3320-1TG37-4AA3	<b>6SL3000-2AH38-1AA0</b>
810	800	6SL3320-1TG38-1AA3	
910	900	6SL3320-1TG38-8AA3	<b>6SL3000-2AH41-0AA0</b>
1025	1000	6SL3320-1TG41-0AA3	<b>6SL3000-2AH41-1AA0</b>
1270	1200	6SL3320-1TG41-3AA3	<b>6SL3000-2AH41-3AA0</b>

\*) Also for liquid-cooled Power Modules in chassis format.

# SINAMICS S120 drive system

## Load-side power components

### Sine-wave filter for chassis format

#### Overview



If a sine-wave filter is connected at the Motor Module output, the voltage between the motor terminals is virtually sinusoidal. This reduces the voltage load on the motor windings and prevents motor noise induced by the pulse frequency.

The pulse frequency of the Motor Modules must be set to 4 kHz for the sine-wave filters. The max. output frequency with sine-wave filter is limited to 150 Hz.

With chassis format units, this reduces the maximum possible output current and the maximum achievable output voltage (see [characteristic curves for Single Motor Modules in chassis format and chapter System description – Dimensioning](#)).

The voltage drops across the sine-wave filter, a factor which must also be taken into account in the drive design (see [chapter System description – Dimensioning](#)).

The sine-wave filter must be installed as close as possible to the Motor Module.

**The sine-wave filter may be operated only when the motor is connected** (sine-wave filter is not no-load-proof). Operation in Servo control mode is not permissible.

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#### Technical specifications

DC link voltage 510 ... 720 V DC		Sine-wave filter				
		6SL3000-2CE32-3AA0	6SL3000-2CE32-8AA0	6SL3000-2CE33-3AA0	6SL3000-2CE34-1AA0	
<b>Rated current</b>	A	225	225	276	333	408
<b>Power loss</b> at 50/60 Hz	kW	0.35/0.6	0.35/0.6	0.4/0.69	0.245/0.53	0.38/0.7
<b>Line connection</b>		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
<b>Load connection</b>		Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw	Flat connector for M10 screw
<b>Cable length, max.</b> between sine-wave filter and motor						
• Shielded/unshielded	m (ft)	300/450 (984/1476)	300/450 (984/1476)	300/450 (984/1476)	300/450 (984/1476)	300/450 (984/1476)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	620 (24.4)	620 (24.4)	620 (24.4)	620 (24.4)	620 (24.4)
• Height	mm (in)	300 (11.8)	300 (11.8)	300 (11.8)	370 (14.6)	370 (14.6)
• Depth	mm (in)	320 (12.6)	320 (12.6)	320 (12.6)	360 (14.2)	360 (14.2)
<b>Weight, approx.</b>	kg (lb)	124 (273)	124 (273)	127 (280)	136 (300)	198 (437)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Single Motor Module chassis format</b>	Type	6SL3320-1TE32-1AA3	6SL3320-1TE32-6AA3	6SL3320-1TE33-1AA3	6SL3320-1TE33-8AA3	6SL3320-1TE35-0AA3
<b>Suitable for Power Module in chassis format</b> <sup>1)</sup>	Type	6SL3310-1TE32-1AA3	6SL3310-1TE32-6AA3	6SL3310-1TE33-1AA3	6SL3310-1TE33-8AA3	6SL3310-1TE35-0AA3
• Rated current of the Single Motor Module or Power Module at a pulse frequency of 4 kHz	A	170	215	270	330	380
• Type rating of the Single Motor Module or Power Module at a pulse frequency of 4 kHz	kW (HP)	90 (120)	110 (150)	132 (200)	160 (250)	200 (400)

<sup>1)</sup> Also for liquid-cooled Power Modules in chassis format.

# SINAMICS S120 drive system

## Load-side power components

### Sine-wave filter for chassis format

#### Selection and ordering data

Rated output current of the Single Motor Module or Power Module	Type rating of the Single Motor Module or Power Module	Suitable for Single Motor Module or Power Module in chassis format	Sine-wave filter
A	kW (HP)	Type	Order No.
<b>DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)</b>			
210	110 (150)	6SL33 . 0-1TE32-1AA3	<b>6SL3000-2CE32-3AA0</b>
260	132 (200)	6SL33 . 0-1TE32-6AA3	
310	160 (250)	6SL33 . 0-1TE33-1AA3	<b>6SL3000-2CE32-8AA0</b>
380	200 (300)	6SL33 . 0-1TE33-8AA3	<b>6SL3000-2CE33-3AA0</b>
490	250 (400)	6SL33 . 0-1TE35-0AA3	<b>6SL3000-2CE34-1AA0</b>

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# SINAMICS S120 drive system

## Supplementary system components

### BOP20 Basic Operator Panel

#### Overview



BOP20 Basic Operator Panel

The BOP20 Basic Operator Panel can be snapped onto any CU310-2 or CU320-2 Control Unit and may be used to acknowledge faults, set parameters and read diagnostic information (e.g. alarm and fault messages).

#### Design

The BOP20 Basic Operator Panel has a backlit two-line display area and 6 keys.

The integrated plug connector on the back of the BOP20 Basic Operator Panel provides the power to the BOP20 Basic Operator Panel and the communication with the CU310-2 or CU320-2 Control Unit.

#### Integration



CU310-2 Control Unit with attached BOP20 Basic Operator Panel



CU320-2 Control Unit with attached BOP20 Basic Operator Panel

#### Selection and ordering data

Description	Order No.
<b>BOP20 Basic Operator Panel</b>	<b>6SL3055-0AA00-4BA0</b>

# SINAMICS S120 drive system

## Supplementary system components

### CBC10 Communication Board

#### Overview



The CBC10 Communication Board is used to interface the CU320-2 Control Unit and therefore the drives to the CAN (Controller Area Network) protocol. The board's driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

- Communication profiles in accordance with DS 301
- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Operational status signaling in accordance with DSP 305

#### Note:

The CAN address can only be set using the two address switches on the CU320-2 DP Control Unit. This address switch is not available on the CU320-2 PN Control Unit. The address can only be set using parameters.

#### Design

The CBC10 Communication Board plugs into the option slot on the CU320-2 Control Unit. The CAN interface on the CBC10 has 2 SUB-D connections for input and output.

#### Technical specifications

<b>CBC10 Communication Board</b> 6SL3055-0AA00-2CA0	
<b>Current requirement</b> at 24 V DC via CU320-2 Control Unit, max.	0.05 A
<b>Power loss</b>	< 10 W
<b>Weight, approx.</b>	0.1 kg (0.2 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CBC10 Communication Board</b>	<b>6SL3055-0AA00-2CA0</b>
<i>Accessories</i>	
<b>SUB-D connector</b> , 9-pin, female (3 units)	<b>6FC9341-2AE</b>
<b>SUB-D connector</b> , 9-pin, male (3 units)	<b>6FC9341-2AF</b>

# SINAMICS S120 drive system

## Supplementary system components

### CBE20 Communication Board

#### Overview



The CBE20 Communication Board can be used to connect to a PROFINET IO network via a CU320-2 Control Unit.

The SINAMICS S120 then assumes the function of a PROFINET IO device and can perform the following functions:

- PROFINET IO device
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real-Time), minimum send cycle 500 µs
- Connects to controls as PROFINET IO devices using PROFIdrive compliant with Specification V4
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 4-port switch with four RJ45 sockets based on the PROFINET ASIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.
- The media redundancy and shared device functions are supported.

With SINAMICS firmware V4.5 and higher the CBE20 Communication Board also supports an ODVA EtherNet/IP protocol stack.

#### Integration

The CBE20 Communication Board plugs into the option slot on the CU320-2 Control Unit.

#### Technical specifications

##### CBE20 Communication Board 6SL3055-0AA00-2EB0

<b>Current requirement</b> at 24 V DC	0.16 A
<b>Ambient temperature, permissible</b>	
• Storage and transport	-40 ... +70 °C (-104 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Dimensions</b>	130 mm × 78 mm (5.12 in × 3.07 in)
<b>Weight, approx.</b>	76 g (2.68 oz)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CBE20 Communication Board</b>	<b>6SL3055-0AA00-2EB0</b>

##### Accessories

##### Industrial Ethernet FC

• RJ45 Plug 145 (1 unit)	<b>6GK1901-1BB30-0AA0</b>
• RJ45 Plug 145 (10 units)	<b>6GK1901-1BB30-0AB0</b>
• Stripping tool	<b>6GK1901-1GA00</b>
• Standard cable GP 2x2	<b>6XV1840-2AH10</b>
• Flexible cable GP 2x2	<b>6XV1870-2B</b>
• Trailing cable GP 2x2	<b>6XV1870-2D</b>
• Trailing cable 2x2	<b>6XV1840-3AH10</b>
• Marine cable 2x2	<b>6XV1840-4AH10</b>

For further information on connectors and cables, please refer to Catalog IK PI or the Siemens Industry Mall.

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

# SINAMICS S120 drive system

## Supplementary system components

### CUA31 Control Unit Adapter

#### Overview



The CUA31 Control Unit Adapter converts the PM-IF interface to a DRIVE-CLiQ interface. The CUA31 Control Unit Adapter allows Power Modules in blocksize format to operate on a CU320-2 or SIMOTION D Control Unit, e.g. as a single axis next to a multi-axis drive. In this case, the CUA31 Control Unit Adapter must be the last device in the DRIVE-CLiQ link from the viewpoint of the CU320-2 or SIMOTION D Control Unit.

#### Design

The CUA31 Control Unit Adapter features the following connections and interfaces:

- 1 temperature sensor input (KTY84-130 or PTC)
- 3 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 safe standstill input (enable pulses)

The status of the CUA31 Control Unit Adapter is indicated via multi-color LEDs.

#### Technical specifications

##### CUA31 Control Unit Adapter 6SL3040-0PA00-0AA1

<b>Current requirement</b> at 24 V DC without DRIVE-CLiQ supply, max.	0.15 A for CUA31 + max. 0.5 A for PM340 Power Module
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
<b>Power loss</b>	< 4 W
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	73 mm (2.87 in)
• Height	165.8 mm (6.53 in)
• Depth	37.3 mm (1.47 in)
<b>Weight, approx.</b>	0.31 kg (0.7 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CUA31 Control Unit Adapter</b> Without DRIVE-CLiQ cable	<b>6SL3040-0PA00-0AA1</b>
<b>Accessories for re-ordering</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>

# SINAMICS S120 drive system

## Supplementary system components

### CUA31 Control Unit Adapter

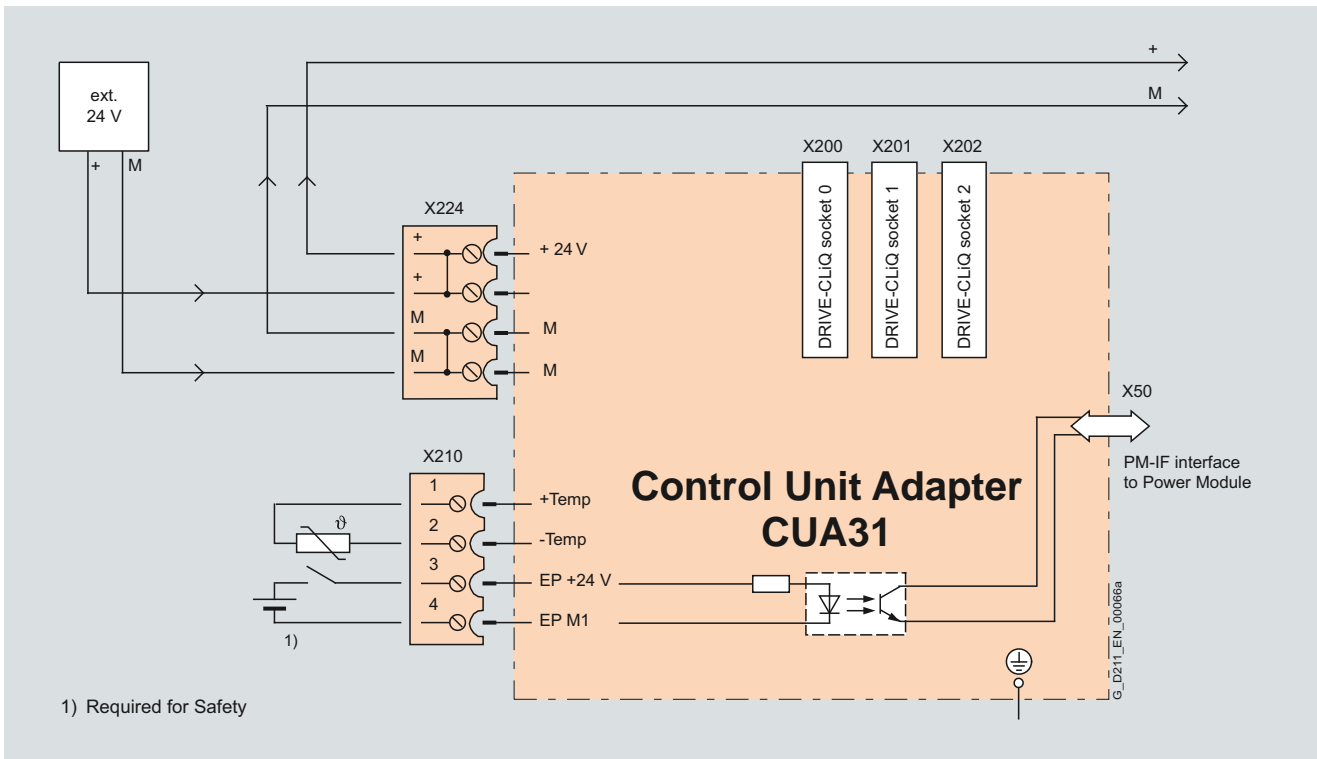
#### Integration

The CUA31 Control Unit Adapter is snapped onto the Power Module in blocksize format and communicates with a CU320-2 or a SIMOTION D Control Unit by means of a DRIVE-CLiQ link.

The CUA31 Control Unit Adapter's power is supplied by the Power Module via the PM-IF interface. If the CUA31 Control Unit

Adapter needs to communicate when the Power Module is switched off, it must be supplied with 24 V DC from an external source.

Other DRIVE-CLiQ devices such as Sensor Modules or Terminal Modules can be connected to the CUA31 Control Unit Adapter.



# SINAMICS S120 drive system

## Supplementary system components

### CUA32 Control Unit Adapter

#### Overview



The CUA32 Control Unit Adapter converts the PM-IF interface to a DRIVE-CLiQ interface. The CUA32 Control Unit Adapter is also equipped with an integral encoder evaluation device which can be configured for an HTL/TTL or SSI encoder.

The CUA32 Control Unit Adapter allows Power Modules in block-size format to operate on a CU320-2 or SIMOTION D Control Unit, e.g. as a single axis next to a multi-axis drive.

In this case, the CUA32 Control Unit Adapter must be the last device in the DRIVE-CLiQ link from the viewpoint of the CU320-2 or SIMOTION D Control Unit.

#### Design

The CUA32 Control Unit Adapter features the following connections and interfaces:

- 1 temperature sensor input (KTY84-130 or PTC)
- 3 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 safe standstill input (enable pulses)
- 1 encoder evaluation
  - The following encoder signals can be evaluated:
    - Incremental encoder TTL/HTL
    - SSI encoder without incremental signals

The status of the CUA32 Control Unit Adapter is indicated via multi-color LEDs.

#### Technical specifications

##### CUA32 Control Unit Adapter

6SL3040-0PA01-0AA0

##### Current requirement

At 24 V DC without DRIVE-CLiQ supply and encoder supply, max.

0.15 A for CUA32  
+ max. 0.5 A for PM340 Power Module

- Conductor cross-section, max.

2.5 mm<sup>2</sup>

##### Encoder evaluation

- Input impedance

- TTL 570 Ω  
- HTL, max. 16 mA

- Encoder supply

- Incremental encoder TTL/HTL
- SSI encoder without incremental signals

24 V DC/0.35 A or  
5 V DC/0.35 A

- Encoder frequency, max.

300 Hz

- SSI baud rate

100 ... 250 kBaud

- Resolution absolute position SSI

30 bit

- Cable length, max.

- TTL encoder 100 m (328 ft) (only bipolar signals permitted)<sup>1)</sup>  
- HTL encoder 100 m (328 ft) for unipolar signals  
300 m (984 ft) for bipolar signals<sup>1)</sup>  
- SSI encoder 100 m (328 ft)

##### Power loss

< 4 W

##### PE connection

M5 screw

##### Dimensions

- Width 73 mm (2.87 in)
- Height 165.8 mm (6.53 in)
- Depth 37.3 mm (1.47 in)

##### Weight, approx.

0.31 kg (0.7 lb)

##### Approvals, according to

cULus available soon

#### Selection and ordering data

Description	Order No.
<b>CUA32 Control Unit Adapter</b>	<b>6SL3040-0PA01-0AA0</b>
Without DRIVE-CLiQ cable	
<b>Accessories for re-ordering</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units)	<b>6SL3066-4CA00-0AA0</b>
For DRIVE-CLiQ port	

<sup>1)</sup> Signal cables twisted in pairs and shielded.

# SINAMICS S120 drive system

## Supplementary system components

### CUA32 Control Unit Adapter

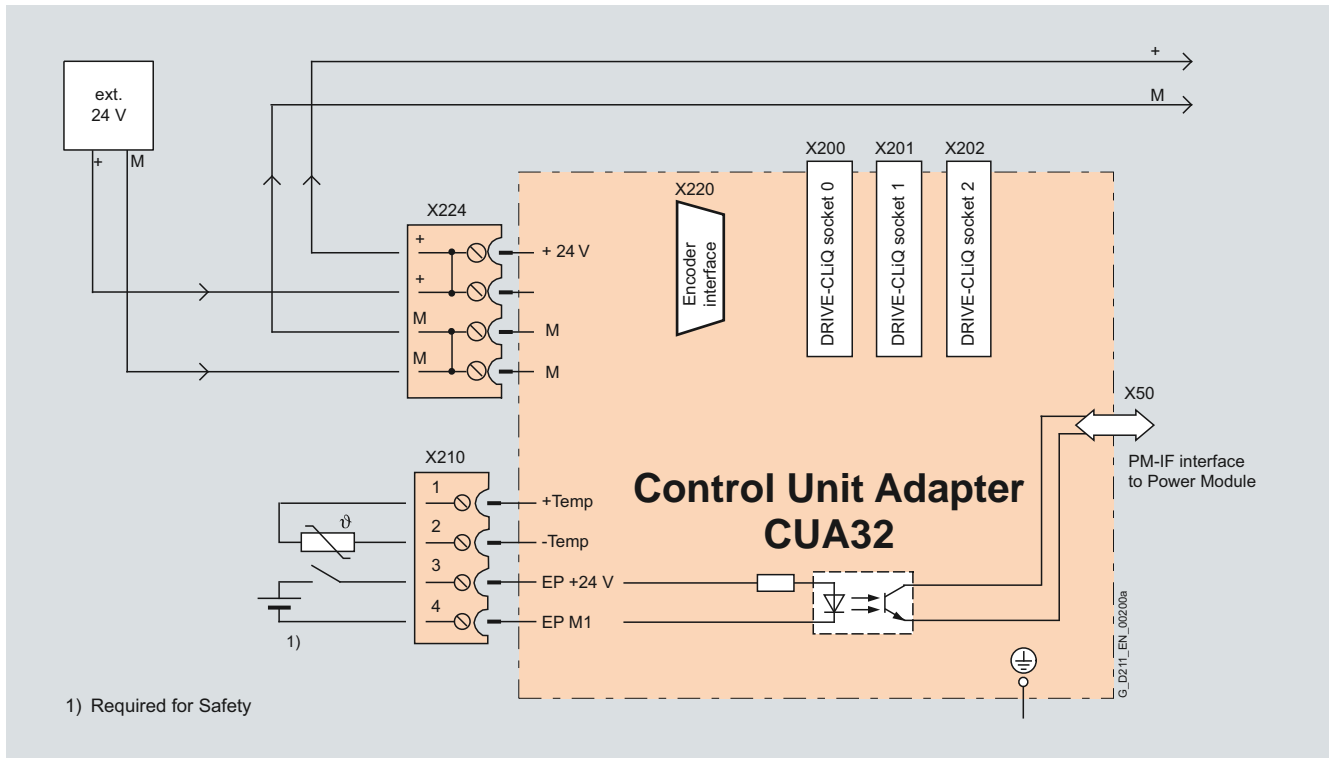
#### Integration

The CUA32 Control Unit Adapter is snapped onto the Power Module in blocksize format and communicates with a CU320-2 or a SIMOTION D Control Unit by means of a DRIVE-CLiQ link.

The CUA32 Control Unit Adapter's power is supplied by the Power Module via the PM-IF interface. If the CUA32 Control Unit

Adapter needs to communicate when the Power Module is switched off, it must be supplied with 24 V DC from an external source.

Other DRIVE-CLiQ devices such as Sensor Modules or Terminal Modules can be connected to the CUA32 Control Unit Adapter.



# SINAMICS S120 drive system

## Supplementary system components

### DMC20 DRIVE-CLiQ Hub Module

#### Overview



DMC20 DRIVE-CLiQ Hub Module

The DMC20 DRIVE-CLiQ Hub Module is used to implement a star-shaped distribution of a DRIVE-CLiQ line. Two DMC20 DRIVE-CLiQ Hub Modules can be connected in series (cascaded).

#### Design

The DMC20 DRIVE-CLiQ Hub Module in degree of protection IP20 is designed for mounting in control cabinets.

The following are located on the DMC20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ nodes
- 1 connection for the electronics power supply via the 24 V DC power supply connector

The status of the DMC20 DRIVE-CLiQ Hub Module is indicated via a multi-color LED.

#### Technical specifications

##### DMC20 DRIVE-CLiQ Hub Module

6SL3055-0AA00-6AA0

<b>Current requirement</b> at 24 V DC without DRIVE-CLiQ supply, max.	0.15 A
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• Conductor cross-section, max.	2.5 mm <sup>2</sup>
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<b>Degree of protection</b>	IP20
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##### Dimensions

• Width	50 mm (1.97 in)
---------	-----------------

• Height	150 mm (5.90 in)
----------	------------------

• Depth	111 mm (4.37 in)
---------	------------------

<b>Weight, approx.</b>	0.8 kg (1.8 lb)
------------------------	-----------------

<b>Approvals, according to</b>	cULus
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#### Selection and ordering data

Description	Order No.
<b>DMC20 DRIVE-CLiQ Hub Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-6AA0</b>

##### Accessories for re-ordering

<b>SINAMICS/SINUMERIK/SIMOTION</b> <b>dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ port	<b>6SL3066-4CA00-0AA0</b>
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# SINAMICS S120 drive system

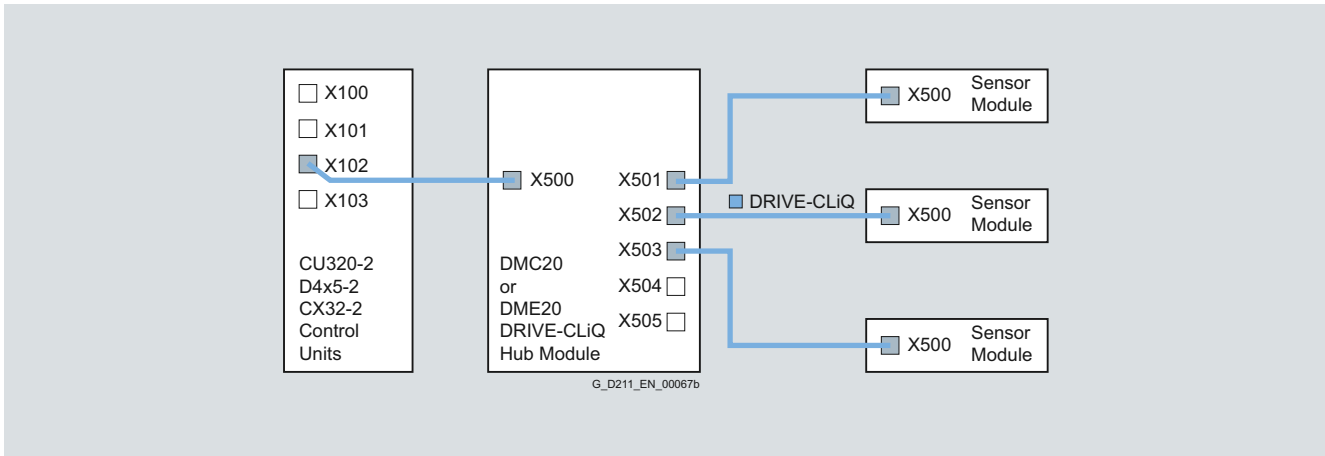
## Supplementary system components

### DMC20 DRIVE-CLiQ Hub Module

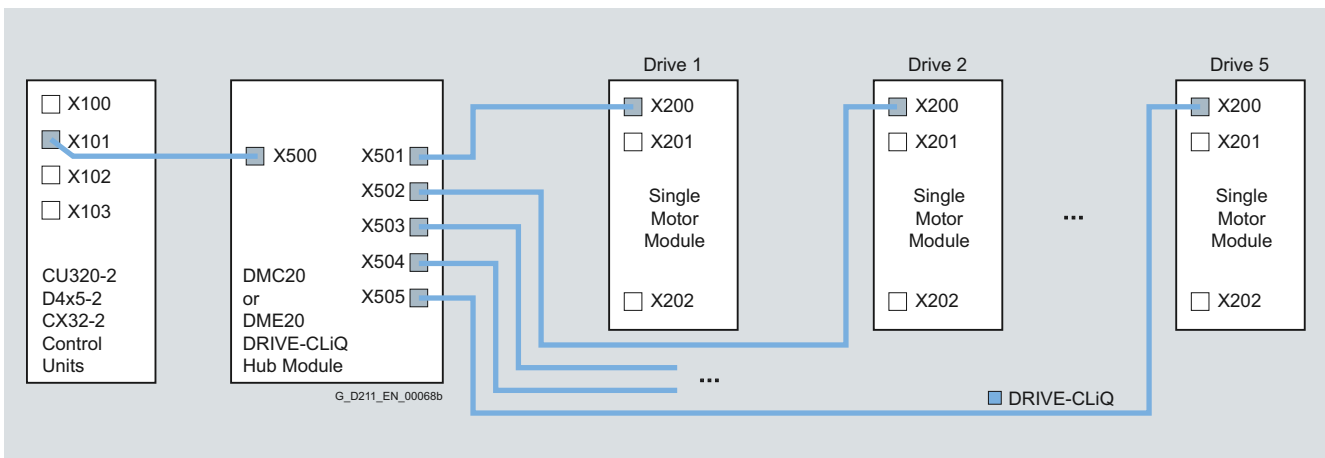
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#### Integration

Signals from more than one encoder can be collected with the DRIVE-CLiQ Hub Module and forwarded to the Control Unit through a single DRIVE-CLiQ cable.



A DRIVE-CLiQ Hub Module allows individual DRIVE-CLiQ devices to be removed without interrupting the data exchange with the remaining devices in the DRIVE-CLiQ line.



# SINAMICS S120 drive system

## Supplementary system components

### DME20 DRIVE-CLiQ Hub Module

#### Overview



DME20 DRIVE-CLiQ Hub Module

The DME20 DRIVE-CLiQ Hub Module is used to implement star-shaped distribution of a DRIVE-CLiQ line. Two DME20 DRIVE-CLiQ Hub Modules can be connected in series (cascaded).

#### Design

The DME20 DRIVE-CLiQ Hub Module in degree of protection IP67 is designed for mounting outside control cabinets.

The following are located on the DME20 DRIVE-CLiQ Hub Module:

- 6 DRIVE-CLiQ sockets for connecting 5 DRIVE-CLiQ nodes
- 1 connection for the electronics power supply via the 24 V DC circular supply connector with conductor cross-section  $4 \times 0.75 \text{ mm}^2$  (pins 1+2 internally bridged; pins 3+4 internally bridged)

The scope of supply of the DRIVE-CLiQ module includes:

- 6 blanking plugs for sealing unused DRIVE-CLiQ sockets.

#### Technical specifications

<b>DME20 DRIVE-CLiQ Hub Module</b> 6SL3055-0AA00-6AB0	
<b>Current requirement, max.</b> at 24 V DC without DRIVE-CLiQ supply	0.15 A
• Conductor cross-section, max.	$4 \times 0.75 \text{ mm}^2$
<b>Degree of protection</b>	IP67
<b>Dimensions</b>	
• Width	99 mm (3.90 in)
• Height	149 mm (5.87 in)
• Depth	55.7 mm (2.19 in) (without connector)
<b>Weight, approx.</b>	0.8 kg (1.8 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>DME20 DRIVE-CLiQ Hub Module</b> Without DRIVE-CLiQ cable; without electronics power supply cable and circular connector for 24 V DC	<b>6SL3055-0AA00-6AB0</b>

#### Accessories

<b>24 V DC power supply cable</b>	Ordering and delivery Phoenix Contact <a href="http://www.phoenixcontact.com">www.phoenixcontact.com</a>
• Shielded connector, 5-pole, user-assembled	Type No. 1508365
• 4-pole non-shielded connector, user-assembled, Speedcon quick-lock	Type No. 1521601

#### Accessories for re-ordering

<b>Dust-proof blanking plugs IP67</b> (6 units) For DRIVE-CLiQ port	<b>6SL3066-4CA01-0AA0</b>
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#### Integration

Refer to DMC20 DRIVE-CLiQ Hub Module.

# SINAMICS S120 drive system

## Supplementary system components

### TB30 Terminal Board

#### Overview



The TB30 Terminal Board supports the addition of digital inputs/digital outputs and analog inputs/analog outputs to the CU320-2 and SIMOTION D4x5-2 Control Units.

#### Design

The following are located on the TB30 Terminal Board:

- Power supply for digital inputs/digital outputs
- 4 digital inputs
- 4 digital outputs
- 2 analog inputs
- 2 analog outputs

The TB30 Terminal Board plugs into the option slot on a Control Unit.

A shield connection for the signal cable shield is located on the Control Unit.

#### Technical specifications

##### TB30 Terminal Board

6SL3055-0AA00-2TA0

##### Current requirement

At 24 V DC via the CU320-2 Control Unit without taking into account the digital outputs, max.

0.05 A

- Conductor cross-section, max. 2.5 mm<sup>2</sup>
- Fuse protection, max. 20 A

##### Digital inputs

in accordance with IEC 61131-2 Type 1

- Voltage -3 ... +30 V
- Low level (an open digital input is interpreted as "low") -3 ... +5 V
- High level 15 ... 30 V
- Current consumption at 24 V DC, typ. 10 mA
- Delay time of digital inputs <sup>1)</sup>, approx.
  - L → H 50 μs
  - H → L 100 μs
- Conductor cross-section, max. 0.5 mm<sup>2</sup>

##### Digital outputs

(sustained short-circuit strength)

- Voltage 24 V DC
- Load current per digital output, max. 500 mA
- Delay time of digital outputs <sup>1)</sup>, approx. 150 μs
- Conductor cross-section, max. 0.5 mm<sup>2</sup>

##### Analog inputs

(difference)

- Voltage range (an open analog input is interpreted as 0 V) -10 ... +10 V
- Internal resistance  $R_i$  65 kΩ
- Resolution <sup>2)</sup> 13 bit + sign
- Conductor cross-section, max. 0.5 mm<sup>2</sup>

##### Analog outputs

(sustained short-circuit strength)

- Voltage range -10 ... +10 V
- Max. load current -3 ... +3 mA
- Resolution 11 bit + sign
- Settling time, approx. 200 μs
- Conductor cross-section, max. 0.5 mm<sup>2</sup>

##### Power loss

< 3 W

##### Weight, approx.

0.1 kg (0.2 lb)

##### Approvals, according to

cULus

#### Selection and ordering data

Description	Order No.
<b>TB30 Terminal Board</b>	<b>6SL3055-0AA00-2TA0</b>

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input is processed.

<sup>2)</sup> If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency  $f_a = 1/t_{\text{time slice}}$  must be at least twice the value of the highest signal frequency  $f_{\text{max}}$

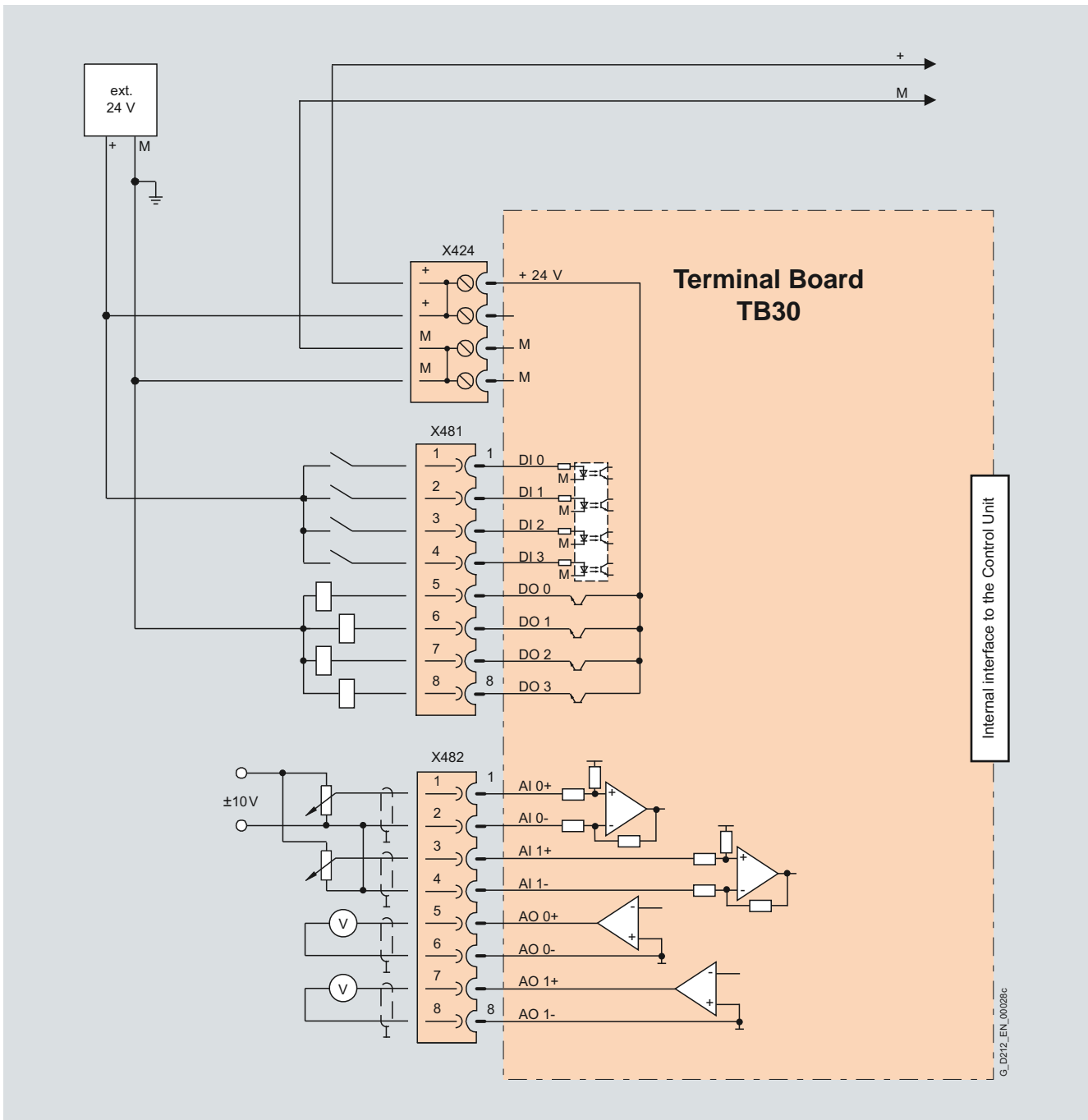
# SINAMICS S120 drive system

## Supplementary system components

### TB30 Terminal Board

#### Integration

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Connection example of a TB30 Terminal Board

# SINAMICS S120 drive system

## Supplementary system components

### TM15 Terminal Module

#### Overview



The number of available digital inputs and outputs within a drive system can be expanded with the TM15 Terminal Module.

#### Design

The following are located on the TM15 Terminal Module:

- 24 bidirectional digital inputs/outputs (isolation in 3 groups with 8 channels each)
- 24 green status LEDs for indicating the logical signal status of the relevant terminal
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The TM15 Terminal Module can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM15 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM15 Terminal Module is indicated via a multi-color LED.

#### Selection and ordering data

Description	Order No.
<b>TM15 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3FA0</b>
<b>Accessories</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ ports	<b>6SL3066-4CA00-0AA0</b>

#### Technical specifications

<b>TM15 Terminal Module</b> 6SL3055-0AA00-3FA0	
<b>Current requirement</b> at 24 V DC without load, max.	0.15 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Number of DRIVE-CLiQ sockets</b>	2
<b>I/O</b>	
• Digital inputs/outputs	Can be parameterized channel-by-channel as DI or DO
• Number of digital inputs/outputs	24
• Isolation	Yes, in groups of 8
• Cables and connections	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital inputs</b>	
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC	5 ... 11 mA
• Delay times of digital inputs, typ. <sup>1)</sup>	
- L → H	50 μs
- H → L	100 μs
<b>Digital outputs</b> (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Delay times (resistive load) <sup>1)</sup>	
- L → H, typ. L → H, max.	50 μs 100 μs
- H → L, typ. H → L, max.	150 μs 225 μs
• Aggregate current of outputs (per group), max.	
- Up to 60 °C	2 A
- Up to 50 °C	3 A
- Up to 40 °C	4 A
<b>Power loss</b>	< 3 W
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.86 kg (2 lb)
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input/output is processed.

# SINAMICS S120 drive system

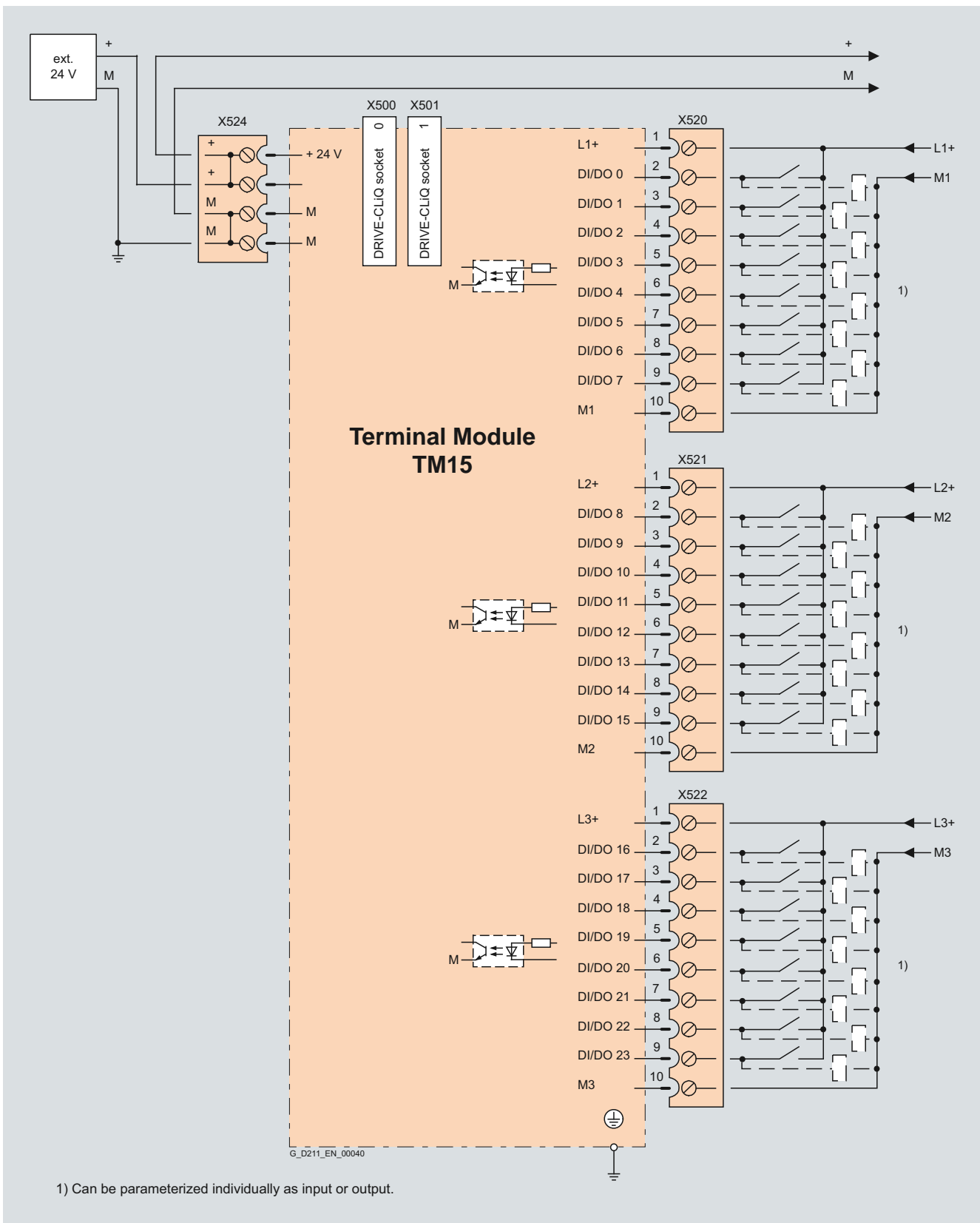
## Supplementary system components

### TM15 Terminal Module

3

#### Integration

The TM15 Terminal Module communicates with a CU310-2, CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



Connection example of a TM15 Terminal Module

# SINAMICS S120 drive system

## Supplementary system components

### TM31 Terminal Module

#### Overview



The TM31 Terminal Module can be used to increase the number of available digital inputs and outputs and the number of analog inputs and outputs within a drive system.

The TM31 Terminal Module also features relay outputs with changeover contact and a temperature sensor input.

#### Design

The following are located on the TM31 Terminal Module:

- 8 digital inputs
- 4 bidirectional digital inputs/outputs
- 2 relay outputs with changeover contact
- 2 analog inputs
- 2 analog outputs
- 1 temperature sensor input (KTY84-130 or PTC)
- 2 DRIVE-CLiQ sockets
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The TM31 Terminal Module can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM31 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM31 Terminal Module is indicated via a multi-color LED.

#### Selection and ordering data

Description	Order No.
<b>TM31 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3AA1</b>
<b>Accessories</b>	
<b>SINAMICS/SINUMERIK/SIMOTION</b> <b>dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ ports	<b>6SL3066-4CA00-0AA0</b>

# SINAMICS S120 drive system

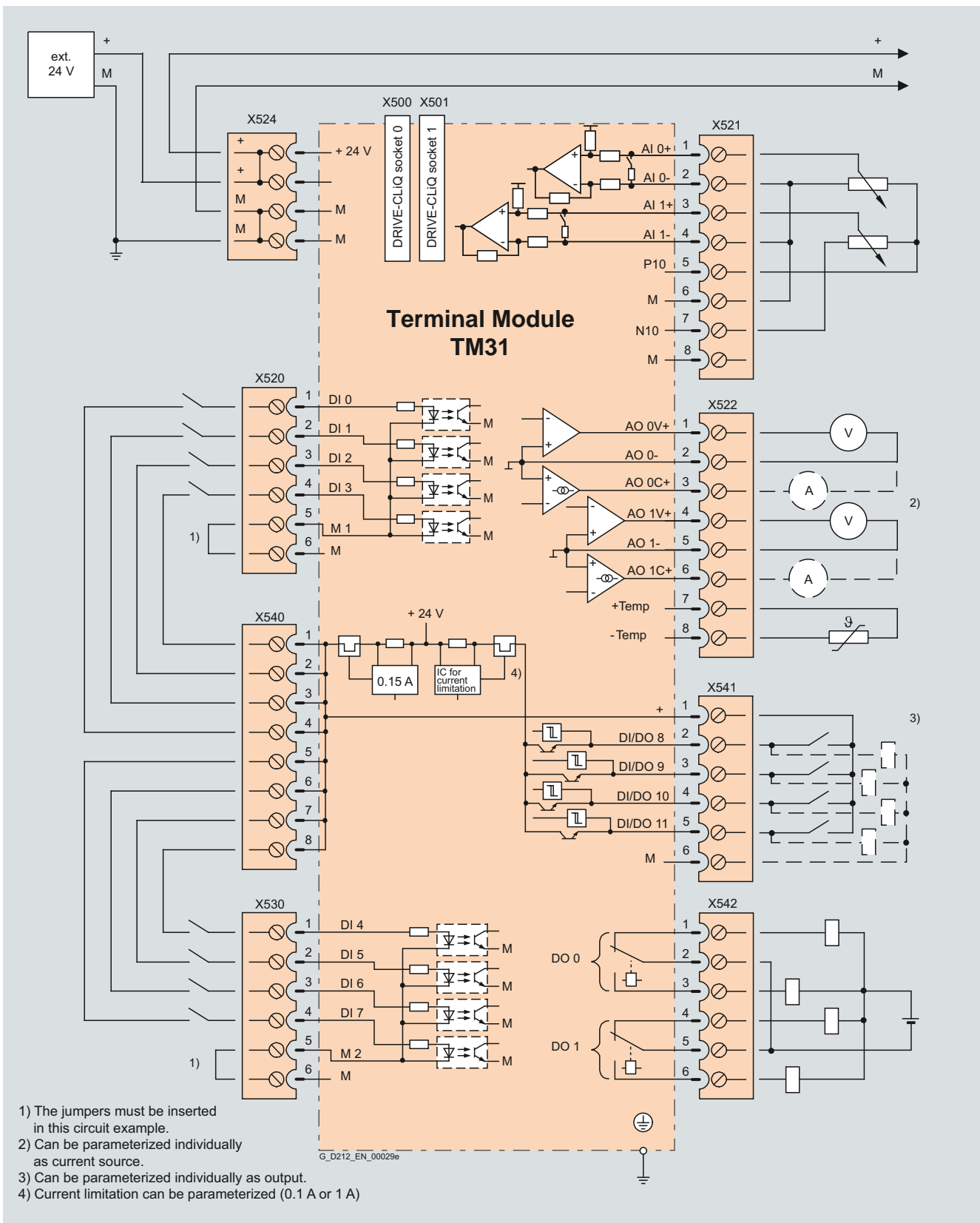
## Supplementary system components

### TM31 Terminal Module

#### Integration

The TM31 Terminal Module communicates with a CU310-2, CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.

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Connection example of a TM31 Terminal Module



#### Technical specifications

<b>TM31 Terminal Module</b> 6SL3055-0AA00-3AA1	
<b>Current requirement</b> at 24 V DC without taking account of digital outputs and DRIVE-CLiQ supply, max.	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Digital inputs</b> in accordance with IEC 61131-2 Type 1	
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay times of digital inputs <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b> (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per digital output, max.	100 mA
• Aggregate current of digital outputs, max.	400 mA
• Delay times of digital outputs <sup>1)</sup>	
- Typ.	150 μs at 0.5 A resistive load
- Max.	500 μs
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Analog inputs</b> (a switch is used to toggle between voltage and current input)	
• As voltage input	
- Voltage range	-10 ... +10 V
- Internal resistance $R_i$	100 kΩ
• As current input	
- Current range	4 ... 20 mA, -20 ... +20 mA, 0 ... 20 mA
- Internal resistance $R_i$	250 Ω
- Resolution <sup>2)</sup>	11 bit + sign
• Conductor cross-section, max.	1.5 mm <sup>2</sup>

<b>TM31 Terminal Module</b> 6SL3055-0AA00-3AA1	
<b>Analog outputs</b> (sustained short-circuit strength)	
• Voltage range	-10 ... +10 V
• Max. load current	-3 ... +3 mA
• Current range	4 ... 20 mA, -20 ... +20 mA, 0 ... 20 mA
• Load resistance, max.	500 Ω for outputs in the range -20 ... +20 mA
• Resolution	11 bit + sign
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Relay outputs</b> (changeover contacts)	
• Max. load current	8 A
• Operating voltage, max.	250 V AC, 30 V DC
• Switching capacity, max.	
- at 250 V AC	2000 VA (cos φ = 1) 750 VA (cos φ = 0.4)
- at 30 V DC	240 W (resistive load)
• Required minimum current	100 mA
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
<b>Power loss</b>	< 10 W
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.87 kg (2 lb)
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input is processed.

<sup>2)</sup> If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency  $f_a = 1/t_{\text{time slice}}$  must be at least twice the value of the highest signal frequency  $f_{\text{max}}$ .

# SINAMICS S120 drive system

## Supplementary system components

### TM41 Terminal Module

#### Overview



The TM41 Terminal Module supplies TTL signals which emulate an incremental encoder, e.g. to a higher-level control. The encoder interface (incremental encoder emulation) can be linked to an encoder signal from the Control Unit, e.g. incremental encoder sin/cos, by parameter assignment.

The TM41 Terminal Module increases the number of digital inputs/outputs and analog inputs that are available in the drive system.

#### Design

The following are located on the TM41 Terminal Module:

- 4 bidirectional digital inputs/outputs
- 4 digital inputs (with electrical isolation)
- 1 analog input
- 1 interface for emulation of TTL incremental encoder (RS422)
- 1 LED for signaling zero mark detection for encoder interface
- 2 DRIVE-CLiQ sockets
- 1 connection for the 24 V DC supply of the digital outputs
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The TM41 Terminal Module can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM41 Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM41 Terminal Module is indicated via a multi-color LED.

An LED next to the interface for TTL pulse encoder emulation is illuminated as soon as a zero mark is detected.

#### Selection and ordering data

Description	Order No.
<b>TM41 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3PA1</b>
<b>Accessories</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ ports	<b>6SL3066-4CA00-0AA0</b>

# SINAMICS S120 drive system

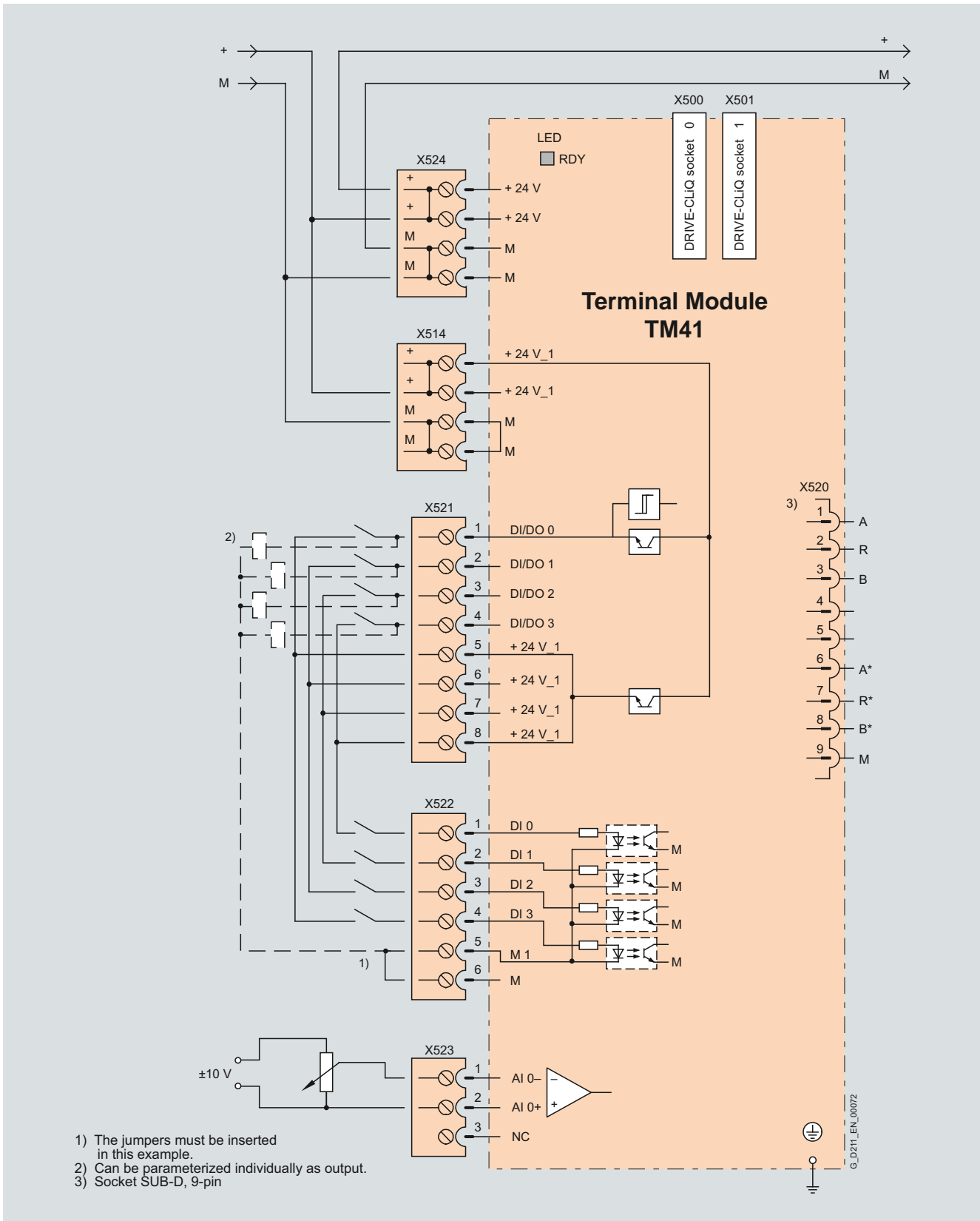
## Supplementary system components

### TM41 Terminal Module

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#### Integration

The TM41 Terminal Module communicates with a CU310-2, CU320-2 or SIMOTION D Control Unit via DRIVE-CLiQ.



Connection example of a TM41 Terminal Module

# SINAMICS S120 drive system

## Supplementary system components

### TM41 Terminal Module

#### Technical specifications

<b>TM41 Terminal Module</b> 6SL3055-0AA00-3PA1	
<b>Current requirement</b> (X524 at 24 V DC) without DRIVE-CLiQ supply or digital outputs (X514)	0.5 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>I/O</b>	
• Digital inputs/outputs	Individually parameterizable as DI or DO
• Number of digital inputs/outputs	4
• Number of digital inputs/outputs (with isolation)	4
• Cables and connections	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital inputs</b>	
• Voltage	
- Without isolation	-3 ... +30 V
- With isolation	-30 ... +30 V
• Low level (an open digital input is interpreted as "low")	
- Without isolation	-3 ... +5 V
- With isolation	-30 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	< 9 mA
• Delay times of digital inputs, max. <sup>1)</sup>	
- L → H	3 ms
- H → L	3 ms
<b>Digital outputs</b> (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per digital output, max.	0.5 A
• Delay times (resistive load) <sup>1)</sup>	
- L → H, typ.	50 μs
- L → H, max.	100 μs
- H → L, typ.	75 μs
- H → L, max.	150 μs
<b>Analog input</b> (difference)	
• Voltage range	-10 ... +10 V
• Internal resistance	≥ 100 kΩ
• Resolution <sup>2)</sup>	12 bit + sign

<b>TM41 Terminal Module</b> 6SL3055-0AA00-3PA1	
<b>Pulse encoder emulation</b>	
• Level	TTL (RS422), A+, A-, B+, B-, zero track N+, N-
• Limit frequency $f_{max}$ .	512 kHz
• Ratio Encoder pulses: encoder emulation	Any pulse ratio possible
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.85 kg (2 lb)
<b>Approvals, according to</b>	cULus

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input/output is processed.

<sup>2)</sup> If the analog input is to be operated in the signal processing sense with continuously variable input voltage, the sampling frequency  $f_a = 1/t_{\text{time slice}}$  must be at least twice the value of the highest signal frequency  $f_{max}$ .

# SINAMICS S120 drive system

## Supplementary system components

### TM54F Terminal Module

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#### Overview



The TM54F Terminal Module is a dual-processor I/O interface with 4 fail-safe digital outputs and 10 fail-safe digital inputs for utilization of the Safety Integrated functions of the SINAMICS S120 drive system over external actuators and sensors.

Every available safety function integrated in the drive can be controlled via the fail-safe digital inputs of the TM54F Terminal Module. In cases where the parameterized safety functions of multiple drives operated on a CU320-2, SIMOTION D4x5-2 or Controller Extension CX32-2 are to be executed on a group basis, the relevant drives can be combined into groups in the TM54F Terminal Module. This has the advantage that only one fail-safe digital input needs to be connected for these drives.

The fail-safe digital outputs and inputs have two channels with internal cross-over data comparison using the two processors. A fail-safe digital output consists of one current sourcing and one current sinking output as well as a digital input for reading back the switching state. A fail-safe digital input consists of two digital inputs.

Safety sensors can be connected over two switchable 24 V sensor supplies and can be evaluated over the fail-safe digital inputs. The switchable 24 V sensor supply ensures that the fail-safe digital inputs can be dynamized for error discovery (fault checking procedure). An unswitchable 24 V sensor supply is additionally provided by the TM54F Terminal Module for connecting undynamizable safety sensors.

The TM54F Terminal Module must be connected to a CU310-2, CU320-2 or SIMOTION D Control Unit via a DRIVE-CLiQ cable. Only one TM54F Terminal Module can be assigned to each Control Unit. It is not permissible to make the TM54F connection via another DRIVE-CLiQ device, e.g. a Motor Module or Line Module.

#### Design

The following are located on the TM54F Terminal Module:

- 4 fail-safe digital outputs
- 10 fail-safe digital inputs
- 4 LEDs, single color for indicating the status of the read back channel of the fail-safe digital outputs
- 4 LEDs, dual-color for indicating the status of the fail-safe digital outputs
- 20 LEDs, dual-color for indicating the status of the fail-safe digital inputs
- 3 LEDs, single color for indicating the status of the 24 V sensor supplies
- 2 DRIVE-CLiQ sockets
- 2 connections for 24 V sensor supply, switchable
- 1 connection for 24 V sensor supply, not switchable
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 connection for the 24 V power supply to digital outputs and sensors
- 1 PE (protective earth) connection

The TM54F Terminal Module can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield can be connected to the TM54F Terminal Module via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used for strain relief.

The status of the TM54F Terminal Module is indicated via a multi-color LED.

Pins for connector coding are supplied with the TM54F Terminal Module.

#### Selection and ordering data

Description	Order No.
<b>TM54F Terminal Module</b>	<b>6SL3055-0AA00-3BA0</b>
Without DRIVE-CLiQ cable	
<b>Accessories</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b>	<b>6SL3066-4CA00-0AA0</b>
(50 units)	
For DRIVE-CLiQ ports	

# SINAMICS S120 drive system

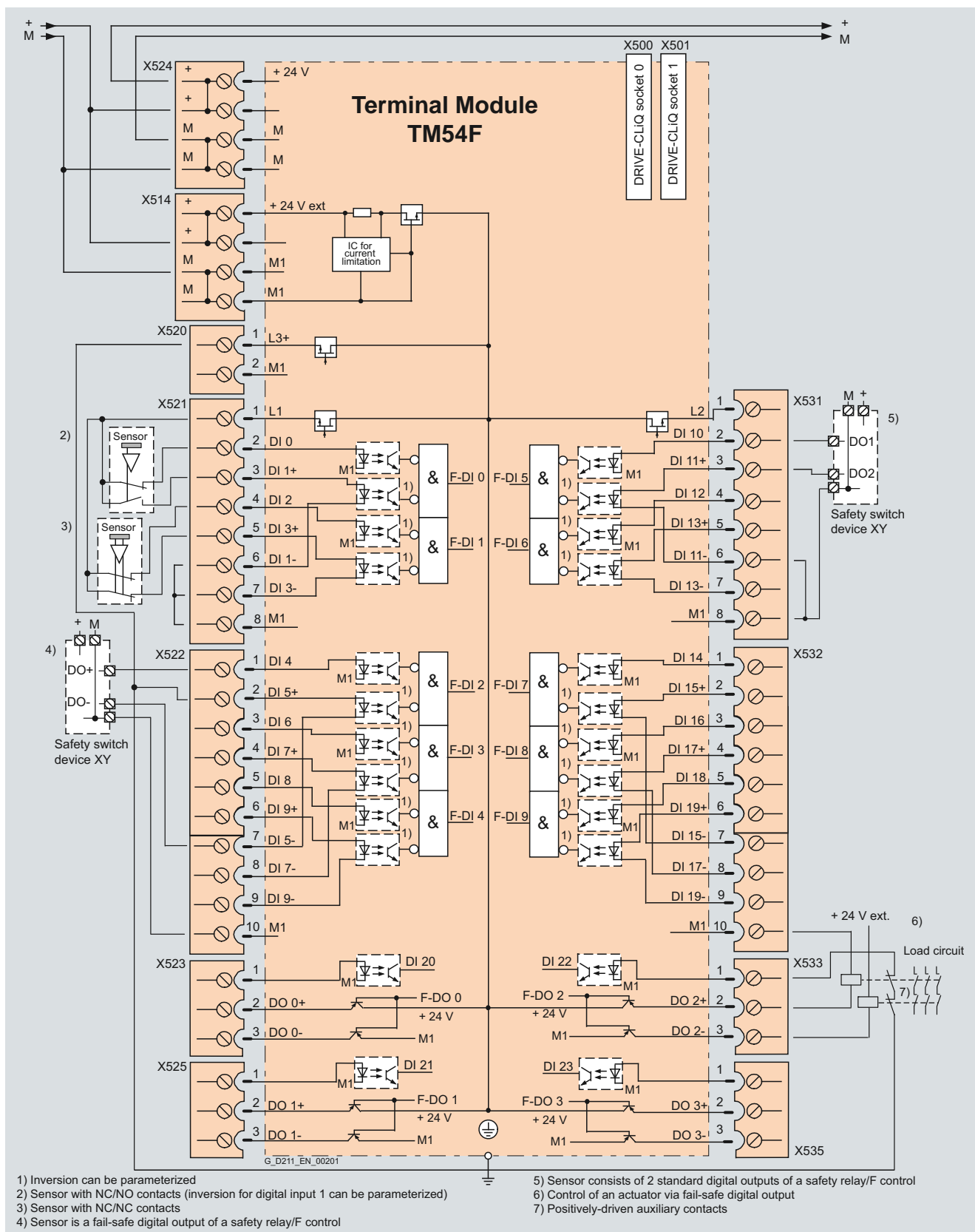
## Supplementary system components

### TM54F Terminal Module

#### Integration

The TM54F Terminal Module communicates with a CU310-2, CU320-2, SIMOTION D or SIMOTION CX32-2 Control Unit via DRIVE-CLIQ.

3



Connection example of a TM54F Terminal Module

# SINAMICS S120 drive system

## Supplementary system components

### TM54F Terminal Module

#### Technical specifications

<b>TM54F Terminal Module</b> 6SL3055-0AA00-3BA0	
<b>Current requirement</b> (X524 at 24 V DC) without DRIVE-CLiQ supply	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Max. current demand ext. 24 V</b> For supplying the digital outputs and 24 V sensor supply (X514 at 24 V DC)	4 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>I/O</b>	
• Number of fail-safe digital inputs	10
• Number of fail-safe digital outputs	4
• 24 V sensor supply	3, of which 2 can be internally shut down temporarily for dynamizing fail-safe digital inputs, current carrying capacity of each is 0.5 A
• Cables and connections	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital inputs</b> According to IEC 61131-2 Type 1, with isolation	
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	> 2 mA
• Delay time of digital inputs, approx. <sup>1)</sup>	
- L → H, typ.	30 μs
- H → L, typ.	60 μs
• Safe state	Low level (for inputs that can be inverted: without inversion)
<b>Digital outputs</b> (sustained short-circuit strength)	
• Voltage	24 V DC
• Load current per fail-safe digital output, max. <sup>2)</sup>	0.5 A
• Delay times (resistive load) <sup>1)</sup>	
- L → H, typ.	300 μs
- H → L, typ.	350 μs
• Safe state	Output switched off
<b>Scanning cycle <math>t_{SI}</math></b> for fail-safe digital inputs or fail-safe digital outputs	4 ... 25 ms (adjustable)

<b>TM54F Terminal Module</b> 6SL3055-0AA00-3BA0	
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.9 kg (2 lb)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1.

<sup>1)</sup> The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input/output is processed.

<sup>2)</sup> The total current of all fail-safe digital outputs must not exceed 5.33 A.

# SINAMICS S120 drive system

## Supplementary system components

### TM120 Terminal Module

#### Overview



The TM120 Terminal Module is capable of evaluating up to 4 temperature sensors (KTY84-130 or PTC). The temperature sensor inputs are safely electrically separated from the evaluation electronics in the TM120 Temperature Module and are suitable for evaluating the temperature of special motors, e.g. 1FN linear motors and 1FW6 built-in torque motors.

The TM120 Terminal Module can be operated on a CU320-2 or SIMOTION D4x5-2 Control Unit or Controller Extension CX32-2 from SINAMICS firmware version 4.3 and higher.

#### Design

The following are located on the TM120 Terminal Module:

- 4 temperature sensor inputs (KTY84-130 or PTC)
- 2 DRIVE-CLiQ sockets

The status of the TM120 Terminal Module is indicated via a multi-color LED.

The TM120 Terminal Module is designed to be snapped onto a TH35 top-hat rail in accordance with EN 60715.

#### Technical specifications

##### TM120 Terminal Module

6SL3055-0AA00-3KA0

<b>Current requirement, max.</b> at 24 V DC	0.5 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A

##### Temperature sensor inputs

The inputs can be parameterized separately for the evaluation of KTY84-130 or PTC sensors or temperature switches.

• Conductor cross-section	0.2 ... 6 mm <sup>2</sup>
• Constant current per sensor, approx.	2 mA
• Safe electrical separation up to the line voltage, max.	480 V AC

<b>PE connection</b>	M4 screw
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##### Dimensions

• Width	30 mm (1.18 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)

<b>Weight, approx.</b>	0.41 kg (1 lb)
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#### Selection and ordering data

Description	Order No.
<b>TM120 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3KA0</b>
<b>Accessories</b>	
<b>SINAMICS/SINUMERIK/SIMOTION dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ ports	<b>6SL3066-4CA00-0AA0</b>



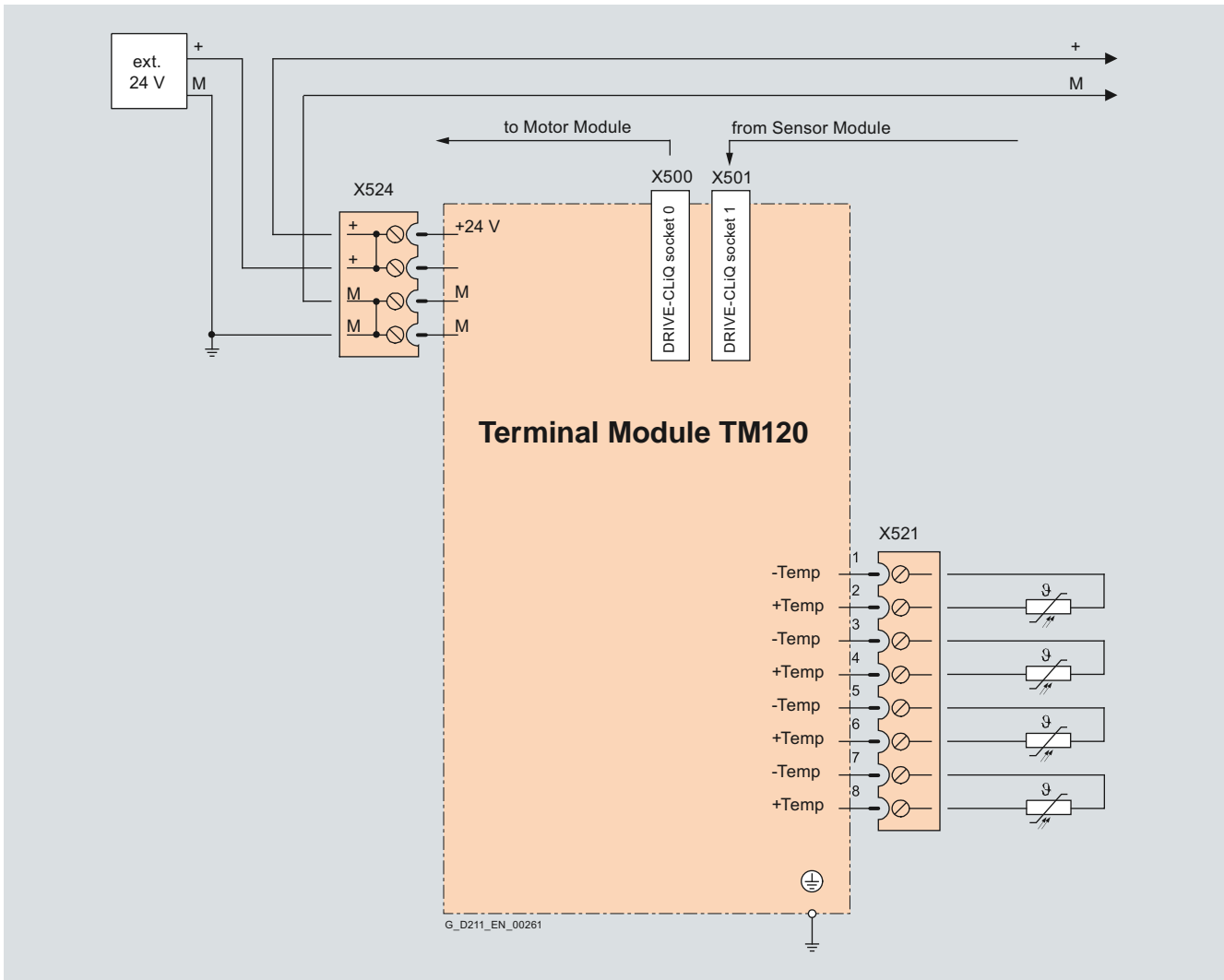
# SINAMICS S120 drive system

## Supplementary system components

### TM120 Terminal Module

Integration

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Connection example of a TM120 Terminal Module

# SINAMICS S120 drive system

## Supplementary system components

### TM150 Terminal Module

#### Overview



The TM150 Terminal Module is a DRIVE-CLiQ component for temperature evaluation. The temperature is measured in a temperature range from -99 °C to +250 °C (-210 °F to +482 °F) for the following temperature sensors:

- Pt100 (with monitoring for open-circuit and short-circuit)
- Pt1000 (with monitoring for open-circuit and short-circuit)
- KTY84 (with monitoring for open-circuit and short-circuit)
- PTC (with short-circuit monitoring)
- Bimetallic NC contact (without monitoring)

For the temperature sensor inputs, for each terminal block the evaluation can be parameterized for 1x2-wire, 2x2-wire, 3-wire or 4-wire. There is no galvanic isolation in the TM150.

The temperature channels of a TM150 can be subdivided into 3 groups and evaluated together.

#### Design

The following are located on the TM150 Terminal Module:

- 6/12 temperature sensor inputs
- 2 DRIVE-CLiQ sockets

The status of the TM150 Terminal Module is indicated via a multi-color LED.

The TM150 Terminal Module is designed to be snapped onto a TH35 top-hat rail in accordance with EN 60715.

#### Technical specifications

##### TM150 Terminal Module

6SL3055-0AA00-3LA0

<b>Current requirement, max.</b> at 24 V DC	0.5 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A

##### Temperature sensor inputs

The inputs can be parameterized individually for the evaluation of sensors

• Conductor cross-section, max.	1.5 mm <sup>2</sup>
• Measuring current per sensor, approx.	0.8 mA

<b>PE connection</b>	M4 screw
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##### Dimensions

• Width	30 mm (1.18 in)
• Height	150 mm (5.90 in)
• Depth	119 mm (4.68 in)

<b>Weight, approx.</b>	0.41 kg (1 lb)
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#### Selection and ordering data

Description	Order No.
<b>TM150 Terminal Module</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-3LA0</b>
<b>Accessories</b>	
<b>SINAMICS/SINUMERIK/SIMOTION</b> <b>dust-proof blanking plugs</b> (50 units) For DRIVE-CLiQ ports	<b>6SL3066-4CA00-0AA0</b>

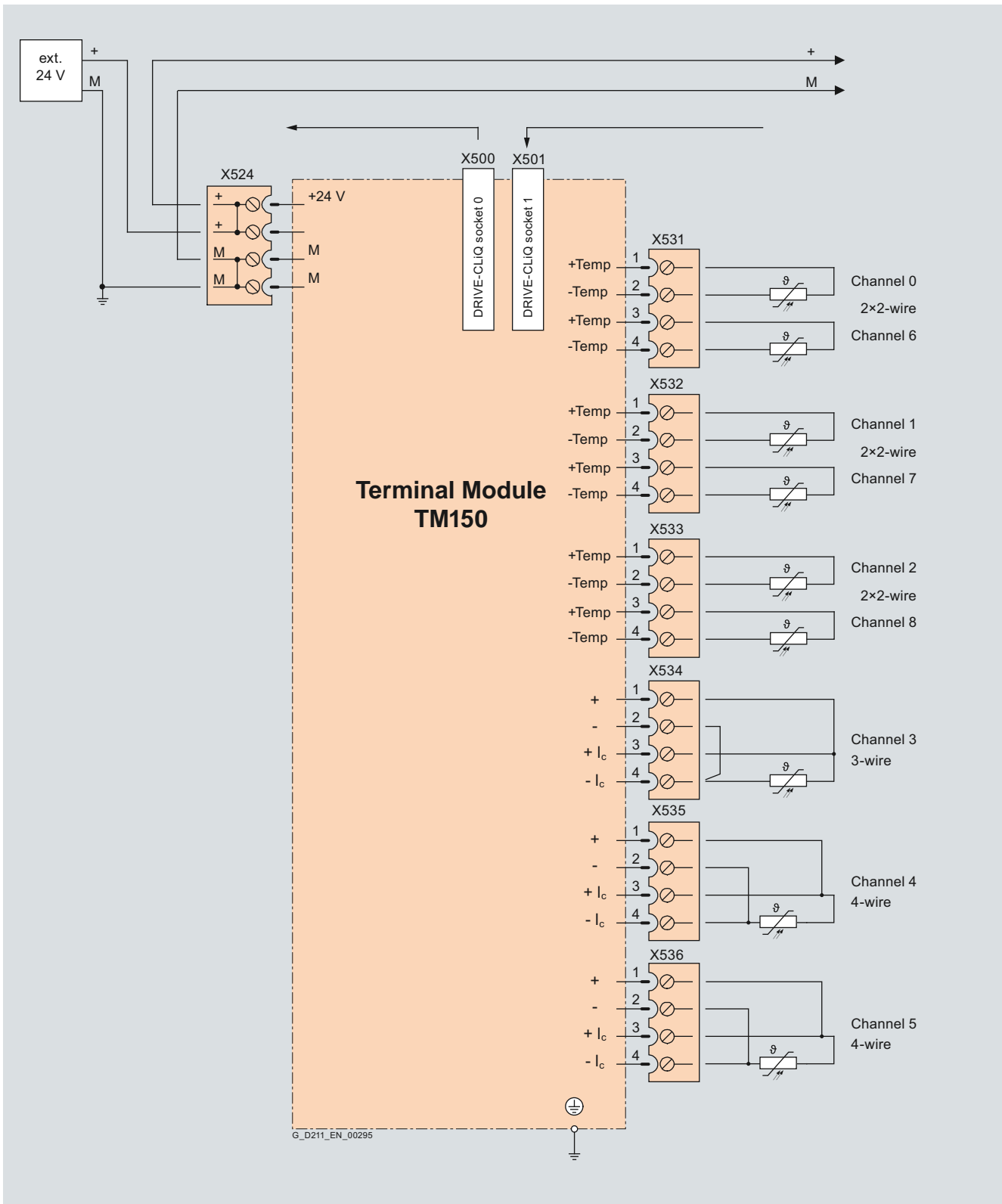
# SINAMICS S120 drive system

## Supplementary system components

### TM150 Terminal Module

#### Integration

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Connection example of a TM150 Terminal Module

# SINAMICS S120 drive system

## Supplementary system components

### VSM10 Voltage Sensing Module

#### Overview



The VSM10 Voltage Sensing Module can detect the exact line voltage characteristic and supports fault-free operation of Line Modules when power supply conditions are unfavorable, e.g. with severe voltage fluctuations or short-time interruptions. The phase differential voltage can be measured, either grounded (in the delivery state with jumper plugged in) or isolated.

The VSM10 Voltage Sensing Module is integrated in chassis format Active Interface Modules and in the chassis format Smart Line Modules. It can be used optionally with all booksize format Active Line Modules and 16 kW, 36 kW, or 55 kW Smart Line Modules.

#### Design

The VSM10 Voltage Sensing Module has the following connections and interfaces:

- 1 connection for direct line voltage detection up to 690 V
- 1 connection for line voltage detection using voltage transformers, maximum voltage 100 V
- 2 analog inputs (reserved for resonance monitoring in Active Interface Modules in chassis format)
- 1 temperature sensor input (KTY84-130 or PTC)
- 1 DRIVE-CLiQ socket
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 plug-in jumper for either grounded (delivery state) or isolated measurement
- 1 PE (protective earth) connection

The VSM10 Voltage Sensing Module can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The status of the VSM10 Voltage Sensing Module is indicated by a two-color LED.

#### Technical specifications

##### VSM10 Voltage Sensing Module 6SL3053-0AA00-3AA1

<b>Current requirement</b> at 24 V DC, max.	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
<b>Power loss</b>	< 10 W
<b>Line voltage detection</b>	
• Insulation resistance, neutral point – ground when the jumper is not inserted:	> 10 MΩ
• Input resistance	
- Terminal X521	> 362 kΩ/phase
- Terminal X522	> 2.5 MΩ/phase
<b>Analog inputs</b> (reserved for monitoring an Active Interface Module in chassis format)	
• Internal resistance, approx. (between differential inputs)	100 kΩ
• Resolution	12 bit
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	50 mm (1.97 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.9 kg (2 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>VSM10 Voltage Sensing Module</b> Without DRIVE-CLiQ cable	<b>6SL3053-0AA00-3AA1</b>

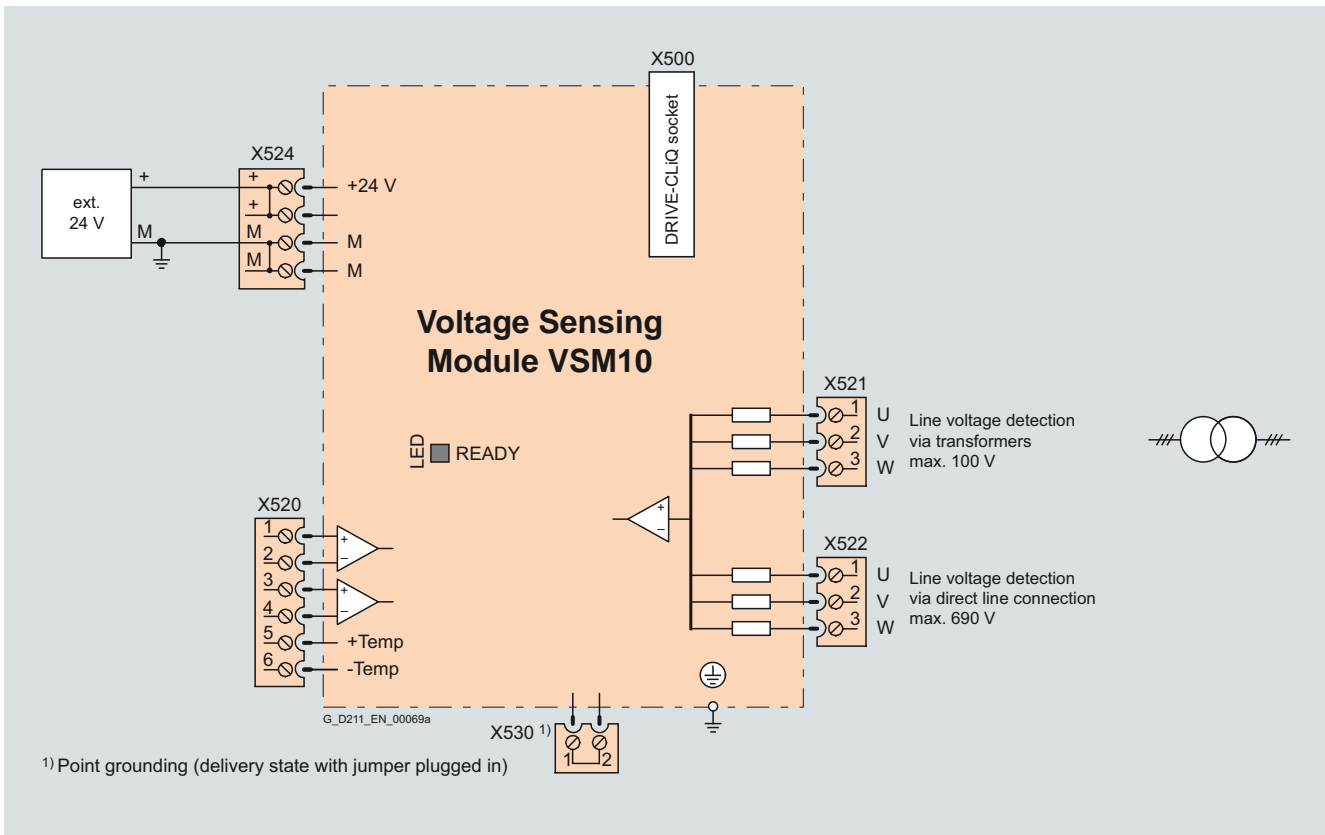
# SINAMICS S120 drive system

## Supplementary system components

### VSM10 Voltage Sensing Module

#### Integration

The VSM10 Voltage Sensing Module communicates with a CU320-2 or SIMOTION D4x5-2 Control Unit, or Controller Extension CX32-2 via DRIVE-CLiQ.



Connection example of a VSM10 Voltage Sensing Module

# SINAMICS S120 drive system

## Supplementary system components

### Safe Brake Relay

#### Overview



In the case of the Safe Brake Relay, the brake is controlled in accordance with ISO 13849-1 or EN 954-1 safety class 3 and IEC 61508 SIL2.

#### Design

The Safe Brake Relay can be installed below the Power Module on the shield connection plate.

The Safe Brake Relay has the following connections and interfaces:

- 1 two-channel transistor output stage to control the motor brake solenoid
- 1 connection for the cable harness (CTRL) to the Power Module in blocksize format
- 1 connection for the 24 V DC power supply

The connection between the 24 V DC supply and the Safe Brake Relay must be kept as short as possible.

The scope of supply of a Safe Brake Relay includes the following:

- 2 cable harnesses for connecting to the CTRL socket of the PM340 Power Module
  - 0.32 m (1.05 ft) length for frame sizes FSA and FSC
  - 0.55 m (1.8 ft) length for frame sizes FSE and FSF

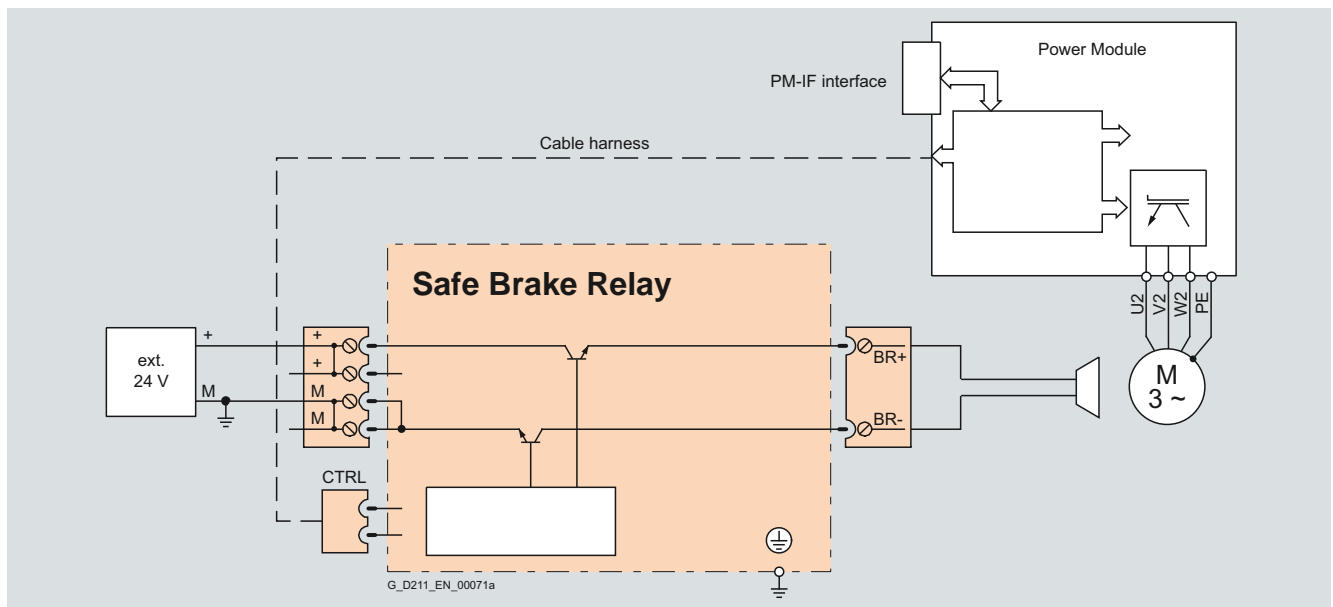
#### Technical specifications

<b>Safe Brake Relay</b> 6SL3252-0BB01-0AA0	
<b>Switching capacity</b> of the NO contact	–
<b>Power supply</b>	20.4 ... 28.8 V DC Recommended rated supply voltage 26 V DC (to compensate for voltage drop in feeder cable to 24 V DC motor brake solenoid)
<b>Current requirement, max.</b>	<ul style="list-style-type: none"> <li>• Motor brake 2 A</li> <li>• 24 V DC 0.05 A + the current requirement of the motor brake</li> <li>• Conductor cross-section, max. 2.5 mm<sup>2</sup></li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>• Width 69 mm (2.72 in)</li> <li>• Height 63 mm (2.48 in)</li> <li>• Depth 33 mm (1.30 in)</li> </ul>
<b>Weight, approx.</b>	0.17 kg (0.4 lb)

#### Selection and ordering data

Description	Order No.
<b>Safe Brake Relay</b> Including cable harness for connection to Power Module	<b>6SL3252-0BB01-0AA0</b>

#### Integration



Connection example of a Safe Brake Relay

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.

# SINAMICS S120 drive system

## Supplementary system components

### Safe Brake Adapter SBA

#### Overview



The Safe Brake Adapter SBA is required to implement a Safe Brake Control (Safety Integrated function "SBC") in conjunction with Motor Modules and Power Modules in chassis format.

The Safe Brake Adapter is available for a 230 V AC brake control voltage.

#### Integration

The control and feedback signal regarding the switching state of the SBA relay is implemented via terminals of the Control Interface Module (CIM) in the Motor Module/Power Module. The excitation coil of the holding brake is connected directly at the SBA.

For SINAMICS S120, the brake supply voltage must be externally supplied at the SBA.

#### Technical specifications

##### Safe Brake Adapter

6SL3355-2DX00-1AA0

##### Electronics power supply

- Supply voltage (via the Control Interface Module) 24 V DC  
20.4 ... 28.8 V

##### Supply voltage of the motor holding brake

230 V AC

##### Current consumption, max perm.

- Motor holding brake 2 A
- Fast de-energization 2 A

##### Cable length, max.

- to the Control Interface Module 10 m (32.8 ft)
- to the brake 300 m (984 ft)

##### Conductor cross-section, max.

2.5 mm<sup>2</sup>

##### Dimensions

- Width 75 mm (2.95 in)
- Height 111 mm (4.37 in)
- Depth 89 mm (3.50 in)

##### Weight, approx.

0.25 kg (0.55 lb)

##### Safety Integrated

Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to EN ISO 13849-1 (previously EN 954-1)

#### Selection and ordering data

Description	Order No.
<b>Safe Brake Adapter</b>	
230 V AC/2 A	<b>6SL3355-2DX00-1AA0</b>
<b>Accessories</b>	
<b>Connecting cable</b> for connecting the SBA to the Control Interface Module in the Motor Module/Power Module	<b>6SL3060-4DX04-0AA0</b>

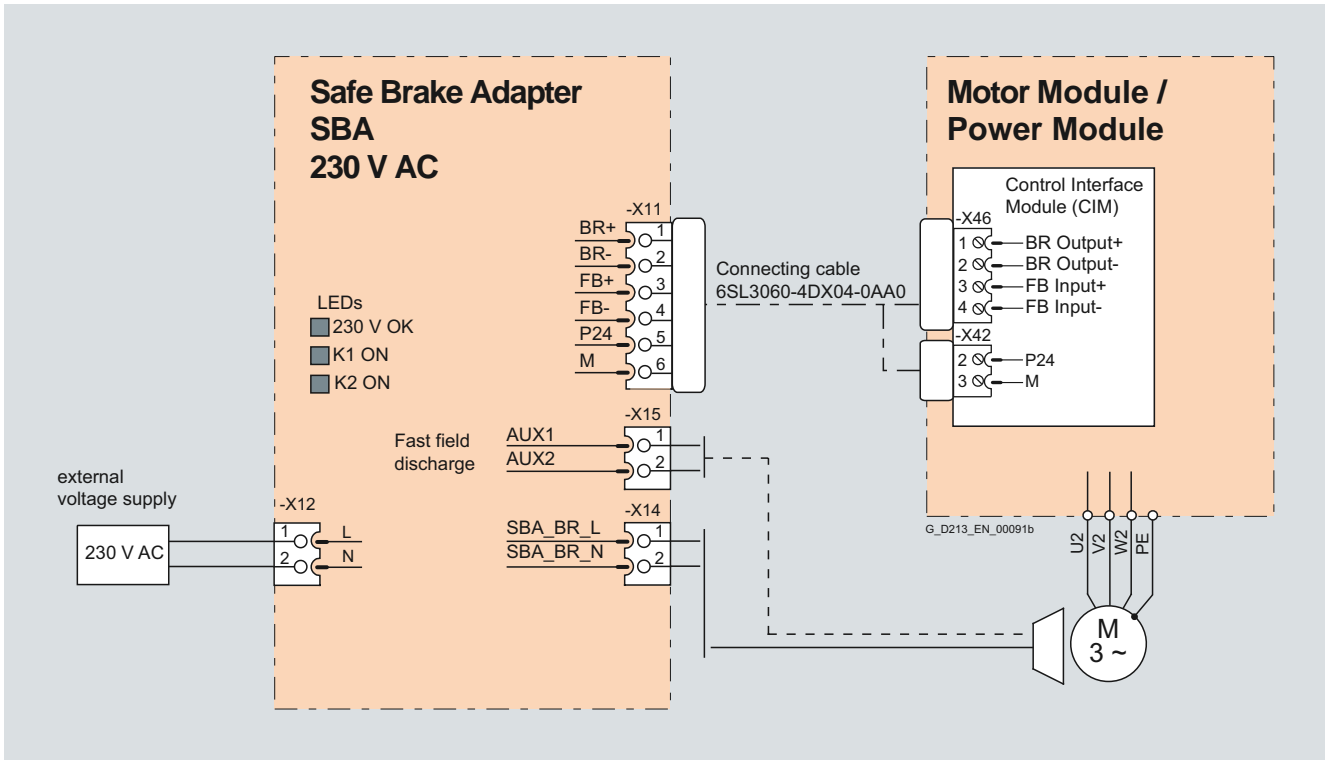
# SINAMICS S120 drive system

## Supplementary system components

### Safe Brake Adapter SBA

#### Integration

3



Connection example of a Safe Brake Adapter SBA



# SINAMICS S120 drive system

## Encoder system connection

### Encoder system connection

#### Overview

##### Motors with DRIVE-CLiQ interface



DRIVE-CLiQ is the preferred method for connecting the encoder systems to SINAMICS S120.

Motors with DRIVE-CLiQ interface are available for this purpose, e.g.

- 1PH8/1FT7/1FK7 synchronous motors
- 1PH8 asynchronous motors (induction motors)
- 1FW3 torque motors

Motors with a DRIVE-CLiQ interface can be directly connected to the associated Motor Module via the available MOTION-CONNECT DRIVE-CLiQ cables. The connection of the MOTION-CONNECT DRIVE-CLiQ cable at the motor has degree of protection IP67.

The DRIVE-CLiQ interface supplies the motor encoder via the integrated 24 V DC supply and transfers the motor encoder and temperature signals and the electronic rating plate data, e.g. a unique identification number and rated data (voltage, current, torque) to the Control Unit. This means that for the various encoder types – e.g. resolver or absolute encoder – different encoder cables with varying permissible lengths are no longer required; just one cable type, MOTION-CONNECT DRIVE-CLiQ with varying permissible lengths, can be used for all encoders.

Motors with DRIVE-CLiQ interface simplify commissioning and diagnostics, as the motor and encoder type are identified automatically.

##### Motors without DRIVE-CLiQ interface

The encoder and temperature signals of motors without DRIVE-CLiQ interfaces, as well as those of external encoders, must be connected via Sensor Modules. Sensor Modules Cabinet-Mounted are available in degree of protection IP20 for control cabinet installation, as well as Sensor Modules External-Mounted (degree of protection IP67).

Only one encoder system can be connected to each Sensor Module.

##### More information

Motor encoder and temperature signals must be connected when possible to the corresponding Motor Module or Power Module and external encoders to the Control Unit. However, the DRIVE-CLiQ connections can also be bundled via DRIVE-CLiQ Hub Modules.

##### Safety Integrated

The Safety Integrated Extended Functions of the SINAMICS S120 drive system require suitable encoders (see [chapter SIMOTICS S servomotors](#)).

##### Motor driven by belt

Unfavorable material combinations generate static electricity between the belt pulley and the belt. Electrostatic charging must be prevented, since this can discharge via the motor shaft and the encoder, thereby causing disturbances in the encoder signals. One remedy is to use an anti-static belt.

# SINAMICS S120 drive system

## Encoder system connection

### SMC10 Sensor Module Cabinet-Mounted

#### Overview



The SMC10 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC10.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multi-pole resolver

#### Design

The SMC10 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The status of the SMC10 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC10 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC10 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Integration

SMC10 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical specifications

<b>SMC10 Sensor Module Cabinet-Mounted</b> 6SL3055-0AA00-5AA3	
<b>Current requirement, max.</b> At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• 2-pole resolver</li> <li>• Multi-pole resolver</li> </ul>
• Excitation voltage, rms	4.1 V
• Excitation frequency	5 ... 10 kHz depending on the current controller clock cycle of the Motor Module or Power Module
• Transformation ratio	0.5
• Encoder frequency, max.	2 kHz (120000 rpm) depending on the number of resolver pole pairs and current controller clock cycle of the Motor Module or Power Module
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• Cable length to encoder, max.	130 m (426 ft)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm (1.18 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.4 kg (1 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SMC10 Sensor Module Cabinet-Mounted</b>	<b>6SL3055-0AA00-5AA3</b>
Without DRIVE-CLiQ cable	

# SINAMICS S120 drive system

## Encoder system connection

### SMC20 Sensor Module Cabinet-Mounted

#### Overview



The SMC20 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC20.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos  $1 V_{pp}$
- Absolute encoder EnDat
- SSI encoder with incremental signals sin/cos  $1 V_{pp}$  (firmware version 2.4 and later)

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### Design

The SMC20 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The status of the SMC20 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC20 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC20 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Integration

SMC20 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical specifications

##### SMC20 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5BA3

<b>Current requirement, max.</b>	0.2 A
At 24 V DC, not taking encoder into account	
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos <math>1 V_{pp}</math></li> <li>• Absolute encoder EnDat</li> <li>• SSI encoder with incremental signals sin/cos <math>1 V_{pp}</math> (firmware version 2.4 and later)</li> </ul>
• Encoder supply	5 V DC / 0.35 A
• Encoder frequency incremental signals, max.	500 kHz
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• SSI baud rate	100 kBaud
• Cable length to encoder, max.	100 m (328 ft)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm (1.18 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.45 kg (1 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SMC20 Sensor Module Cabinet-Mounted</b>	<b>6SL3055-0AA00-5BA3</b>
Without DRIVE-CLiQ cable	

# SINAMICS S120 drive system

## Encoder system connection

### SMC30 Sensor Module Cabinet-Mounted

#### Overview



The SMC30 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### Design

The SMC30 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection including motor temperature detection (KTY84-130 or PTC) via SUB-D connector or terminals
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The status of the SMC30 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC30 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 top-hat rail in accordance with EN 60715 (IEC 60715).

The maximum encoder cable length between SMC30 modules and encoders is 100 m (328 ft). For HTL encoders, this length can be increased to 300 m if the A+/A- and B+/B- signals are evaluated and the power supply cable has a minimum cross-section of 0.5 mm<sup>2</sup>.

The signal cable shield can be connected to the SMC30 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Integration

SMC30 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical specifications

<b>SMC30 Sensor Module Cabinet-Mounted</b> 6SL3055-0AA00-5CA2	
<b>Current requirement, max.</b> At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• Incremental encoder TTL/HTL</li> <li>• SSI encoder with TTL/HTL incremental signals</li> <li>• SSI encoder without incremental signals</li> </ul>
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBaud
• Limiting frequency	300 kHz
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) <sup>1)</sup>
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals <sup>1)</sup>
- SSI encoder	100 m (328 ft)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm (1.18 in)
• Height	150 mm (5.90 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.45 kg (1 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SMC30 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5CA2</b>

<sup>1)</sup> Signal cables twisted in pairs and shielded.

# SINAMICS S120 drive system

## Encoder system connection

### SME20/SME25 Sensor Modules External

#### Overview



SME20/SME25 Sensor Modules External are encoder evaluation units for machine encoders (direct measuring systems). The devices are designed with IP67 degree of protection. This means that the units can be installed outside the control cabinet near the machine encoder.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos  $1 V_{pp}$  without rotor position track (C and D tracks)
- Absolute encoder EnDat 2.1
- SSI absolute encoder <sup>1)</sup> with incremental signals sin/cos  $1 V_{pp}$  (firmware version V2.4 and later)

It is possible to connect a motor with a 17-pole circular encoder connector to the 12-pole circular connector of the SME20 using adapter cable 6FX 8002-2CA88-...

- KTY/PTC temperature sensors can be used for motor temperature evaluation (only possible with SME20).
- The Sensor Module is only suitable for motors without absolute track signals (C and D tracks, e.g.:
  - Synchronous motors with pole position identification (1FN, 1FW)
  - Asynchronous (induction) motors (1PH)

SME20/SME25 Sensor Modules External evaluate the encoder signals and convert the information obtained to DRIVE-CLiQ. Neither motor nor encoder data are saved in the SME20/SME25.

#### Design

SME20/SME25 Sensor Modules External feature the following connections and interfaces as standard:

- 1 DRIVE-CLiQ interface with integrated 24 V DC electronics power supply from the Control Unit or Motor Module
- 1 encoder connection (circular connector)
- 1 PE (protective earth) connection

#### Selection and ordering data

Description	Order No.
<b>SME20 Sensor Module External</b> For incremental measuring systems Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5EA3</b>
<b>SME25 Sensor Module External</b> For absolute measuring systems Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5HA3</b>
<b>Accessories</b>	
<b>Adapter cable <sup>2)</sup></b> For SME20, for connecting motors with 17-pole encoder connector, with encoders, without C and D tracks	<b>6FX8002-2CA88-....</b>

#### Integration

SME20/SME25 Sensor Modules External communicate with a Control Unit via DRIVE-CLiQ.

<sup>1)</sup> For SME25, only SSI encoders with 5 V supply voltage.

<sup>2)</sup> For length code, see MOTION-CONNECT connection systems.

# SINAMICS S120 drive system

## Encoder system connection

### SME20/SME25 Sensor Modules External

#### Technical specifications

		<b>SME20 Sensor Module External</b> 6SL3055-0AA00-5EA3	<b>SME25 Sensor Module External</b> 6SL3055-0AA00-5HA3
<b>Encoders</b>		<ul style="list-style-type: none"> <li>Incremental encoder sin/cos <math>1 V_{pp}</math> with 5 V power supply 0.35 A</li> </ul>	<ul style="list-style-type: none"> <li>Absolute encoder EnDat with 5 V power supply 0.35 A</li> <li>Absolute encoder SSI with incremental signals sin/cos <math>1 V_{pp}</math> with 5 V voltage supply 0.35 A</li> </ul>
<b>Signal subdivision</b> (Interpolation)		≤ 16384-times (14 bit)	≤ 16384-times (14 bit)
<b>Max. encoder frequency that can be evaluated</b>	kHz	≤ 500	≤ 500
<b>SSI/EnDat 2.1 baud rate</b>	kHz	–	100
<b>Measuring system interface</b>		12-pin M23 circular connector	17-pin M23 circular connector
<b>Output</b>		IP67 DRIVE-CLiQ connector	IP67 DRIVE-CLiQ connector
<b>Current requirement, max.</b> At 24 V DC, not taking encoder into account	A	0.11	0.11
<ul style="list-style-type: none"> <li>Conductor cross-section</li> <li>Protection</li> </ul>		Acc. to connector contacts Via DRIVE-CLiQ power supply source	Acc. to connector contacts Via DRIVE-CLiQ power supply source
<b>Power loss</b>	W	< 4	< 4
<b>PE connection</b>		M4 screw/1.8 Nm	M4 screw/1.8 Nm
<b>Cable length, max.</b>			
<ul style="list-style-type: none"> <li>To measuring system <sup>1)</sup></li> <li>To automatic speed control</li> </ul>	m (ft)	3 (9.84) 100 (328)	3 (9.84) 100 (328)
<b>Degree of protection</b>		IP67	IP67
<b>Dimensions</b>			
<ul style="list-style-type: none"> <li>Width</li> <li>Height</li> <li>Depth</li> </ul>	mm (in)	58 (2.28) 44 (1.73) 112 (4.41)	58 (2.28) 44 (1.73) 112 (4.41)
<b>Weight, approx.</b>	kg (lb)	0.31 (0.7)	0.31 (0.7)
<b>Approvals, according to</b>		cULus	cULus

<sup>1)</sup> The maximum cable length for the encoder system interface depends on the current consumption of the encoder system and the cross-section of the wires in the cable. However, the maximum length is 10 m (32.8 ft).  
(for further details see [Manual SINAMICS S120 Control Units and supplementary system components](#)).

# SINAMICS S120 drive system

## Encoder system connection

### SME120/SME125 Sensor Modules External

#### Overview



The SME120/SME125 Sensor Modules External are encoder evaluation units with degree of protection IP67, especially suitable for use in linear and torque motor applications. They can be installed close to the motor systems and encoders in the machine.

Sensor Modules External evaluate the encoder signals and motor temperature sensors specifically and convert the information obtained for DRIVE-CLiQ. The motor temperature signals are safely electrically separated.

A Hall-effect sensor box can be connected for the SME120 to determine the commutation position of a linear motor.

Neither motor nor encoder data are saved in the SME120/SME125.

The SME120 and SME125 can be operated on Control Units with firmware release V2.4 and later.

The following encoder signals can be evaluated depending on the type of Sensor Module:

- Incremental encoder sin/cos 1 V<sub>pp</sub>
- Absolute encoder EnDat 2.1
- SSI absolute encoder <sup>1)</sup> with sin/cos 1 V<sub>pp</sub> incremental signals, but without reference signal

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### Design

SME120/SME125 Sensor Modules External feature the following connections and interfaces as standard:

- 1 DRIVE-CLiQ interface with integrated 24 V DC electronics power supply from the Control Unit or Motor Module
- 1 encoder connection (circular connector)
- 1 temperature sensor connection (circular connector)
- 1 Hall-effect sensor connection (circular connector) (SME120 only)
- 1 PE (protective earth) connection

#### Selection and ordering data

Description	Order No.
<b>SME120 Sensor Module External</b> For incremental measuring systems Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5JA3</b>
<b>SME125 Sensor Module External</b> For absolute measuring systems Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5KA3</b>
<b>Accessories</b>	
<b>Connector</b> for temperature sensor input (connector kits, 6+1-pole)	<b>6FX2003-0SU07</b>
<b>Connector</b> for Hall sensor input (connector kits, 9-pole)	<b>6FX2003-0SU01</b>
<b>Connector</b> for encoder system interface SME120 (connector kits, 12-pole)	<b>6FX2003-0SA12</b>
<b>Connector</b> for SME125 encoder system interface (connector kits, 17-pole)	<b>6FX2003-0SA17</b>

<sup>1)</sup> For SME125, only SSI encoders with 5 V supply voltage.

# SINAMICS S120 drive system

## Encoder system connection

### SME120/SME125 Sensor Modules External

#### Technical specifications

		<b>SME120 Sensor Module External</b> 6SL3055-0AA00-5JA3	<b>SME125 Sensor Module External</b> 6SL3055-0AA00-5KA3
<b>Encoders</b>		<ul style="list-style-type: none"> <li>Incremental encoder sin/cos 1 V<sub>pp</sub> with 5 V power supply</li> </ul>	<ul style="list-style-type: none"> <li>Absolute encoder EnDat with 5 V power supply</li> <li>SSI with incremental encoder sin/cos 1 V<sub>pp</sub> with 5 V power supply</li> </ul>
<b>Signal subdivision</b> (Interpolation)		≤ 16384-times (14 bit)	≤ 16384-times (14 bit)
<b>Max. encoder frequency that can be evaluated</b>	kHz	≤ 500	≤ 500
<b>SSI/EnDat 2.1 baud rate</b>	kHz	–	100
<b>Measuring system interface</b>		12-pin M23 circular connector	17-pin M23 circular connector
<b>Temperature sensor input</b>		6-pin M17 circular connector	6-pin M17 circular connector
<b>Hall effect sensor input</b>		9-pin M23 circular connector	–
<b>Output</b>		IP67 DRIVE-CLiQ connector	IP67 DRIVE-CLiQ connector
<b>Current requirement, max.</b> At 24 V DC, not taking encoder into account	A	0.16	0.16
<ul style="list-style-type: none"> <li>Current carrying capacity of the encoder supply for measuring system (at 5 V DC) and, where applicable, including hall effect sensor box</li> </ul>	A	0.35	0.35
<ul style="list-style-type: none"> <li>Conductor cross-section</li> <li>Protection</li> </ul>		Acc. to connector contacts Via DRIVE-CLiQ power supply source	Acc. to connector contacts Via DRIVE-CLiQ power supply source
<b>Power loss</b>	W	≤ 4.5	≤ 4.5
<b>PE connection</b>		M4 screw/1.8 Nm	M4 screw/1.8 Nm
<b>Cable length, max.</b>			
<ul style="list-style-type: none"> <li>To measuring system <sup>1)</sup>/ temperature sensor</li> </ul>	m (ft)	3 (9.84)	3 (9.84)
<ul style="list-style-type: none"> <li>To automatic speed control</li> </ul>	m (ft)	100 (328)	100 (328)
<b>Degree of protection</b>		IP67	IP67
<b>Dimensions</b>			
<ul style="list-style-type: none"> <li>Width</li> <li>Height</li> <li>Depth</li> </ul>	mm (in)	117.6 (4.63)	117.6 (4.63)
	mm (in)	44 (1.73)	44 (1.73)
	mm (in)	127 (5.00)	127 (5.00)
<b>Weight, approx.</b>	kg (lb)	0.7 (1.5)	0.7 (1.5)
<b>Approvals, according to</b>		cULus	cULus

<sup>1)</sup> The maximum cable length for the encoder system interface depends on the current consumption of the encoder system and the cross-section of the wires in the cable. However, the maximum length is 10 m (32.8 ft).  
(for further details see Manual SINAMICS S120 Control Units and supplementary system components).



## SIMOTICS servomotors

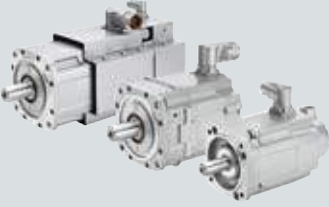
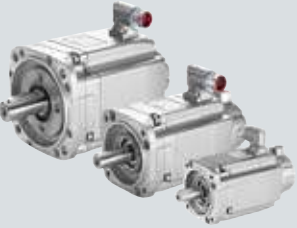


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<b>4/4</b>	<b>Technical definitions for AC motors</b>
<b>4/14</b>	<b>SIMOTICS S synchronous motors for SINAMICS S120</b>
4/14	<u>SIMOTICS S-1FT7 motors</u>
4/16	Compact core type – Natural cooling
4/18	Compact – Natural cooling
4/22	Compact – Forced ventilation
4/24	Compact – Water cooling
4/28	High Dynamic – Forced ventilation/ Water cooling
4/30	<u>SIMOTICS S-1FK7 motors</u>
4/34	Compact – Natural cooling
4/40	High Dynamic – Natural cooling
4/42	High Inertia – Natural cooling
4/44	Compact for Power Modules 230 V 1 AC
4/48	High Dynamic for Power Modules 230 V 1 AC
4/50	<u>Built-in holding brakes for SIMOTICS S-1FT7/1FK7 motors</u>
4/51	<u>SIMOTICS S-1FT7 geared servomotors</u>
4/51	with SP+ planetary gearbox
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4/64	1FK7-DYA compact geared motors Natural cooling
4/68	<u>SIMOTICS S-1FK7 geared servomotors</u>
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<b>4/102</b>	<b>Dimensional drawings</b>
4/102	<u>SIMOTICS S-1FT7</u>
4/102	without DRIVE-CLiQ – Natural cooling
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4/105	with DRIVE-CLiQ – Water cooling
4/106	without/with DRIVE-CLiQ – Forced ventilation
4/107	<u>SIMOTICS S-1FK7</u>
4/107	Natural cooling – SH 20/SH 28
4/108	Natural cooling
4/112	<u>Geared servomotors</u> <u>SIMOTICS S-1FT7/1FK7</u>
4/112	1FT7/1FK7 with SP+ planetary gearbox
4/114	1FK7 with LP+ planetary gearbox
4/115	1FK7-DYA compact geared motors
Part 14	<b>CAD CREATOR</b> Dimension drawing and 2D/3D CAD generator <a href="http://www.siemens.com/cadcreator">www.siemens.com/cadcreator</a>

# SIMOTICS servomotors

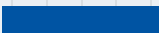




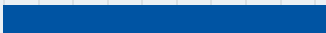
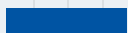



## Overview

4

Motor type	Features	Degree of protection	Cooling method
<b>SIMOTICS S-1FT7 servomotors</b> 	<b>Compact</b> Permanent-magnet synchronous servomotor	IP64 (optional IP65, IP67)	Natural cooling  Forced ventilation  Water cooling
	<b>High Dynamic</b> Permanent-magnet synchronous servomotor Very low rotor moment of inertia	IP64 (optional IP65, IP67)	Forced ventilation  Water cooling
<b>SIMOTICS S-1FK7 servomotors</b> 	<b>Compact</b> Permanent-magnet synchronous servomotor	IP64 (optional IP65)	Natural cooling
	<b>High Dynamic</b> Permanent-magnet synchronous servomotor	IP64 (optional IP65)	Natural cooling
	<b>High Inertia</b> Permanent-magnet synchronous servomotor Increased rotor moment of inertia	IP64 (optional IP65)	Natural cooling
	<b>Compact for Power Modules 230 V 1 AC</b>  <b>High Dynamic for Power Modules 230 V 1 AC</b> Permanent-magnet synchronous servomotor	IP64 (optional IP65)	Natural cooling

SIMOTICS S geared servomotors	Page
SIMOTICS S-1FT7 geared servomotors • with SP+ planetary gearbox	<b>4/51</b>
SIMOTICS S-1FK7 geared servomotors • with SP+ planetary gearbox • with LP+ planetary gearbox	<b>4/56</b> <b>4/62</b>
1FK7-DYA compact geared motors with planetary gearbox	<b>4/64</b>
SIMOTICS S-1FK7 geared servomotors • with helical gearbox • with parallel shaft gearbox • with bevel gearbox • with worm gearbox	<b>4/68</b> <b>4/70</b> <b>4/78</b> <b>4/82</b> <b>4/88</b>

The selection and ordering data for the SINAMICS S120 Motor Modules are based on the booksize format by way of example. Other formats are also possible. The SIZER for Siemens Drives engineering tool is available for detailed configuration.

Shaft height	Rated power $P_{\text{rated}}$ for S1 duty kW (HP)	Rated torque $M_{\text{rated}}$	Page
SH 36/SH 48/SH 63/ SH 80/SH 100	 0.88 (1.18) 10.5 (14.1)	1.4 ... 61 Nm (12.4 ... 540 lb <sub>F</sub> -in)	4/16
SH 80/SH 100	 5 (6.71) 19.8 (26.6)	21 ... 73 Nm (186 ... 646 lb <sub>F</sub> -in)	
SH 63/SH 80/SH 100	 3.1 (4.16) 34.2 (45.9)	9.2 ... 125 Nm (81.4 ... 1106 lb <sub>F</sub> -in)	
SH 63/SH 80	 3.8 (5.10) 10.8 (14.5)	11 ... 33 Nm (97.4 ... 292 lb <sub>F</sub> -in)	4/28
SH 63/SH 80	 5.7 (7.64) 21.7 (29.1)	16.5 ... 51 Nm (146 ... 451 lb <sub>F</sub> -in)	
SH 20/SH 28/SH 36/SH 48/ SH 63/SH 80/SH 100	 0.05 (0.07) 8.2 (11.0)	0.08 ... 37 Nm (0.7 ... 327 lb <sub>F</sub> -in)	4/34
SH 36/SH 48/SH 63/SH 80	 0.6 (0.80) 3.8 (5.10)	0.9 ... 18 Nm (8 ... 159 lb <sub>F</sub> -in)	4/40
SH 48/SH 63/SH 80	 0.9 (1.21) 3.1 (4.16)	1.5 ... 15 Nm (13.3 ... 133 lb <sub>F</sub> -in)	4/42
SH 20/SH 28/SH 36/SH 48	 0.05 (0.07) 0.8 (1.07)	0.08 ... 2.6 Nm (0.07 ... 23 lb <sub>F</sub> -in)	4/44
SH 36/SH 48	 0.4 (0.54) 0.9 (1.21)	1.2 ... 3 Nm (10.6 ... 26.6 lb <sub>F</sub> -in)	4/48

# SIMOTICS servomotors

## Technical definitions for AC motors

### Overview

#### Regulations, standards and specifications

The motors comply with the appropriate standards and regulations, see table below.

As a result of the fact that in many countries the national regulations have been completely harmonized with the international IEC 60034-1 recommendation, there are no longer any differences with respect to coolant temperatures, temperature classes and temperature rise limits.

General specifications for rotating electrical machines	IEC 60034-1
Terminal designations and direction of rotation for electrical machines	IEC 60034-8
Types of construction of rotating electrical machines	IEC 60034-7
Cooling methods of rotating electrical machines	IEC 60034-6
Degrees of protection of rotating electrical machines	IEC 60034-5
Vibration severity of rotating electrical machines	IEC 60034-14
Noise limit values for rotating electrical machines	IEC 60034-9
Cylindrical shaft extensions for electrical machines	DIN 748-3/IEC 60072-1

The motors listed below are UL-approved by Underwriters Laboratories Inc. and also comply with Canadian cUR standards:

SIMOTICS S-1FK7/1FT7/SIMOTICS T-1FW3/1FW6/  
SIMOTICS M-1PH8 (without brake)/SIMOTICS L-1FN3/1FN6.

#### Degrees of protection for AC motors

A suitable degree of protection must be selected to protect the machine against the following hazards depending on the relevant operating and environmental conditions:

- Ingress of water, dust and solid foreign objects,
- Contact with or approach to rotating parts inside a motor and
- Contact with or approach to live parts.

Degrees of protection of electric motors are specified by a code. This comprises 2 letters, 2 digits and, if required, an additional letter.

#### IP (International Protection)

Code letter designating the degree of protection against contact and the ingress of solid foreign objects and water

#### 0 to 6

1st digit designating the degree of touch protection and protection against ingress of solid foreign objects

#### 0 to 8

2nd digit designating the degree of protection against ingress of water (no oil protection)

#### W, S and M

Additional code letters for special degrees of protection

Most motors are supplied with the following degrees of protection:

Motor	Degree of protection	1st digit: Touch protection	Protection against foreign objects	2nd digit: Protection against water
Internally cooled	<b>IP23</b>	Protection against finger contact	Protection against medium-sized, solid foreign objects above 12 mm Ø	Protection against spray water up to 60° from the vertical
Surface-cooled	<b>IP54</b>	Complete protection against accidental contact	Protection against harmful dust deposits	Splash water from any direction
	<b>IP55</b>			Jet-water from any direction
	<b>IP64</b>	Complete protection against accidental contact	Protection against dust ingress	Splash water from any direction
	<b>IP65<sup>1)</sup></b>			Jet-water from any direction
	<b>IP67<sup>1)</sup></b>			Motor under defined pressure and time conditions under water

#### Recommended degrees of protection for AC motors

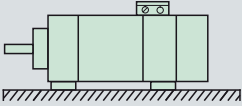
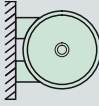
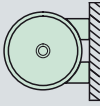
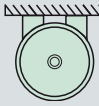
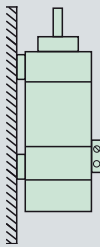
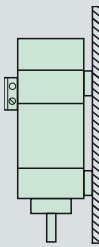
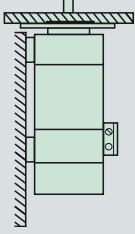
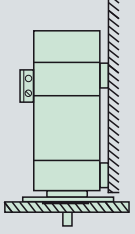
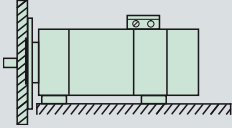
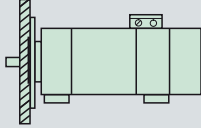
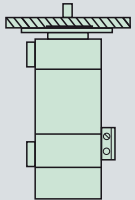
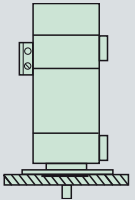
When cooling lubricants are used, protection against water alone is inadequate. The IP rating should only be considered here as a guideline. The motors may have to be protected by suitable covers. Attention must be paid to providing suitable sealing of the motor shaft for the selected degree of protection for the motor (for 1FT7: degree of protection IP67 and flange 0).

The table can serve as a decision aid for selecting the proper degree of protection for motors. A permanent covering of liquid on the flange must be avoided when the motor is mounted with the shaft extension facing upwards (IM V3, IM V19).

Effect	Liquids General workshop environment	Water; gen. cooling lubricant (95 % water, 5 % oil)
Dry	IP64	–
Water-enriched environment/ increased humidity	–	IP64
Mist	–	IP65
Spray	–	IP65
Jet	–	IP67
Splash/ brief immersion/ constant inundation	–	IP67

<sup>1)</sup> DIN VDE 0530 Part 5 or EN 60034 Part 5 specifies that there are only 5 degrees of protection for the first digit code and 8 degrees of protection for the second digit code in relation to rotating electrical machinery. However, IP6 is included in DIN 40050 which generally applies to electrical equipment.

**Overview (continued)**

Types of construction/mounting positions	Types of construction/mounting positions
<b>IM B3</b> 	<b>IM B6</b> 
<b>IM B7</b> 	<b>IM B8</b> 
<b>IM V6</b> 	<b>IM V5</b> 
<b>IM V35<sup>1)</sup></b> 	<b>IM V15<sup>1)</sup></b> 
<b>IM B35<sup>1)</sup></b> 	<b>IM B5</b> 
<b>IM V3</b> 	<b>IM V1</b> 

<sup>1)</sup> Fixing on the flange and feet is necessary.

# SIMOTICS servomotors

## Technical definitions for AC motors

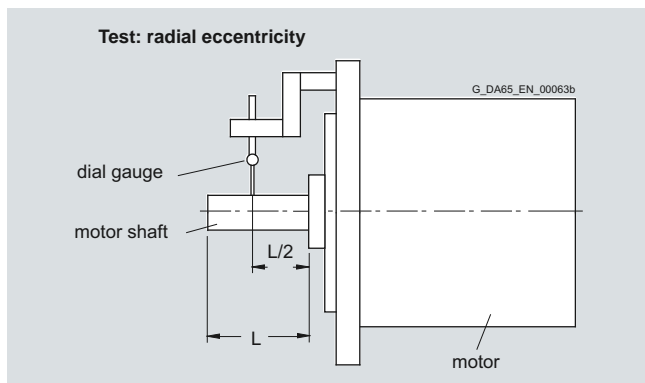
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### Overview (continued)

#### Radial eccentricity tolerance of shaft in relation to housing axis

refers to cylindrical shaft extensions

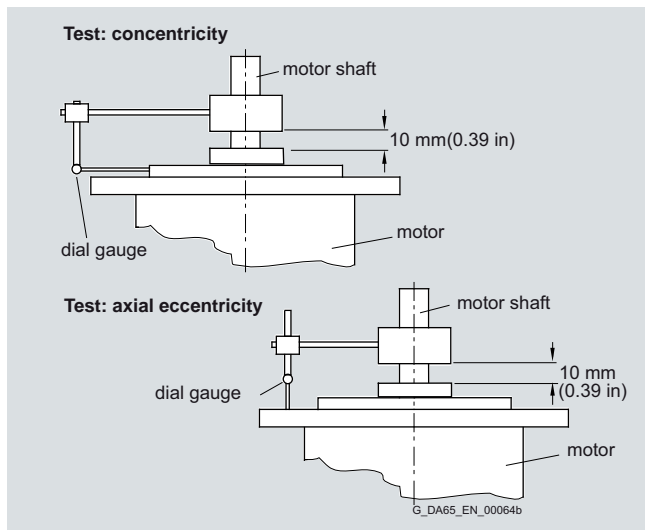
Shaft height	Tolerance N	Tolerance R	Tolerance SPECIAL
SH	mm (in)	mm (in)	mm (in)
28/36	0.035 (0.0014)	0.018 (0.0007)	-
48/63	0.04 (0.0016)	0.021 (0.0008)	-
80/100/132	0.05 (0.0020)	0.025 (0.0010)	0.01 (0.0004)
160/180/225	0.06 (0.0024)	0.03 (0.0012)	0.01/- / - (0.0004/- / -)
280	0.07 (0.0028)	0.035 (0.0014)	-
355	0.08 (0.0031)	0.04 (0.0016)	-



#### Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis

referred to the centering diameter of the mounting flange

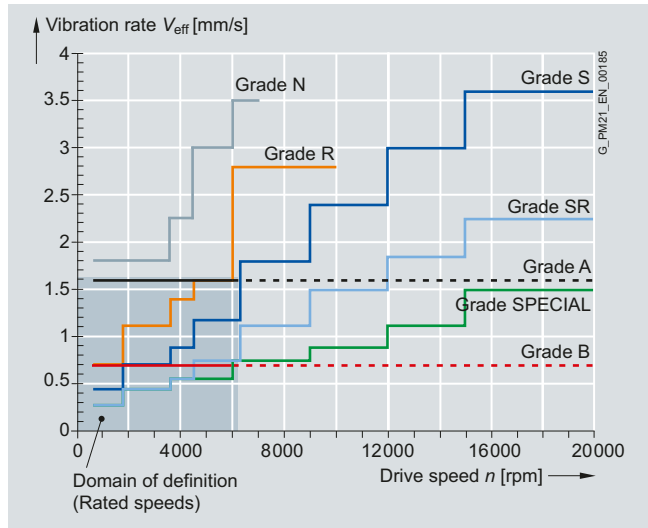
Shaft height	Tolerance N	Tolerance R	Tolerance SPECIAL
SH	mm (in)	mm (in)	mm (in)
28/36/48	0.08 (0.0031)	0.04 (0.0016)	-
63/80/100	0.1 (0.0039)	0.05 (0.0020)	- / 0.03/0.04 (- / 0.0012/0.0016)
132/160/180/225	0.125 (0.0049)	0.063 (0.0025)	0.04/0.04/ - / - (0.0016/0.0016/ - / -)
280/355	0.16 (0.0063)	0.08 (0.0031)	-



#### Vibration severity and vibration severity grade A according to IEC 60034-14

The vibration severity is the RMS value of the vibration velocity (frequency range from 10 to 1000 Hz). The vibration severity is measured using electrical measuring instruments in compliance with DIN 45666.

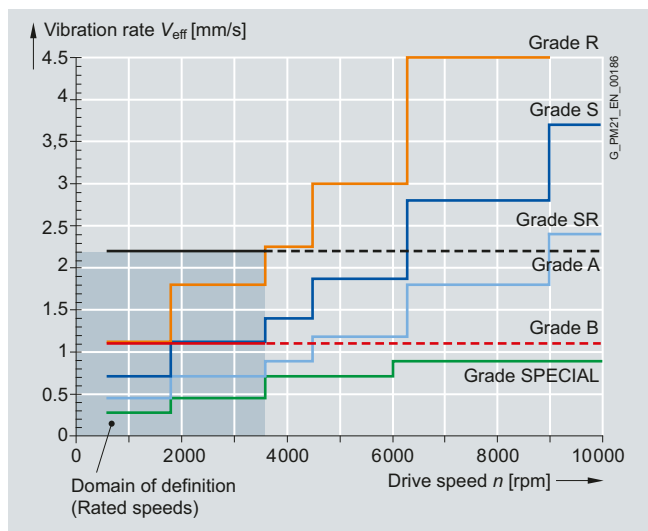
The values indicated refer only to the motor. These values can increase as a result of the overall system vibrational behavior due to installation.



Vibration severity limit values for shaft heights 20 to 132

The speeds of 1800 rpm and 3600 rpm and the associated limit values are defined according to IEC 60034-14. Speeds of 4500 rpm and 6000 rpm and the specified values are defined by the motor manufacturer.

The motors maintain vibration severity grade A up to rated speed.



Vibration severity limit values for shaft heights 160 to 355

### Overview (continued)

#### Balancing according to DIN ISO 8821

In addition to the balance quality of the motor, the vibration quality of motors with mounted belt pulleys and coupling is essentially determined by the balance quality of the mounted component.

If the motor and mounted component are separately balanced before they are assembled, then the process used to balance the belt pulley or coupling must be adapted to the motor balancing type. The following different balancing methods are used on motors of types SIMOTICS M-1PH8:

- Half-key balancing
- Full-key balancing
- Plain shaft extension

The letter H (half key) or F (full key) is printed on the shaft extension face to identify a half-key balanced or a full-key balanced SIMOTICS M-1PH8 motor.

SIMOTICS S-1FT7/1FK7 motors with feather key are always half-key balanced.

In general, motors with a plain shaft are recommended for systems with the most stringent vibrational quality requirements. For full-key balanced motors, we recommend belt pulleys with two opposite keyways, but only one feather key in the shaft extension.

#### Vibration stress, immitted vibration values

The following maximum permissible vibration stress limits at full functionality apply only to the SIMOTICS S-1FT7/1FK7 permanent-magnet servomotors and SIMOTICS T-1FW3 torque motors.

Vibration stress according to DIN ISO 10816:

- 1 g at 20 Hz to 2 kHz

For all main motors of type SIMOTICS M-1PH8, the following limits are valid for (immitted) vibration values introduced into the motor from outside:

Vibration frequency	Vibration values for 1PH808/1PH810/1PH813/1PH816	
< 6.3 Hz	Vibration displacement $s$	$\leq 0.16 \text{ mm (0.01 in)}$
6.3 ... 250 Hz	Vibration velocity $V_{\text{rms}}$	$\leq 4.5 \text{ mm/s (0.18 in/s)}$
> 250 Hz	Vibration acceleration $a$	$\leq 10 \text{ m/s}^2 (32.8 \text{ ft/s}^2)$

Vibration frequency	Vibration values for 1PH818/1PH822/1PH828/1PH835	
< 6.3 Hz	Vibration displacement $s$	$\leq 0.25 \text{ mm (0.01 in)}$
6.3 ... 63 Hz	Vibration velocity $V_{\text{rms}}$	$\leq 7.1 \text{ mm/s (0.28 in/s)}$
> 63 Hz	Vibration acceleration $a$	$\leq 4.0 \text{ m/s}^2 (13.1 \text{ ft/s}^2)$

For all torque motors of type SIMOTICS T-1FW3, the following limits are valid for (immitted) vibration values introduced into the motor from outside:

Vibration frequency	Vibration values for 1FW3	
< 6.3 Hz	Vibration displacement $s$	$\leq 0.26 \text{ mm (0.01 in)}$
6.3 ... 63 Hz	Vibration velocity $V_{\text{am}}$	$\leq 7.1 \text{ mm/s (0.28 in/s)}$
> 63 Hz	Vibration acceleration $a$	$\leq 4.0 \text{ m/s}^2 (13.1 \text{ ft/s}^2)$

#### Coolant temperature (ambient temperature) and installation altitude

Operation (unrestricted): -15 °C to +40 °C (5 °F to 104 °F)

The rated power (rated torque) is applicable to continuous duty (S1) according to EN 60034-1 at rated frequency, a coolant temperature of 40 °C (104 °F) and an installation altitude of 1000 m (3281 ft) above sea level.

Apart from the SIMOTICS M-1PH8 motors, all motors are designed for temperature class 155 (F) and utilized according to temperature class 155 (F). The SIMOTICS M-1PH8 motors are designed for temperature class 180 (H). For all other conditions, the factors given in the table below must be applied to determine the permissible output (torque).

The coolant temperature and installation altitude are rounded to 5 °C and 500 m (1640 ft) respectively.

Installation altitude above sea level m (ft)	Coolant temperature (ambient temperature)			
	< 30 °C (86 °F)	30 ... 40 °C (86 ... 104 °F)	45 °C (113 °F)	50 °C (122 °F)
1000 (3281)	1.07	1.00	0.96	0.92
1500 (4922)	1.04	0.97	0.93	0.89
2000 (6562)	1.00	0.94	0.90	0.86
2500 (8203)	0.96	0.90	0.86	0.83
3000 (9843)	0.92	0.86	0.82	0.79
3500 (11484)	0.88	0.82	0.79	0.75
4000 (13124)	0.82	0.77	0.74	0.71

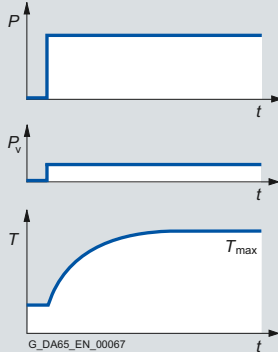
# SIMOTICS servomotors

## Technical definitions for AC motors

### Overview (continued)

#### Duty types S1 and S6 according to EN 60034-1

##### S1: Continuous duty

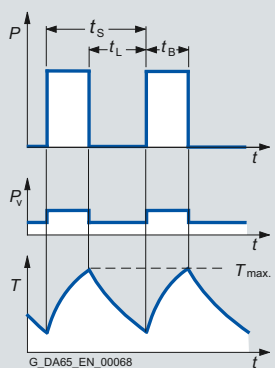


Duty cycle under constant load condition of sufficient duration to establish thermal equilibrium.

Designation: S1  
Output specification (torque).

G\_DA65\_EN\_00067

##### S6: Continuous duty with intermittent loading



Duty cycle comprising a sequence of identical duty cycles, each of which consists of a period of constant load followed by an interval at no load. There are no de-energized intervals.

Designation:  
e.g.: S6 - 40 %, 85 kW  
(114 HP)

$$t_r = \frac{t_B}{t_B + t_L}$$

$$t_s = 10 \text{ min}$$

G\_DA65\_EN\_00068

#### Rated torque

The torque supplied on the shaft is indicated in Nm in the selection and ordering data.

$$M_{\text{rated}} = 9.55 \times P_{\text{rated}} \times \frac{1000}{n_{\text{rated}}}$$

$P_{\text{rated}}$  Rated power in kW  
 $n_{\text{rated}}$  Rated speed in rpm  
 $M_{\text{rated}}$  Rated torque in Nm

$$M_{\text{rated}} = P_{\text{rated}} \times \frac{5250}{n_{\text{rated}}}$$

$P_{\text{rated}}$  Rated power in HP  
 $n_{\text{rated}}$  Rated speed in rpm  
 $M_{\text{rated}}$  Rated torque in lb<sub>f</sub>-ft

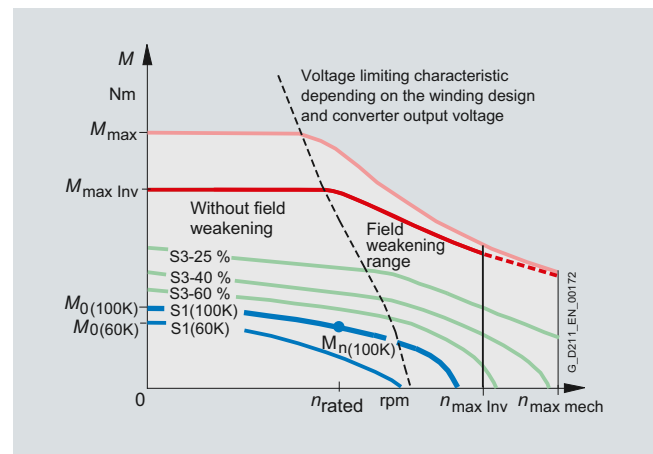
#### DURIGNIT IR 2000 insulation system

The DURIGNIT IR 2000 insulation system consists of high-quality enamel wires and insulating sheeting in conjunction with a solvent-free resin impregnation.

The insulating material system ensures that these motors will have a high mechanical and electrical stability, high service value and a long service life.

The insulation system protects the winding to a large degree against aggressive gases, vapors, dust, oil and increased air humidity. It can withstand the usual vibration stressing.

#### Characteristic curves



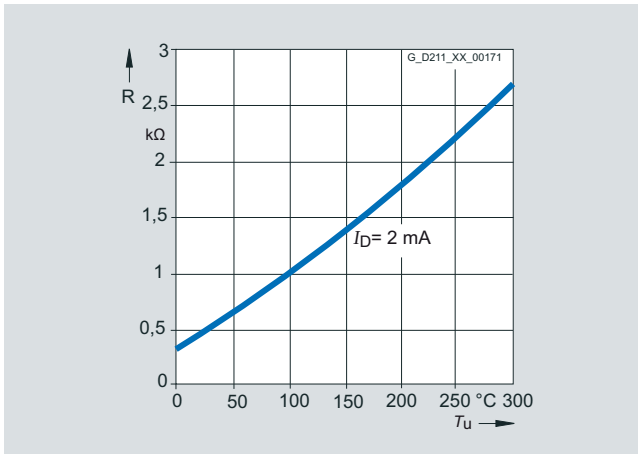
Torque characteristic of a synchronous motor operating on a converter with field weakening (example)

$n_{\text{rated}}$	Rated speed
$n_{\text{max Inv}}$	Maximum permissible electric speed limit
$n_{\text{max mech}}$	Maximum permissible mechanical speed limit
$M_0$	Static torque
$M_{\text{rated}}$	Rated torque at rated speed
$M_{\text{max Inv}}$	Achievable maximum torque with recommended motor module
$M_{\text{max}}$	Maximum permissible torque



### Overview (continued)

#### Motor protection



The KTY84-130 temperature sensor is used to measure the motor temperature for converter-fed motor operation.

This sensor is a semi-conductor that changes its resistance depending on temperature in accordance with a defined curve.

Siemens converters determine the motor temperature using the resistance of the temperature sensor.

Their parameters can be set for specific alarm and shutdown temperatures.

The SIMOTICS L-1FN3/-1FN6 and SIMOTICS T-1FW6 motors are additionally equipped with PTC sensors (PTC elements). In these motor series, evaluation is performed using the SME120/SME125 Sensor Module External or TM120 Terminal Module (see SINAMICS S120 drive system).

The KTY84-130 temperature sensor is embedded in the winding overhang of the motor like a PTC thermistor.

The sensor is evaluated in the SINAMICS S120 drive system as a standard function.

If the motors are operated on converters that do not feature a KTY84 evaluation circuit, the temperature can be measured with the external 3RS1040 temperature monitoring relay. For a detailed description, please see Catalog IC 10 or Siemens Industry Mall:

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

#### Paint finish

Motors without a paint finish have an impregnated resin coating. Motors with primer have corrosion protection.

All motors can be painted over with commercially available paints. Up to 2 additional paint coats are permissible.

Version	Suitability of paint finish for climate group according to IEC 60721, Part 2-1	
Paint finish	<b>Moderate</b> (expanded) for indoor and outdoor installation with roof protection	
	Briefly	Up to 150 °C (302 °F)
	Continuously	Up to 120 °C (248 °F)
Special paint finish	<b>Worldwide</b> (expanded) for outdoor installation	
	Briefly	Up to 150 °C (302 °F)
	Continuously	Up to 120 °C (248 °F)
	Also	For corrosive atmospheres up to 1 % acid and alkali concentration or permanent dampness in sheltered rooms

# SIMOTICS servomotors

## Technical definitions for AC motors

### Overview (continued)

#### Built-in encoder systems without DRIVE-CLiQ interface

For motors without an integrated DRIVE-CLiQ interface, the analog encoder signal in the drive system is converted into a digital signal. For these motors as well as external encoders, the encoder signals must be connected to SINAMICS S120 via Sensor Modules.

#### Built-in encoder systems with DRIVE-CLiQ interface

For motors with an integrated DRIVE-CLiQ interface, the analog encoder signal is internally converted to a digital signal. There is no further conversion of the encoder signal in the drive system. The motor-internal encoders are the same encoders that are used for motors without a DRIVE-CLiQ interface. Motors with a DRIVE-CLiQ interface simplify the commissioning and diagnostics, for example, due to automatic identification of the encoder system.

The different encoder types, incremental, absolute or resolver, are uniformly connected with one type of MOTION-CONNECT DRIVE-CLiQ cable.

#### Short designations for the encoder systems

The first letters of the short designation define the encoder type. This is followed by the resolution in signals per revolution if S/R is specified (for encoders without DRIVE-CLiQ interface) or in bits if DQ is specified (for encoders with DRIVE-CLiQ interface).

Type	Resolution/interface	
AM AS IC IN HTL	xxxxSR	Encoder <u>without</u> DRIVE-CLiQ interface Resolution = xxxx signals per revolution
AM AS IC IN R	xxDQ or xxDQI	Encoder <u>with</u> DRIVE-CLiQ interface Resolution = xx bits ( $2^{xx}$ )
AM		Multi-turn absolute encoder
AS		Single-turn absolute encoder
IC		Incremental encoder sin/cos with commutation position C and D tracks
IN		Incremental encoder sin/cos without commutation position
HTL		Incremental encoder with HTL signal
R		Resolver

#### Overview of motor encoder systems

Encoder <u>without</u> DRIVE-CLiQ interface					Encoder <u>with</u> DRIVE-CLiQ interface					Absolute position within a revolution (single-turn)	Absolute position over 4096 revolutions (multi-turn)	For use in Safety applications <sup>1)</sup>
Encoder	Identification letter in the motor order number				Encoder	Identification letter in the motor order number						
	1FT7	1FK7	1FW3	1PH8		1FT7	1FK7	1FW3	1PH8			
–	–	–	–	–	AM24DQI	C	C	–	–	Yes	Yes	Yes
–	–	–	–	–	AM20DQI	–	R	–	–	Yes	Yes	Yes
–	–	–	–	–	AS24DQI	B	B	–	–	Yes	No	Yes
–	–	–	–	–	AS20DQI	–	Q	–	–	Yes	No	Yes
AM2048S/R	M	E	E	E	AM22DQ	F	F	F	F	Yes	Yes	Yes
AM512S/R	–	H	–	–	AM20DQ	–	L	–	–	Yes	Yes	Yes
AM32S/R	–	G	–	–	AM16DQ	–	K	–	–	Yes	Yes	No
AM16S/R	–	J	–	–	AM15DQ	–	V	–	–	Yes	Yes	No
AS2048S/R	–	–	N	–	AS22DQ	–	–	P	–	Yes	No	No
IC2048S/R	N	A	A	M	IC22DQ	D	D	D	D	No	No	Yes
IN2048S/R	–	–	–	–	IN22DQ	–	–	–	–	No	No	Yes
HTL1024S/R	–	–	–	H	–	–	–	–	–	No	No	No
HTL2048S/R	–	–	–	J	–	–	–	–	–	No	No	No
Resolver p=1	–	T	–	–	R14DQ	–	P	–	–	Yes	No	No
Resolver p=3	–	S	S	–	R15DQ	–	U	U	–	No	No	No
Resolver p=4	–	S	S	–	R15DQ	–	U	U	–	No	No	No

All encoders are not available for every motor shaft height.

– Not possible

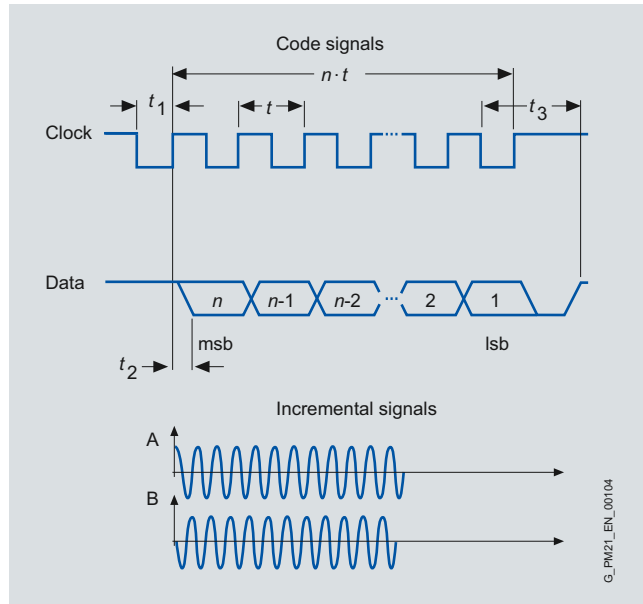
<sup>1)</sup> Not for 1FW3 motors.

### Overview (continued)

#### Multi-turn absolute encoder

This encoder outputs an absolute angular position between 0° and 360° in the specified resolution. An internal measuring gearbox enables it to differentiate 4096 revolutions.

So with a ball screw, for example, the absolute position of the slide can be determined over a long distance.



Multi-turn absolute encoder

#### Single-turn absolute encoder

This encoder outputs an absolute angular position between 0° and 360° in the specified resolution. In contrast to the multi-turn absolute encoder, it has no measuring gearbox and can therefore only supply the position value within one revolution. It does not have a traversing range.

#### Absolute encoders without DRIVE-CLiQ interface

AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn, with EnDat interface
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn, with EnDat interface
AM32S/R encoder	Absolute encoder 32 S/R, 4096 revolutions, multi-turn, with EnDat interface
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn, with EnDat interface
AS2048S/R encoder	Absolute encoder single-turn 2048 S/R

#### Absolute encoders with DRIVE-CLiQ interface

AM24DQI encoder	Absolute encoder 24 bit (resolution 16777216, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM20DQI encoder	Absolute encoder 20 bit (resolution 1048576, internal 512 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM22DQ encoder	Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM20DQ encoder	Absolute encoder 20 bit (resolution 1048576, internal 512 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM16DQ encoder	Absolute encoder 16 bit (resolution 65536, internal 32 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AM15DQ encoder	Absolute encoder 15 bit (resolution 32768, internal 16 S/R) + 12 bit multi-turn (traversing range 4096 revolutions)
AS24DQI encoder <sup>2)</sup>	Single-turn absolute encoder 24 bit
AS20DQI encoder <sup>2)</sup>	Single-turn absolute encoder 20 bit
AS22DQ encoder	Single-turn absolute encoder 22 bit

#### Technical specifications

##### Absolute encoders without DRIVE-CLiQ interface

Supply voltage	5 V
Absolute position interface via EnDat 2.1	
• Traversing range (multi-turn) <sup>1)</sup>	4096 revolutions
Incremental signals (sinusoidal, 1 V <sub>pp</sub> )	
• Signals per revolution	2048/512/32/16

##### Absolute encoders with DRIVE-CLiQ interface

Supply voltage	24 V
Absolute position via DRIVE-CLiQ	
• Resolution within one revolution	$2^{24}/2^{22}/2^{20}/2^{16}/2^{15}$ bit
• Traversing range (multi-turn) <sup>1)</sup>	4096 revolutions

<sup>1)</sup> Not for absolute encoder, single-turn AS.

<sup>2)</sup> The single-turn absolute encoder is used for the previous incremental encoders.

# SIMOTICS servomotors

## Technical definitions for AC motors

### Overview (continued)

#### Incremental encoder

This encoder senses relative movements and does not supply absolute position information. In combination with evaluation logic, a zero point can be determined using the integrated reference mark, which can be used to calculate the absolute position.

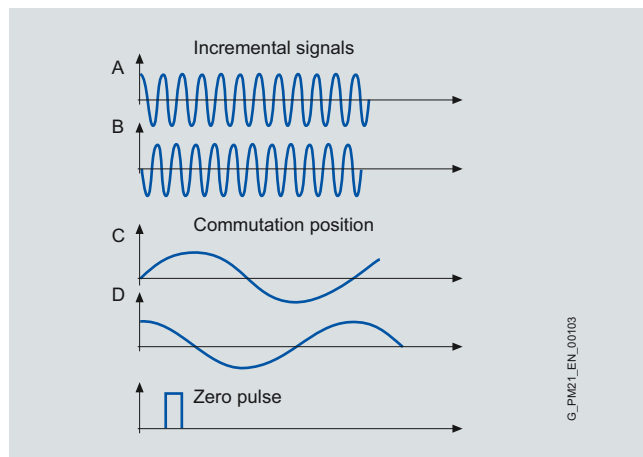
#### Incremental encoder IC/IN (sin/cos)

The encoder outputs sine and cosine signals. These can be interpolated using evaluation logic (usually 2048 points) and the direction of rotation can be determined.

In the version with DRIVE-CLiQ interface, this evaluation logic is already integrated in the encoder.

#### Commutation position

The position of the rotor is required for commutation of a synchronous motor. Encoders with commutation position (also termed C and D track) detect the angular position of the rotor.

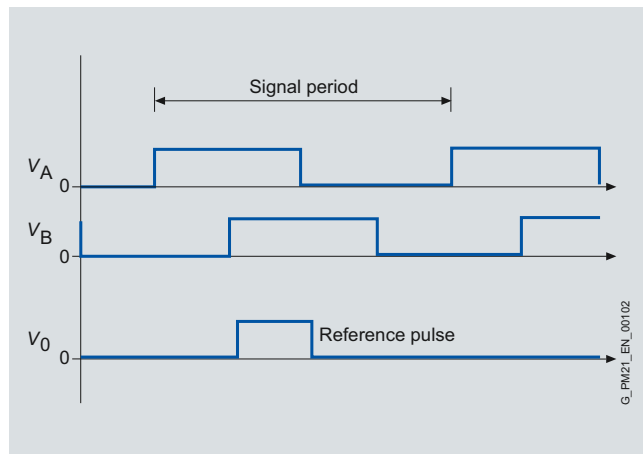


Incremental encoder IC/IN (sin/cos), commutation position only for IC

#### HTL incremental encoder

The encoder outputs square wave signals. The direction of rotation can be evaluated by means of edge evaluation.

The resolution is four times the number of encoder pulses. This encoder type is preferred for long signal cables.



HTL incremental encoder

#### Incremental encoder without DRIVE-CLiQ interface

IC2048S/R encoder	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks
IN2048S/R encoder	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R without C and D tracks
HTL2048S/R encoder	Incremental encoder HTL 2048 S/R
HTL1024S/R encoder	Incremental encoder HTL 1024 S/R

#### Incremental encoders with DRIVE-CLiQ interface<sup>1)</sup>

IC22DQ encoder	Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
IN22DQ encoder	Incremental encoder 22 bit (resolution 4194304, internal encoder 2048 S/R) without commutation position

#### Technical specifications

##### Incremental encoders IC/IN (sin/cos) without DRIVE-CLiQ interface

Supply voltage	5 V
Incremental signals per revolution	
• Resolution (sin/cos)	2048
• Commutation position (for IC only)	1 sin/cos
• Reference signal	1

##### Incremental encoders IC/IN (sin/cos) with DRIVE-CLiQ interface

Supply voltage	24 V
Incremental signals per revolution	
• Resolution	2 <sup>22</sup> bit
• Commutation position in bit (for IC only)	11
• Reference signal	1

##### Incremental encoders HTL without DRIVE-CLiQ interface

Supply voltage	10 ... 30 V
Incremental signals per revolution	
• Resolution (HTL)	2048/1024
• Reference signal	1

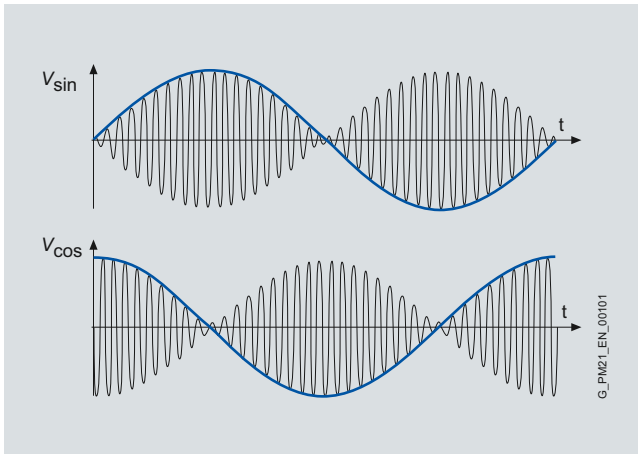
<sup>1)</sup> Instead of the IC22DQ incremental encoder, the AS24DQ1 single-turn absolute encoder is used for SIMOTICS S-1FK7/1FT7.

### Overview (continued)

#### Resolver

The number of sine and cosine periods per revolution corresponds to the number of pole pairs of the resolver. In the case of a 2-pole resolver, the evaluation electronics may output an additional zero pulse per encoder revolution. This zero pulse ensures a unique assignment of the position information in relation to an encoder revolution. A 2-pole resolver can therefore be used as a single-turn encoder.

2-pole resolvers can be used for motors with any number of pairs of poles. In the case of multi-pole resolvers, the number of pairs of poles of the motor and resolver are always the same. The resolution is correspondingly higher than with 2-pole resolvers.



#### Resolvers without DRIVE-CLiQ interface<sup>1)</sup>

Resolver p = 1	2-pole resolver
Resolver p = 3	6-pole resolver
Resolver p = 4	8-pole resolver

#### Resolvers with DRIVE-CLiQ interface

R15DQ encoder	Resolver 15 bit (resolution 32768, internal, multi-pole)
R14DQ encoder	Resolver 14 bit (resolution 16384, internal, 2-pole)

#### Technical specifications

##### Resolvers without DRIVE-CLiQ interface

Excitation voltage, rms	2 ... 8 V
Excitation frequency	5 ... 10 kHz
Output signals	$U_{\text{sine track}} = r \times U_{\text{excitation}} \times \sin \alpha$ $U_{\text{cosine track}} = r \times U_{\text{excitation}} \times \cos \alpha$ $\alpha = \arctan (U_{\text{sine track}} / U_{\text{cosine track}})$
Transmission ratio	$r = 0.5 \pm 5 \%$

##### Resolvers with DRIVE-CLiQ interface

Supply voltage	24 V
Resolution	$2^{15}/2^{14}$ bit

<sup>1)</sup> Output signals:  
2-pole resolver: 1 sin/cos signal per revolution  
6-pole resolver: 3 sin/cos signals per revolution  
8-pole resolver: 4 sin/cos signals per revolution

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 motors

#### Overview



SIMOTICS S-1FT7 motors, forced ventilation, water cooling and natural cooling

The SIMOTICS S-1FT7 motors are permanent-magnet synchronous motors with very compact dimensions and an optically attractive design.

The 1FT7 motors fulfill the highest demands on dynamic performance, speed setting range, shaft and flange accuracy. They are equipped with state-of-the-art encoder technology and optimized for operation on our fully digital drive and control systems.

Natural cooling, forced ventilation or water cooling are available as cooling types. With the natural cooling method, heat is dissipated through the surface of the motor, whereas with the forced ventilation method, heat is forced out by means of built-on fans. Maximum cooling, and thus maximum power ratings can be achieved using water cooling.

#### Benefits

- Excellent dynamic performance in a wide speed range thanks to high overload capability  $\geq 4 \times M_0$  with natural cooling
- Wide speed setting range
- High robustness against vibratory and shock loads thanks to vibration-isolated encoder mounting
- High degree of protection – allows operation even with demanding ambient conditions
- Quick and easy mounting due to cross-profile and rotatable connectors with quick-release locks
- Zero-backlash holding brake
- Extremely high efficiency

#### **SIMOTICS S-1FT7 Compact motors**

Due to their low torque ripple, 1FT7 Compact motors are especially suited for use in machine tools that require maximum surface quality and optimum machining quality. Their compact dimensions permit mounting in confined spaces.

#### **SIMOTICS S-1FT7 High Dynamic motors**

1FT7 High Dynamic motors have very low rotor moments of inertia to achieve extremely good dynamic performance and very short cycle times. As the motors are available with forced ventilation and with water cooling, they possess high continuous performance capabilities.

#### Application

- High-performance machine tools
- Machines with stringent requirements in terms of dynamic performance and precision, e.g.:
  - Packaging machines
  - Foil extractor machines
  - Printing machines
  - Handling equipment

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 motors

#### Technical specifications

SIMOTICS S-1FT7 Compact/High Dynamic motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling, forced ventilation, water cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding according to EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F). For water cooling, max. inlet temperature 30 °C (86 °F). Avoid condensation.
Type of construction according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3) with flange 0/flange 1 (compatible with 1FT6)
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP64/IP65/IP67
Shaft extension on the drive end according to DIN 748-3 (IEC 60072-1)	Plain shaft/feather key and keyway (half-key balancing)
Shaft and flange accuracy according to DIN 42955 (IEC 60072-1) <sup>1)</sup>	Tolerance N/Tolerance R
Vibration severity according to EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed/Grade R
Sound pressure level $L_{pA}$ (1 m) according to EN ISO 1680, max. Tolerance + 3 dB	
• 1FT703	60 dB
• 1FT704 ... 1FT706	65 dB
• 1FT708 ... 1FT710	70 dB
Connection	Connectors for signals and power rotatable
Paint finish	Pearl dark gray RAL 9023
2nd rating plate	Enclosed separately
Holding brake	Without/with
Approvals, according to	cURus

#### Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 $V_{pp}$ 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn

#### Built-in encoder systems with DRIVE-CLiQ interface

Absolute encoders, single-turn <sup>2)</sup>	
AS24DQI encoder	Absolute encoder, single-turn, 24 bit
Multi-turn absolute encoder	
AM24DQI encoder	Absolute encoder 24 bit + 12 bit multi-turn

S/R = signals/revolution

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

<sup>2)</sup> The single-turn absolute encoder is applied for the previously used incremental encoders.

<sup>3)</sup> Additional plain text is required.

#### Options

Order code	Description
J..	Mounting of SP+ planetary gearbox (see Geared servomotors)
N05	Non-standard shaft extension (dimensions as for 1FT5 motors)
N16	Nickel-plated connectors and special paint application (PS Premium) for increased chemical resistance, e.g. in the food industry.
Q12	Sealing air connection (Only in conjunction with IP67 degree of protection. Not in combination with terminal box.)
Y84	Customer specifications on rating plate (max. 30 characters) <sup>3)</sup>
	Paint finish
K23	Special paint finish for "worldwide" climate group: Primer and paint finish in anthracite RAL 7016
K23+X..	Special paint finish for "worldwide" climate group: Primer and paint finish selectable from X01 to X09
K24	Primed (unpainted)
X01	Paint finish: Jet black, matt RAL 9005
X02	Paint finish: Cream white RAL 9001
X03	Paint finish: Reseda green RAL 6011
X04	Paint finish: Pebble gray RAL 7032
X05	Paint finish: Sky blue RAL 5015
X06	Paint finish: Light ivory RAL 1015
X08	Paint finish: White aluminum
X09	Paint finish: Anthracite RAL 7016

When ordering a motor with options, **-Z** should be added to the order number.

#### N05 Non-standard shaft extension (dimensions as for 1FT5 motors)

For the following order numbers, naturally cooled 1FT7 Compact servomotors can be delivered with the shaft dimensions compatible with 1FT5 motors:

- 1FT7034-5A.71-.... /1FT7042-5A.71-....
- 1FT7062-5A.71-.... /1FT7064-5A.71-....
- 1FT7082-5A.71-.... /1FT7084-5A.71-.... /1FT7086-5A.71-....
- 1FT7102-5A.71-.... /1FT7105-5A.71-.... /1FT7108-5A.71-....

Shaft dimensions (diameter × length) according to shaft height (SH) with Option N05:

- SH 36: 11 × 23 mm (0.43 × 0.91 in)
- SH 48: 14 × 30 mm (0.55 × 1.18 in)
- SH 63: 19 × 40 mm (0.75 × 1.57 in) (not compatible with flange)
- SH 80: 24 × 50 mm (0.94 × 1.97 in)
- SH 100: 32 × 58 mm (1.26 × 2.28 in)

#### N16 Version for increased chemical resistance with protective properties checked according to DIN EN ISO 4628-1

Option N16 is only available for the following naturally cooled SIMOTICS S-1FT7 Compact motors:

- 1FT7...-5A...-1C.. AM24DQI encoder
- 1FT7...-5A...-1M.. AM2048S/R encoder

For a detailed description of Option N16, see SIMOTICS S-1FK7 options (Page 4/33).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 Compact core type motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A	Core type Order No.		$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
<b>1FT7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling</b>									
<b>2000</b>	100	5.03 (6.75)	30 (22.1)	24 (17.7)	10	<b>1FT7102-1AC7</b> ■-1 ■ ■ 1	5	91.4 (80.9)	26.1 (57.6)
		7.96 (10.7)	50 (36.9)	38 (28.0)	15	<b>1FT7105-1AC7</b> ■-1 ■ ■ 1	5	178 (158)	44.2 (97.5)
<b>3000</b>	48	1.35 (1.81)	5 (3.7)	4.3 (3.2)	2.6	<b>1FT7044-1AF7</b> ■-1 ■ ■ 1	3	5.43 (4.81)	7.2 (15.9)
		63	1.7 (2.28)	6 (4.4)	5.4 (4.0)	3.9	<b>1FT7062-1AF7</b> ■-1 ■ ■ 1	5	7.36 (6.51)
	80	2.39 (3.20)	9 (6.6)	7.6 (5.6)	5.2	<b>1FT7064-1AF7</b> ■-1 ■ ■ 1	5	11.9 (10.5)	9.7 (21.4)
		3.24 (4.34)	13 (9.6)	10.3 (7.6)	6.6	<b>1FT7082-1AF7</b> ■-1 ■ ■ 1	5	26.5 (23.5)	14.0 (30.9)
		4.56 (6.11)	20 (14.8)	14.5 (10.7)	8.5	<b>1FT7084-1AF7</b> ■-1 ■ ■ 1	5	45.1 (39.9)	20.8 (45.9)
4500	80	5.65 (7.58)	28 (20.7)	18 (13.3)	11	<b>1FT7086-1AF7</b> ■-1 ■ ■ 1	5	63.6 (56.3)	27.5 (60.6)
		4.82 (6.46) <sup>1)</sup>	20 (14.8)	11.5 (8.5) <sup>1)</sup>	10.1 <sup>1)</sup>	<b>1FT7084-1AH7</b> ■-1 ■ ■ 1	5	45.1 (39.9)	20.8 (45.9)
<b>6000</b>	36	4.71 (6.32)	28 (20.7)	10 (7.4)	10	<b>1FT7086-1AH7</b> ■-1 ■ ■ 1	5	63.6 (56.3)	27.5 (60.6)
		0.88 (1.18)	2 (1.5)	1.4 (1.0)	2.1	<b>1FT7034-1AK7</b> ■-1 ■ ■ 1	3	0.85 (0.75)	3.8 (8.38)
		2.13 (2.86) <sup>2)</sup>	6 (4.4)	3.7 (2.7) <sup>2)</sup>	5.9 <sup>2)</sup>	<b>1FT7062-1AK7</b> ■-1 ■ ■ 1	5	7.36 (6.51)	7.1 (15.7)
		2.59 (3.47) <sup>3)</sup>	9 (6.6)	5.5 (4.1) <sup>3)</sup>	6.1 <sup>3)</sup>	<b>1FT7064-1AK7</b> ■-1 ■ ■ 1	5	11.9 (10.5)	9.7 (21.4)
<b>Type of construction:</b>		IM B5	Flange 0		0				
		IM B5	Flange 1 (compatible with 1FT6)		1				
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>		IC2048S/R encoder						N	
		AM2048S/R encoder						M	
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>		AS24DQI encoder						B	
		AM24DQI encoder						C	
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>					
Plain shaft		Tolerance N		Without					G
Plain shaft		Tolerance N		With					H
<b>Vibration severity:</b>		<b>Degree of protection:</b>							1
Grade A		IP65							

To select the type of construction and degree of protection, see Technical definitions.

Some SIMOTICS S-1FT7 Compact motors are available as core types. These core types can be express delivered as replacement motors in the event of plant outages and offer the advantage of a quicker spare parts supply. For this reason, core types should be used for configuration wherever possible.



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 Compact core type motors**  
Natural cooling

Motor type (repeated)	Efficiency <sup>4)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>7)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>5)</sup> $I_{rated}$ A	Booksize format For additional versions and components see SINAMICS S120 drive system Order No.	Motor connection (and brake connection) via power connector		
						Power connector	Cable cross-section <sup>6)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
1FT7102-1AC7...	93	12.5	6.28 (8.42)	18	6SL312-1-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-....
1FT7105-1AC7...	93	18	10.47 (14.0)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7044-1AF7...	92	2.8	1.57 (2.11)	3	6SL312-1-TE13-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7062-1AF7...	91	3.9	1.88 (2.52)	5	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7064-1AF7...	93	5.7	2.83 (3.80)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7082-1AF7...	93	7.6	4.08 (5.47)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7084-1AF7...	93	11	6.28 (8.42)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7086-1AF7...	93	15.5	8.80 (11.8)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7084-1AH7...	93	15.6	9.42 (12.6)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7086-1AH7...	91	22.4	13.19 (17.7)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7034-1AK7...	90	2.7	1.26 (1.69)	3	6SL312-1-TE13-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7062-1AK7...	90	8.4	3.77 (5.06)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7064-1AK7...	91	9	5.65 (7.58)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

<b>Power cable:</b>	
MOTION-CONNECT 800	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

<sup>1)</sup> These values refer to  $n = 4000$  rpm.

<sup>2)</sup> These values refer to  $n = 5500$  rpm.

<sup>3)</sup> These values refer to  $n = 4500$  rpm.

<sup>4)</sup> Optimum efficiency in continuous duty.

<sup>5)</sup> With default setting of the pulse frequency.

<sup>6)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

<sup>7)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 Compact motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	<b>SIMOTICS S-1FT7 Compact synchronous motors</b>	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.	$p$	$J$	$m$
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lbf-in-s}^2$ )	kg (lb)
<b>1FT7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling</b>									
<b>1500</b>	100	4.08 (5.47)	30 (22.1)	26 (19.2)	8	<b>1FT7102-5AB7-1</b> ■ ■ ■ ■	5	91.4 (80.9)	26.1 (57.5)
		6.60 (8.85)	50 (36.9)	42 (31.0)	13	<b>1FT7105-5AB7-1</b> ■ ■ ■ ■	5	178 (157)	44.2 (97.5)
		9.58 (12.8)	70 (51.6)	61 (45.0)	16	<b>1FT7108-5AB7-1</b> ■ ■ ■ ■	5	248 (219)	59 (130)
<b>2000</b>	80	2.39 (3.20)	13 (9.6)	11.4 (8.4)	4.9	<b>1FT7082-5AC7-1</b> ■ ■ ■ ■	5	26.5 (23.5)	14 (30.9)
		3.54 (4.75)	20 (14.8)	16.9 (12.5)	8.4	<b>1FT7084-5AC7-1</b> ■ ■ ■ ■	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	22.5 (16.6)	9.2	<b>1FT7086-5AC7-1</b> ■ ■ ■ ■	5	63.6 (56.3)	27.5 (60.6)
	100	5.03 (6.75)	30 (22.1)	24 (17.7)	10	<b>1FT7102-5AC7-1</b> ■ ■ ■ ■	5	91.4 (80.9)	26.1 (57.5)
		7.96 (10.7)	50 (36.9)	38 (28.0)	15	<b>1FT7105-5AC7-1</b> ■ ■ ■ ■	5	178 (157)	44.2 (97.5)
		10.5 (14.1)	70 (51.6)	50 (36.9)	18	<b>1FT7108-5AC7-1</b> ■ ■ ■ ■	5	248 (219)	59 (130)
<b>3000</b>	48	0.85 (1.14)	3 (2.2)	2.7 (2.0)	2.1	<b>1FT7042-5AF7-1</b> ■ ■ ■ ■	3	2.81 (2.49)	4.6 (10.1)
		1.35 (1.81)	5 (3.7)	4.3 (3.2)	2.6	<b>1FT7044-5AF7-1</b> ■ ■ ■ ■	3	5.43 (4.81)	7.2 (15.9)
		1.76 (2.36)	7 (5.2)	5.6 (4.1)	3.5	<b>1FT7046-5AF7-1</b> ■ ■ ■ ■	3	7.52 (6.66)	9.3 (20.5)
	63	1.70 (2.28)	6 (4.4)	5.4 (4.0)	3.9	<b>1FT7062-5AF7-1</b> ■ ■ ■ ■	5	7.36 (6.51)	7.1 (15.7)
		2.39 (3.20)	9 (6.6)	7.6 (5.6)	5.2	<b>1FT7064-5AF7-1</b> ■ ■ ■ ■	5	11.9 (10.5)	9.7 (21.4)
		2.92 (3.92)	12 (8.9)	9.3 (6.9)	7.2	<b>1FT7066-5AF7-1</b> ■ ■ ■ ■	5	16.4 (14.5)	12.3 (27.1)
		3.42 (4.59)	15 (11.1)	10.9 (8.0)	6.7	<b>1FT7068-5AF7-1</b> ■ ■ ■ ■	5	23.2 (20.5)	16.3 (35.9)
	80	3.24 (4.34)	13 (9.6)	10.3 (7.6)	6.6	<b>1FT7082-5AF7-1</b> ■ ■ ■ ■	5	26.5 (23.5)	14 (30.9)
		4.55 (6.10)	20 (14.8)	14.5 (10.7)	8.5	<b>1FT7084-5AF7-1</b> ■ ■ ■ ■	5	45.1 (39.9)	20.8 (45.9)
		5.65 (7.58)	28 (20.7)	18 (13.3)	11	<b>1FT7086-5AF7-1</b> ■ ■ ■ ■	5	63.6 (56.3)	27.5 (60.6)
	100	6.28 (8.42)	30 (22.1)	20 (14.8)	12	<b>1FT7102-5AF7-1</b> ■ ■ ■ ■	5	91.4 (80.9)	26.1 (57.5)
		8.80 (11.8)	50 (36.9)	28 (20.7)	15	<b>1FT7105-5AF7-1</b> ■ ■ ■ ■	5	178 (157)	44.2 (97.5)
6.28 (8.42)		70 (51.6)	20 (14.8)	12	<b>1FT7108-5AF7-1</b> ■ ■ ■ ■	5	248 (220)	59 (130)	
<b>Type of construction:</b>		IM B5	Flange 0	0					
		IM B5	Flange 1 (compatible with 1FT6)	1					
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>		IC2048S/R encoder		N					
		AM2048S/R encoder		M					
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>		AS24DQI encoder		B					
		AM24DQI encoder		C					
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>					
Feather key and keyway		Tolerance N		Without					
Feather key and keyway		Tolerance N		With					
Feather key and keyway		Tolerance R		Without					
Feather key and keyway		Tolerance R		With					
Plain shaft		Tolerance N		Without					
Plain shaft		Tolerance N		With					
Plain shaft		Tolerance R		Without					
Plain shaft		Tolerance R		With					
<b>Vibration severity:</b>		<b>Degree of protection:</b>							
Grade A		IP64		0					
Grade A		IP65		1					
Grade A		IP67		2					
Grade R		IP64		3					
Grade R		IP65		4					
Grade R		IP67		5					

To select the type of construction and degree of protection, see Technical definitions.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 Compact motors**  
**Natural cooling**

Motor type (repeated)	Efficiency <sup>1)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>4)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current <sup>2)</sup> $I_{rated}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Power connector Size	Cable cross-section <sup>3)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
1FT7102-5AB7...	93	9	4.71 (6.32)	9	6SL312-1-TE21-0AA3	1.5	4 × 1.5	6FX002-5N21-....
1FT7105-5AB7...	93	15	7.85 (10.5)	18	6SL312-1-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-....
1FT7108-5AB7...	93	18	10.99 (14.7)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7082-5AC7...	93	5	2.72 (3.65)	5	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7084-5AC7...	93	9	4.19 (5.62)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7086-5AC7...	93	10.6	5.86 (7.86)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7102-5AC7...	93	12.5	6.28 (8.42)	18	6SL312-1-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-....
1FT7105-5AC7...	93	18	10.47 (14.0)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7108-5AC7...	93	25	14.66 (19.7)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7042-5AF7...	92	2.1	0.94 (1.26)	3	6SL312-1-TE13-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7044-5AF7...	92	2.8	1.57 (2.11)	3	6SL312-1-TE13-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7046-5AF7...	92	4	2.20 (2.95)	5	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7062-5AF7...	91	3.9	1.88 (2.52)	5	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7064-5AF7...	93	5.7	2.83 (3.80)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7066-5AF7...	92	8.4	3.77 (5.06)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7068-5AF7...	92	8.3	4.71 (6.32)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7082-5AF7...	93	7.6	4.08 (5.47)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7084-5AF7...	93	11	6.28 (8.42)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7086-5AF7...	93	15.5	8.80 (11.8)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7102-5AF7...	93	18	9.42 (12.6)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7105-5AF7...	94	26	15.71 (21.1)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7108-5AF7...	93	36	21.99 (29.5)	45	6SL312-1-TE24-5AA3	1.5	4 × 6	6FX002-5N54-....

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

<b>Power cable:</b>	
MOTION-CONNECT 800	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

4)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb_f-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 Compact motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A		Order No.	$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
<b>1FT7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling</b>									
<b>4500</b>	48	1.32 (1.77) <sup>1)</sup>	7 (5.2)	3.6 (2.7) <sup>1)</sup>	4.7 <sup>1)</sup>	<b>1FT7046-5AH7-1</b> ■ ■ ■ ■	3	7.52 (6.66)	9.3 (20.5)
	63	2.55 (3.42) <sup>2)</sup>	12 (8.9)	6.1 (4.5) <sup>2)</sup>	7.5 <sup>2)</sup>	<b>1FT7066-5AH7-1</b> ■ ■ ■ ■	5	16.4 (14.5)	12.3 (27.1)
	80	3.77 (5.06)	13 (9.6)	8 (5.9)	7.8	<b>1FT7082-5AH7-1</b> ■ ■ ■ ■	5	26.5 (23.5)	14 (30.9)
		4.82 (6.46) <sup>2)</sup>	20 (14.8)	11.5 (8.5) <sup>2)</sup>	10.1 <sup>2)</sup>	<b>1FT7084-5AH7-1</b> ■ ■ ■ ■	5	45.1 (39.9)	20.8 (45.9)
		4.71 (6.32)	28 (20.7)	10 (7.4)	10	<b>1FT7086-5AH7-1</b> ■ ■ ■ ■	5	63.6 (56.3)	27.5 (60.6)
<b>6000</b>	36	0.88 (1.18)	2 (1.5)	1.4 (1.0)	2.1	<b>1FT7034-5AK7-1</b> ■ ■ ■ ■	3	0.85 (0.75)	3.8 (8.38)
		1.07 (1.43)	3 (2.2)	1.7 (1.3)	2.4	<b>1FT7036-5AK7-1</b> ■ ■ ■ ■	3	1.33 (1.18)	5.0 (11.0)
	48	1.26 (1.69)	3 (2.2)	2 (1.5)	3	<b>1FT7042-5AK7-1</b> ■ ■ ■ ■	3	2.81 (2.49)	4.6 (10.1)
		1.41 (1.89) <sup>3)</sup>	5 (3.7)	3 (2.2) <sup>3)</sup>	3.6 <sup>3)</sup>	<b>1FT7044-5AK7-1</b> ■ ■ ■ ■	3	5.43 (4.81)	7.2 (15.9)
	63	2.13 (2.86) <sup>4)</sup>	6 (4.4)	3.7 (2.7) <sup>4)</sup>	5.9 <sup>4)</sup>	<b>1FT7062-5AK7-1</b> ■ ■ ■ ■	5	7.36 (6.51)	7.1 (15.7)
		2.59 (3.47) <sup>3)</sup>	9 (6.6)	5.5 (4.1) <sup>3)</sup>	6.1 <sup>3)</sup>	<b>1FT7064-5AK7-1</b> ■ ■ ■ ■	5	11.9 (10.5)	9.7 (21.4)
<b>Type of construction:</b>			IM B5	Flange 0	0				
			IM B5	Flange 1 (compatible with 1FT6)	1				
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder					N	
			AM2048S/R encoder					M	
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder					B	
			AM24DQI encoder					C	
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>			
Feather key and keyway			Tolerance N			Without			A
Feather key and keyway			Tolerance N			With			B
Feather key and keyway			Tolerance R			Without			D
Feather key and keyway			Tolerance R			With			E
Plain shaft			Tolerance N			Without			G
Plain shaft			Tolerance N			With			H
Plain shaft			Tolerance R			Without			K
Plain shaft			Tolerance R			With			L
<b>Vibration severity:</b>			<b>Degree of protection:</b>						0
Grade A			IP64						1
Grade A			IP65						2
Grade A			IP67						3
Grade R			IP64						4
Grade R			IP65						5
Grade R			IP67						

To select the type of construction and degree of protection, see Technical definitions.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 Compact motors**  
**Natural cooling**

Motor type (repeated)	Efficiency <sup>5)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>8)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current <sup>6)</sup> $I_{rated}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Power connector Size	Cable cross-section <sup>7)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
1FT7046-5AH7...	90	8.1	3.3 (4.43)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7066-5AH7...	90	13.6	5.65 (7.58)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7082-5AH7...	93	12.3	6.13 (8.22)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7084-5AH7...	93	15.6	9.42 (12.6)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7086-5AH7...	91	22.4	13.19 (17.7)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7034-5AK7...	90	2.7	1.26 (1.69)	3	6SL312-1-TE13-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7036-5AK7...	90	4.0	1.88 (2.52)	5	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7042-5AK7...	91	3.9	1.88 (2.52)	5	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7044-5AK7...	91	5.7	3.14 (4.21)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7062-5AK7...	90	8.4	3.77 (5.06)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7064-5AK7...	91	9	5.65 (7.58)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

<b>Power cable:</b>	
MOTION-CONNECT 800	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

1) These values refer to  $n = 3500$  rpm.

2) These values refer to  $n = 4000$  rpm.

3) These values refer to  $n = 4500$  rpm.

4) These values refer to  $n = 5500$  rpm.

5) Optimum efficiency in continuous duty.

6) With default setting of the pulse frequency.

7) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

8)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$       $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 Compact motors Forced ventilation

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A		Order No.	$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lbf-in-s}^2$ )	kg (lb)
<b>1FT7 Compact for DC link voltage 510 ... 720 V DC – Forced ventilation</b>									
<b>2000</b>	80	5.0 (6.7)	27 (19.9)	24 (17.7)	13.5	<b>1FT7084-5SC7-1</b> ■■■■	5	45 (39.8)	25 (55.1)
		6.7 (8.98)	36 (26.5)	32 (23.6)	17	<b>1FT7086-5SC7-1</b> ■■■■	5	64 (56.7)	36 (79.4)
	100	11.7 (15.7)	65 (47.9)	56 (41.3)	29	<b>1FT7105-5SC7-1</b> ■■■■	5	178 (157.6)	50 (110.3)
		15.3 (20.5)	91 (67.1)	73 (53.8)	33	<b>1FT7108-5SC7-1</b> ■■■■	5	248 (219.5)	64 (141.1)
<b>3000</b>	80	7.2 (9.66)	27 (19.9)	23 (17)	18.5	<b>1FT7084-5SF7-1</b> ■■■■	5	45 (39.8)	25 (55.1)
		9.1 (12.2)	36 (26.5)	29 (21.4)	24	<b>1FT7086-5SF7-1</b> ■■■■	5	64 (56.7)	36 (79.4)
	100	15.1 (20.3)	65 (47.9)	48 (35.4)	35	<b>1FT7105-5SF7-1</b> ■■■■	5	178 (157.6)	50 (110.3)
		18.8 (25.1)	91 (67.1)	60 (44.3)	38	<b>1FT7108-5SF7-1</b> ■■■■	5	248 (219.5)	64 (141.1)
<b>4500</b>	80	9.9 (13.3)	27 (19.9)	21 (15.5)	24.5	<b>1FT7084-5SH7-1</b> ■■■■	5	45 (39.8)	25 (55.1)
		11.8 (15.8)	36 (26.5)	25 (18.4)	25	<b>1FT7086-5SH7-1</b> ■■■■	5	64 (56.7)	36 (79.4)
<b>Type of construction:</b>			IM B5	Flange 0	<b>0</b>				
			IM B5	Flange 1 (compatible with 1FT6)	<b>1</b>				
<b>Connector outlet direction:</b>			Connector sizes 1 and 1.5	Rotatable connector	<b>1</b>				
			Connector size 3 <sup>1)</sup>	Transverse right	<b>1</b>				
				Transverse left	<b>2</b>				
				Axial NDE	<b>3</b>				
				Axial DE	<b>4</b>				
<b>Terminal box/ cable entry:<sup>1)</sup></b>			Top/transverse from right		<b>5</b>				
			Top/transverse from left		<b>6</b>				
			Top/axial from NDE		<b>7</b>				
			Top/axial from DE		<b>8</b>				
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder		<b>N</b>				
			AM2048S/R encoder		<b>M</b>				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder		<b>B</b>				
			AM24DQI encoder		<b>C</b>				
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>					
Feather key			Tolerance N	Without					<b>A</b>
Feather key			Tolerance N	With					<b>B</b>
Feather key			Tolerance R	Without					<b>D</b>
Feather key			Tolerance R	With					<b>E</b>
Plain shaft			Tolerance N	Without					<b>G</b>
Plain shaft			Tolerance N	With					<b>H</b>
Plain shaft			Tolerance R	Without					<b>K</b>
Plain shaft			Tolerance R	With					<b>L</b>
<b>Vibration severity:</b>			<b>Degree of protection:<sup>2)</sup></b>						
Grade A			IP64		<b>0</b>				
Grade A			IP65		<b>1</b>				
Grade R			IP64		<b>3</b>				
Grade R			IP65		<b>4</b>				

To select the type of construction and degree of protection, see Technical definitions.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 Compact motors**  
Forced ventilation

Motor type (repeated)	Efficiency <sup>3)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>6)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>4)</sup> $I_{rated}$ A	Booksized format	Motor connection (and brake connection) via power connector		
					For additional versions and components see SINAMICS S120 drive system	Power connector	Cable cross-section <sup>5)</sup>	Pre-assembled cable
					Order No.	Size	mm <sup>2</sup>	Order No.
1FT7084-5SC7...	93	15	5.7 (7.64)	18	<b>6SL312-1-TE21-8AA3</b>	1.5	4 × 1.5	<b>6FX002-5-N21-....</b>
1FT7086-5SC7...	93	19.5	7.5 (10.1)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 2.5	<b>6FX002-5-N31-....</b>
1FT7105-5SC7...	93	31	13.6 (18.2)	45	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 6	<b>6FX002-5-N54-....</b>
1FT7108-5SC7...	93	39	19.1 (25.6)	45	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 10	<b>6FX002-5-N64-....</b>
1FT7084-5SF7...	94	21	8.5 (11.4)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 2.5	<b>6FX002-5-N31-....</b>
1FT7086-5SF7...	93	29	11.3 (15.2)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 6	<b>6FX002-5-N51-....</b>
1FT7105-5SF7...	94	45	20.4 (27.4)	45	<b>6SL312-1-TE24-5AA3</b>	3	4 × 10	<b>6FX002-5-S14-....</b>
1FT7108-5SF7...	94	57	28.6 (38.4)	60	<b>6SL312-1-TE26-0AA3</b>	3	4 × 16	<b>6FX002-5-S23-....</b>
1FT7084-5SH7...	94	30.5	12.7 (17.0)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 6	<b>6FX002-5-N51-....</b>
1FT7086-5SH7...	93	34	17.0 (22.8)	45	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 6	<b>6FX002-5-N54-....</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>
<b>Motor Module:</b>	
Single Motor Module	<b>1</b>
Double Motor Module	<b>2</b>

<b>Power cable:</b>	
MOTION-CONNECT 800	<b>8</b>
MOTION-CONNECT 500	<b>5</b>
Without brake cores	<b>C</b>
With brake cores	<b>D</b>
Length code	<b>....</b>

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

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1) Connector size 3 not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) The degree of protection refers to the motor. The built-in fan meets the requirements of degree of protection IP54.

3) Optimum efficiency in continuous duty.

4) With default setting of the pulse frequency.

5) The current carrying capacity of the power cable complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

6)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 Compact motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	<b>SIMOTICS S-1FT7 Compact synchronous motors</b>	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.	$p$	$J$	$m$
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
<b>1FT7 Compact for DC link voltage 510 ... 720 V DC – Water cooling</b>									
<b>1500</b>	100	7.9 (10.6)	50 (36.9)	50 (36.9)	20.3	<b>1FT7102-5WB7-1</b> ■■■■	5	98.9 (87.5)	36.6 (80.7)
		14.1 (18.9)	90 (66.3)	90 (66.3)	29.5	<b>1FT7105-5WB7-1</b> ■■■■	5	191 (169)	54.8 (121)
		19.6 (26.3)	125 (92.1)	125 (92.1)	40.3	<b>1FT7108-5WB7-1</b> ■■■■	5	265 (235)	68.6 (151)
<b>2000</b>	80	4.4 (5.90)	21 (15.5)	21 (15.5)	11	<b>1FT7082-5WC7-1</b> ■■■■	5	28.9 (25.6)	20.7 (45.6)
		7.33 (9.83)	35 (25.8)	35 (25.8)	17	<b>1FT7084-5WC7-1</b> ■■■■	5	48.3 (42.8)	27.5 (60.6)
		10.5 (14.1)	50 (36.9)	50 (36.9)	24	<b>1FT7086-5WC7-1</b> ■■■■	5	67.8 (60.0)	34.1 (75.2)
	100	10.4 (14.0)	50 (36.9)	49.5 (36.5)	29.3	<b>1FT7102-5WC7-1</b> ■■■■	5	98.9 (87.5)	36.6 (80.7)
		18.8 (25.2)	90 (66.3)	90 (66.3)	40.8	<b>1FT7105-5WC7-1</b> ■■■■	5	191 (169)	54.8 (121)
		26.2 (35.1)	125 (92.1)	125 (92.1)	47.5	<b>1FT7108-5WC7-1</b> ■■■■	5	265 (235)	69.6 (153)
<b>Type of construction:</b>			IM B5	Flange 0	<b>0</b>				
			IM B5	Flange 1 (compatible with 1FT6)	<b>1</b>				
<b>Connector outlet direction:</b>			Connector sizes 1 and 1.5	Rotatable connector	<b>1</b>				
			Connector size 3 <sup>1)</sup>	Transverse right	<b>1</b>				
				Transverse left	<b>2</b>				
				Axial NDE	<b>3</b>				
				Axial DE	<b>4</b>				
<b>Terminal box/cable entry:<sup>1)</sup></b>			Top/transverse from right		<b>5</b>				
			Top/transverse from left		<b>6</b>				
			Top/axial from NDE		<b>7</b>				
			Top/axial from DE		<b>8</b>				
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder		<b>N</b>				
			AM2048S/R encoder		<b>M</b>				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder		<b>B</b>				
			AM24DQI encoder		<b>C</b>				
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>				
Feather key and keyway			Tolerance N		Without				<b>A</b>
Feather key and keyway			Tolerance N		With				<b>B</b>
Feather key and keyway			Tolerance R		Without				<b>D</b>
Feather key and keyway			Tolerance R		With				<b>E</b>
Plain shaft			Tolerance N		Without				<b>G</b>
Plain shaft			Tolerance N		With				<b>H</b>
Plain shaft			Tolerance R		Without				<b>K</b>
Plain shaft			Tolerance R		With				<b>L</b>
<b>Vibration severity:</b>			<b>Degree of protection:</b>						
Grade A			IP64						<b>0</b>
Grade A			IP65						<b>1</b>
Grade A			IP67						<b>2</b>
Grade R			IP64						<b>3</b>
Grade R			IP65						<b>4</b>
Grade R			IP67						<b>5</b>

To select the type of construction and degree of protection, see Technical definitions.



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 Compact motors**  
Water cooling

Motor type (repeated)	Efficiency <sup>2)</sup>	Stall current $I_0$ at $M_0$ $\Delta T=100$ K	Calculated power $P_{calc}$ <sup>5)</sup>  $P_{calc}$ at $M_0$ $\Delta T=100$ K	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>3)</sup> $I_{rated}$  A	Booksized format For additional versions and components see SINAMICS S120 drive system  Order No.	Motor connection (and brake connection) via power connector		
	$\eta$  %	A	kW (HP)			Power connector  Size	Cable cross-section <sup>4)</sup>  mm <sup>2</sup>	Pre-assembled cable  Order No.
1FT7102-5WB7...	93	17.8	7.9 (10.6)	18	<b>6SL312-1-TE21-8AA3</b>	1.5	4 × 2.5	<b>6FX002-5-N31-....</b>
1FT7105-5WB7...	94	28	14.1 (18.9)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX002-5-N41-....</b>
1FT7108-5WB7...	94	39	19.6 (26.3)	45	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 10	<b>6FX002-5-N64-....</b>
1FT7082-5WC7...	93	10.7	4.4 (5.90)	18	<b>6SL312-1-TE21-8AA3</b>	1.5	4 × 1.5	<b>6FX002-5-N21-....</b>
1FT7084-5WC7...	94	16.5	7.3 (9.79)	18	<b>6SL312-1-TE21-8AA3</b>	1.5	4 × 2.5	<b>6FX002-5-N31-....</b>
1FT7086-5WC7...	94	23	10.5 (14.1)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX002-5-N41-....</b>
1FT7102-5WC7...	94	25.5	10.5 (14.1)	30	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX002-5-N41-....</b>
1FT7105-5WC7...	94	39	18.8 (25.2)	45	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 10	<b>6FX002-5-N64-....</b>
1FT7108-5WC7...	95	45.3	26.2 (35.1)	45	<b>6SL312-1-TE24-5AA3</b>	3	4 × 10	<b>6FX002-5-N14-....</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>
<b>Motor Module:</b>	
Single Motor Module	<b>1</b>
Double Motor Module	<b>2</b>

<b>Power cable:</b>	
MOTION-CONNECT 800	<b>8</b>
MOTION-CONNECT 500	<b>5</b>
Without brake cores	<b>C</b>
With brake cores	<b>D</b>
Length code	....

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

1) Connector size 3 not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) Optimum efficiency in continuous duty.

3) With default setting of the pulse frequency.

4) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

5)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$       $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 Compact motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FT7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)	
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{rated}$ at $\Delta T=100\text{ K}$	$I_{rated}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$	
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A	Order No.		$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)	
<b>1FT7 Compact for DC link voltage 510 ... 720 V DC – Water cooling</b>										
<b>3000</b>	63	3.1 (4.2)	10 (7.4)	10 (7.4)	7.8	<b>1FT7062-5WF7-1</b> ■■■■	5	8.1 (7.17)	11 (24.3)	
		5 (6.7)	16 (11.8)	16 (11.8)	12.5	<b>1FT7064-5WF7-1</b> ■■■■	5	12.9 (11.4)	13.7 (30.2)	
		6.2 (8.3)	20 (14.8)	19.6 (14.5)	14.4	<b>1FT7066-5WF7-1</b> ■■■■	5	17.7 (15.7)	16.3 (35.9)	
		9.3 (12.5)	30 (22.1)	29.5 (21.8)	19.6	<b>1FT7068-5WF7-1</b> ■■■■	5	24.8 (22.0)	20.1 (44.3)	
	80	6.28 (8.42)	21 (15.5)	20.5 (15.1)	16	<b>1FT7082-5WF7-1</b> ■■■■	5	28.9 (25.6)	20.7 (45.6)	
		11 (14.8)	35 (25.8)	35 (25.8)	24.2	<b>1FT7084-5WF7-1</b> ■■■■	5	48.3 (42.8)	27.5 (60.6)	
		15.4 (20.7)	50 (36.9)	49 (36.1)	36	<b>1FT7086-5WF7-1</b> ■■■■	5	67.8 (60.0)	34.1 (75.2)	
	100	14.3 (19.2)	50 (36.9)	45.5 (33.6)	38.8	<b>1FT7102-5WF7-1</b> ■■■■	5	98.9 (87.5)	36.6 (80.7)	
		24.8 (33.3)	90 (66.4)	79 (58.3)	49.5	<b>1FT7105-5WF7-1</b> ■■■■	5	164 (145.1)	55.9 (123.3)	
		34.2 (45.9)	125 (92.2)	109 (80.4)	60	<b>1FT7108-5WF7-1</b> ■■■■	5	265 (235)	69.6 (153.5)	
	<b>4500</b>	63	9.1 (12.2)	20 (14.8)	19.4 (14.3)	20.8	<b>1FT7066-5WH7-1</b> ■■■■	5	17.7 (15.7)	16.3 (35.9)
			8.95 (12.0)	21 (15.5)	19 (14.0)	23.9	<b>1FT7082-5WH7-1</b> ■■■■	5	28.9 (25.6)	20.7 (45.6)
80		14.6 (20.0)	35 (25.8)	32 (23.6)	34.5	<b>1FT7084-5WH7-1</b> ■■■■	5	48.3 (42.8)	27.5 (60.6)	
		20.3 (40.6)	50 (36.9)	43 (31.7)	38	<b>1FT7086-5WH7-1</b> ■■■■	5	67.8 (60.0)	34.1 (75.2)	
<b>6000</b>	63	5.8 (7.78)	10 (7.4)	9.2 (6.80)	12.7	<b>1FT7062-5WK7-1</b> ■■■■	5	8.1 (7.17)	11 (24.3)	
		8.9 (11.9)	16 (11.8)	14.2 (10.5)	20	<b>1FT7064-5WK7-1</b> ■■■■	5	12.9 (11.4)	13.7 (30.2)	
<b>Type of construction:</b>			IM B5	Flange 0	0					
			IM B5	Flange 1 (compatible with 1FT6)	1					
<b>Connector outlet direction:</b>			Connector sizes 1 and 1.5	Rotatable connector	1					
			Connector size 3 <sup>1)</sup>	Transverse right	1					
				Transverse left	2					
				Axial NDE	3					
				Axial DE	4					
<b>Terminal box/cable entry:<sup>1)</sup></b>			Top/transverse from right		5					
			Top/transverse from left		6					
			Top/axial from NDE		7					
			Top/axial from DE		8					
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder			N				
			AM2048S/R encoder			M				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder			B				
			AM24DQI encoder			C				
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>	<b>Holding brake:</b>			A			
Feather key and keyway			Tolerance N	Without			B			
Feather key and keyway			Tolerance N	With			D			
Feather key and keyway			Tolerance R	Without			E			
Feather key and keyway			Tolerance R	With			G			
Plain shaft			Tolerance N	Without			H			
Plain shaft			Tolerance N	With			K			
Plain shaft			Tolerance R	Without			L			
Plain shaft			Tolerance R	With						
<b>Vibration severity:</b>			<b>Degree of protection:</b>				0			
Grade A			IP64				1			
Grade A			IP65				2			
Grade A			IP67				3			
Grade R			IP64				4			
Grade R			IP65				5			
Grade R			IP67							

To select the type of construction and degree of protection, see Technical definitions.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 Compact motors**  
**Water cooling**

Motor type (repeated)	Efficiency <sup>2)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>6)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>3)</sup> $I_{rated}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Motor connection (and brake connection) via power connector		
						Power connector Size	Cable cross-section <sup>4)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
1FT7062-5WF7...	91	7.4	3.1 (4.16)	9	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FT7064-5WF7...	91	11.9	5.0 (6.7)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7066-5WF7...	91	14	6.3 (8.5)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7068-5WF7...	93	19	9.4 (12.6)	18 <sup>5)</sup>	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX002-5N11-....
1FT7082-5WF7...	94	16	6.6 (8.85)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7084-5WF7...	94	23	11.0 (14.8)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7086-5WF7...	94	34	15.7 (21.1)	45	6SL312-1-TE24-5AA3	1.5	4 × 6	6FX002-5N54-....
1FT7102-5WF7...	95	40	15.7 (21.1)	45	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX002-5N64-....
1FT7105-5WF7...	94	53.2	28.3 (38.0)	60	6SL312-1-TE26-0AA3	3	4 × 16	6FX002-5S23-....
1FT7108-5WF7...	95	65	39.3 (52.7)	85	6SL312-1-TE28-5AA3	3	4 × 16	6FX002-5G23-....
1FT7066-5WH7...	91	19.7	9.4 (12.6)	30	6SL312-1-TE23-0AA3	1	4 × 2.5	6FX002-5N11-....
1FT7082-5WH7...	94	24	9.9 (13.3)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7084-5WH7...	94	34.3	16.5 (22.1)	45	6SL312-1-TE24-5AA3	1.5	4 × 6	6FX002-5N54-....
1FT7086-5WH7...	94	40.5	23.6 (31.7)	45	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX002-5N64-....
1FT7062-5WK7...	92	12.5	6.3 (8.45)	18	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FT7064-5WK7...	92	20.2	10.1 (13.5)	30	6SL312-1-TE23-0AA3	1	4 × 2.5	6FX002-5N11-....

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

<b>Power cable:</b>	
MOTION-CONNECT 800	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

1) Connector size 3 is not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) Optimum efficiency in continuous duty.

3) With default setting of the pulse frequency.

4) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

5) With the specified Motor Module, at  $\Delta T = 100$  K winding temperature rise, the motor cannot be fully utilized with  $M_0$ .  
If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

6)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 High Dynamic motors Forced ventilation/Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FT7 High Dynamic synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lbf-ft)	Nm (lbf-ft)	A	Order No.		$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
<b>1FT7 High Dynamic for DC link voltage 510 ... 720 V DC – Forced ventilation</b>									
<b>3000</b>	63	3.8 (5.10)	14 (10.3)	12 (8.90)	10.5	<b>1FT7065-7SF7-1</b> ■■■■	5	6.4 (5.66)	19 (41.9)
		4.4 (5.90)	17 (12.5)	14 (10.3)	13	<b>1FT7067-7SF7-1</b> ■■■■	5	8.3 (7.35)	23 (50.7)
	80	7.2 (9.66)	34 (25.1)	23 (17.0)	20	<b>1FT7085-7SF7-1</b> ■■■■	5	20.7 (18.3)	34 (75.0)
		10.4 (14.0)	48 (35.4)	33 (24.3)	29	<b>1FT7087-7SF7-1</b> ■■■■	5	27.4 (24.3)	42 (92.6)
<b>4500</b>	63	5.2 (6.97)	14 (10.3)	11 (8.10)	13.5	<b>1FT7065-7SH7-1</b> ■■■■	5	6.4 (5.66)	19 (41.9)
		6.1 (8.18)	17 (12.5)	13 (9.60)	15	<b>1FT7067-7SH7-1</b> ■■■■	5	8.3 (7.35)	23 (50.7)
	80	8.2 (11.0)	34 (25.1)	17.5 (12.9)	22.5	<b>1FT7085-7SH7-1</b> ■■■■	5	20.7 (18.3)	34 (75.0)
		10.8 (14.5)	48 (35.4)	23 (17.0)	24	<b>1FT7087-7SH7-1</b> ■■■■	5	27.4 (24.3)	43 (94.8)
<b>1FT7 High Dynamic for DC link voltage 510 ... 720 V DC – Water cooling</b>									
<b>3000</b>	63	5.7 (7.64)	19 (14.0)	18 (13.3)	15	<b>1FT7065-7WF7-1</b> ■■■■	5	6.4 (5.66)	16 (35.3)
		7.4 (9.92)	25 (18.4)	23.5 (17.3)	21	<b>1FT7067-7WF7-1</b> ■■■■	5	8.3 (7.35)	22 (48.5)
	80	11.9 (16.0)	43 (31.7)	38 (28.0)	32	<b>1FT7085-7WF7-1</b> ■■■■	5	20.7 (18.3)	32 (70.6)
		16.0 (21.5)	61 (45.0)	51 (37.6)	43	<b>1FT7087-7WF7-1</b> ■■■■	5	27.4 (24.3)	41 (90.4)
<b>4500</b>	63	7.8 (10.5)	19 (14.0)	16.5 (12.2)	20	<b>1FT7065-7WH7-1</b> ■■■■	5	6.4 (5.66)	16 (35.3)
		10.4 (14.0)	25 (18.4)	22 (16.2)	25	<b>1FT7067-7WH7-1</b> ■■■■	5	8.3 (7.35)	22 (48.5)
	80	15.6 (20.9)	43 (31.7)	33 (24.3)	48	<b>1FT7085-7WH7-1</b> ■■■■	5	20.7 (18.3)	32 (70.6)
		21.7 (29.1)	61 (45.0)	46 (33.9)	53	<b>1FT7087-7WH7-1</b> ■■■■	5	27.4 (24.3)	41 (90.4)
<b>Type of construction:</b>									
			IM B5	Flange 0	<b>0</b>				
			IM B5	Flange 1 (compatible with 1FT6)	<b>1</b>				
<b>Connector outlet direction:</b>									
			Connector sizes 1 and 1.5	Rotatable connector	<b>1</b>				
			Connector size 3 <sup>1)</sup>	Transverse right	<b>1</b>				
				Transverse left	<b>2</b>				
				Axial NDE	<b>3</b>				
				Axial DE	<b>4</b>				
<b>Terminal box/cable entry:<sup>1)</sup></b>									
			Top/transverse from right	<b>5</b>					
			Top/transverse from left	<b>6</b>					
			Top/axial from NDE	<b>7</b>					
			Top/axial from DE	<b>8</b>					
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>									
			IC2048S/R encoder	<b>N</b>					
			AM2048S/R encoder	<b>M</b>					
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>									
			AS24DQI encoder	<b>B</b>					
			AM24DQI encoder	<b>C</b>					
<b>Shaft extension:</b>									
Feather key and keyway			<b>Shaft and flange accuracy:</b>	Tolerance N	Holding brake:	Without	<b>A</b>		
Feather key and keyway						Tolerance N	With	<b>B</b>	
Feather key and keyway			Tolerance R	Without	<b>D</b>				
Feather key and keyway			Tolerance R	With	<b>E</b>				
Plain shaft			Tolerance N	Without	<b>G</b>				
Plain shaft			Tolerance N	With	<b>H</b>				
Plain shaft			Tolerance R	Without	<b>K</b>				
Plain shaft			Tolerance R	With	<b>L</b>				
<b>Vibration severity:</b>									
Grade A			<b>Degree of protection:</b>	IP64	<b>0</b>				
Grade A				IP65	<b>1</b>				
Grade A				IP67 (only for water cooling)	<b>2</b>				
Grade R			IP64	<b>3</b>					
Grade R			IP65	<b>4</b>					
Grade R			IP67 (only for water cooling)	<b>5</b>					

To select the type of construction and degree of protection, see Technical definitions.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FT7 High Dynamic motors**  
Forced ventilation/Water cooling

Motor type (repeated)	Efficiency <sup>2)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>5)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>3)</sup> $I_{rated}$ A	Booksize format For additional versions and components see SINAMICS S120 drive system Order No.	Motor connection (and brake connection) via power connector		
						Power connector Size	Cable cross-section <sup>4)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
1FT7065-7SF7...	92	12	4.4 (5.90)	18	6SL312-1-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-....
1FT7067-7SF7...	94	15	5.3 (7.11)	18	6SL312-1-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-....
1FT7085-7SF7...	92	28	10.7 (14.4)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7087-7SF7...	93	40	15.1 (20.3)	45	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX002-5N64-....
1FT7065-7SH7...	92	16	6.6 (8.85)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7067-7SH7...	94	19	8.0 (10.7)	30	6SL312-1-TE23-0AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7085-7SH7...	92	40	16.0 (21.5)	45	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX002-5N64-....
1FT7087-7SH7...	93	45	22.6 (30.3)	45	6SL312-1-TE24-5AA3	3	4 × 10	6FX002-5S14-....
1FT7065-7WF7...	92	16	6.0 (8.05)	18	6SL312-1-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-....
1FT7067-7WF7...	94	22	7.9 (10.6)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7085-7WF7...	93	36	13.5 (18.1)	45	6SL312-1-TE24-5AA3	1.5	4 × 6	6FX002-5N54-....
1FT7087-7WF7...	94	51	19.2 (25.8)	60	6SL312-1-TE26-0AA3	3	4 × 16	6FX002-5S23-....
1FT7065-7WH7...	92	22	9.0 (12.1)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7067-7WH7...	94	28	11.8 (15.8)	30	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FT7085-7WH7...	94	58	20.3 (27.2)	60	6SL312-1-TE26-0AA3	3	4 × 16	6FX002-5S23-....
1FT7087-7WH7...	94	67	28.7 (38.5)	85	6SL312-1-TE28-5AA3	3	4 × 25	6FX002-5DG33-....

Cooling:	
Internal air cooling	0
External air cooling	1
Motor Module:	
Single Motor Module	1
Double Motor Module	2

Power cable:	
MOTION-CONNECT 800	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

1) Connector size 3 is not rotatable. An alternative terminal box can be selected with connector size 3 only.

2) Optimum efficiency in continuous duty.

3) With default setting of the pulse frequency.

4) The current carrying capacity of the power cable complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

5)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb_r-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 motors

#### Overview



SIMOTICS S-1FK7 motors

SIMOTICS S-1FK7 motors are compact permanent-magnet synchronous motors. The available options, gear units and encoders, together with the expanded product range, mean that the 1FK7 motors can be optimally adapted to any application. They therefore also satisfy the permanently increasing demands of state-of-the-art machine generations.

1FK7 motors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. The integrated encoder systems for speed and position control can be selected depending on the application.

The motors are designed for operation without external cooling and the heat is dissipated through the motor surface. 1FK7 motors have a high overload capability.

#### Benefits

##### **SIMOTICS S-1FK7 Compact motors:**

- Space-saving installation due to extremely high power density
- Can be used for universal applications
- Wide range of motors

##### **SIMOTICS S-1FK7 High Dynamic motors:**

- Extremely high dynamic response thanks to the very low rotor moment of inertia

##### **SIMOTICS S-1FK7 High Inertia motors:**

- Robust closed-loop control properties for high or variable load moment of inertia
- Minimal optimization and commissioning overhead for the compensation of disturbances

#### Application

- Machine tools
- Robots and handling systems
- Wood, glass, ceramics and stone working
- Packaging, plastics and textile machines
- Printing machines
- Auxiliary axes

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 motors

#### Technical specifications

SIMOTICS S-1FK7 Compact/High Dynamic/High Inertia motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding according to EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)
Type of construction according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection according to EN 60034-5 (IEC 60034-5) <sup>1)</sup>	IP64 (optional IP65)
Shaft extension on the drive end according to DIN 748-3 (IEC 60072-1)	Plain shaft, optional shaft with feather key (half-key balancing)
Shaft and flange accuracy according to DIN 42955 (IEC 60072-1) <sup>2)</sup>	Tolerance N
Vibration severity according to EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level $L_{pA}$ (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB	
• 1FK701 ... 1FK704 • 1FK706 • 1FK708/1FK710	55 dB 65 dB 70 dB
Connection	Connectors for signals and power
Paint finish <sup>3)</sup>	Anthracite RAL 7016
2nd rating plate	Enclosed separately
Holding brake	Optional integrated holding brake (free of backlash, 24 V DC)
Approvals, according to	cURus

#### Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

#### Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoders/absolute encoders, single-turn <sup>4)</sup>	
IC22DQ encoder	Incremental encoder, 22 bit + commutation position, 11 bit
AS24DQI encoder	Absolute encoder, single-turn, 24 bit
AS20DQI encoder	Absolute encoder, single-turn, 20 bit
Multi-turn absolute encoder	
AM24DQI encoder	Absolute encoder, 24 bit + 12 bit multi-turn
AM22DQ encoder	Absolute encoder, 22 bit + 12 bit multi-turn
AM20DQI/AM20DQ encoder	Absolute encoder, 20 bit + 12 bit multi-turn
AM15DQ encoder	Absolute encoder, 15 bit + 12 bit multi-turn
Resolver	
R15DQ resolver	Resolver 15 bit (internal, multi-pole)
R14DQ resolver	Resolver 14 bit (internal, 2-pole)

S/R = signals/revolution

- 1) 1FK701 can be supplied only with IP54 degree of protection.  
 2) Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.  
 3) 1FK702 without a paint finish as standard.  
 4) The single-turn absolute encoder is applied for the previously used incremental encoders.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 motors

#### Options

Order code	Description
J..	Mounting of SP+ planetary gearbox (see <a href="#">Geared servomotors</a> )
M03	Version for Zone 2 hazardous areas in accordance with EN 50021/IEC 60079-15
M39	Version for Zone 22 hazardous areas in accordance with EN 50281/IEC 61241-1
N05	Non-standard shaft extension (dimensions as for 1FT5 motors)
N16	Nickel-plated connectors and special paint application (PS Premium) for increased chemical resistance, e.g. in the food industry.
Q31	Metal rating plate instead of adhesive label
V..	Mounting of LP+ planetary gearbox (see <a href="#">Geared servomotors</a> )
	Paint finish
K23	Special paint finish for "worldwide" climate group: Primer and paint finish: Anthracite RAL 7016 <sup>1)</sup>
K23+X..	Special paint finish for "worldwide" climate group: Primer and paint finish selectable from X01 to X27
K24	Primed (unpainted) <sup>2)</sup>
X01	Paint finish: Jet black, matt RAL 9005 <sup>1)</sup>
X02	Paint finish: Cream white RAL 9001 <sup>1)</sup>
X03	Paint finish: Reseda green RAL 6011 <sup>1)</sup>
X04	Paint finish: Slate gray RAL 7032 <sup>1)</sup>
X05	Paint finish: Sky blue RAL 5015 <sup>1)</sup>
X06	Paint finish: Pale ivory RAL 1015 <sup>1)</sup>
X08	Paint finish: Suitable for food grade applications White aluminum RAL 9006 <sup>1)</sup>
X27	Paint finish: Dark pearl gray RAL 9023 <sup>1)</sup>

When ordering a motor with options, **-Z** should be added to the order number.

<sup>1)</sup> For the paint finish, 1FK702 motors must be ordered with 3 or 5 in the 16th data position.

<sup>2)</sup> For the paint primer, 1FK702 motors must be ordered with 0 or 2 in the 16th data position.



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 motors

#### Options (continued)

##### M03

##### Version for Zone 2 hazardous areas according to IEC EN 60079-15

Combustible or explosive gases or vapors occur only rarely or briefly in Zone 2 areas. The type of protection designation is Ex nA II (non sparking).

The special conditions for operating 1FK7 motors in Zone 2 areas, in particular the reduction in permissible operating speeds, are described in detail in Appendix 610.40089.01 to the EC Declaration of Conformity 664.20038.02.

##### M39

##### Version for Zone 22 hazardous areas according to IEC 61241-1

Combustible or potentially explosive dust (non-conductive dust) occurs only rarely or briefly in Zone 22 areas. The type of protection designation is Ex 3D T 160 °C.

The special conditions for operating 1FK7 motors in Zone 22 areas are described in detail in Appendix 610.40090.01 to the EC Declaration of Conformity 664 20039.02.

##### Note regarding M03 and M39 options:

When used in Zone 2 or Zone 22, 1FK7 motors are only designed for encoder connection through connectors. A version with a DRIVE-CLiQ interface on the motor is not possible. Connection to SINAMICS S120 is only possible via SMC (Sensor Module Cabinet-Mounted).

##### N05

##### Non-standard shaft extension (dimensions as for 1FT5 motors)

1FK7 motors are shipped with the following shaft dimensions that are compatible with 1FT5 motors (diameter × length):

- SH 36: 11 × 23 mm (0.43 × 0.91 in)
- SH 48: 14 × 30 mm (0.55 × 1.18 in)
- SH 63: 19 × 40 mm (0.75 × 1.57 in)
- SH 80: 24 × 50 mm (0.94 × 1.97 in)
- SH 100: 32 × 58 mm (1.26 × 2.28 in)

##### Note:

1FK706 motors with Option N05 do not have a compatible flange with 1FT506 motors.

##### N16

##### Version for increased chemical resistance with protective properties checked according to DIN EN ISO 4628-1

Suitable for all areas with increased demands on the protective properties of the paint system. These requirements can comprise contact with acids (e.g. phosphoric acid), alkali (e.g. activated chlorine), disinfectant (e.g. hydrogen peroxide and peracetic acid), saltwater among others.

##### Note:

The PS Premium paint finish has been tested with a broad spectrum of industrial cleaning agents in the pH range of 1.5 – 13. Resistance to the acidic and alkaline cleaning agents and disinfectants in general use was verified in a material resistance test conducted by the company ECOLAB Deutschland GmbH.

Option N16 is only available for the following motor versions:

- 1FK7...-.....-1C.. AM24DQI encoder
- 1FK7...-.....-1E.. AM2048S/R encoder
- 1FK7...-.....-1R.. AM20DQI encoder
- 1FK7...-.....-1S.. Resolver, multi-pole (without DRIVE-CLiQ interface)
- 1FK7...-.....-1T.. Resolver, 2-pole (without DRIVE-CLiQ interface)

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 Compact motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A	Order No.		$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)	
<b>1FK7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling</b>										
<b>2000</b>	48	0.6 (0.80)	3.0 (2.21)	2.8 (2.07)	1.55	<b>1FK7042-2AC71-1</b> ■ ■ ■ ■	4	2.9 (2.57)	4.6 (10.1)	
		63	1.1 (1.48)	6.0 (4.43)	5.3 (3.91)	2.95	<b>1FK7060-2AC71-1</b> ■ ■ ■ ■	4	7.7 (6.82)	7.1 (15.7)
			1.5 (2.01)	8.5 (6.27)	7.0 (5.16)	2.65	<b>1FK7062-2AC71-1</b> ■ ■ ■ ■	4	11.2 (9.91)	9.1 (20.1)
			1.9 (2.55)	11.0 (8.11)	8.9 (6.56)	4.4	<b>1FK7063-2AC71-1</b> ■ ■ ■ ■	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	12.0 (8.85)	10.0 (7.38)	4.4	<b>1FK7081-2AC71-1</b> ■ ■ ■ ■	4	20 (17.7)	12.9 (28.4)	
		2.6 (3.49)	16.0 (11.8)	12.5 (9.22)	6.3	<b>1FK7083-2AC71-1</b> ■ ■ ■ ■	4	26 (23.0)	15.6 (34.4)	
		3.1 (4.16)	20.0 (14.8)	15.0 (11.1)	6.7	<b>1FK7084-2AC71-1</b> ■ ■ ■ ■	4	32.5 (28.8)	18.3 (40.3)	
	100	3.0 (4.02)	18.0 (13.3)	14.5 (10.7)	7.1	<b>1FK7100-2AC71-1</b> ■ ■ ■ ■	4	54 (47.8)	17.6 (38.8)	
		4.3 (5.77)	27.0 (19.9)	20.5 (15.1)	9.7	<b>1FK7101-2AC71-1</b> ■ ■ ■ ■	4	79 (69.9)	23.0 (50.7)	
		5.2 (6.97)	36.0 (26.6)	25.0 (18.4)	11.0	<b>1FK7103-2AC71-1</b> ■ ■ ■ ■	4	104 (92.0)	28.5 (62.8)	
		7.7 (10.3)	48.0 (35.4)	37.0 (27.3)	16.0	<b>1FK7105-2AC71-1</b> ■ ■ ■ ■	4	154 (136)	39.0 (86.0)	
	<b>3000</b>	48	0.8 (1.07)	3.0 (2.21)	2.6 (1.92)	2.0	<b>1FK7042-2AF71-1</b> ■ ■ ■ ■	4	2.9 (2.57)	4.6 (10.1)
63			1.5 (2.01)	6.0 (4.43)	4.7 (3.47)	3.7	<b>1FK7060-2AF71-1</b> ■ ■ ■ ■	4	7.7 (6.82)	7.1 (15.7)
			1.9 (2.55)	8.5 (6.27)	6.0 (4.43)	4.0	<b>1FK7062-2AF71-1</b> ■ ■ ■ ■	4	11.2 (9.91)	9.1 (20.1)
			2.3 (3.08)	11.0 (8.11)	7.3 (5.38)	5.6	<b>1FK7063-2AF71-1</b> ■ ■ ■ ■	4	14.7 (13.0)	11.1 (24.5)
80		2.1 (2.82)	8.0 (5.90)	6.8 (5.02)	4.4	<b>1FK7080-2AF71-1</b> ■ ■ ■ ■	4	14.2 (12.6)	10.3 (22.7)	
		2.7 (3.62)	12.0 (8.85)	8.7 (6.42)	6.8	<b>1FK7081-2AF71-1</b> ■ ■ ■ ■	4	20 (17.7)	12.9 (28.4)	
		3.3 (4.43)	16.0 (11.8)	10.5 (7.74)	7.2	<b>1FK7083-2AF71-1</b> ■ ■ ■ ■	4	26 (23.0)	15.6 (34.4)	
		3.1 (4.16)	20.0 (14.8)	10.0 (7.38)	6.5	<b>1FK7084-2AF71-1</b> ■ ■ ■ ■	4	32.5 (28.8)	18.3 (40.3)	
100		3.8 (5.10)	18.0 (13.3)	12.0 (8.85)	8.0	<b>1FK7100-2AF71-1</b> ■ ■ ■ ■	4	54 (47.8)	17.6 (38.8)	
		4.9 (6.57)	27.0 (19.9)	15.5 (11.4)	11.6	<b>1FK7101-2AF71-1</b> ■ ■ ■ ■	4	79 (69.9)	23.0 (50.7)	
		4.4 (5.90)	36.0 (26.6)	14.0 (10.3)	11.5	<b>1FK7103-2AF71-1</b> ■ ■ ■ ■	4	104 (92.0)	28.5 (62.8)	
		8.2 (11.0)	48.0 (35.4)	26.0 (19.2)	18.0	<b>1FK7105-2AF71-1</b> ■ ■ ■ ■	4	154 (136)	39.0 (86.0)	

<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver	A E S T
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	AS24DQI encoder AM24DQI encoder AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver	B C Q R U P
<b>Shaft extension:</b> Feather key Feather key Plain shaft Plain shaft	<b>Shaft and flange accuracy:</b> Tolerance N Tolerance N Tolerance N Tolerance N	A B G H
<b>Holding brake:</b> Without With Without With		
<b>Degree of protection:</b>	IP64 IP65 IP65 and DE flange IP67	0 1 2

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 Compact motors**  
**Natural cooling**

Motor type (repeated)	Efficiency <sup>1)</sup>	Stall current	Calculated power $P_{calc}$ <sup>5)</sup>	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current <sup>2)</sup>	Booksized format For additional versions and components see SINAMICS S120 drive system	Power connector	Cable cross-section <sup>3)</sup>	Pre-assembled cable
	$\eta$	$I_0$ at $M_0$ $\Delta T=100$ K	$P_{calc}$ at $M_0$ $\Delta T=100$ K	$I_{rated}$	Order No.	Size	mm <sup>2</sup>	Order No.
	%	A	kW (HP)	A				
Line voltage 380 ... 480 V 3 AC								
1FK7042-2AC71-...	88	1.6	0.6 (0.80)	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7060-2AC71-...	90	3.15	1.3 (1.74)	3 <sup>4)</sup>	6SL312-TE13-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7062-2AC71-...	91	3.0	1.8 (2.41)	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7063-2AC71-...	91	5.3	2.3 (3.08)	5 <sup>4)</sup>	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7081-2AC71-...	93	5.0	2.5 (3.35)	5	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7083-2AC71-...	93	7.5	3.4 (4.56)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7084-2AC71-...	93	8.5	4.2 (5.63)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7100-2AC71-...	92	8.4	3.8 (5.10)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7101-2AC71-...	93	12.3	5.7 (7.64)	18	6SL312-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-...
1FK7103-2AC71-...	93	14.4	7.5 (10.1)	18	6SL312-TE21-8AA3	1.5	4 × 1.5	6FX002-5N21-...
1FK7105-2AC71-...	93	20.0	10.1 (13.5)	30	6SL312-1TE23-0AA3	1.5	4 × 2.5	6FX002-5N31-...
1FK7042-2AF71-...	89	2.2	0.9 (1.21)	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7060-2AF71-...	90	4.45	1.9 (2.55)	5	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7062-2AF71-...	91	5.3	2.7 (3.62)	5 <sup>4)</sup>	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7063-2AF71-...	91	8.0	3.5 (4.69)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7080-2AF71-...	92	4.9	2.5 (3.35)	5	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7081-2AF71-...	93	8.7	3.8 (5.10)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-...
1FK7083-2AF71-...	93	10.1	5 (6.71)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-...
1FK7084-2AF71-...	93	12.1	6.3 (8.45)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-...
1FK7100-2AF71-...	92	11.1	5.7 (7.64)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-...
1FK7101-2AF71-...	93	18.8	8.5 (11.4)	18 <sup>4)</sup>	6SL312-TE21-8AA3	1.5	4 × 2.5	6FX002-5N31-...
1FK7103-2AF71-...	93	26.0	11.3 (15.2)	30	6SL312-1TE23-0AA3	1.5	4 × 4	6FX002-5N41-...
1FK7105-2AF71-...	94	31.0	15.1 (20.2)	30 <sup>4)</sup>	6SL312-1TE23-0AA3	1.5	4 × 6	6FX002-5N51-...

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

<b>Power cable:</b>	
MOTION-CONNECT 800 PLUS	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables can be found under MOTION-CONNECT connection systems

<sup>1)</sup> Optimum efficiency in continuous duty.

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

<sup>4)</sup> With the specified Motor Module, the motor cannot be fully utilized with  $M_0$  at  $\Delta T = 100$  K winding temperature rise. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>5)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 Compact motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)		
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A	Order No.	$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)			
<b>1FK7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling</b>											
<b>4500</b>	63	1.7 (2.28)	6.0 (4.43)	3.7 (2.73)	4.3	<b>1FK7060-2AH71-1</b> ■■■■	4	7.7 (6.82)	7.1 (15.7)		
		1.4 (1.88)	8.5 (6.27)	3.0 (2.21)	3.3	<b>1FK7062-2AH71-1</b> ■■■■	4	11.2 (9.91)	9.1 (20.1)		
		1.4 (1.88)	11.0 (8.11)	3.0 (2.21)	3.8	<b>1FK7063-2AH71-1</b> ■■■■	4	14.7 (13.0)	11.1 (24.5)		
	80	2.1 (2.82)	8.0 (5.9)	4.5 (3.32)	4.8	<b>1FK7080-2AH71-1</b> ■■■■	4	14.2 (12.6)	10.3 (22.7)		
		1.8 (2.41)	12.0 (8.85)	3.8 (2.8)	4.9	<b>1FK7081-2AH71-1</b> ■■■■	4	20 (17.7)	12.9 (28.4)		
		1.4 (1.88)	16.0 (11.8)	3.0 (2.21)	3.6	<b>1FK7083-2AH71-1</b> ■■■■	4	26 (23.0)	15.6 (34.4)		
<b>6000</b>	36	0.5 (0.67)	1.15 (0.85)	0.8 (0.59)	1.3	<b>1FK7032-2AK71-1</b> ■■■■	3	0.65 (0.58)	2.7 (5.95)		
		0.6 (0.8)	1.6 (1.18)	1.0 (0.74)	1.3	<b>1FK7034-2AK71-1</b> ■■■■	3	0.9 (0.8)	3.5 (7.72)		
	48	0.7 (0.94)	1.6 (1.18)	1.1 (0.81)	1.85	<b>1FK7040-2AK71-1</b> ■■■■	4	1.6 (1.42)	3.2 (7.06)		
		0.9 (1.21)	3.0 (2.21)	1.5 (1.11)	2.5	<b>1FK7042-2AK71-1</b> ■■■■	4	2.9 (2.57)	4.6 (10.1)		
		<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>		IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver					<b>A E S T</b>		
		<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>		AS24DQI encoder AM24DQI encoder AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver					<b>B C Q R U P</b>		
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>							
Feather key		Tolerance N		Without		<b>A B G H</b>					
Feather key		Tolerance N		With							
Plain shaft		Tolerance N		Without							
Plain shaft		Tolerance N		With							
<b>Degree of protection:</b>		IP64 IP65 IP65 and DE flange IP67			<b>0 1 2</b>						

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# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 Compact motors**  
Natural cooling

Motor type (repeated)	Efficiency <sup>1)</sup>	Stall current	Calculated power $P_{calc}$ <sup>4)</sup>	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>2)</sup>	Booksized format For additional versions and components see SINAMICS S120 drive system	Motor connection (and brake connection) via power connector		
	$\eta$	$I_0$ at $M_0$ $\Delta T=100$ K	$P_{calc}$ at $M_0$ $\Delta T=100$ K	$I_{rated}$	Order No.	Power connector	Cable cross-section <sup>3)</sup>	Pre-assembled cable
	%	A	kW (HP)	A		Size	mm <sup>2</sup>	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>								
1FK7060-2AH71-...	90	6.3	2.8 (3.75)	9	<b>6SL312-TE21-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7062-2AH71-...	91	8.0	4 (5.36)	9	<b>6SL312-TE21-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7063-2AH71-...	90	12.0	5.2 (6.97)	18	<b>6SL312-TE21-8AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7080-2AH71-...	92	7.4	3.8 (5.1)	9	<b>6SL312-TE21-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7081-2AH71-...	93	13.1	5.7 (7.64)	18	<b>6SL312-TE21-8AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7083-2AH71-...	93	15.0	7.5 (10.1)	18	<b>6SL312-TE21-8AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7032-2AK71-...	88	1.7	0.7 (0.94)	3	<b>6SL312-TE13-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7034-2AK71-...	88	1.9	1 (1.34)	3	<b>6SL312-TE13-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7040-2AK71-...	88	2.35	1 (1.34)	3	<b>6SL312-TE13-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7042-2AK71-...	89	4.4	1.9 (2.55)	5	<b>6SL312-TE15-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

<b>Power cable:</b>	
MOTION-CONNECT 800 PLUS	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

<sup>1)</sup> Optimum efficiency in continuous duty.

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

<sup>4)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 Compact motors SH 20/SH 28 – Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A	Order No.		$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)
<b>1FK7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling</b>									
<b>6000</b>	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.85	<b>1FK7011-5AK71-1</b> ■■■	4	0.064 (0.057)	0.9 (2.0)
		0.1 (0.13)	0.35 (0.26)	0.16 (0.12)	0.85	<b>1FK7015-5AK71-1</b> ■■■	4	0.083 (0.073)	1.1 (2.4)
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	<b>1FK7022-5AK71-1</b> ■■■	3	0.28 (0.25)	1.8 (4.0)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder			A H J S T			
			AM512S/R encoder (only for 1FK702)						
			AM16S/R encoder						
			Multi-pole resolver 2-pole resolver						
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b> (only for 1FK702) <sup>1)</sup>			IC22DQ encoder			D L V U P			
			AM20DQ encoder						
			AM15DQ encoder						
			R15DQ resolver R14DQ resolver						
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>		A B G H			
Feather key		Tolerance N		Without					
Feather key		Tolerance N		With					
Plain shaft		Tolerance N		Without					
Plain shaft		Tolerance N		With					
<b>Degree of protection:</b>				<b>Paint finish:</b>		0 2 3 5			
IP64 (only for 1FK702)				Without					
IP65 and DE flange IP67 (only for 1FK702)				Without					
IP54 (only for 1FK701), IP64 (only for 1FK702) IP65 and DE flange IP67 (only for 1FK702)				With					

<sup>1)</sup> 1FK701 motors cannot be equipped with a DRIVE-CLiQ interface. The encoder systems are connected via the SMC (Sensor Module Cabinet-Mounted).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 Compact motors**  
SH 20/SH 28 – Natural cooling

Motor type (repeated)	Efficiency <sup>1)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>4)</sup> at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>2)</sup> $I_{rated}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Motor connection (and brake connection) via power connector	Power connector Size	Cable cross-section <sup>3)</sup> mm <sup>2</sup>
				Line voltage 380 ... 480 V 3 AC				
1FK7011-5AK71-...	62	1.5	0.1 (0.13)	3	<b>6SL312-TE13-0AA3</b>	0.5	4 × 1.5	<b>6FX5002-5DN20-....</b>
1FK7015-5AK71-...	68	1.5	0.2 (0.27)	3	<b>6SL312-TE13-0AA3</b>	0.5	4 × 1.5	<b>6FX5002-5DN20-....</b>
1FK7022-5AK71-...	86	1.8	0.5 (0.67)	3	<b>6SL312-TE13-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>

Cooling:	
Internal air cooling	0
External air cooling	1
Motor Module:	
Single Motor Module	1
Double Motor Module	2

Power cable:	
MOTION-CONNECT 800 PLUS	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

4

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

4)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 High Dynamic motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 High Dynamic synchronous motors Natural cooling	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{rated}$ at $\Delta T=100\text{ K}$	$I_{rated}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	A	Order No.	$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)	
<b>1FK7 High Dynamic for DC link voltage 510 ... 720 V DC – Natural cooling</b>									
<b>2000</b>	63	2.1 (2.82)	12.0 (8.85)	10.0 (7.38)	7.1	<b>1FK7064-4CC71-1</b> ■■■	3	7.5 (6.64)	15.4 (34.0)
	80	3.1 (4.16)	22.0 (16.2)	15.0 (11.1)	10.0	<b>1FK7085-4CC71-1</b> ■■■	4	22 (19.47)	23.0 (50.7)
		3.8 (5.10)	28.0 (20.6)	18.0 (13.3)	9.0	<b>1FK7086-4CC71-1</b> ■■■	4	22 (19.47)	23.0 (50.7)
<b>3000</b>	48	1.2 (1.61)	4.5 (3.32)	3.7 (2.73)	3.45	<b>1FK7044-4CF71-1</b> ■■■	3	1.26 (1.12)	7.4 (16.3)
	63	1.7 (2.28)	6.4 (4.72)	5.4 (3.98)	5.3	<b>1FK7061-4CF71-1</b> ■■■	3	4.1 (3.63)	9.5 (20.9)
		2.5 (3.35)	12.0 (8.85)	8.0 (5.9)	7.6	<b>1FK7064-4CF71-1</b> ■■■	3	7.5 (6.64)	15.4 (34.0)
		80	2 (2.68)	22.0 (16.2)	6.5 (4.79)	7.0	<b>1FK7085-4CF71-1</b> ■■■	4	22 (19.47)
	80	2 (2.68)	28.0 (20.6)	6.5 (4.79)	5.7	<b>1FK7086-4CF71-1</b> ■■■	4	22 (19.47)	23.0 (50.7)
		48	1.2 (1.61)	3.5 (2.58)	2.6 (1.92)	3.3	<b>1FK7043-4CH71-1</b> ■■■	3	1 (0.89)
<b>4500</b>	48	1.4 (1.88)	4.5 (3.32)	3.0 (2.21)	3.9	<b>1FK7044-4CH71-1</b> ■■■	3	1.26 (1.12)	7.4 (16.3)
		63	2 (2.68)	6.4 (4.72)	4.3 (3.17)	6.2	<b>1FK7061-4CH71-1</b> ■■■	3	4.1 (3.63)
	63	2.4 (3.22)	12.0 (8.85)	5.0 (3.69)	7.0	<b>1FK7064-4CH71-1</b> ■■■	3	7.5 (6.64)	15.4 (34.0)
<b>6000</b>	36	0.6 (0.80)	1.3 (0.96)	0.9 (0.66)	1.6	<b>1FK7033-4CK71-1</b> ■■■	3	0.25 (0.22)	3.0 (6.62)
	48	1.3 (1.74)	3.5 (2.58)	2.0 (1.48)	3.5	<b>1FK7043-4CK71-1</b> ■■■	3	1 (0.89)	6.0 (13.2)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver			<b>A E S T</b>			
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder AM24DQI encoder AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver			<b>B C Q R U P</b>			
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>			<b>A B G H</b>
Feather key			Tolerance N			Without			
Feather key			Tolerance N			With			
Plain shaft			Tolerance N			Without			
Plain shaft			Tolerance N			With			
<b>Degree of protection:</b>			IP64 IP65 IP65 and DE flange IP67			<b>0 1 2</b>			



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 High Dynamic motors**  
Natural cooling

Motor type (repeated)	Efficiency <sup>1)</sup>	Stall current	Calculated power $P_{calc}$ <sup>4)</sup>	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>2)</sup>	Booksized format For additional versions and components see SINAMICS S120 drive system	Motor connection (and brake connection) via power connector		
	$\eta$	$I_0$ at $M_0$ $\Delta T=100$ K	$P_{calc}$ at $M_0$ $\Delta T=100$ K	$I_{rated}$	Order No.	Power connector	Cable cross-section <sup>3)</sup>	Pre-assembled cable
	%	A	kW (HP)	A		Size	mm <sup>2</sup>	Order No.
Line voltage 380 ... 480 V 3 AC								
1FK7064-4CC71-...	93	8.1	2.5 (3.35)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7085-4CC71-...	92	13.5	4.6 (6.17)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FK7086-4CC71-...	93	13.2	5.9 (7.91)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FK7044-4CF71-...	91	4.0	1.4 (1.88)	5	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7061-4CF71-...	93	6.1	2 (2.68)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7064-4CF71-...	93	10.8	3.8 (5.10)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FK7085-4CF71-...	92	22.0	6.9 (9.25)	30	6SL312-1TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FK7086-4CF71-...	93	21.5	8.8 (11.8)	30	6SL312-1TE23-0AA3	1.5	4 × 4	6FX002-5N41-....
1FK7043-4CH71-...	90	4.1	1.6 (2.15)	5	6SL312-TE15-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7044-4CH71-...	91	5.4	2.1 (2.82)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7061-4CH71-...	93	8.7	3 (4.02)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7064-4CH71-...	93	15.0	5.7 (7.64)	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX002-5N01-....
1FK7033-4CK71-...	88	2.1	0.8 (1.07)	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX002-5N01-....
1FK7043-4CK71-...	90	5.6	2.2 (2.95)	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX002-5N01-....

Cooling:	
Internal air cooling	0
External air cooling	1
Motor Module:	
Single Motor Module	1
Double Motor Module	2

Power cable:	
MOTION-CONNECT 800 PLUS	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

<sup>1)</sup> Optimum efficiency in continuous duty.

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

<sup>4)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 High Inertia motors Natural cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	<b>SIMOTICS S-1FK7 synchronous motors High Inertia</b>	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.	$p$	$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_r\text{-in-s}^2$ )	kg (lb)
<b>1FK7 High Inertia for DC link voltage 510 ... 720 V DC – Natural cooling</b>									
<b>2000</b>	80	3.1 (4.16)	20.0 (14.7)	15.0 (11.1)	6.7	<b>1FK7084-3BC71-1</b> ■ ■ ■ ■	4	99 (87.6)	23.0 (50.7)
<b>3000</b>	63	1.5 (2.01)	6.0 (4.43)	4.7 (3.47)	3.7	<b>1FK7060-3BF71-1</b> ■ ■ ■ ■	4	12.5 (11.1)	7.9 (17.4)
		1.9 (2.55)	8.5 (6.27)	6.0 (4.43)	4.0	<b>1FK7062-3BF71-1</b> ■ ■ ■ ■	4	23.5 (20.8)	10.7 (23.6)
	80	2.7 (3.62)	12.0 (8.85)	8.7 (6.42)	6.8	<b>1FK7081-3BF71-1</b> ■ ■ ■ ■	4	49 (43.4)	15.2 (33.5)
		3.1 (4.16)	20.0 (14.8)	10.0 (7.38)	6.5	<b>1FK7084-3BF71-1</b> ■ ■ ■ ■	4	99 (87.6)	23.0 (50.7)
<b>6000</b>	48	0.9 (1.21)	3.0 (2.21)	1.5 (1.11)	2.5	<b>1FK7042-3BK71-1</b> ■ ■ ■ ■	4	5.1 (4.51)	5.1 (11.2)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder AM2048S/R encoder			A E			
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder AM24DQI encoder AS20DQI encoder AM20DQI encoder			B C Q R			
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>			A B G H
Feather key			Tolerance N			Without			
Feather key			Tolerance N			With			
Plain shaft			Tolerance N			Without			
Plain shaft			Tolerance N			With			
<b>Degree of protection:</b>			IP64 IP65 IP65 and DE flange IP67			0 1 2			

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# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 High Inertia motors**  
Natural cooling

Motor type (repeated)	Efficiency <sup>1)</sup>	Stall current $I_0$ at $M_0$ $\Delta T=100$ K	Calculated power $P_{calc}$ <sup>5)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K	SINAMICS S120 Motor Module		Power cable with complete shield		
				Rated output current <sup>2)</sup> $I_{rated}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Motor connection (and brake connection) via power connector	Power connector Size	Cable cross-section <sup>3)</sup> mm <sup>2</sup>
				Line voltage 380 ... 480 V 3 AC				
1FK7084-3BC71-...	93	8.5	4.2 (5.63)	9	<b>6SL312-TE21-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7060-3BF71-...	90	4.45	1.9 (2.55)	5	<b>6SL312-TE15-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7062-3BF71-...	91	5.3	2.7 (3.62)	5 <sup>4)</sup>	<b>6SL312-TE15-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7081-3BF71-...	93	8.7	3.8 (5.1)	9	<b>6SL312-TE21-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7084-3BF71-...	93	12.1	6.3 (8.45)	18	<b>6SL312-TE21-8AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>
1FK7042-3BK71-...	89	4.4	1.9 (2.55)	5	<b>6SL312-TE15-0AA3</b>	1	4 × 1.5	<b>6FX002-5N01-....</b>

Cooling:		
Internal air cooling	0	
External air cooling	1	
Motor Module:		
Single Motor Module	1	
Double Motor Module	2	

Power cable:		
MOTION-CONNECT 800	8	
MOTION-CONNECT 500	5	
Without brake cores		C
With brake cores		D
Length code		....

[Information about the cables can be found under MOTION-CONNECT connection systems](#)

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

4) With the specified Motor Module, the motor cannot be fully utilized with  $M_0$  at  $\Delta T = 100$  K winding temperature rise. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

5)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 Compact motors for Power Modules 230 V 1 AC

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 Compact synchronous motors for Power Modules 230 V 1 AC	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated at } \Delta T=100 \text{ K}}$	$M_0 \text{ at } \Delta T=100 \text{ K}$	$M_{\text{rated at } \Delta T=100 \text{ K}}$	$I_{\text{rated at } \Delta T=100 \text{ K}}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A		Order No.	$10^{-4} \text{ kgm}^2$ ( $10^{-3} \text{ lb}_r\text{-in-s}^2$ )	kg (lb)
<b>1FK7 Compact for DC link voltage 270 ... 330 V DC – Natural cooling</b>									
<b>3000</b>	36	0.3 (0.4)	1.15 (0.85)	1.0 (0.74)	1.6	<b>1FK7032-2AF21-1</b> ■ ■ ■	3	0.65 (0.58)	2.7 (5.95)
		0.5 (0.67)	1.6 (1.18)	1.45 (1.07)	1.8	<b>1FK7034-2AF21-1</b> ■ ■ ■	3	0.9 (0.8)	3.5 (7.72)
	48	0.8 (1.07)	3.0 (2.21)	2.6 (1.92)	3.5	<b>1FK7042-2AF21-1</b> ■ ■ ■	4	2.9 (2.57)	4.6 (10.1)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver			A E S T			
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder AM24DQI encoder AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver			B C Q R U P			
<b>Shaft extension:</b>			<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>			A B G H
Feather key			Tolerance N			Without			
Feather key			Tolerance N			With			
Plain shaft			Tolerance N			Without			
Plain shaft			Tolerance N			With			
<b>Degree of protection:</b>			IP64 IP65 IP65 and DE flange IP67			0 1 2			

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 Compact motors  
for Power Modules 230 V 1 AC**

Motor type (repeated)	Efficiency <sup>1)</sup> $\eta$	Stall current $I_0$ at $M_0$ $\Delta T = 100$ K	Calculated power <sup>5)</sup> $P_{calc}$ at $M_0$ $\Delta T = 100$ K	SINAMICS S110/S120 Blocksize format		Power cable with complete shield Motor connection (and brake connection) via power connector			
				Rated output current <sup>2)</sup> $I_{rated}$	PM340 Power Module Air cooling Order No.	Power connector Size	Cable cross-section <sup>3)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.	
				Line voltage 200 ... 240 V 1 AC					
1FK7032-2AF21-...	85	1.7	0.4 (0.54)	2.3	6SL3210-1SB12-3 A0	1	4 × 1.5	6FX 002-5 G10-....	
1FK7034-2AF21-...	85	1.9	0.5 (0.67)	2.3	6SL3210-1SB12-3 A0	1	4 × 1.5	6FX 002-5 G10-....	
1FK7042-2AF21-...	88	3.95	0.9 (1.21)	3.9 <sup>4)</sup>	6SL3210-1SB14-0 A0	1	4 × 1.5	6FX 002-5 G10-....	
				Line filter: Without Integrated		U A	Power cable: MOTION-CONNECT 800 PLUS MOTION-CONNECT 500		8 5
							Without brake cores With brake cores		C D
							Length code		....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

4

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

4) With the specified Motor Module, the motor cannot be fully utilized with  $M_0$  at  $\Delta T = 100$  K winding temperature rise. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

5)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 Compact motors for Power Modules 230 V 1 AC

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	<b>SIMOTICS S-1FK7 Compact synchronous motors for Power Modules 230 V 1 AC</b>  Order No.	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)	
$n_{\text{rated}}$	SH	$P_{\text{rated at } \Delta T=100 \text{ K}}$	$M_0$ at $\Delta T=100 \text{ K}$	$M_{\text{rated at } \Delta T=100 \text{ K}}$	$I_{\text{rated at } \Delta T=100 \text{ K}}$		$p$	$J$	$m$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4} \text{ kgm}^2$ ( $10^{-3} \text{ lb}_r\text{-in-s}^2$ )	kg (lb)	
<b>1FK7 Compact for DC link voltage 270 ... 330 V DC – Natural cooling</b>										
<b>6000</b>	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.5	<b>1FK7011-5AK21-1</b> ■■■	4	0.064 (0.057)	0.9 (1.98)	
		0.1 (0.13)	0.35 (0.26)	0.16 (0.12)	0.5	<b>1FK7015-5AK21-1</b> ■■■	4	0.083 (0.073)	1.1 (2.43)	
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	<b>1FK7022-5AK21-1</b> ■■■	3	0.28 (0.25)	1.8 (3.97)	
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder			<b>A</b> <b>H</b> <b>J</b> <b>S</b> <b>T</b>				
			AM512S/R encoder							
			AM16S/R encoder (only for 1FK702)							
			Multi-pole resolver							
			2-pole resolver							
<b>Encoder systems for motors with DRIVE-CLiQ interface: (only for 1FK702)</b>			IC22DQ encoder			<b>D</b> <b>L</b> <b>V</b> <b>U</b> <b>P</b>				
			AM20DQ encoder							
			AM15DQ encoder							
			R15DQ resolver							
			R14DQ resolver							
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>					
Feather key		Tolerance N			Without		<b>A</b>			
Feather key		Tolerance N			With					
Plain shaft		Tolerance N			Without		<b>G</b>			
Plain shaft		Tolerance N			With					
<b>Degree of protection:</b>					<b>Paint finish:</b>					
IP64 (only for 1FK702)					Without					<b>0</b>
IP65 and DE flange IP67 (only for 1FK702)					Without					
IP54 (only for 1FK701), IP64 (only for 1FK702)					With					
IP65 and DE flange IP67 (only for 1FK702)					With					

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 Compact motors  
for Power Modules 230 V 1 AC**

Motor type (repeated)	Efficiency <sup>1)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>4)</sup> at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S110/S120 Blocksize format		Power cable with complete shield Motor connection (and brake connection) via power connector		
				Rated output current <sup>2)</sup> $I_{rated}$ A	PM340 Power Module Air cooling Order No.	Power connector Size	Cable cross-section <sup>3)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
Line voltage 200 ... 240 V 1 AC								
1FK7011-5AK21-...	62	0.85	0.1 (0.13)	0.9	6SL3210-1SB11-0 A0	0.5	4 × 1.5	6FX5002-5DN30-....
1FK7015-5AK21-...	68	0.85	0.2 (0.27)	0.9	6SL3210-1SB11-0 A0	0.5	4 × 1.5	6FX5002-5DN30-....
1FK7022-5AK21-...	86	1.8	0.5 (0.67)	2.3	6SL3210-1SB12-3 A0	1	4 × 1.5	6FX002-5 G10-....
Line filter:								
Without				U				
Integrated				A				
Power cable:								
MOTION-CONNECT 800 PLUS						8		
MOTION-CONNECT 500						5		
Without brake cores								C
With brake cores								D
Length code								....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

4

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

4)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb_r-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 High Dynamic motors for Power Modules 230 V 1 AC

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 High Dynamic synchronous motors for Power Modules 230 V 1 AC	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$		$p$	$J$	$m$
rpm		kW (HP)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	A	Order No.		$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lb}_f\text{-in-s}^2$ )	kg (lb)
<b>1FK7 High Dynamic for DC link voltage 270 ... 330 V DC – Natural cooling</b>									
<b>3000</b>	36	0.4 (0.54)	1.3 (0.96)	1.2 (0.89)	2.05	<b>1FK7033-4CF21-1</b> ■ ■ ■	3	0.25 (0.22)	3.0 (6.62)
	48	0.9 (1.21)	3.3 (2.43)	3.0 (2.21)	3.7	<b>1FK7043-4CF21-1</b> ■ ■ ■	3	1 (0.89)	6.0 (13.23)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver			<b>A</b> <b>E</b> <b>S</b> <b>T</b>			
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS24DQI encoder AM24DQI encoder AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver			<b>B</b> <b>C</b> <b>Q</b> <b>R</b> <b>U</b> <b>P</b>			
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>		<b>Holding brake:</b>		<b>A</b> <b>B</b> <b>G</b> <b>H</b>			
Feather key		Tolerance N		Without					
Feather key		Tolerance N		With					
Plain shaft		Tolerance N		Without					
Plain shaft		Tolerance N		With					
<b>Degree of protection:</b>			IP64 IP65 IP65 and DE flange IP67			<b>0</b> <b>1</b> <b>2</b>			

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# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 High Dynamic motors  
for Power Modules 230 V 1 AC**

Motor type (repeated)	Efficiency <sup>1)</sup> $\eta$ %	Stall current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>4)</sup> at $M_0$ $\Delta T=100$ K kW (HP)	SINAMICS S120 blocksize format		Power cable with complete shield		
				Rated output current <sup>2)</sup> $I_{rated}$ A	PM340 Power Module Air cooling Order No.	Motor connection (and brake connection) via power connector		
				Line voltage 200 ... 240 V 1 AC		Power connector	Cable cross-section <sup>3)</sup> mm <sup>2</sup>	Pre-assembled cable Order No.
1FK7033-4CF21-...	86	2.1	0.4 (0.54)	2.3	<b>6SL3210-1SB12-3 A0</b>	1	4 × 1.5	<b>6FX 002-5 G10-....</b>
1FK7043-4CF21-...	88	3.9	1 (1.34)	3.9	<b>6SL3210-1SB14-0 A0</b>	1	4 × 1.5	<b>6FX 002-5 G10-....</b>

Line filter:	U	Power cable:	
Without	A	MOTION-CONNECT 800 PLUS	8
Integrated		MOTION-CONNECT 500	5
		Without brake cores	C
		With brake cores	D
		Length code	....

Information about the cables  
can be found under  
MOTION-CONNECT connection systems

1) Optimum efficiency in continuous duty.

2) With default setting of the pulse frequency.

3) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

4)  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$      $P_{calc} [hp] = \frac{M_0 [lb_f-ft] \times n_{rated}}{5250}$

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### Built-in holding brakes for SIMOTICS S-1FT7/1FK7 motors

#### Overview

Many drives need a holding brake with an emergency stop function for safety reasons or to meet process requirements.

The permanent-magnet or spring-loaded, single-face brakes used for the 1FT7/1FK7 motors function according to the closed-circuit current principle. The magnetic field of the permanent-magnet exerts a tension on the brake anchor plate, i.e. in a condition of zero current, the brake is closed and the motor shaft thereby stopped. When the rated voltage of 24 V DC  $\pm$  10 % is applied to the brake, current flows through the coil and produces a counter-field that cancels the pull of the permanent-magnet, causing the brake to release.

The spring-loaded, single-face brake operates by the force of pressure exerted by the spring instead of a permanent-magnet.

In the event of an emergency stop or power outage, approximately 2000 braking operations can be performed with the maximum switched energy without causing excessive wear on the holding brake (condition: maximum external moment of inertia = moment of inertia of motor and  $n_{max}$  type-specific).

The holding brake is not an operational brake.

In order to avoid switching overvoltages and any related effects on the plant environment, the brake cables must be connected externally with a varistor. The connection is made via the power connector or the terminal box.

When connected to the SINAMICS S120 drive system, this over-voltage protection is already included.

#### Technical specifications

Motor Shaft height SH	Type	Built-in holding brake					
		Holding torque <sup>1)</sup>	Direct current	Opening time with varistor	Closing time with varistor	Moment of inertia	Maximum switched energy per brake operation from $n = 3000$ rpm
		Nm (lb <sub>r</sub> -ft)	A	ms	ms	$10^{-4}$ kgm <sup>2</sup> ( $10^{-3}$ lb <sub>r</sub> -in-s <sup>2</sup> )	J
<b>1FT7 motors with permanent-magnet brake, zero backlash</b>							
36	1FT703	3 (2.21)	0.3	60	25	0.12 (0.11)	30
48	1FT704	8 (5.9)	0.6	90	30	0.87 (0.77)	270
63	1FT706	18 (13.3)	0.8	150	50	2.84 (2.51)	880
80	1FT708	48 (35.4)	1.0	220	65	15.4 (13.6)	1900
100	1FT710	85 (62.7)	1.6	250	70	27.6 (24.4)	5300
<b>1FK7 Compact/High Dynamic/High Inertia motors with permanent-magnet brake, zero backlash</b>							
10	1FK701	0.4 (0.3)	0.3	30	20	0.019 (0.017)	2
28	1FK7022	1.0 (0.74)	0.3	30	20	0.07 (0.06)	8
36	1FK703	1.9 (1.4)	0.3	50	30	0.098 (0.087)	40
48	1FK704	4.0 (2.95)	0.5	70	30	0.32 (0.28)	150
63	1FK706	13 (9.59)	0.8	100	50	0.99 (0.88)	380
80	1FK708	22 (16.2)	0.9	200	60	3.28 (2.90)	1400
100	1FK7100	23 (17.0)	1.0	300	70	7.5 (6.64)	3380
100	1FK7101 1FK7103 1FK7105	43 (31.7)	1.0	300	70	7.5 (6.64)	3380
<b>1FK7-DYA geared servomotors and 1FK7 helical/bevel/parallel shaft/worm geared motors</b>							
36	1FK7032	1.3 (0.96)	0.4	50	30	0.08 (0.07)	17
48	1FK704	3.2 (2.36)	0.6	70	30	0.72 (0.64)	74
63	1FK706	13 (9.59)	0.8	100	50	2.25 (1.99)	400
80	1FK7080 1FK7083	10 (7.38) 22 (16.2)	0.7 0.9	100 200	50 60	3.1 (2.74) 8.6 (7.61)	400 1400
100	1FK7100	22 (16.2)	0.9	200	60	8.6 (7.61)	1400
100	1FK7101 1FK7103 1FK7105	41 (30.2)	1.0	300	70	13.5 (11.95)	3000

<sup>1)</sup> The holding torque is the highest permissible torque with which the closed brake can be loaded in steady-state operation without slip (holding function when motor is stationary).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 geared servomotors with SP+ planetary gearbox

#### Overview



SIMOTICS S-1FT7 motor with built-on SP+ planetary gearbox

SIMOTICS S-1FT7 motors can be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual, SIMOTICS S-1FT7 synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design.

#### Benefits

- High efficiency  
Single-stage: > 97 %  
Two-stage: > 94 %
- Minimum torsional backlash  
Single-stage: ≤ 4 arcmin  
Two-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration severity grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.  
The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight

#### Integration

S-1FT703 to 1FT710 SIMOTICS motors can be supplied ex works (Siemens AG) complete with flange-mounted planetary gearbox.

The gearboxes assigned to the individual motors and gear ratios  $i$  available for these motor/gearbox combinations are listed in the subsequent selection table. When making a selection, account must be taken of the maximum permissible input speed of the gearbox (this is the same as the maximum motor speed).

The motor/gearbox combinations listed in the selection tables are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min).

Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min).  
The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for SIMOTICS S-1FT7 synchronous motors when assigning gearboxes to the motor.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 geared servomotors with SP+ planetary gearbox

#### Selection and ordering data

Motor Type	Planetary gearbox single-stage			Available gear ratio $i =$				Motor speed, max. S3-60 % $n_{G1}$ ( $n_1$ ) rpm	Output torque, max. S3-60 % $M_{G2}$ ( $T_{2B}$ ) Nm (lb <sub>r</sub> -ft)	Radial output shaft loading, max. <sup>1)</sup> $F_r$ ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	Axial output shaft loading, max. <sup>1)</sup> $F_a$ ( $F_{2Amax}$ ) N (lb <sub>f</sub> )							
	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)	4	5	7	10											
1FT7034	SP 060S-MF1	≤ 4	1.9 (4.19)	✓	✓	✓	–	6000	40 (29.5)	2700 (607)	2400 (540)							
1FT7034	SP 075S-MF1	≤ 4	3.9 (8.6)	–	–	–	✓	6000	110 (81.1)	4000 (899)	3350 (753)							
1FT7036				✓	✓	✓	✓											
1FT7042				✓	✓	✓	✓											
1FT7044				✓	✓	✓	✓											
1FT7046				✓	✓	✓	–											
1FT7046	SP 100S-MF1	≤ 3	7.7 (17.0)	–	–	–	✓	4500	300 (221)	6300 (1416)	5650 (1270)							
1FT7062				✓	✓	✓	✓											
1FT7064				✓	✓	✓	✓											
1FT7065				✓	✓	✓	–											
1FT7066				✓	✓	✓	✓											
1FT7067				✓	✓	✓	–											
1FT7068				✓	✓	✓	–											
1FT7065				SP 140S-MF1	≤ 3	17.2 (37.9)	–					–	–	✓	4000	600 (443)	9450 (2124)	9870 (2219)
1FT7067	–	–	–				✓											
1FT7068	–	–	–				✓											
1FT7082	✓	✓	✓				✓											
1FT7084	✓	✓	✓				✓											
1FT7085	✓	✓	✓				–											
1FT7086	✓	✓	✓				–											
1FT7087	✓	✓	–				–											
1FT7085	SP 180S-MF1	≤ 3	34 (75.0)				–	–	–	✓	3500	1100 (811)	14700 (3305)	14150 (3181)				
1FT7086							–	–	–	✓								
1FT7087				–	–	✓	✓											
1FT7102				✓	✓	✓	✓											
1FT7105				✓	✓	✓	–											
1FT7108	✓	✓	✓	–														
1FT7105	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✓	2500	2500 (1844)	21000 (4721)	30000 (6744)							
1FT7108				–	–	–	✓											
<b>Gear shaft</b>				<b>Order code</b>														
With feather key				J02	J03	J05	J09											
Without feather key				J22	J23	J25	J29											

#### Preconditions:

SP+ planetary gearboxes can be mounted with the following motor versions:

- Flange 1
- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- Vibration severity grade A/IP65 degree of protection

SP+ planetary gearboxes can therefore only be ordered with these motors:

**1FT7...-5..71...G1**  
**1FT7...-5..71...H1**  
**1FT7...-7..71...G1**  
**1FT7...-7..71...H1**

When ordering a motor with gearbox, **-Z** should be added to the order number.

#### Example:

1FT7042 motor without holding brake  
 with single-stage SP+ planetary gearbox  
 with  $i = 5$  and gear shaft without feather key  
**1FT7042-5AF71-1NG1-Z**  
**J23**

✓ Possible

– Not possible

1) In reference to the output shaft center.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 geared servomotors with SP+ planetary gearbox

#### Technical specifications

##### SIMOTICS S-1FT7 motor with SP+ planetary gearbox

Single-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearboxes (referred to the drive)				
				Continuous duty S1 <sup>1)</sup>	1FT703.	1FT704.	1FT706.	1FT708.
	$i$	$n_{N1}$ rpm	$M_{N2}$ ( $T_{2N}$ ) Nm (lb <sub>f</sub> -ft)	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF1	4	3300	26 (19.2)	0.22 (0.08)	–	–	–	–
	5	3300	26 (19.2)	0.20 (0.07)	–	–	–	–
	7	4000	26 (19.2)	0.18 (0.06)	–	–	–	–
SP 075S-MF1	4	2900	75 (55.3)	0.61 (0.21)	0.78 (0.27)	–	–	–
	5	2900	75 (55.3)	0.51 (0.17)	0.68 (0.23)	–	–	–
	7	3100	75 (55.3)	0.42 (0.14)	0.59 (0.20)	–	–	–
	10	3100	52 (38.4)	0.38 (0.13)	0.54 (0.19)	–	–	–
SP 100S-MF1	4	2500	180 (133)	–	–	3.04 (1.04)	–	–
	5	2500	175 (129)	–	–	2.61 (0.89)	–	–
	7	2800	170 (125)	–	–	2.29 (0.78)	–	–
	10	2800	120 (88.5)	–	1.38 (0.47)	2.07 (0.71)	–	–
SP 140S-MF1	4	2100	360 (266)	–	–	–	11.0 (3.76)	–
	5	2100	360 (266)	–	–	–	9.95 (3.40)	–
	7	2600	360 (266)	–	–	–	9.01 (3.08)	–
	10	2600	220 (162)	–	–	5.28 (1.80)	8.44 (2.88)	–
SP 180S-MF1	4	1500	750 (553)	–	–	–	–	33.9 (11.6)
	5	1500	750 (553)	–	–	–	–	27.9 (9.53)
	7	2300	750 (553)	–	–	–	–	22.2 (7.59)
	10	2300	750 (553)	–	–	–	19.2 (6.56)	19.2 (6.56)
SP 210S-MF1	10	2000	1000 (738)	–	–	–	–	53.1 (18.1)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 geared servomotors with SP+ planetary gearbox

#### Selection and ordering data

Motor	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max. <sup>1)</sup>	Axial output shaft loading, max. <sup>1)</sup>							
				16	20	28	40	50											
Type	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)						$n_{G1}$ ( $n_1$ ) rpm	$M_{G2}$ ( $T_{2B}$ ) Nm (lb <sub>r</sub> -ft)	$F_r$ ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	$F_a$ ( $F_{2Amax}$ ) N (lb <sub>f</sub> )							
1FT7034 1FT7036	SP 075S-MF2	≤ 6	3.6 (7.94)	✓	✓	✓	-	-	6000	110 (81.1)	4000 (899)	3350 (753)							
1FT7042				✓	-	-	-	-											
1FT7034 1FT7036				-	✓	✓	✓	✓											
1FT7042 1FT7044 1FT7046 1FT7062 1FT7064	SP 100S-MF2	≤ 5	7.9 (17.4)	-	-	-	✓	✓	4500	300 (221)	6300 (1416)	5650 (1270)							
1FT7042				-	✓	✓	✓	✓											
1FT7044				✓	✓	✓	-	-											
1FT7046				✓	✓	-	-	-											
1FT7062				✓	✓	-	-	-											
1FT7064				✓	-	-	-	-											
1FT7044 1FT7046 1FT7062 1FT7064 1FT7065 1FT7066 1FT7067 1FT7068 1FT7082 1FT7084	SP 140S-MF2	≤ 5	17 (37.5)	-	-	-	✓	✓	4000	600 (443)	9450 (2124)	9870 (2219)							
1FT7046				-	-	✓	✓	✓											
1FT7062				-	-	✓	✓	✓											
1FT7064				-	✓	✓	-	-											
1FT7065				✓	✓	-	-	-											
1FT7066				✓	✓	-	-	-											
1FT7067				✓	-	-	-	-											
1FT7068				✓	✓	-	-	-											
1FT7082				✓	✓	-	-	-											
1FT7084				✓	-	-	-	-											
1FT7064 1FT7065 1FT7066 1FT7067 1FT7068 1FT7082 1FT7084 1FT7085 1FT7086 1FT7102	SP 180S-MF2	≤ 5	36.4 (80.3)	-	-	-	✓	✓	4000	1100 (811)	14700 (3305)	14150 (3181)							
1FT7065				-	-	✓	✓	-											
1FT7066				-	-	✓	✓	✓											
1FT7067				-	✓	✓	-	-											
1FT7068				-	-	✓	✓	✓											
1FT7082				-	-	✓	✓	✓											
1FT7084				-	✓	✓	-	-											
1FT7085				✓	-	-	-	-											
1FT7086				✓	✓	-	-	-											
1FT7102				✓	✓	-	-	-											
1FT7084 1FT7085 1FT7086 1FT7087 1FT7102 1FT7105 1FT7108				SP 210S-MF2	≤ 5	55 (121)	-	-					-	✓	✓	3500	2400 (1770) (2500 for $i = 20$ )	21000 (4721)	30000 (6744)
1FT7085							-	✓					✓	-	-				
1FT7086	-	-	✓				✓	-											
1FT7087	✓	✓	✓				-	-											
1FT7102	-	-	✓				-	-											
1FT7105	✓	✓	-				-	-											
1FT7108	✓	-	-				-	-											
1FT7085 1FT7086 1FT7102 1FT7105 1FT7108	SP 240S-MF2	≤ 5	80.6 (178)	-	-	-	✓	✓	3500	4500 (3319) (4000 for $i = 40$ 4300 for $i = 50$ )	30000 (6744)	33000 (7419)							
1FT7086				-	-	-	✓	✓											
1FT7102				-	-	-	✓	✓											
1FT7105				-	-	✓	✓	-											
1FT7108				-	✓	✓	-	-											

#### Gear shaft

With feather key

Without feather key

#### Order code

J12

J13

J15

J16

J17

J32

J33

J35

J36

J37

For preconditions see page 4/52.

✓ Possible

- Not possible

<sup>1)</sup> In reference to the output shaft center.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FT7 geared servomotors with SP+ planetary gearbox

#### Technical specifications

##### SIMOTICS S-1FT7 motor with SP+ planetary gearbox

Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearboxes (referred to the drive)				
				Continuous duty S1 <sup>1)</sup>	1FT703.	1FT704.	1FT706.	1FT708.
	$i$	$n_{N1}$ rpm	$M_{N2}$ ( $T_{2N}$ ) Nm (lb <sub>f</sub> -ft)	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 075S-MF2	16	3500	75 (55.3)	0.23 (0.08)	0.55 (0.19)	–	–	–
	20	3500	75 (55.3)	0.20 (0.07)	–	–	–	–
	28	3500	75 (55.3)	0.18 (0.06)	–	–	–	–
SP 100S-MF2	16	3100	180 (133)	–	0.81 (0.28)	2.18 (0.75)	–	–
	20	3100	180 (133)	0.54 (0.19)	0.70 (0.24)	2.07 (0.71)	–	–
	28	3100	180 (133)	0.43 (0.15)	0.60 (0.21)	–	–	–
	40	3100	180 (133)	0.38 (0.13)	0.55 (0.19)	–	–	–
	50	3500	175 (129)	0.38 (0.13)	0.54 (0.19)	–	–	–
SP 140S-MF2	16	2900	360 (265)	–	–	3.19 (1.09)	10.3 (3.52)	–
	20	2900	360 (265)	–	–	2.71 (0.93)	9.77 (3.34)	–
	28	2900	360 (265)	–	1.65 (0.56)	2.34 (0.80)	–	–
	40	2900	360 (265)	–	1.40 (0.48)	2.10 (0.72)	–	–
	50	3200	360 (265)	–	1.39 (0.48)	2.08 (0.71)	–	–
SP 180S-MF2	16	2700	750 (553)	–	–	–	12.4 (4.24)	13.5 (4.61)
	20	2700	750 (553)	–	–	–	10.9 (3.73)	12.0 (4.10)
	28	2700	750 (553)	–	–	6.32 (2.16)	9.48 (3.24)	–
	40	2700	750 (553)	–	–	5.51 (1.88)	8.67 (2.96)	–
	50	2900	750 (553)	–	–	5.45 (1.86)	8.61 (2.94)	–
SP 210S-MF2	16	2500	1500 (1106)	–	–	–	–	34.5 (11.8)
	20	2500	1500 (1106)	–	–	–	–	31.5 (10.8)
	28	2500	1500 (1106)	–	–	–	30.0 (10.3)	30.0 (10.3)
	40	2500	1500 (1106)	–	–	–	28.5 (9.74)	–
	50	2500	1500 (1106)	–	–	–	28.3 (9.67)	–
SP 240S-MF2	20	2500	2500 (1844)	–	–	–	–	34.6 (11.8)
	28	2500	2500 (1844)	–	–	–	–	30.5 (10.4)
	40	2500	2500 (1844)	–	–	–	–	28.2 (9.64)
	50	2500	2500 (1844)	–	–	–	27.9 (9.53)	27.9 (9.53)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with SP+ planetary gearbox

#### Overview



SIMOTICS S-1FK7 motor with built-on SP+ planetary gearbox

SIMOTICS S-1FK7 motors can easily be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual, SIMOTICS S-1FK7 synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design.

#### Benefits

- High efficiency  
Single-stage: > 97 %  
Two-stage: > 94 %
- Minimum torsional backlash  
Single-stage: ≤ 4 arcmin  
Two-stage: ≤ 6 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- Very low moment of inertia and thus short acceleration times of the motors
- Output shaft bearings dimensioned for high cantilever and axial loads with preloaded tapered-roller bearings
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration severity grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are enclosed (seal between gearbox and motor) and filled with oil at the factory. They are lubricated and sealed for their service life.  
The gearboxes are suitable for all mounting positions.
- Degree of protection of gearbox: IP65
- Small dimensions
- Low weight

#### Integration

S-1FK702 to 1FK710 SIMOTICS motors can be supplied ex works (Siemens AG) complete with flange-mounted planetary gearbox.

The gearboxes assigned to the individual motors and gear ratios  $i$  available for these motor/gearbox combinations are listed in the subsequent selection table. When making a selection, account must be taken of the maximum permissible input speed of the gearbox (this is the same as the maximum motor speed).

The motor/gearbox combinations listed in the selection table are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min).

Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min).  
The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for SIMOTICS S-1FK7 synchronous motors when assigning gearboxes to the motor.



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with SP+ planetary gearbox

#### Selection and ordering data

Motor	Planetary gearbox single-stage			Available gear ratio $i =$				Motor speed, max. S3-60 % $n_{G1}$ ( $n_1$ ) rpm	Output torque, max. S3-60 % $M_{G2}$ ( $T_{2B}$ ) Nm (lb <sub>r</sub> -ft)	Radial output shaft loading, max. <sup>1)</sup> $F_r$ ( $F_{2Rmax}$ ) N (lb <sub>r</sub> )	Axial output shaft loading, max. <sup>1)</sup> $F_a$ ( $F_{2Amax}$ ) N (lb <sub>r</sub> )
	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)	4	5	7	10				
1FK7022	SP 060S-MF1	≤ 4	1.9 (4.19)	✓	✓	✓	✓	6000	40 (295) (32 for $i = 10$ )	2700 (607)	2400 (540)
1FK7032				✓	✓	✓	✓				
1FK7033				✓	✓	✓	✓				
1FK7034				✓	✓	✓	✓				
1FK7040	SP 075S-MF1	≤ 4	3.9 (8.6)	✓	✓	✓	✓	6000	110 (81.1) (90 for $i = 10$ )	4000 (899)	3350 (753)
1FK7042				✓	✓	✓	✓				
1FK7043				✓	✓	✓	✓				
1FK7044				✓	✓	✓	✓				
1FK7060	SP 100S-MF1	≤ 3	7.7 (17.0)	✓	✓	✓	✓	4500	300 (221) (225 for $i = 10$ )	6300 (1416)	5650 (1270)
1FK7061				✓	✓	✓	✓				
1FK7062				✓	✓	✓	✓				
1FK7063				✓	✓	✓	✓				
1FK7064				✓	✓	✓	✓				
1FK7080	SP 140S-MF1	≤ 3	17.2 (37.9)	✓	✓	✓	✓	4000	600 (442) (480 for $i = 10$ )	9450 (2124)	9870 (2219)
1FK7081				✓	✓	✓	✓				
1FK7083				✓	✓	✓	✓				
1FK7084				✓	✓	✓	✓				
1FK7085				✓	✓	✓	✓				
1FK7086				✓	✓	✓	✓				
1FK7100	SP 180S-MF1	≤ 3	34 (75.0)	✓	✓	✓	✓	3500	1100 (810) (880 for $i = 10$ )	14700 (3305)	14150 (3181)
1FK7101				✓	✓	✓	✓				
1FK7103				✓	✓	✓	✓				
1FK7105				✓	✓	✓	–				
1FK7105	SP 210S-MF1	≤ 3	56 (123)	–	–	–	✓	2500	2500 (1844) (2400 for $i = 7$ 1900 for $i = 10$ )	21000 (4721)	30000 (6744)
<b>Gear shaft</b>				<b>Order code</b>							
With feather key				J02	J03	J05	J09				
Without feather key				J22	J23	J25	J29				

#### Preconditions:

SP+ planetary gearboxes can be mounted with the following motor versions:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP65 degree of protection and anthracite paint finish

SP+ planetary gearboxes can therefore only be ordered with these motors:

**1FK7 . . . -2 A . . . . .** ■ 1 Compact  
**1FK7 . . . -3 B . . . . .** ■ 1 High Inertia  
**1FK7 . . . -4 C . . . . .** ■ 1 High Dynamic  
**G** without brake  
**H** with brake

or

**1FK7 0 2 . -5 A . . . . .** ■ G 5  
**1FK7 0 2 . -5 A . . . . .** ■ H 5

✓ Possible

– Not possible

<sup>1)</sup> In reference to the output shaft center.

When ordering a motor with gearbox, **-Z** should be added to the order number.

#### Example:

1FK7042 motor without holding brake with single-stage SP+ planetary gearbox with  $i = 7$  and gear shaft without feather key.

**1FK7042-2AF71-1AG1-Z**  
**J25**

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with SP+ planetary gearbox

#### Technical specifications

##### SIMOTICS S-1FK7 motor with SP+ planetary gearbox

Single-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearboxes (referred to the drive)					
				Continuous duty S1 <sup>1)</sup>		1FK702.	1FK703.	1FK704.	1FK706.
	<i>i</i>	$n_{N1}$ rpm	$M_{N2}$ ( $T_{2N}$ ) Nm (lb <sub>f</sub> -ft)	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	$J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF1	4	3300	26 (19.2)	0.15 (0.05)	0.22 (0.08)	–	–	–	–
	5	3300	26 (19.2)	0.12 (0.04)	0.20 (0.07)	–	–	–	–
	7	4000	26 (19.2)	0.10 (0.034)	0.18 (0.062)	–	–	–	–
	10	4000	17 (12.5)	0.09 (0.031)	0.17 (0.058)	–	–	–	–
SP 075S-MF1	4	2900	75 (55.3)	–	–	0.78 (0.27)	–	–	–
	5	2900	75 (55.3)	–	–	0.68 (0.23)	–	–	–
	7	3100	75 (55.3)	–	–	0.59 (0.20)	–	–	–
	10	3100	52 (38.4)	–	–	0.54 (0.19)	–	–	–
SP 100S-MF1	4	2500	180 (133)	–	–	–	3.04 (1.04)	–	–
	5	2500	175 (129)	–	–	–	2.61 (0.89)	–	–
	7	2800	170 (125)	–	–	–	2.29 (0.78)	–	–
	10	2800	120 (88.5)	–	–	–	2.07 (0.71)	–	–
SP 140S-MF1	4	2100	360 (266)	–	–	–	–	11.0 (3.76)	–
	5	2100	360 (266)	–	–	–	–	9.95 (3.40)	–
	7	2600	360 (266)	–	–	–	–	9.01 (3.08)	–
	10	2600	220 (162)	–	–	–	–	8.44 (2.88)	–
SP 180S-MF1	4	1500	750 (553)	–	–	–	–	–	33.9 (11.6)
	5	1500	750 (553)	–	–	–	–	–	27.9 (9.53)
	7	2300	750 (553)	–	–	–	–	–	22.2 (7.59)
	10	2300	750 (553)	–	–	–	–	–	19.2 (6.56)
SP 210S-MF1	10	2000	1000 (738)	–	–	–	–	–	53.1 (18.1)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with SP+ planetary gearbox

#### Selection and ordering data

Motor	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max. <sup>1)</sup>	Axial output shaft loading, max. <sup>1)</sup>
				16	20	28	40	50				
Type	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)						$n_{G1}$ ( $n_1$ ) rpm	$M_{G2}$ ( $T_{2B}$ ) Nm (lb <sub>r</sub> -ft)	$F_r$ ( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	$F_a$ ( $F_{2Amax}$ ) N (lb <sub>f</sub> )
1FK7022	SP 060S-MF2	≤ 6	2 (4.41)	✓	✓	✓	–	–	6000	40 (29.5)	2700 (607)	2400 (540)
1FK7032				✓	✓	–	–	–				
1FK7033				✓	✓	–	–	–				
1FK7022	SP 075S-MF2	≤ 6	3.6 (7.9)	–	–	–	✓	✓	6000	110 (81.1)	4000 (899)	3350 (753)
1FK7032				–	–	✓	✓	✓				
1FK7033				–	–	✓	✓	✓				
1FK7034				✓	✓	✓	–	–				
1FK7040				✓	✓	✓	–	–				
1FK7042				✓	✓	–	–	–				
1FK7043				✓	–	–	–	–				
1FK7044				–	–	–	–	–				
1FK7034	SP 100S-MF2	≤ 5	7.9 (17.4)	–	–	–	✓	✓	4500	300 (221)	6300 (1416)	2400 (540)
1FK7040				–	–	–	✓	✓				
1FK7042				–	–	✓	✓	✓				
1FK7043				–	✓	✓	✓	✓				
1FK7044				✓	✓	✓	✓	–				
1FK7060				✓	✓	✓	–	–				
1FK7061				✓	✓	–	–	–				
1FK7062				✓	✓	–	–	–				
1FK7044	SP 140S-MF2	≤ 5	17 (37.5)	–	–	–	–	✓	4000	600 (442)	9450 (2124)	9870 (2219)
1FK7060				–	–	–	✓	✓				
1FK7061				–	–	✓	✓	✓				
1FK7062				–	–	✓	✓	–				
1FK7063				✓	✓	✓	–	–				
1FK7064				✓	✓	✓	–	–				
1FK7080				✓	✓	✓	✓	–				
1FK7081				✓	✓	✓	–	–				
1FK7083	✓	✓	–	–	–							
1FK7084	✓	–	–	–	–							

#### Gear shaft

With feather key

Without feather key

#### Order code

J12 J13 J15 J16 J17

J32 J33 J35 J36 J37

#### Preconditions:

SP+ planetary gearboxes can be mounted with the following motor versions:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP65 degree of protection and anthracite paint finish

SP+ planetary gearboxes can therefore only be ordered with these motors:

1FK7 . . . -2 A . . . . . 1 Compact  
 1FK7 . . . -3 B . . . . . 1 High Inertia  
 1FK7 . . . -4 C . . . . . 1 High Dynamic  
 G without brake  
 H with brake

or

1FK7 0 2 . -5 A . . . . . G 5  
 1FK7 0 2 . -5 A . . . . . H 5

✓ Possible

– Not possible

<sup>1)</sup> In relation to the center of the output shaft at 100 rpm.

When ordering a motor with gearbox, **-Z** should be added to the order number.

#### Example:

1FK7042 motor without holding brake  
 with two-stage SP+ planetary gearbox  
 with  $i = 28$  and gear shaft without feather key  
 1FK7042-2AF71-1AG1-**Z**  
**J35**

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with SP+ planetary gearbox

#### Selection and ordering data

Motor	Planetary gearbox two-stage			Available gear ratio $i =$					Motor speed, max. S3-60 %	Output torque, max. S3-60 %	Radial output shaft loading, max. <sup>1)</sup>	Axial output shaft loading, max. <sup>1)</sup>
				16	20	28	40	50				
Type	Type	Torsional backlash arcmin	Gearbox weight, approx. kg (lb)						$n_{G1}$	$M_{G2}$	$F_r$	$F_a$
									( $n_1$ ) rpm	( $T_{2B}$ ) Nm (lb <sub>f</sub> -ft)	( $F_{2Rmax}$ ) N (lb <sub>f</sub> )	( $F_{2Amax}$ ) N (lb <sub>f</sub> )
1FK7062	SP 180S-MF2	≤ 5	36.4 (80.3)	-	-	-	-	✓	4000	1100 (811)	14700 (3305)	14150 (3181)
1FK7063				-	-	-	✓	✓				
1FK7064				-	-	-	✓	✓				
1FK7080				-	-	-	-	✓				
1FK7081				-	-	-	-	✓				
1FK7083				-	-	-	✓	-				
1FK7084				-	✓	✓	-	-				
1FK7085				✓	✓	-	-	-				
1FK7086				✓	✓	-	-	-				
1FK7100				✓	✓	✓	-	-				
1FK7101	✓	✓	-	-	-							
1FK7103	✓	-	-	-	-							
1FK7083	SP 210S-MF2	≤ 6	55 (121)	-	-	-	✓	✓	3500	2400 (1770) (2500 for $i = 20$ )	21000 (4721)	30000 (6744)
1FK7084				-	-	-	✓	✓				
1FK7085				-	-	✓	✓	-				
1FK7086				-	-	✓	-	-				
1FK7100				-	-	-	✓	✓				
1FK7101				-	-	✓	-	-				
1FK7103	-	✓	-	-	-							
1FK7105	✓	✓	-	-	-							
1FK7101	SP 240S-MF2	≤ 6	80.6 (178)	-	-	-	✓	✓	3500	4500 (3319) (4000 for $i = 40$ 4300 for $i = 50$ )	30000 (6744)	33000 (7419)
1FK7103				-	-	✓	✓	-				
1FK7105				-	-	✓	-	-				
<b>Gear shaft</b>				<b>Order code</b>								
With feather key				J12	J13	J15	J16	J17				
Without feather key				J32	J33	J35	J36	J37				

#### Preconditions:

SP+ planetary gearboxes can be mounted with the following motor versions:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP65 degree of protection and anthracite paint finish

SP+ planetary gearboxes can therefore only be ordered with these motors:

**1FK7 . . . -2 A . . . . . 1** Compact  
**1FK7 . . . -3 B . . . . . 1** High Inertia  
**1FK7 . . . -4 C . . . . . 1** High Dynamic  
**G** without brake  
**H** with brake

or

**1FK7 0 2 . -5 A . . . . . G 5**  
**1FK7 0 2 . -5 A . . . . . H 5**

When ordering a motor with gearbox, **-Z** should be added to the order number.

#### Example:

1FK7042 motor without holding brake with two-stage SP+ planetary gearbox with  $i = 16$  and gear shaft without feather key  
**1FK7103-2AC71-1AG1-Z J32**

✓ Possible

- Not possible

<sup>1)</sup> In reference to the output shaft center.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 geared servomotors  
with SP+ planetary gearbox**

### Technical specifications

#### SIMOTICS S-1FK7 motor with SP+ planetary gearbox

Two-stage Type	Gear ratio	Motor speed	Output torque	Moments of inertia of gearboxes (referred to the drive)					
				$i$	$n_{N1}$ rpm	$M_{N2}$ ( $T_{2N}$ ) Nm (lb <sub>f</sub> -ft)	1FK702. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK703. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )	1FK704. $J_1$ kgcm <sup>2</sup> (lb <sub>f</sub> -in <sup>2</sup> )
SP 060S-MF2	16	4400	26 (19.2)	0.08 (0.03)	0.17 (0.06)	–	–	–	–
	20	4400	26 (19.2)	0.07 (0.024)	0.16 (0.05)	–	–	–	–
	28	4400	26 (19.2)	0.06 (0.021)	–	–	–	–	–
SP 075S-MF2	16	3500	75 (55.3)	–	0.23 (0.08)	0.55 (0.19)	–	–	–
	20	3500	75 (55.3)	–	0.20 (0.07)	0.53 (0.18)	–	–	–
	28	3500	75 (55.3)	–	0.18 (0.062)	0.50 (0.17)	–	–	–
	40	3500	75 (55.3)	0.10 (0.03)	0.17 (0.058)	–	–	–	–
	50	3800	75 (55.3)	0.10 (0.03)	0.16 (0.055)	–	–	–	–
SP 100S-MF2	16	3100	180 (133)	–	–	0.81 (0.28)	2.18 (0.75)	–	–
	20	3100	180 (133)	–	–	0.70 (0.24)	2.07 (0.71)	–	–
	28	3100	180 (133)	–	–	0.60 (0.21)	1.97 (0.67)	–	–
	40	3100	180 (133)	–	0.38 (0.13)	0.55 (0.188)	–	–	–
	50	3500	175 (129)	–	0.38 (0.13)	0.54 (0.185)	–	–	–
SP 140S-MF2	16	2900	360 (265)	–	–	–	3.19 (1.09)	10.3 (3.52)	–
	20	2900	360 (265)	–	–	–	2.71 (0.93)	9.77 (3.34)	–
	28	2900	360 (265)	–	–	–	2.34 (0.80)	9.41 (3.21)	–
	40	2900	360 (265)	–	–	–	2.10 (0.72)	9.16 (3.13)	–
	50	3200	360 (265)	–	–	1.39 (0.48)	2.08 (0.71)	–	–
SP 180S-MF2	16	2700	750 (553)	–	–	–	–	12.4 (4.24)	13.5 (4.61)
	20	2700	750 (553)	–	–	–	–	10.9 (3.73)	12.0 (4.10)
	28	2700	750 (553)	–	–	–	–	9.48 (3.24)	10.6 (3.62)
	40	2700	750 (553)	–	–	–	5.51 (1.88)	8.67 (2.96)	–
	50	2900	750 (553)	–	–	–	5.45 (1.86)	8.61 (2.94)	–
SP 210S-MF2	16	2500	1500 (1106)	–	–	–	–	–	34.5 (11.8)
	20	2500	1500 (1106)	–	–	–	–	–	31.5 (10.8)
	28	2500	1500 (1106)	–	–	–	–	30.0 (10.3)	30.0 (10.3)
	40	2500	1500 (1106)	–	–	–	–	28.5 (9.74)	28.5 (9.74)
	50	2500	1500 (1106)	–	–	–	–	28.3 (9.67)	28.3 (9.67)
SP 240S-MF2	28	2500	2500 (1844)	–	–	–	–	–	30.5 (10.4)
	40	2500	2500 (1844)	–	–	–	–	–	28.2 (9.64)
	50	2500	2500 (1844)	–	–	–	–	–	27.9 (9.53)

<sup>1)</sup> The limit values in the table apply for S1 continuous duty (ON time > 60 % or > 20 min) for a maximum gearbox temperature of 90 °C (194 °F).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with LP+ planetary gearbox

#### Overview



SIMOTICS S-1FK7 motor with built-on LP+ planetary gearbox

SIMOTICS S-1FK7 motors can easily be combined with planetary gearboxes to form compact coaxial drive units. The gearboxes are flanged directly to the drive end of the motors.

When selecting the gearbox, ensure that its maximum permissible input speed is not exceeded by the maximum speed of the motor. In the case of high operating frequencies, allowance must be made for the factor  $f_2$  (see Configuration Manual, SIMOTICS S-1FK7 synchronous motors). The frictional losses of the gearbox must always be taken into account.

The gearboxes are only available in non-balanced design and with feather key.

#### Benefits

- High efficiency, single-stage: > 97 %
- Minimum torsional backlash, single-stage: ≤ 12 arcmin
- Power transmission from the central sun wheel via planet wheels
- No shaft deflections in the planet wheel set due to symmetrical force distribution
- The gearboxes are connected to the motor shaft via an integrated clamping hub. A plain motor shaft extension is necessary for this purpose. Shaft and flange accuracy tolerance N in accordance with DIN 42955 and vibration severity grade A in accordance with EN 60034-14 are sufficient. The motor flange is adapted by means of adapter plates.
- Output shaft of gearbox exactly coaxial with the motor
- The gearboxes are suitable for all mounted systems.
- The gearboxes are enclosed (seal between gearbox and motor) and filled with grease in the factory. They are lubricated and sealed for their service life.
- Degree of protection of gearbox: IP64
- Small dimensions
- Low weight

#### Integration

S-1FK702 to 1FK710 SIMOTICS motors can be supplied ex works (Siemens AG) complete with flange-mounted planetary gearbox.

The gearboxes assigned to the individual motors and gear ratios  $i$  available for these motor/gearbox combinations are listed in the subsequent selection table. When making a selection, account must be taken of the maximum permissible input speed of the gearbox (this is the same as the maximum motor speed).

The motor/gearbox combinations listed in the selection table are mainly intended for cycle operation S3-60 % (ON time ≤ 60 % and ≤ 20 min).

Reduced maximum motor speeds and output torques apply for use in S1 continuous duty (ON time > 60 % or > 20 min).

The gearbox temperature may not exceed 90 °C (194 °F).

Follow the instructions contained in the Configuration Manual for SIMOTICS S-1FK7 synchronous motors when assigning gearboxes to the motor.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors with LP+ planetary gearbox

#### Selection and ordering data

Motor Type	LP+ planetary gearbox single-stage Torsional backlash ≤ 12 arcmin		Available gear ratio $i =$		Input speed, max. S3-60 % $n_{G1}$ rpm	Output torque, max. S3-60 % $M_{G2}$ at $i = 5$ $M_{G2}$ at $i = 10$		Output shaft radial force, max. <sup>1)</sup> $F_r$ N (lb <sub>f</sub> )	Gearbox moment of inertia $J_G$ at $i = 5/10$  $10^{-4} \text{ kgm}^2$ ( $10^{-3} \text{ lb}_f\text{-in-s}^2$ )
	Type	Gearbox weight, approx. kg (lb)	5	10		Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)		
1FK7022	LP 050-MO1	0.75 (1.65)	✓	–	8000	12 (8.9)	11 (8.1)	650 (146)	0.055 (0.05)
1FK7022	LP 070-MO1	2 (4.41)	–	✓	6000	35 (25.8)	32 (23.6)	1450 (326)	0.28 (0.25)
1FK7032			✓	✓					
1FK7033			✓	✓					
1FK7034			✓	✓					
1FK7040	LP 090-MO1	4 (8.82)	✓	✓	6000	90 (66.4)	80 (59.0)	1900 (427)	1.77 (1.57)
1FK7042			✓	✓					
1FK7043			✓	✓					
1FK7044			✓	✓					
1FK7060	LP 120-MO1	8.6 (19.0)	✓	✓	4800	220 (162)	200 (148)	4000 (899)	5.42 (4.80)
1FK7061			✓	✓					
1FK7062			✓	✓					
1FK7063			✓	✓					
1FK7064			✓	–					
1FK7080	LP 155-MO1	17 (37.5)	✓	✓	3600	450 (332)	350 (258)	6000 (1349)	25.7 (22.8)
1FK7081			✓	✓					
1FK7083			✓	✓					
1FK7084			✓	✓					
1FK7085			✓	✓					
1FK7086			✓	✓					
1FK7100			✓	✓					
1FK7101			✓	–					
1FK7103			✓	–					
1FK7105			✓	–					
<b>Gear shaft</b> With feather key		<b>Order code</b> V40    V42							

#### Preconditions:

With the following motor versions, LP+ planetary gearboxes can be mounted:

- Plain motor shaft extension, shaft and flange accuracy tolerance N, without/with holding brake
- IP64 degree of protection and anthracite paint finish

LP+ planetary gearboxes can therefore only be ordered with these motors:

**1FK7 . . . -2 A . 7 1 - 1 . 0** Compact  
**1FK7 . . . -3 B . 7 1 - 1 . 0** High Inertia  
**1FK7 . . . -4 C . 7 1 - 1 . 0** High Dynamic  
**G** without brake  
**H** with brake

or

**1FK7 0 2 . -5 A . 7 1 - 1 . G 5**  
**1FK7 0 2 . -5 A . 7 1 - 1 . H 5**

When ordering a motor with gearbox, **-Z** should be added to the order number.

#### Example:

1FK7042 motor with holding brake  
with single-stage LP+ planetary gearbox  
with  $i = 5$  and gear shaft with feather key  
1FK7042-3BK71-1AH0-Z

**V40**

#### Continuous duty

Continuous duty is permissible at the rated speed and rated torque. The gearbox temperature may not exceed 90 °C (194 °F).

LP+ planetary gearbox single-stage Torsional backlash ≤ 12 arcmin	Rated input speed	Rated output torque	
Type	$n_{G1}$	$M_{G2}$ at $i = 5$	$M_{G2}$ at $i = 10$
	rpm	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)
LP 050-MO1	4000	5.7 (4.2)	–
LP 070-MO1	3700	18 (13.3)	16.5 (12.2)
LP 090-MO1	3400	45 (33.2)	40 (29.5)
LP 120-MO1	2600	110 (81.1)	100 (73.8)
LP 155-MO1	2000	320 (236)	190 (140)

✓ Possible

– Not possible

<sup>1)</sup> In relation to the center of the output shaft at 100 rpm.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7-DYA compact geared motors

#### Overview



1FK7-DYA compact geared motor

The 1FK7-DYA compact geared motor combines electrical and mechanical components in the smallest space possible. This mechatronic unit consists of a permanent-magnet 1FK7 synchronous motor and a directly mounted single-stage planetary gearbox.

The 1FK7-DYA compact geared motors with IP64 degree of protection are designed for operation without external cooling and the heat is dissipated over the motor surface. The integrated planetary gearboxes have high maximum torques and permit high radial and axial forces at the shaft extension.

#### Benefits

- Space-saving installation due to the high power density of the motor and integration of the planetary gearbox directly into the motor end shield. Mounting to the machine is greatly simplified by this and the logistics are reduced to a minimum.
- Mounting in construction types IM B5 and IMB14 is possible
- Highly dynamic due to lower motor moment of inertia; this means shorter cycle times.
- Maintenance-free
- Suitable for S1 continuous duty
- High positioning accuracy thanks to low mechanical torsional backlash of < 8 arcmin
- Mechanical compatibility with regard to IM B14 flange and shaft extension for the LP+ planetary gearbox
- Power and signals are connected via a connector

#### Application

In general mechanical engineering, any place where coaxial drive units are used, e.g. in

- Packaging machines
- Wood, glass and ceramic processing machines
- Plastic, injection molding and foil stretching machines
- Handling systems
- Machine tools
- All kinds of auxiliary axes

#### Integration

1FK7-DYA compact geared motors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. The integrated encoder system for speed and position control can be selected depending on the application.



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

**SIMOTICS S-1FK7 geared servomotors**  
**1FK7-DYA compact geared motors**

### Technical specifications

1FK7-DYA compact geared motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding according to EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)
Type of construction according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3) IM B14
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP64
Shaft extension on the drive end according to DIN 748-3 (IEC 60072-1)	With feather key
Shaft and flange accuracy according to DIN 42955 (IEC 60072-1) <sup>1)</sup>	Tolerance N
Vibration severity according to EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level $L_{pA}$ (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB	
<ul style="list-style-type: none"> <li>• 1FK703</li> <li>• 1FK704</li> <li>• 1FK706</li> <li>• 1FK708</li> </ul>	72 dB 75 dB 80 dB 82 dB
Connection	Connectors for signals and power can be rotated 270°
Paint finish	Anthracite RAL 7016
2nd rating plate 3rd rating plate	Attached in the NDE cover Enclosed separately
Holding brake	Without/with
Approvals, according to	cURus

### Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 $V_{pp}$ 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM32S/R encoder	Absolute encoder 32 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

### Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoder	
IC22DQ encoder	Incremental encoder, 22 bit + commutation position, 11 bit
Absolute encoder	
AM22DQ encoder	Absolute encoder, 22 bit + 12 bit multi-turn
AM20DQ encoder	Absolute encoder, 20 bit + 12 bit multi-turn
AM16DQ encoder	Absolute encoder, 16 bit + 12 bit multi-turn
AM15DQ encoder	Absolute encoder, 15 bit + 12 bit multi-turn
Resolver	
R15DQ resolver	Resolver 15 bit (internal, multi-pole)
R14DQ resolver	Resolver 14 bit (internal, 2-pole)

S/R = signals/revolution

4

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7-DYA compact geared motors

#### Selection and ordering data

Rated speed	Rated power	Speed, max.	Torque, max.	Static torque	Rated torque <sup>1)</sup>	Available gear ratio	<b>1FK7-DYA compact geared motor</b>	Number of pole pairs	Moment of inertia of rotor <sup>2)</sup> without brake	with brake	
$n_{2 \text{ rated}}$	$P_2$	$n_{2 \text{ max}}$	$M_{2 \text{ max}}$	$M_{20}$	$M_{2 \text{ rated}}$	$i$	Order No.	Order code	$J$	$J$	
rpm	kW (HP)	rpm	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)				$10^{-4} \text{ kgm}^2$ ( $10^{-3} \text{ lb}_f\text{-in-s}^2$ )	$10^{-4} \text{ kgm}^2$ ( $10^{-3} \text{ lb}_f\text{-in-s}^2$ )	
<b>1FK7-DYA – Natural cooling</b>											
<b>370</b>	0.37 (0.50)	600	32 (23.6)	11 (8.1)	9.5 (7.0)	10	<b>1FK7032-5AK71-1</b>	<b>3-Z A03</b>	3	0.75 (0.66)	0.83 (0.73)
<b>740</b>	0.5 (0.67)	1200	32 (23.6)	7.5 (5.5)	6.5 (4.8)	5	<b>1FK7034-5AK71-1</b>	<b>3-Z A00</b>	3	1.04 (0.92)	1.12 (0.99)
<b>340</b>	0.45 (0.60)	600	49 (36.1)	15 (11.1)	12.5 (9.2)	10	<b>1FK7040-5AK71-1</b>	<b>3-Z A13</b>	4	2.3 (2.04)	3 (2.66)
<b>680</b>	0.71 (0.95)	1200	51 (37.6)	13 (9.6)	10 (7.4)	5	<b>1FK7042-5AK71-1</b>	<b>3-Z A10</b>	4	3.6 (3.19)	4.3 (3.81)
<b>260</b>	1.25 (1.68)	480	175 (129)	57 (42)	46 (33.9)	10	<b>1FK7060-5AH71-1</b>	<b>3-Z A73</b>	4	10.3 (9.12)	12.5 (11.1)
<b>520</b>	1.74 (2.33)	960	170 (125)	51 (37.6)	32 (23.6)	5	<b>1FK7063-5AH71-1</b>	<b>3-Z A70</b>	4	17.4 (15.4)	19.6 (17.4)
<b>200</b>	1.47 (1.97)	360	242 (179)	76 (56.1)	70 (51.6)	10	<b>1FK7080-5AH71-1</b>	<b>3-Z A83</b>	4	28.7 (25.4)	31.8 (28.2)
<b>400</b>	1.88 (2.52)	720	233 (172)	68 (50.2)	45 (33.2)	5	<b>1FK7083-5AH71-1</b>	<b>3-Z A80</b>	4	41 (36.3)	49.6 (43.9)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>		IC2048S/R encoder					<b>A</b>				
		AM2048S/R encoder (not for 1FK703)					<b>E</b>				
		AM512S/R encoder (only for 1FK703)					<b>H</b>				
		AM32S/R encoder (not for 1FK703)					<b>G</b>				
		AM16S/R encoder (only for 1FK703)					<b>J</b>				
		Multi-pole resolver					<b>S</b>				
		2-pole resolver					<b>T</b>				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>		IC22DQ encoder					<b>D</b>				
		AM22DQ encoder					<b>F</b>				
		AM20DQ encoder					<b>L</b>				
		AM16DQ encoder					<b>K</b>				
		AM15DQ encoder					<b>V</b>				
		R15DQ resolver					<b>U</b>				
		R14DQ resolver					<b>P</b>				
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>						
Feather key and keyway		Tolerance N			Without						
Feather key and keyway		Tolerance N			With						
<b>Degree of protection:</b>		IP64, anthracite paint finish									<b>3</b>

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7-DYA compact geared motors

Motor type (repeated)	Weight without brake	with brake	Stall current	Maxi- mum current	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection (and brake connection) via power connector		
	<i>m</i>	<i>m</i>	$I_0$ at $M_0$ $\Delta T=100$ K	$I_{max}$	Rated output current <sup>3)</sup>	Booksized format For additional versions and components see SINAMICS S120 drive system	Power connec- tor	Cable cross- section <sup>4)</sup>	Pre-assembled cable
	kg (lb)	kg (lb)	A	A	A	Order No.	Size	mm <sup>2</sup>	Order No.
1FK7032-5AK71-...	4.11 (9.06)	4.47 (9.86)	1.7	5	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7034-5AK71-...	5.01 (11.1)	5.37 (11.8)	1.9	7.9	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7040-5AK71-...	6.60 (14.6)	7.61 (16.8)	2.3	7.4	3	6SL312-TE13-0AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7042-5AK71-...	7.91 (17.4)	8.62 (19.0)	4.4	14.9	5	6SL312-TE15-0AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7060-5AH71-...	13.9 (30.7)	15 (33.1)	6.2	19	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7063-5AH71-...	17.6 (38.8)	19 (41.9)	12	41	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7080-5AH71-...	23.4 (51.6)	24.6 (54.2)	7.4	24	9	6SL312-TE21-0AA3	1	4 × 1.5	6FX 002-5S01-...
1FK7083-5AH71-...	28.6 (63.1)	31.2 (68.8)	15	48	18	6SL312-TE21-8AA3	1	4 × 1.5	6FX 002-5S01-...

Cooling:	
Internal air cooling	0
External air cooling	1

Motor Module:	
Single Motor Module	1
Double Motor Module	2

Power cable:	
MOTION-CONNECT 800	8
MOTION-CONNECT 500	5
Without brake cores	C
With brake cores	D
Length code	....

Information about the cables can be found under [MOTION-CONNECT connection systems](#)

<sup>1)</sup> If the absolute encoder is used,  $M_{2 rated}$  is reduced by 10 %.

<sup>2)</sup> In reference to the internal motor shaft.

<sup>3)</sup> With default setting of the pulse frequency.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Overview



1FK7 bevel geared motor/1FK7 parallel shaft geared motor



1FK7 worm geared motor/1FK7 helical geared motor

The 1FK7 geared servomotors are pre-assembled as a complete unit and supplied with a gearbox filled with oil.

The type range comprises helical geared motors with 9 gearbox sizes, parallel shaft geared motors with 5 gearbox sizes, bevel geared motors with 8 gearbox sizes and worm geared motors with 5 gearbox sizes. A wide range of mechanical mounting methods can be implemented with the numerous options.

1FK7 geared servomotors are designed for operation without external cooling and the heat is dissipated through the motor surface and the gearbox mounting surface.

1FK7 geared servomotors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality.

#### Benefits

- Extremely compact design as a result of the direct mounting (because there is no coupling cage between the motor and gearbox)
- Maintenance-free and lubricated for life (exception, worm gearing)
- High efficiency
- Low torsional backlash
- Low running noise due to the helical teeth
- High endurance gearing (exception, worm gearing)
- Suitable for cyclic operation with alternating load and continuous duty
- Low-cost solution when compared to planetary geared motors

#### Application

1FK7 geared servomotors are ideally suited for applications in general machine construction for basic positioning tasks and auxiliary drives with servo quality that continually operate, for example in:

- Packaging machines
- High-bay racking units (storage and retrieval systems)
- Wood, glass and ceramic processing machines
- Beverage filling plants
- Conveyor belts

For information on other Siemens geared motors, please visit:

[www.siemens.com/geared-motors](http://www.siemens.com/geared-motors)

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Technical specifications

##### 1FK7 helical geared motor

Nominal ratio $i_{nom}$	3.8 ... 70
Rated output torque $M_2$	3.6 ... 1737 Nm (2.7 ... 1281 lb <sub>f</sub> -ft)
Acceleration torque $M_{2max}$	19 ... 4140 Nm (14 ... 3054 lb <sub>f</sub> -ft)
Torsional backlash	10 ... 20 arcmin
Efficiency	94 ... 96 %
Mechanical options	Solid shaft with feather key, flange, mounting feet, tapped hole group

##### 1FK7 parallel shaft geared motor

Nominal ratio $i_{nom}$	4.3 ... 35
Rated output torque $M_2$	4 ... 587 Nm (3 ... 433 lb <sub>f</sub> -ft)
Acceleration torque $M_{2max}$	24 ... 1100 Nm (2.7 ... 811 lb <sub>f</sub> -ft)
Torsional backlash	10 ... 11 arcmin
Efficiency	94 ... 96 %
Mechanical options	Solid shaft, hollow shaft with feather key, hollow shaft with tensioning element/shrink disk, flange, mounting feet, tapped hole group

##### 1FK7 bevel geared motor

Nominal ratio $i_{nom}$	4 ... 76
Rated output torque $M_2$	3.8 ... 1626 Nm (2.8 ... 1199 lb <sub>f</sub> -ft)
Acceleration torque $M_{2max}$	22 ... 4650 Nm (16 ... 3430 lb <sub>f</sub> -ft)
Torsional backlash	10 ... 12 arcmin
Efficiency	94 ... 96 %
Mechanical options	Solid shaft, hollow shaft with feather key, hollow shaft with tensioning element/shrink disk, flange, mounting feet, tapped hole group, torque bracket

##### 1FK7 worm geared motor

Nominal ratio $i_{nom}$	9.2 ... 70
Rated output torque $M_2$	8.5 ... 399 Nm (6.3 ... 294 lb <sub>f</sub> -ft)
Acceleration torque $M_{2max}$	43 ... 791 Nm (32 ... 583 lb <sub>f</sub> -ft)
Torsional backlash	Depending on the gearbox size and gear ratio
Mechanical options	Solid shaft, hollow shaft with feather key, hollow shaft with tensioning element/shrink disk, flange, mounting feet, tapped hole group, torque bracket

#### Explanation of the designations in the selection tables

$n_2$	Gear unit output speed referred to the input speed of the motor of $n_1 = 3000$ rpm for a horizontal gear shaft output
$i_{nom}$	Nominal gear ratio (approximate value as decimal number)
$i_{exact}$	Exact gear ratio (specified as a fraction for parameter entry in the drive converter)
$f_B$	Gear unit overload factor (quotient between the max. permissible acceleration torque and static torque of the motor and ratio)

#### Built-in encoder systems without DRIVE-CLiQ interface

##### Incremental encoder

IC2048S/R encoder	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks
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##### Absolute encoder

AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
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AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
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AM32S/R encoder	Absolute encoder 32 S/R, 4096 revolutions, multi-turn
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AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
-----------------	---

##### Resolver

Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
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2-pole resolver	2-pole resolver
-----------------	-----------------

#### Built-in encoder systems with DRIVE-CLiQ interface

##### Incremental encoder

IC22DQ encoder	Incremental encoder, 22 bit + commutation position, 11 bit
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##### Absolute encoder

AM22DQ encoder	Absolute encoder, 22 bit + 12 bit multi-turn
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AM20DQ encoder	Absolute encoder, 20 bit + 12 bit multi-turn
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AM16DQ encoder	Absolute encoder, 16 bit + 12 bit multi-turn
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AM15DQ encoder	Absolute encoder, 15 bit + 12 bit multi-turn
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##### Resolver

R15DQ resolver	Resolver 15 bit (internal, multi-pole)
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R14DQ resolver	Resolver 14 bit (internal, 2-pole)
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S/R = signals/revolution

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>r</sub> )	$f_B$
<b>Natural cooling – SH 36/SH 48/SH 63</b>							
<b>0.30 (0.40)</b>	782	3.63 (2.68)	19 (14.0)	3.8	441/115	560 (126)	4.2
	476	5.96 (4.40)	29 (21.4)	6.3	2035/323	660 (148)	3.9
	291	9.74 (7.18)	51 (37.6)	10.5	1421/138	778 (175)	4.2
	192	14.8 (10.9)	72 (53.1)	15.5	1595/102	894 (201)	3.9
	129	22 (16.2)	65 (47.9)	23	325/14	1020 (229)	2.4
	86	33.1 (24.4)	65 (47.9)	35	1261/36	1170 (263)	1.6
	64	44.3 (32.7)	65 (47.9)	47	7865/168	1289 (290)	1.2
	43	66.6 (49.1)	138 (102)	70	775/11	2099 (472)	1.7
<b>0.41 (0.55)</b>	782	5.02 (3.70)	36 (26.6)	3.8	441/115	560 (126)	6.0
	476	8.25 (6.10)	55 (40.6)	6.3	2035/323	660 (148)	5.6
	291	13.5 (10.0)	72 (53.1)	10.5	1421/138	778 (175)	4.5
	192	20.5 (15.1)	72 (53.1)	15.5	1595/102	894 (201)	3.0
	128	30.8 (22.7)	138 (102)	24	1035/44	1456 (327)	3.8
	129	30.4 (22.4)	65 (47.9)	23	325/14	1020 (229)	1.8
	86	45.9 (33.9)	138 (102)	35	2700/77	1663 (374)	2.5
	86	45.9 (33.9)	65 (47.9)	35	1261/36	1170 (263)	1.2
	64	61.4 (45.3)	138 (102)	47	516/11	1833 (412)	1.9
	<b>0.79 (1.06)</b>	782	9.67 (7.10)	36 (26.6)	3.8	441/115	560 (126)
476		15.9 (11.7)	55 (40.6)	6.3	2035/323	660 (148)	3.0
	291	26 (19.2)	72 (53.1)	10.5	1421/138	778 (175)	2.4
	191	39.6 (29.2)	138 (102)	15.5	377/24	1273 (286)	3.0
	192	39.4 (29.1)	72 (53.1)	15.5	1595/102	894 (201)	1.6
	128	59.3 (43.7)	138 (102)	24	1035/44	1456 (327)	2.0
	86	88.4 (65.2)	138 (102)	35	2700/77	1663 (374)	1.4
	64	118 (87.0)	138 (102)	47	516/11	1833 (412)	1.0
<b>1.43 (1.92)</b>	782	17.5 (12.9)	50 (36.9)	3.8	441/115	560 (126)	2.2
	476	28.7 (21.2)	59 (43.5)	6.3	2035/323	660 (148)	1.6
	511	26.8 (19.8)	102 (75.2)	5.9	47/8	917 (206)	3.0
	291	46.9 (34.6)	72 (53.1)	10.5	1421/138	778 (175)	1.2
	289	47.3 (34.9)	138 (102)	10.5	841/81	1109 (249)	2.3
	191	71.6 (52.8)	138 (102)	15.5	377/24	1273 (286)	1.5
	196	69.7 (51.4)	230 (170)	15.5	703/46	1775 (399)	2.6
	128	107 (78.9)	138 (102)	25	1035/44	1456 (327)	1.0
	128	107 (78.9)	350 (258)	24	845/36	3045 (685)	2.6

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

Gearbox size	Motor shaft height	1FK7 helical geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	
SH						
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D01	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D02	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D03	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D04	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D05	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D06	G . .	H . .	8.6 (19.0)
C002	36	1FK7032-5AK71-1 ■■■ 5-Z	D07	G . .	H . .	8.6 (19.0)
C102	36	1FK7032-5AK71-1 ■■■ 5-Z	D18	G . .	H . .	13.5 (29.8)
C002	48	1FK7040-5AK71-1 ■■■ 5-Z	D01	G . .	H . .	9.4 (20.7)
C002	48	1FK7040-5AK71-1 ■■■ 5-Z	D02	G . .	H . .	9.4 (20.7)
C002	48	1FK7040-5AK71-1 ■■■ 5-Z	D03	G . .	H . .	9.4 (20.7)
C002	48	1FK7040-5AK71-1 ■■■ 5-Z	D04	G . .	H . .	9.4 (20.7)
C102	48	1FK7040-5AK71-1 ■■■ 5-Z	D15	G . .	H . .	14.3 (31.5)
C002	48	1FK7040-5AK71-1 ■■■ 5-Z	D05	G . .	H . .	9.4 (20.7)
C102	48	1FK7040-5AK71-1 ■■■ 5-Z	D16	G . .	H . .	14.3 (31.5)
C002	48	1FK7040-5AK71-1 ■■■ 5-Z	D06	G . .	H . .	9.4 (20.7)
C102	48	1FK7040-5AK71-1 ■■■ 5-Z	D17	G . .	H . .	14.3 (31.5)
C002	48	1FK7042-5AF71-1 ■■■ 5-Z	D01	G . .	H . .	10.7 (23.6)
C002	48	1FK7042-5AF71-1 ■■■ 5-Z	D02	G . .	H . .	10.7 (23.6)
C002	48	1FK7042-5AF71-1 ■■■ 5-Z	D03	G . .	H . .	10.7 (23.6)
C102	48	1FK7042-5AF71-1 ■■■ 5-Z	D14	G . .	H . .	15.6 (34.4)
C002	48	1FK7042-5AF71-1 ■■■ 5-Z	D04	G . .	H . .	10.7 (23.6)
C102	48	1FK7042-5AF71-1 ■■■ 5-Z	D15	G . .	H . .	15.6 (34.4)
C102	48	1FK7042-5AF71-1 ■■■ 5-Z	D16	G . .	H . .	15.6 (34.4)
C102	48	1FK7042-5AF71-1 ■■■ 5-Z	D17	G . .	H . .	15.6 (34.4)
C002	63	1FK7060-5AF71-1 ■■■ 5-Z	D01	G . .	H . .	13.4 (29.6)
C002	63	1FK7060-5AF71-1 ■■■ 5-Z	D02	G . .	H . .	13.4 (29.6)
C102	63	1FK7060-5AF71-1 ■■■ 5-Z	D12	G . .	H . .	18.3 (40.4)
C002	63	1FK7060-5AF71-1 ■■■ 5-Z	D03	G . .	H . .	13.4 (29.6)
C102	63	1FK7060-5AF71-1 ■■■ 5-Z	D13	G . .	H . .	18.3 (40.4)
C102	63	1FK7060-5AF71-1 ■■■ 5-Z	D14	G . .	H . .	18.3 (40.4)
C202	63	1FK7060-5AF71-1 ■■■ 5-Z	D24	G . .	H . .	22.3 (49.2)
C102	63	1FK7060-5AF71-1 ■■■ 5-Z	D15	G . .	H . .	18.3 (40.4)
C302	63	1FK7060-5AF71-1 ■■■ 5-Z	D35	G . .	H . .	27.4 (60.4)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder (from shaft height 48) AM512S/R encoder (shaft height 36 only) AM32S/R encoder (from shaft height 48) AM16S/R encoder (shaft height 36 only) Multi-pole resolver 2-pole resolver	A E H G J S T				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder (from shaft height 48) AM20DQ encoder (shaft height 36 only) AM16DQ encoder (from shaft height 48) AM15DQ encoder (shaft height 36 only) R15DQ resolver R14DQ resolver	D F L K V U P				
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	U V				

Order codes for type/gear shaft extension and type of construction/  
mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>f</sub> )	$f_B$
<b>Natural cooling – SH 63/SH 80</b>							
<b>1.42 (1.90)</b>	85	160 (118)	230 (170)	35	1372/39	2343 (527)	1.1
<b>1.43 (1.92)</b>	86	159 (117)	550 (406)	35	975/28	5961 (1340)	2.7
	60	227 (167)	400 (295)	50	2736/55	3911 (879)	1.4
<b>1.44 (1.93)</b>	60	229 (169)	600 (443)	50	1305/26	6734 (1514)	2.1
	43	319 (235)	550 (406)	70	559/8	7519 (1690)	1.4
	43	319 (235)	850 (627)	70	10075/144	9229 (2075)	2.1
<b>2.23 (2.99)</b>	782	27.2 (20.1)	50 (36.9)	3.8	441/115	560 (126)	1.2
	511	41.6 (30.7)	102 (75.2)	5.9	47/8	917 (206)	1.6
<b>2.22 (2.98)</b>	289	73.5 (54.2)	138 (102)	10.5	841/81	1109 (249)	1.2
	196	108 (79.7)	230 (170)	15.5	703/46	1775 (399)	1.4
	128	166 (122)	350 (258)	23	845/36	3045 (685)	1.4
<b>2.23 (2.99)</b>	86	247 (182)	550 (406)	35	975/28	5961 (1340)	1.5
	60	355 (262)	600 (443)	50	1305/26	6734 (1514)	1.1
<b>2.23 (2.99)</b>	43	495 (365)	850 (627)	70	10075/144	9229 (2075)	1.1
	773	25.6 (18.9)	101 (74.5)	3.9	1363/351	799 (180)	3.3
<b>2.08 (2.79)</b>	511	38.8 (28.6)	115 (84.8)	5.9	47/8	917 (206)	2.5
<b>2.07 (2.78)</b>	289	68.5 (50.5)	138 (102)	10.5	847/81	1109 (249)	1.7
	196	101 (74.5)	230 (170)	15.5	703/46	1775 (399)	1.9
<b>2.08 (2.79)</b>	191	104 (76.7)	138 (102)	15.5	377/24	1273 (286)	1.1
	128	155 (114)	350 (258)	23	845/36	3045 (685)	1.9
<b>2.07 (2.78)</b>	127	156 (115)	230 (170)	24	637/27	2051 (461)	1.3
	86	230 (170)	550 (406)	35	975/28	5961 (1340)	2.0
<b>2.08 (2.79)</b>	86	231 (170)	350 (258)	35	1261/36	3479 (782)	1.3
<b>2.07 (2.78)</b>	60	329 (243)	920 (679)	50	1943/39	8241 (1853)	2.4
<b>2.09 (2.80)</b>	44	454 (335)	1380 (1018)	69	620/9	12344 (2775)	2.6
<b>3.20 (4.29)</b>	773	39.5 (29.1)	101 (74.5)	3.9	1363/351	799 (180)	1.7
	772	39.6 (29.2)	154 (114)	3.9	486/125	1125 (253)	2.5
	511	59.8 (44.1)	115 (84.8)	5.9	47/8	917 (206)	1.3
	518	59.0 (43.5)	176 (130)	5.8	666/115	1284 (289)	2.0
	320	95.6 (70.5)	230 (170)	9.4	2450/261	1509 (339)	1.6
	322	94.8 (69.9)	350 (258)	9.3	3575/384	2237 (503)	2.4
<b>3.19 (4.28)</b>	193	158 (117)	400 (295)	15.5	544/35	2654 (597)	1.7
<b>3.18 (4.26)</b>	190	160 (118)	600 (443)	16	63/4	4576 (1029)	2.5
<b>3.19 (4.28)</b>	128	238 (176)	550 (406)	23	1495/64	5219 (1173)	1.5
	128	238 (176)	850 (627)	23	1495/64	6402 (1439)	2.3
<b>3.20 (4.29)</b>	86	355 (262)	550 (406)	35	975/28	5961 (1340)	1.0
	86	355 (262)	1380 (1018)	35	1360/39	9838 (2212)	2.6
<b>3.19 (4.28)</b>	60	507 (374)	920 (679)	50	1943/39	2265 (509)	1.2
<b>3.20 (4.29)</b>	64	477 (352)	1971 (1454)	47	515/11	14923 (3355)	2.7
<b>3.23 (4.33)</b>	44	702 (518)	1380 (1018)	69	620/9	12344 (2775)	1.3
<b>3.19 (4.28)</b>	43	708 (522)	2300 (1697)	70	765/11	17027 (3828)	2.1



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

Gearbox size	Motor shaft height	1FK7 helical geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	
SH						
C202	63	1FK7060-5AF71-1 ■■■ 5-Z	D26	G . .	H . .	22.3 (49.2)
C402	63	1FK7060-5AF71-1 ■■■ 5-Z	D46	G . .	H . .	37.6 (82.9)
C302	63	1FK7060-5AF71-1 ■■■ 5-Z	D37	G . .	H . .	27.4 (60.4)
C402	63	1FK7060-5AF71-1 ■■■ 5-Z	D47	G . .	H . .	37.6 (82.9)
C402	63	1FK7060-5AF71-1 ■■■ 5-Z	D48	G . .	H . .	37.6 (82.9)
C502	63	1FK7060-5AF71-1 ■■■ 5-Z	D58	G . .	H . .	49.2 (108)
C002	63	1FK7063-5AF71-1 ■■■ 5-Z	D01	G . .	H . .	17.1 (37.7)
C102	63	1FK7063-5AF71-1 ■■■ 5-Z	D12	G . .	H . .	22.0 (48.5)
C102	63	1FK7063-5AF71-1 ■■■ 5-Z	D13	G . .	H . .	22.0 (48.5)
C202	63	1FK7063-5AF71-1 ■■■ 5-Z	D24	G . .	H . .	26.0 (57.3)
C302	63	1FK7063-5AF71-1 ■■■ 5-Z	D35	G . .	H . .	31.1 (68.6)
C402	63	1FK7063-5AF71-1 ■■■ 5-Z	D46	G . .	H . .	41.3 (91.1)
C402	63	1FK7063-5AF71-1 ■■■ 5-Z	D47	G . .	H . .	41.3 (91.1)
C502	63	1FK7063-5AF71-1 ■■■ 5-Z	D58	G . .	H . .	52.9 (117)
C102	80	1FK7080-5AF71-1 ■■■ 5-Z	D11	G . .	H . .	21.7 (47.9)
C102	80	1FK7080-5AF71-1 ■■■ 5-Z	D12	G . .	H . .	21.7 (47.9)
C102	80	1FK7080-5AF71-1 ■■■ 5-Z	D13	G . .	H . .	21.7 (47.9)
C202	80	1FK7080-5AF71-1 ■■■ 5-Z	D24	G . .	H . .	25.7 (56.7)
C102	80	1FK7080-5AF71-1 ■■■ 5-Z	D14	G . .	H . .	21.7 (47.9)
C302	80	1FK7080-5AF71-1 ■■■ 5-Z	D35	G . .	H . .	30.8 (67.9)
C202	80	1FK7080-5AF71-1 ■■■ 5-Z	D25	G . .	H . .	25.7 (56.7)
C402	80	1FK7080-5AF71-1 ■■■ 5-Z	D46	G . .	H . .	41.0 (90.4)
C302	80	1FK7080-5AF71-1 ■■■ 5-Z	D36	G . .	H . .	30.8 (67.9)
C502	80	1FK7080-5AF71-1 ■■■ 5-Z	D57	G . .	H . .	52.6 (116)
C612	80	1FK7080-5AF71-1 ■■■ 5-Z	D68	G . .	H . .	67.9 (150)
C102	80	1FK7083-5AF71-1 ■■■ 5-Z	D11	G . .	H . .	26.9 (59.3)
C202	80	1FK7083-5AF71-1 ■■■ 5-Z	D21	G . .	H . .	30.9 (68.1)
C102	80	1FK7083-5AF71-1 ■■■ 5-Z	D12	G . .	H . .	26.9 (59.3)
C202	80	1FK7083-5AF71-1 ■■■ 5-Z	D22	G . .	H . .	30.9 (68.1)
C202	80	1FK7083-5AF71-1 ■■■ 5-Z	D23	G . .	H . .	30.9 (68.1)
C302	80	1FK7083-5AF71-1 ■■■ 5-Z	D33	G . .	H . .	36.0 (79.4)
C302	80	1FK7083-5AF71-1 ■■■ 5-Z	D34	G . .	H . .	36.0 (79.4)
C402	80	1FK7083-5AF71-1 ■■■ 5-Z	D44	G . .	H . .	46.2 (102)
C402	80	1FK7083-5AF71-1 ■■■ 5-Z	D45	G . .	H . .	46.2 (102)
C502	80	1FK7083-5AF71-1 ■■■ 5-Z	D55	G . .	H . .	57.8 (127)
C402	80	1FK7083-5AF71-1 ■■■ 5-Z	D46	G . .	H . .	46.2 (102)
C612	80	1FK7083-5AF71-1 ■■■ 5-Z	D66	G . .	H . .	73.1 (161)
C502	80	1FK7083-5AF71-1 ■■■ 5-Z	D57	G . .	H . .	57.8 (127)
C712	80	1FK7083-5AF71-1 ■■■ 5-Z	D77	G . .	H . .	108.4 (239)
C612	80	1FK7083-5AF71-1 ■■■ 5-Z	D68	G . .	H . .	73.1 (161)
C712	80	1FK7083-5AF71-1 ■■■ 5-Z	D78	G . .	H . .	108.4 (239)

**Encoder systems for motors without DRIVE-CLiQ interface:** IC2048S/R encoder  
AM2048S/R encoder  
AM32S/R encoder  
Multi-pole resolver  
2-pole resolver

A  
E  
G  
S  
T

**Encoder systems for motors with DRIVE-CLiQ interface:** IC22DQ encoder  
AM22DQ encoder  
AM16DQ encoder  
R15DQ resolver  
R14DQ resolver

D  
F  
K  
U  
P

**Holding brake:** Motor without holding brake  
Motor with holding brake

U  
V

Order codes for type/gear shaft extension and type of construction/  
mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>r</sub> )	$f_B$
<b>Natural cooling – SH 100</b>							
<b>3.66 (4.91)</b>	774 512	45.1 (33.3) 68.2 (50.3)	251 (185) 288 (212)	3.9 5.9	190/49 2584/441	1671 (376) 1917 (431)	3.7 2.8
<b>3.64 (4.88)</b>	322	108 (79.7)	350 (258)	9.3	3575/384	2237 (503)	2.2
<b>3.66 (4.91)</b>	193	181 (134)	400 (295)	15.5	544/35	2654 (597)	1.5
<b>3.64 (4.88)</b>	190	183 (135)	600 (443)	16	63/4	4576 (1029)	2.2
<b>3.65 (4.89)</b>	128 128	272 (201) 272 (201)	850 (627) 550 (406)	23 23	1495/64 1495/64	6402 (1439) 5219 (1173)	2.1 1.3
<b>3.66 (4.91)</b>	86	406 (300)	1380 (1018)	35	1360/39	9838 (2212)	2.3
<b>3.65 (4.89)</b>	66 64	528 (390) 545 (402)	1380 (1018) 2300 (1697)	45 47	136/3 515/11	1852 (416) 14923 (3355)	1.7 2.8
<b>3.70 (4.96)</b>	44	802 (592)	4140 (3054)	69	620/9	23146 (5203)	3.4
<b>4.73 (6.34)</b>	774	58.3 (43.0)	251 (185)	3.9	190/49	1671 (376)	2.5
<b>4.72 (6.33)</b>	512 324	88.1 (65.1) 139 (103)	288 (212) 550 (406)	5.9 9.3	2584/441 3445/372	1917 (431) 3834 (862)	1.9 2.3
	322 191	140 (103) 236 (174)	350 (258) 920 (679)	9.3 15.5	3575/384 377/24	2237 (503) 5609 (1261)	1.4 2.2
	190	237 (175)	600 (443)	16	63/4	4576 (1029)	1.5
<b>4.70 (6.30)</b>	128	351 (259)	850 (627)	23	1495/64	6402 (1439)	1.4
<b>4.71 (6.32)</b>	120	375 (277)	1650 (1217)	25	5185/208	8797 (1978)	2.5
<b>4.75 (6.37)</b>	86	527 (389)	2300 (1697)	35	2700/77	13552 (3047)	2.5
<b>4.71 (6.32)</b>	66	682 (503)	1380 (1018)	45	136/3	10737 (2414)	1.2
<b>4.72 (6.33)</b>	64	704 (519)	2300 (1697)	47	515/11	14923 (3355)	1.9
<b>4.77 (6.40)</b>	44	1036 (764)	4140 (3054)	69	620/9	23146 (5203)	2.3

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

Gearbox size	Motor shaft height SH	1FK7 helical geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Gearbox type	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	
C302	100	1FK7100-5AF71-1 ■■■ 5-Z	D31	G . .	H . .	38.2 (84.2)
C302	100	1FK7100-5AF71-1 ■■■ 5-Z	D32	G . .	H . .	38.2 (84.2)
C302	100	1FK7100-5AF71-1 ■■■ 5-Z	D33	G . .	H . .	38.2 (84.2)
C302	100	1FK7100-5AF71-1 ■■■ 5-Z	D34	G . .	H . .	38.2 (84.2)
C402	100	1FK7100-5AF71-1 ■■■ 5-Z	D44	G . .	H . .	48.4 (107)
C502	100	1FK7100-5AF71-1 ■■■ 5-Z	D55	G . .	H . .	60.0 (132)
C402	100	1FK7100-5AF71-1 ■■■ 5-Z	D45	G . .	H . .	48.4 (107)
C612	100	1FK7100-5AF71-1 ■■■ 5-Z	D66	G . .	H . .	75.3 (166)
C612	100	1FK7100-5AF71-1 ■■■ 5-Z	D67	G . .	H . .	75.3 (166)
C712	100	1FK7100-5AF71-1 ■■■ 5-Z	D77	G . .	H . .	110.6 (244)
C812	100	1FK7100-5AF71-1 ■■■ 5-Z	D88	G . .	H . .	170.2 (375)
C302	100	1FK7101-5AF71-1 ■■■ 5-Z	D31	G . .	H . .	43.8 (96.6)
C302	100	1FK7101-5AF71-1 ■■■ 5-Z	D32	G . .	H . .	43.8 (96.6)
C402	100	1FK7101-5AF71-1 ■■■ 5-Z	D43	G . .	H . .	43.8 (96.6)
C302	100	1FK7101-5AF71-1 ■■■ 5-Z	D33	G . .	H . .	54.0 (119)
C502	100	1FK7101-5AF71-1 ■■■ 5-Z	D54	G . .	H . .	65.6 (145)
C402	100	1FK7101-5AF71-1 ■■■ 5-Z	D44	G . .	H . .	54.0 (119)
C502	100	1FK7101-5AF71-1 ■■■ 5-Z	D55	G . .	H . .	65.6 (145)
C612	100	1FK7101-5AF71-1 ■■■ 5-Z	D65	G . .	H . .	80.9 (178)
C712	100	1FK7101-5AF71-1 ■■■ 5-Z	D76	G . .	H . .	116.2 (256)
C612	100	1FK7101-5AF71-1 ■■■ 5-Z	D67	G . .	H . .	80.9 (178)
C712	100	1FK7101-5AF71-1 ■■■ 5-Z	D77	G . .	H . .	116.2 (256)
C812	100	1FK7101-5AF71-1 ■■■ 5-Z	D88	G . .	H . .	175.8 (388)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder AM32S/R encoder Multi-pole resolver 2-pole resolver	A E G S T				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder AM16DQ encoder R15DQ resolver R14DQ resolver	D F K U P				
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	U V				

Order codes for type/gear shaft extension and type of construction/  
mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>r</sub> )	$f_B$
<b>Natural cooling – SH 100</b>							
<b>5.19 (6.96)</b>	644	77 (56.8)	251 (185)	3.9	190/49	1671 (376)	1.9
<b>5.18 (6.95)</b>	423	117 (86.3)	288 (212)	5.9	2584/441	1917 (431)	2.0
<b>5.19 (6.96)</b>	424	117 (86.3)	420 (310)	5.9	377/64	3297 (741)	1.4
<b>5.18 (6.95)</b>	269	184 (136)	350 (258)	9.3	3575/384	2237 (503)	2.5
<b>5.20 (6.97)</b>	241	206 (152)	850 (627)	9.3	3445/372	4886 (1098)	1.1
<b>5.21 (6.99)</b>	159	313 (231)	600 (443)	16	63/4	4576 (1029)	1.1
<b>5.19 (6.96)</b>	154	322 (238)	1650 (1217)	16	1037/64	7620 (1713)	2.9
<b>5.20 (6.97)</b>	107	464 (342)	850 (627)	23	1495/64	6402 (1439)	1.9
<b>5.19 (6.96)</b>	100	496 (366)	1650 (1217)	25	5185/208	8797 (1978)	1.1
<b>5.23 (7.01)</b>	72	694 (512)	1380 (1018)	35	1360/39	9838 (2212)	3.4
	71	703 (519)	4140 (3054)	35	106/3	18528 (4165)	1.1
<b>5.17 (6.93)</b>	53	931 (687)	2300 (1697)	47	515/11	14923 (3355)	2.2
<b>5.18 (6.95)</b>	46	1076 (794)	4140 (3054)	54	704/13	21362 (4802)	1.2
<b>5.16 (6.92)</b>	36	1370 (1011)	4140 (3054)	69	620/9	23146 (5203)	1.1
<b>7.92 (10.6)</b>	770	98.2 (72.4)	366 (270)	3.9	841/216	2872 (646)	2.0
<b>7.93 (10.6)</b>	774	97.8 (72.1)	251 (185)	3.9	190/49	1671 (377)	1.4
<b>7.95 (10.7)</b>	513	148 (109)	650 (479)	5.9	117/20	4036 (907)	2.4
<b>7.93 (10.6)</b>	512	148 (109)	288 (212)	5.9	2584/441	1917 (431)	1.1
<b>7.94 (10.7)</b>	324	234 (173)	850 (627)	9.3	3445/372	4703 (1057)	2.0
	324	234 (173)	550 (406)	9.3	3445/372	3834 (862)	1.3
<b>7.92 (10.6)</b>	191	396 (292)	920 (679)	16	377/24	5609 (1261)	1.3
	185	409 (302)	1650 (1217)	16	1037/64	7620 (1713)	2.2
<b>7.90 (10.6)</b>	129	585 (432)	2300 (1697)	23	255/11	11806 (2654)	2.1
	120	629 (464)	1650 (1217)	25	5185/208	8797 (1978)	1.4
<b>7.93 (10.6)</b>	85	891 (657)	4140 (3054)	36	106/3	18528 (4165)	2.5
<b>7.96 (10.7)</b>	86	884 (652)	2300 (1697)	35	2700/77	13552 (3047)	1.4
<b>7.93 (10.6)</b>	66	1148 (847)	4140 (3054)	46	592/13	20163 (4533)	2.0
<b>7.91 (10.6)</b>	64	1181 (871)	2300 (1697)	47	515/11	14923 (3355)	1.1
<b>8.00 (10.7)</b>	44	1737 (1281)	4140 (3054)	69	620/9	23146 (5203)	1.3

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 helical geared motors

Gearbox size	Motor shaft height SH	1FK7 helical geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Gearbox type	Type/gear shaft extension Type of construction/ mounting position/ connector mounting position	
C302	100	1FK7103-5AF71-1 ■■■ 5-Z	D31	G . .	H . .	50.4 (111)
C302	100	1FK7103-5AF71-1 ■■■ 5-Z	D32	G . .	H . .	50.4 (111)
C402	100	1FK7103-5AF71-1 ■■■ 5-Z	D42	G . .	H . .	60.6 (134)
C302	100	1FK7103-5AF71-1 ■■■ 5-Z	D33	G . .	H . .	50.4 (111)
C502	100	1FK7103-5AF71-1 ■■■ 5-Z	D53	G . .	H . .	72.2 (159)
C402	100	1FK7103-5AF71-1 ■■■ 5-Z	D44	G . .	H . .	60.6 (134)
C612	100	1FK7103-5AF71-1 ■■■ 5-Z	D64	G . .	H . .	87.5 (193)
C502	100	1FK7103-5AF71-1 ■■■ 5-Z	D55	G . .	H . .	72.2 (159)
C612	100	1FK7103-5AF71-1 ■■■ 5-Z	D65	G . .	H . .	87.5 (193)
C612	100	1FK7103-5AF71-1 ■■■ 5-Z	D66	G . .	H . .	87.5 (193)
C812	100	1FK7103-5AF71-1 ■■■ 5-Z	D86	G . .	H . .	182.4 (402)
C712	100	1FK7103-5AF71-1 ■■■ 5-Z	D77	G . .	H . .	122.8 (271)
C812	100	1FK7103-5AF71-1 ■■■ 5-Z	D87	G . .	H . .	182.4 (402)
C812	100	1FK7103-5AF71-1 ■■■ 5-Z	D88	G . .	H . .	182.4 (402)
C402	100	1FK7105-5AF71-1 ■■■ 5-Z	D41	G . .	H . .	70.6 (156)
C302	100	1FK7105-5AF71-1 ■■■ 5-Z	D31	G . .	H . .	60.4 (133)
C502	100	1FK7105-5AF71-1 ■■■ 5-Z	D52	G . .	H . .	82.2 (181)
C302	100	1FK7105-5AF71-1 ■■■ 5-Z	D32	G . .	H . .	60.4 (133)
C502	100	1FK7105-5AF71-1 ■■■ 5-Z	D53	G . .	H . .	82.2 (181)
C402	100	1FK7105-5AF71-1 ■■■ 5-Z	D43	G . .	H . .	70.6 (156)
C502	100	1FK7105-5AF71-1 ■■■ 5-Z	D54	G . .	H . .	82.2 (181)
C612	100	1FK7105-5AF71-1 ■■■ 5-Z	D64	G . .	H . .	97.5 (215)
C712	100	1FK7105-5AF71-1 ■■■ 5-Z	D75	G . .	H . .	132.8 (293)
C612	100	1FK7105-5AF71-1 ■■■ 5-Z	D65	G . .	H . .	97.5 (215)
C812	100	1FK7105-5AF71-1 ■■■ 5-Z	D86	G . .	H . .	192.4 (424)
C712	100	1FK7105-5AF71-1 ■■■ 5-Z	D76	G . .	H . .	132.8 (293)
C812	100	1FK7105-5AF71-1 ■■■ 5-Z	D87	G . .	H . .	192.4 (424)
C712	100	1FK7105-5AF71-1 ■■■ 5-Z	D77	G . .	H . .	132.8 (293)
C812	100	1FK7105-5AF71-1 ■■■ 5-Z	D88	G . .	H . .	192.4 (424)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder AM32S/R encoder Multi-pole resolver 2-pole resolver	A E G S T				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder AM16DQ encoder R15DQ resolver R14DQ resolver	D F K U P				
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	U V				

Order codes for type/gear shaft extension and type of construction/  
mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 parallel shaft geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>f</sub> )	$f_B$
<b>Natural cooling – SH 36/SH 48/SH 63</b>							
<b>0.30 (0.40)</b>	696	4.07 (3.00)	24 (17.7)	4.3	56/13	1021 (230)	4.7
	464	6.11 (4.51)	33 (24.3)	6.5	84/13	1169 (263)	4.5
	275	10.3 (7.60)	52 (38.4)	11	273/25	1392 (313)	4.1
	221	12.9 (9.52)	62 (45.7)	13.5	231/17	1497 (337)	3.9
<b>0.41 (0.55)</b>	130	21.8 (16.1)	114 (84.1)	23	3185/138	1786 (402)	4.2
	86	33.1 (24.4)	120 (88.5)	35	3575/102	2053 (462)	2.9
	696	5.64 (4.16)	45 (33.2)	4.3	56/13	1021 (230)	6.7
	464	8.46 (6.24)	64 (47.2)	6.5	84/13	1169 (263)	6.3
<b>0.79 (1.06)</b>	275	14.3 (10.5)	99 (73.0)	11	273/25	1392 (313)	5.8
	221	17.8 (13.1)	105 (77.4)	13.5	231/17	1497 (337)	5.0
	130	30.2 (22.3)	120 (88.5)	23	3185/138	1786 (402)	3.4
	86	45.9 (33.9)	120 (88.5)	35	3575/102	2053 (462)	2.2
<b>1.43 (1.92)</b>	696	10.9 (8.04)	45 (33.2)	4.3	56/13	1021 (230)	3.6
	464	16.3 (12.0)	64 (47.2)	6.5	84/13	1169 (263)	3.4
	275	27.5 (20.3)	99 (73.0)	11	273/25	1392 (313)	3.1
	221	34.3 (25.3)	105 (77.4)	13.5	231/17	1497 (337)	2.7
	130	58.2 (42.9)	120 (88.5)	23	3185/138	1786 (402)	1.8
	128	59.1 (43.6)	233 (172)	23	2320/99	2308 (519)	3.4
	86	88.4 (65.2)	120 (88.5)	35	3575/102	2053 (462)	1.2
	85	89.4 (65.9)	270 (199)	35	390/11	2650 (596)	2.6
<b>2.22 (2.98)</b>	696	19.6 (14.5)	80 (59.0)	4.3	56/13	1021 (230)	3.2
	464	29.5 (21.8)	91 (67.1)	6.5	84/13	1169 (263)	2.4
	275	49.8 (36.7)	105 (77.4)	11	273/25	1392 (313)	1.7
	278	49.3 (36.4)	196 (145)	11	7303/676	1783 (402)	3.1
	221	61.9 (45.7)	105 (77.4)	13.5	231/17	1497 (337)	1.3
	220	62.1 (45.8)	210 (155)	13.5	109/8	1927 (433)	2.6
	128	107 (78.9)	270 (199)	23	2320/99	2308 (519)	2.0
	85	162 (120)	270 (199)	35	390/11	2650 (596)	1.3
<b>2.22 (2.98)</b>	86	160 (118)	450 (332)	35	7252/207	3666 (824)	2.2
	696	30.5 (22.5)	80 (59.0)	4.3	56/13	1021 (230)	1.7
	464	45.8 (33.8)	91 (67.1)	6.5	84/13	1169 (263)	1.3
	540	39.3 (29.0)	112 (82.6)	5.6	5341/962	1428 (321)	1.9
	278	76.5 (56.4)	196 (145)	11	7303/676	1783 (401)	1.7
	220	96.5 (71.2)	210 (155)	13.5	109/8	1927 (433)	1.4
	128	166 (122)	270 (199)	23	2320/99	2308 (519)	1.1
	86	248 (183)	450 (332)	35	7252/207	3666 (824)	1.2

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 parallel shaft geared motors

Gearbox size	Motor shaft height	1FK7 parallel shaft geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Gearbox type	Type/gear shaft extension Type of construction/ mounting position/ connector mounting position	
	SH					
F102	36	1FK7032-5AK71-1 ■■■ 5-Z	C11	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■■ 5-Z	C12	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■■ 5-Z	C13	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■■ 5-Z	C14	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■■ 5-Z	C15	G . .	H . .	13.8 (30.4)
F102	36	1FK7032-5AK71-1 ■■■ 5-Z	C16	G . .	H . .	13.8 (30.4)
F102	48	1FK7040-5AK71-1 ■■■ 5-Z	C11	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■■ 5-Z	C12	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■■ 5-Z	C13	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■■ 5-Z	C14	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■■ 5-Z	C15	G . .	H . .	14.6 (32.2)
F102	48	1FK7040-5AK71-1 ■■■ 5-Z	C16	G . .	H . .	14.6 (32.2)
F102	48	1FK7042-5AF71-1 ■■■ 5-Z	C11	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■■ 5-Z	C12	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■■ 5-Z	C13	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■■ 5-Z	C14	G . .	H . .	15.9 (35.1)
F102	48	1FK7042-5AF71-1 ■■■ 5-Z	C15	G . .	H . .	15.9 (35.1)
F202	48	1FK7042-5AF71-1 ■■■ 5-Z	C25	G . .	H . .	24.1 (53.1)
F102	48	1FK7042-5AF71-1 ■■■ 5-Z	C16	G . .	H . .	15.9 (35.1)
F202	48	1FK7042-5AF71-1 ■■■ 5-Z	C26	G . .	H . .	24.1 (53.1)
F102	63	1FK7060-5AF71-1 ■■■ 5-Z	C11	G . .	H . .	18.6 (41.0)
F102	63	1FK7060-5AF71-1 ■■■ 5-Z	C12	G . .	H . .	18.6 (41.0)
F102	63	1FK7060-5AF71-1 ■■■ 5-Z	C13	G . .	H . .	18.6 (41.0)
F202	63	1FK7060-5AF71-1 ■■■ 5-Z	C23	G . .	H . .	26.8 (59.1)
F102	63	1FK7060-5AF71-1 ■■■ 5-Z	C14	G . .	H . .	18.6 (41.0)
F202	63	1FK7060-5AF71-1 ■■■ 5-Z	C24	G . .	H . .	26.8 (59.1)
F202	63	1FK7060-5AF71-1 ■■■ 5-Z	C25	G . .	H . .	26.8 (59.1)
F202	63	1FK7060-5AF71-1 ■■■ 5-Z	C26	G . .	H . .	26.8 (59.1)
F302	63	1FK7060-5AF71-1 ■■■ 5-Z	C36	G . .	H . .	34.4 (75.9)
F102	63	1FK7063-5AF71-1 ■■■ 5-Z	C11	G . .	H . .	22.3 (49.2)
F102	63	1FK7063-5AF71-1 ■■■ 5-Z	C12	G . .	H . .	22.3 (49.2)
F202	63	1FK7063-5AF71-1 ■■■ 5-Z	C22	G . .	H . .	30.5 (67.3)
F202	63	1FK7063-5AF71-1 ■■■ 5-Z	C23	G . .	H . .	30.5 (67.3)
F202	63	1FK7063-5AF71-1 ■■■ 5-Z	C24	G . .	H . .	30.5 (67.3)
F202	63	1FK7063-5AF71-1 ■■■ 5-Z	C25	G . .	H . .	30.5 (67.3)
F302	63	1FK7063-5AF71-1 ■■■ 5-Z	C36	G . .	H . .	38.1 (84.0)

**Encoder systems for motors without DRIVE-CLiQ interface:** IC2048S/R encoder  
AM2048S/R encoder (from shaft height 48)  
AM512S/R encoder (shaft height 36 only)  
AM32S/R encoder (from shaft height 48)  
AM16S/R encoder (shaft height 36 only)  
Multi-pole resolver  
2-pole resolver

**Encoder systems for motors with DRIVE-CLiQ interface:** IC22DQ encoder  
AM22DQ encoder (from shaft height 48)  
AM20DQ encoder (shaft height 36 only)  
AM16DQ encoder (from shaft height 48)  
AM15DQ encoder (shaft height 36 only)  
R15DQ resolver  
R14DQ resolver

**Holding brake:** Motor without holding brake  
Motor with holding brake

A  
E  
H  
G  
J  
S  
TD  
F  
L  
K  
V  
U  
PU  
V

Order codes for type/gear shaft extension and type of construction/mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 parallel shaft geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>r</sub> )	$f_B$
<b>Natural cooling – SH 80/SH 100</b>							
<b>2.08 (2.79)</b>	540	36.6 (27.0)	173 (128)	5.6	5341/962	1428 (321)	4.0
	278	71.3 (52.6)	210 (155)	11	7303/676	1783 (401)	2.5
	220	89.9 (66.3)	210 (155)	13.5	109/8	1927 (433)	2.0
	128	155 (114)	270 (199)	23	2320/99	2308 (519)	1.5
	128	155 (114)	450 (332)	24	588/25	3210 (722)	2.5
<b>3.20 (4.29)</b>	86	231 (170)	450 (332)	35	7252/207	3666 (824)	1.7
	86	231 (170)	700 (516)	35	2210/63	4523 (1017)	2.6
	540	56.5 (41.7)	173 (128)	5.6	5341/962	1428 (321)	2.0
	278	110 (81.1)	210 (155)	11	7303/676	1783 (401)	1.3
	278	110 (81.1)	350 (258)	11	1456/135	2475 (556)	2.1
<b>3.66 (4.91)</b>	224	136 (100)	350 (258)	13.5	7696/575	2660 (598)	1.7
	221	138 (102)	550 (406)	13.5	5984/441	3296 (741)	2.6
	128	240 (177)	450 (332)	24	588/25	3210 (722)	1.2
	129	236 (174)	700 (516)	23	325/14	3942 (886)	1.9
	86	357 (263)	700 (516)	35	2210/63	4523 (1017)	1.3
<b>4.72 (6.33)</b>	85	359 (265)	1100 (811)	35	845/24	6120 (1376)	2.0
	516	67.7 (49.9)	482 (356)	5.8	3784/651	2484 (558)	4.8
	277	126 (92.9)	550 (406)	11	682/63	3057 (687)	2.9
	221	158 (117)	550 (406)	13.5	5984/441	3296 (741)	2.3
	129	270 (199)	700 (516)	23	325/14	3942 (886)	1.7
<b>5.20 (6.97)</b>	129	271 (200)	1100 (811)	23	1885/81	5331 (1198)	2.7
	86	408 (301)	700 (516)	35	2210/63	4523 (1017)	1.1
	516	87.4 (64.5)	482 (356)	5.8	3784/651	2484 (558)	3.2
	277	163 (120)	550 (406)	11	682/63	3057 (687)	1.9
	221	204 (151)	550 (406)	13.5	5984/441	3296 (741)	1.5
<b>7.93 (10.6)</b>	220	205 (151)	1000 (738)	13.5	871/64	4458 (1002)	2.8
	129	349 (257)	700 (516)	23	325/14	3942 (886)	1.2
	85	529 (390)	1100 (811)	35	845/24	6120 (1376)	1.2
	430	115 (84.8)	482 (356)	5.8	3784/651	2484 (558)	2.4
	231	215 (159)	550 (406)	11	682/63	3057 (687)	1.5
<b>7.93 (10.6)</b>	231	215 (159)	991 (731)	11	2077/192	4130 (928)	2.6
	184	269 (198)	550 (406)	13.5	5984/441	3296 (741)	1.2
	183	270 (199)	1000 (738)	13.5	871/64	4458 (1002)	2.1
	108	460 (339)	1100 (811)	23	1885/81	5331 (1198)	1.4
	529	143 (106)	766 (565)	5.7	1407/248	3330 (749)	2.9
<b>7.93 (10.6)</b>	516	147 (108)	482 (356)	6	3784/651	2484 (558)	1.8
	277	273 (201)	991 (731)	11	2077/192	4130 (928)	2.0
	277	273 (201)	550 (406)	11	682/63	3057 (687)	1.1
	220	343 (253)	1000 (738)	13.6	871/64	4458 (1002)	1.6
	129	587 (433)	1100 (811)	24	1885/81	5331 (1198)	1.0



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 parallel shaft geared motors

Gearbox size	Motor shaft height	1FK7 parallel shaft geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Gearbox type	Type/gear shaft extension Type of construction/ mounting position/ connector mounting position	
	SH					
F202	80	1FK7080-5AF71-1 ■■■ 5-Z	C22	G . .	H . .	30.2 (66.6)
F202	80	1FK7080-5AF71-1 ■■■ 5-Z	C23	G . .	H . .	30.2 (66.6)
F202	80	1FK7080-5AF71-1 ■■■ 5-Z	C24	G . .	H . .	30.2 (66.6)
F202	80	1FK7080-5AF71-1 ■■■ 5-Z	C25	G . .	H . .	30.2 (66.6)
F302	80	1FK7080-5AF71-1 ■■■ 5-Z	C35	G . .	H . .	37.8 (83.4)
F302	80	1FK7080-5AF71-1 ■■■ 5-Z	C36	G . .	H . .	37.8 (83.4)
F402	80	1FK7080-5AF71-1 ■■■ 5-Z	C46	G . .	H . .	46.1 (102)
F202	80	1FK7083-5AF71-1 ■■■ 5-Z	C22	G . .	H . .	35.4 (78.1)
F202	80	1FK7083-5AF71-1 ■■■ 5-Z	C23	G . .	H . .	35.4 (78.1)
F302	80	1FK7083-5AF71-1 ■■■ 5-Z	C33	G . .	H . .	43.0 (94.8)
F302	80	1FK7083-5AF71-1 ■■■ 5-Z	C34	G . .	H . .	43.0 (94.8)
F402	80	1FK7083-5AF71-1 ■■■ 5-Z	C44	G . .	H . .	51.3 (113)
F302	80	1FK7083-5AF71-1 ■■■ 5-Z	C35	G . .	H . .	43.0 (94.8)
F402	80	1FK7083-5AF71-1 ■■■ 5-Z	C45	G . .	H . .	51.3 (113)
F402	80	1FK7083-5AF71-1 ■■■ 5-Z	C46	G . .	H . .	51.3 (113)
F602	80	1FK7083-5AF71-1 ■■■ 5-Z	C66	G . .	H . .	78.3 (173)
F402	100	1FK7100-5AF71-1 ■■■ 5-Z	C42	G . .	H . .	53.5 (118)
F402	100	1FK7100-5AF71-1 ■■■ 5-Z	C43	G . .	H . .	53.3 (118)
F402	100	1FK7100-5AF71-1 ■■■ 5-Z	C44	G . .	H . .	53.5 (118)
F402	100	1FK7100-5AF71-1 ■■■ 5-Z	C45	G . .	H . .	53.3 (118)
F602	100	1FK7100-5AF71-1 ■■■ 5-Z	C65	G . .	H . .	80.5 (178)
F402	100	1FK7100-5AF71-1 ■■■ 5-Z	C46	G . .	H . .	53.3 (118)
F402	100	1FK7101-5AF71-1 ■■■ 5-Z	C42	G . .	H . .	59.1 (130)
F402	100	1FK7101-5AF71-1 ■■■ 5-Z	C43	G . .	H . .	59.1 (130)
F402	100	1FK7101-5AF71-1 ■■■ 5-Z	C44	G . .	H . .	59.1 (130)
F602	100	1FK7101-5AF71-1 ■■■ 5-Z	C64	G . .	H . .	86.1 (190)
F402	100	1FK7101-5AF71-1 ■■■ 5-Z	C45	G . .	H . .	59.1 (130)
F602	100	1FK7101-5AF71-1 ■■■ 5-Z	C66	G . .	H . .	86.1 (190)
F402	100	1FK7103-5AF71-1 ■■■ 5-Z	C42	G . .	H . .	65.7 (145)
F402	100	1FK7103-5AF71-1 ■■■ 5-Z	C43	G . .	H . .	65.7 (145)
F602	100	1FK7103-5AF71-1 ■■■ 5-Z	C63	G . .	H . .	92.7 (204)
F402	100	1FK7103-5AF71-1 ■■■ 5-Z	C44	G . .	H . .	65.7 (145)
F602	100	1FK7103-5AF71-1 ■■■ 5-Z	C64	G . .	H . .	92.7 (145)
F602	100	1FK7103-5AF71-1 ■■■ 5-Z	C65	G . .	H . .	92.7 (145)
F602	100	1FK7105-5AF71-1 ■■■ 5-Z	C62	G . .	H . .	103 (227)
F402	100	1FK7105-5AF71-1 ■■■ 5-Z	C42	G . .	H . .	75.7 (167)
F602	100	1FK7105-5AF71-1 ■■■ 5-Z	C63	G . .	H . .	103 (227)
F402	100	1FK7105-5AF71-1 ■■■ 5-Z	C43	G . .	H . .	75.7 (167)
F602	100	1FK7105-5AF71-1 ■■■ 5-Z	C64	G . .	H . .	103 (227)
F602	100	1FK7105-5AF71-1 ■■■ 5-Z	C65	G . .	H . .	103 (227)

<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder AM32S/R encoder Multi-pole resolver 2-pole resolver	A E G S T
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder AM16DQ encoder R15DQ resolver R14DQ resolver	D F K U P
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	U V

Order codes for type/gear shaft extension and type of construction/mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 bevel geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor	
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>r</sub> )	$f_B$	
<b>Natural cooling – SH 36/SH 48/SH 63</b>								
<b>0.30 (0.40)</b>	750	3.78 (2.79)	22 (16.2)	4	4/1	1494 (336)	4.7	
	500	5.68 (4.19)	31 (22.9)	6	6/1	1710 (384)	4.5	
	296	9.59 (7.07)	48 (35.4)	10	507/50	2037 (458)	4.1	
	179	15.8 (11.7)	73 (53.8)	16.5	117/7	2406 (541)	3.8	
	129	22.0 (16.2)	102 (75.2)	23	1140/49	2686 (604)	3.8	
	85	33.2 (24.5)	135 (99.6)	35	3686/105	3081 (693)	3.3	
	65	43.7 (32.2)	185 (137)	46	1849/40	4053 (911)	3.4	
	43	65.7 (48.5)	159 (117)	69	6665/96	4641 (1043)	2.0	
	<b>0.41 (0.55)</b>	750	5.24 (3.87)	42 (31.0)	4	4/1	1494 (336)	6.7
		500	7.86 (5.80)	59 (43.5)	6	6/1	1710 (384)	6.3
296		13.3 (9.81)	92 (67.9)	10	507/50	2037 (458)	5.8	
179		21.9 (16.2)	122 (90.0)	16.5	117/7	2406 (541)	4.7	
129		30.5 (22.5)	135 (99.6)	23	1140/49	2686 (604)	3.7	
85		46.0 (33.9)	135 (99.6)	35	3686/105	3081 (693)	2.5	
65		60.5 (44.6)	220 (162)	46	1849/40	4053 (911)	3.1	
<b>0.79 (1.06)</b>		750	10.1 (7.45)	42 (31.0)	4	4/1	1494 (336)	3.6
		500	15.1 (11.1)	59 (43.5)	6	6/1	1710 (384)	3.4
		296	25.6 (18.9)	92 (67.9)	10	507/50	2037 (458)	3.1
	179	42.2 (31.1)	122 (90.0)	16.5	117/7	2406 (541)	2.5	
	129	58.7 (43.3)	135 (99.6)	23	1140/49	2686 (604)	2.0	
	85	88.5 (65.3)	135 (99.6)	35	3686/105	3081 (693)	1.3	
	87	87.1 (64.2)	220 (162)	35	1935/56	3678 (1043)	2.2	
	<b>1.43 (1.92)</b>	750	18.2 (13.4)	76 (56.1)	4	4/1	1494 (336)	3.3
		500	27.4 (20.2)	87 (64.2)	6	6/1	1710 (384)	2.5
		296	46.2 (34.1)	103 (76.0)	10	507/50	2037 (458)	1.8
178		76.9 (56.7)	219 (162)	17	2967/176	2895 (651)	2.2	
129		106 (78.2)	220 (162)	23	2967/128	3220 (724)	1.6	
129		106 (78.2)	385 (284)	23	559/24	3762 (846)	2.8	
87		158 (117)	220 (162)	35	1935/56	3678 (1043)	1.1	
86		158 (117)	385 (284)	35	903/26	4298 (966)	1.9	
65		211 (156)	385 (284)	46	1849/40	4728 (1063)	1.4	
65		211 (156)	600 (443)	46	602/13	7570 (1702)	2.2	
46	290 (214)	1000 (738)	65	12586/195	10154 (2283)	2.7		

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 bevel geared motors

Gearbox size	Motor shaft height	1FK7 bevel geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Gearbox type	Type/gear shaft extension Type of construction/ mounting position/ connector mounting position	
	SH					
K102	36	1FK7032-5AK71-1 ■■■ 5-Z	B11	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■■ 5-Z	B12	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■■ 5-Z	B13	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■■ 5-Z	B14	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■■ 5-Z	B15	G . .	H . .	12.3 (27.1)
K102	36	1FK7032-5AK71-1 ■■■ 5-Z	B16	G . .	H . .	12.3 (27.1)
K202	36	1FK7032-5AK71-1 ■■■ 5-Z	B27	G . .	H . .	19.8 (43.7)
K202	36	1FK7032-5AK71-1 ■■■ 5-Z	B28	G . .	H . .	19.8 (43.7)
K102	48	1FK7040-5AK71-1 ■■■ 5-Z	B11	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■■ 5-Z	B12	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■■ 5-Z	B13	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■■ 5-Z	B14	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■■ 5-Z	B15	G . .	H . .	13.1 (28.9)
K102	48	1FK7040-5AK71-1 ■■■ 5-Z	B16	G . .	H . .	13.1 (28.9)
K202	48	1FK7040-5AK71-1 ■■■ 5-Z	B27	G . .	H . .	20.6 (45.4)
K102	48	1FK7042-5AF71-1 ■■■ 5-Z	B11	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■■ 5-Z	B12	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■■ 5-Z	B13	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■■ 5-Z	B14	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■■ 5-Z	B15	G . .	H . .	14.4 (31.8)
K102	48	1FK7042-5AF71-1 ■■■ 5-Z	B16	G . .	H . .	14.4 (31.8)
K202	48	1FK7042-5AF71-1 ■■■ 5-Z	B26	G . .	H . .	21.9 (48.3)
K102	63	1FK7060-5AF71-1 ■■■ 5-Z	B11	G . .	H . .	17.1 (37.7)
K102	63	1FK7060-5AF71-1 ■■■ 5-Z	B12	G . .	H . .	17.1 (37.7)
K102	63	1FK7060-5AF71-1 ■■■ 5-Z	B13	G . .	H . .	17.1 (37.7)
K202	63	1FK7060-5AF71-1 ■■■ 5-Z	B24	G . .	H . .	24.6 (54.2)
K202	63	1FK7060-5AF71-1 ■■■ 5-Z	B25	G . .	H . .	24.6 (54.2)
K302	63	1FK7060-5AF71-1 ■■■ 5-Z	B35	G . .	H . .	29.6 (65.3)
K202	63	1FK7060-5AF71-1 ■■■ 5-Z	B26	G . .	H . .	24.6 (54.2)
K302	63	1FK7060-5AF71-1 ■■■ 5-Z	B36	G . .	H . .	29.6 (65.3)
K302	63	1FK7060-5AF71-1 ■■■ 5-Z	B37	G . .	H . .	29.6 (65.3)
K402	63	1FK7060-5AF71-1 ■■■ 5-Z	B47	G . .	H . .	43.1 (95.0)
K513	63	1FK7060-5AF71-1 ■■■ 5-Z	B58	G . .	H . .	48.9 (108)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder (from shaft height 48) AM512S/R encoder (shaft height 36 only) AM32S/R encoder (from shaft height 48) AM16S/R encoder (shaft height 36 only) Multi-pole resolver 2-pole resolver	A E H G J S T				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder (from shaft height 48) AM20DQ encoder (shaft height 36 only) AM16DQ encoder (from shaft height 48) AM15DQ encoder (shaft height 36 only) R15DQ resolver R14DQ resolver	D F L K V U P				
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	U V				

Order codes for type/gear shaft extension and type of construction/ mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 bevel geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{Tperm}$ N (lb <sub>r</sub> )	$f_B$
<b>Natural cooling – SH 63/SH 80/SH 100</b>							
<b>2.22 (2.98)</b>	750	28.3 (20.9)	76 (56.1)	4	4/1	1494 (336)	1.8
	750	28.3 (20.9)	83 (61.2)	4	4/1	1793 (403)	2.0
	500	42.5 (31.3)	87 (64.2)	6	6/1	1710 (384)	1.4
	500	42.5 (31.3)	128 (94.4)	6	6/1	2394 (538)	2.0
	324	65.6 (48.4)	186 (137)	9.3	1075/116	2767 (622)	1.9
	178	119 (87.8)	219 (162)	17	2967/176	2895 (651)	1.2
	129	165 (122)	385 (284)	23	559/24	3762 (846)	1.5
	86	246 (181)	385 (284)	35	903/26	4298 (966)	1.0
	65	328 (242)	600 (443)	46	602/13	7570 (1702)	1.2
<b>2.17 (2.91)</b>	46	450 (332)	1000 (738)	65	12586/195	10154 (2283)	1.5
<b>2.07 (2.78)</b>	750	26.4 (19.5)	135 (99.6)	4	4/1	1793 (403)	4.4
	500	39.6 (29.2)	155 (114)	6	6/1	2052 (461)	3.3
	298	66.4 (49.0)	184 (136)	10	2881/286	2439 (548)	2.4
	177	112 (82.6)	384 (283)	17	559/33	3383 (761)	2.9
	129	153 (113)	220 (162)	23	2967/128	3220 (724)	1.2
	129	154 (114)	385 (284)	23	559/24	3762 (846)	2.1
	86	229 (169)	600 (443)	35	4171/120	6879 (1546)	2.2
<b>2.03 (2.72)</b>	62	313 (231)	1000 (738)	48	2697/56	9210 (2071)	2.7
	39	495 (365)	1600 (1180)	76	126697/1664	12763 (2869)	2.7
<b>3.20 (4.29)</b>	750	40.7 (30.0)	135 (99.6)	4	4/1	1793 (403)	2.2
	500	61.1 (45.1)	155 (114)	6	6/1	2052 (461)	1.7
	500	61.1 (45.1)	271 (200)	6	6/1	2394 (538)	2.9
	298	103 (76.0)	184 (136)	10	2881/286	2439 (548)	1.2
	324	94.4 (69.6)	314 (232)	9.3	1075/116	2767 (622)	2.2
	177	173 (128)	384 (283)	17	559/33	3383 (761)	1.5
	177	173 (128)	575 (424)	17	559/33	5414 (1217)	2.2
	129	237 (175)	385 (284)	23	559/24	3762 (846)	1.1
<b>3.14 (4.21)</b>	123	244 (180)	1000 (738)	24	11687/480	7337 (1649)	2.7
	93	324 (239)	1000 (738)	32	20677/640	8062 (1812)	2.0
	62	483 (356)	1000 (738)	48	2697/56	9210 (2071)	1.4
	63	479 (353)	1600 (1180)	48	39711/832	10923 (2456)	2.2
	46	648 (478)	1000 (738)	65	12586/195	10154 (2283)	1.0
	46	651 (480)	2574 (1899)	65	33201/512	16635 (3740)	2.6
<b>3.19 (4.28)</b>	86	354 (261)	600 (443)	35	4171/120	6879 (1546)	1.1
<b>3.66 (4.91)</b>	750	46.6 (34.4)	356 (263)	4	4/1	3346 (752)	5.1
	500	69.8 (51.5)	407 (300)	6	6/1	3830 (861)	3.9
	297	118 (87.0)	484 (357)	10	1333/132	4556 (1024)	2.7
	177	197 (145)	575 (424)	17	559/33	5414 (1217)	1.9
	129	271 (200)	600 (443)	23	559/24	6020 (1353)	1.5
<b>3.60 (4.83)</b>	123	279 (206)	1000 (738)	24	11687/480	7337 (1649)	2.4
	93	371 (274)	1000 (738)	32	20677/640	8062 (1812)	1.8
	87	397 (293)	1600 (1180)	35	35441/1024	9813 (2206)	2.7
	60	572 (422)	2600 (1918)	50	166005/3328	15242 (3427)	3.0
	46	744 (549)	2600 (1918)	65	33201/512	16635 (3740)	2.3

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 bevel geared motors

Gearbox size	Motor shaft height	1FK7 bevel geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	
SH						
K102	63	1FK7063-5AF71-1 ■■■ 5-Z	B11	G . .	H . .	20.8 (45.9)
K202	63	1FK7063-5AF71-1 ■■■ 5-Z	B21	G . .	H . .	28.3 (62.4)
K102	63	1FK7063-5AF71-1 ■■■ 5-Z	B12	G . .	H . .	20.8 (45.9)
K302	63	1FK7063-5AF71-1 ■■■ 5-Z	B32	G . .	H . .	33.3 (73.4)
K302	63	1FK7063-5AF71-1 ■■■ 5-Z	B33	G . .	H . .	33.3 (73.4)
K202	63	1FK7063-5AF71-1 ■■■ 5-Z	B24	G . .	H . .	28.3 (62.4)
K302	63	1FK7063-5AF71-1 ■■■ 5-Z	B35	G . .	H . .	33.3 (73.4)
K302	63	1FK7063-5AF71-1 ■■■ 5-Z	B36	G . .	H . .	33.3 (73.4)
K402	63	1FK7063-5AF71-1 ■■■ 5-Z	B47	G . .	H . .	46.8 (103)
K513	63	1FK7063-5AF71-1 ■■■ 5-Z	B58	G . .	H . .	52.6 (116)
K202	80	1FK7080-5AF71-1 ■■■ 5-Z	B21	G . .	H . .	28.0 (61.7)
K202	80	1FK7080-5AF71-1 ■■■ 5-Z	B22	G . .	H . .	28.0 (61.7)
K202	80	1FK7080-5AF71-1 ■■■ 5-Z	B23	G . .	H . .	28.0 (61.7)
K302	80	1FK7080-5AF71-1 ■■■ 5-Z	B34	G . .	H . .	33.0 (72.8)
K202	80	1FK7080-5AF71-1 ■■■ 5-Z	B25	G . .	H . .	28.0 (61.7)
K302	80	1FK7080-5AF71-1 ■■■ 5-Z	B35	G . .	H . .	33.0 (72.8)
K402	80	1FK7080-5AF71-1 ■■■ 5-Z	B46	G . .	H . .	46.5 (103)
K513	80	1FK7080-5AF71-1 ■■■ 5-Z	B57	G . .	H . .	52.3 (115)
K613	80	1FK7080-5AF71-1 ■■■ 5-Z	B68	G . .	H . .	73.8 (163)
K202	80	1FK7083-5AF71-1 ■■■ 5-Z	B21	G . .	H . .	33.2 (73.2)
K202	80	1FK7083-5AF71-1 ■■■ 5-Z	B22	G . .	H . .	33.2 (73.2)
K302	80	1FK7083-5AF71-1 ■■■ 5-Z	B32	G . .	H . .	38.2 (84.2)
K202	80	1FK7083-5AF71-1 ■■■ 5-Z	B23	G . .	H . .	33.2 (73.2)
K302	80	1FK7083-5AF71-1 ■■■ 5-Z	B33	G . .	H . .	38.2 (84.2)
K302	80	1FK7083-5AF71-1 ■■■ 5-Z	B34	G . .	H . .	38.2 (84.2)
K402	80	1FK7083-5AF71-1 ■■■ 5-Z	B44	G . .	H . .	51.7 (114)
K302	80	1FK7083-5AF71-1 ■■■ 5-Z	B35	G . .	H . .	38.2 (84.2)
K513	80	1FK7083-5AF71-1 ■■■ 5-Z	B55	G . .	H . .	57.5 (127)
K513	80	1FK7083-5AF71-1 ■■■ 5-Z	B56	G . .	H . .	57.5 (127)
K513	80	1FK7083-5AF71-1 ■■■ 5-Z	B57	G . .	H . .	57.5 (127)
K613	80	1FK7083-5AF71-1 ■■■ 5-Z	B67	G . .	H . .	79.0 (174)
K513	80	1FK7083-5AF71-1 ■■■ 5-Z	B58	G . .	H . .	57.5 (127)
K713	80	1FK7083-5AF71-1 ■■■ 5-Z	B78	G . .	H . .	107.3 (237)
K402	80	1FK7083-5AF71-1 ■■■ 5-Z	B46	G . .	H . .	51.7 (114)
K402	100	1FK7100-5AF71-1 ■■■ 5-Z	B41	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■■ 5-Z	B42	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■■ 5-Z	B43	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■■ 5-Z	B44	G . .	H . .	53.9 (119)
K402	100	1FK7100-5AF71-1 ■■■ 5-Z	B45	G . .	H . .	53.9 (119)
K513	100	1FK7100-5AF71-1 ■■■ 5-Z	B55	G . .	H . .	59.7 (132)
K513	100	1FK7100-5AF71-1 ■■■ 5-Z	B56	G . .	H . .	59.7 (132)
K613	100	1FK7100-5AF71-1 ■■■ 5-Z	B66	G . .	H . .	81.2 (179)
K713	100	1FK7100-5AF71-1 ■■■ 5-Z	B77	G . .	H . .	109.5 (241)
K713	100	1FK7100-5AF71-1 ■■■ 5-Z	B78	G . .	H . .	109.5 (241)

<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder AM32S/R encoder Multi-pole resolver 2-pole resolver	<b>A E G S T</b>
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder AM16DQ encoder R15DQ resolver R14DQ resolver	<b>D F K U P</b>
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	<b>U V</b>

Order codes for type/gear shaft extension and type of construction/ mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 bevel geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{rperm}$ N (lb <sub>f</sub> )	$f_B$
<b>Natural cooling – SH 100</b>							
<b>4.72 (6.33)</b>	750	60.1 (44.3)	356 (263)	4	4/1	3346 (752)	3.4
	500	90.2 (66.5)	407 (300)	6	6/1	3830 (861)	2.6
	297	152 (112)	484 (357)	10	1333/132	4556 (1024)	1.8
	177	255 (188)	575 (424)	17	559/33	5414 (1217)	1.3
<b>4.66 (6.25)</b>	186	238 (176)	1000 (738)	16	26071/1620	6391 (1437)	2.4
	123	361 (266)	1000 (738)	24	11687/480	7337 (1649)	1.6
	125	356 (263)	1584 (1168)	24	24583/1024	8687 (1953)	2.6
	87	513 (378)	1600 (1180)	35	35441/1024	9813 (2206)	1.8
	85	525 (387)	2600 (1918)	35	567/16	13600 (3057)	2.8
<b>4.64 (6.22)</b>	60	739 (545)	2600 (1918)	50	166005/3328	15242 (3427)	2.0
<b>4.63 (6.21)</b>	46	961 (709)	2600 (1918)	65	33201/512	16635 (3740)	1.6
<b>4.67 (6.26)</b>	46	969 (714)	4650 (3430)	65	188387/2880	21991 (4944)	2.8
<b>5.17 (6.93)</b>	625	79 (58.3)	356 (263)	4	4/1	3346 (752)	2.5
<b>5.20 (6.97)</b>	417	119 (87.8)	407 (300)	6	6/1	3830 (861)	1.9
<b>5.19 (6.96)</b>	248	200 (148)	484 (357)	10	1333/132	4556 (1024)	1.4
<b>5.13 (6.88)</b>	246	199 (147)	900 (664)	10	203/20	5481 (1232)	2.6
	155	315 (232)	1000 (738)	16	26071/1620	6391 (1437)	1.8
	158	310 (229)	1380 (1018)	16	54839/3456	7567 (1701)	2.5
	103	477 (352)	1000 (738)	24	11687/480	7337 (1649)	1.2
	104	470 (347)	1584 (1168)	24	24583/1024	8687 (1953)	1.9
	72	678 (500)	1600 (1180)	35	35441/1024	9813 (2206)	1.3
<b>5.16 (6.92)</b>	71	694 (512)	2600 (1918)	35	567/16	13600 (3057)	2.1
<b>5.12 (6.87)</b>	50	978 (721)	2600 (1918)	50	166005/3328	15242 (3427)	1.5
<b>5.13 (6.88)</b>	51	960 (708)	4650 (3430)	49	5487/112	19971 (4490)	2.8
<b>5.19 (6.96)</b>	39	1271 (938)	2600 (1918)	65	33201/512	16635 (3740)	1.2
<b>5.09 (6.83)</b>	38	1280 (944)	4650 (3430)	65	188387/2880	21991 (4944)	2.1
<b>7.93 (10.6)</b>	750	101 (74.5)	356 (263)	4	4/1	3346 (752)	1.9
	500	151 (111)	407 (300)	6	6/1	3830 (861)	1.5
<b>7.81 (10.5)</b>	296	252 (186)	900 (664)	10	203/20	5481 (1232)	1.9
<b>7.93 (10.6)</b>	297	255 (188)	484 (357)	10	1333/132	4556 (1024)	1.0
<b>7.80 (10.5)</b>	189	394 (291)	1380 (1018)	16	54839/3456	7567 (1701)	1.9
	186	400 (295)	1000 (738)	16	26071/1620	6391 (1437)	1.4
	125	597 (440)	1584 (1168)	24	24583/1024	8687 (1953)	1.4
	119	626 (462)	2600 (1918)	25	64449/2560	12135 (2728)	2.3
<b>7.84 (10.5)</b>	85	881 (650)	2600 (1918)	35	567/16	3276 (736)	1.6
<b>7.80 (10.5)</b>	83	898 (662)	4255 (3139)	36	2891/80	18045 (4057)	2.6
	61	1218 (898)	4650 (3430)	49	5487/112	19971 (4490)	2.1
	60	1240 (915)	2600 (1918)	50	166005/3328	15242 (3427)	1.1
<b>7.83 (10.5)</b>	46	1626 (1199)	4650 (3430)	65	188387/2880	21991 (4944)	1.5

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 bevel geared motors

Gearbox size	Motor shaft height	1FK7 bevel geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Type/gear shaft extension	Type of construction/ mounting position/ connector mounting position	
SH						
K402	100	1FK7101-5AF71-1 ■■■ 5-Z	B41	G . .	H . .	59.5 (131)
K402	100	1FK7101-5AF71-1 ■■■ 5-Z	B42	G . .	H . .	59.5 (131)
K402	100	1FK7101-5AF71-1 ■■■ 5-Z	B43	G . .	H . .	59.5 (131)
K402	100	1FK7101-5AF71-1 ■■■ 5-Z	B44	G . .	H . .	59.5 (131)
K513	100	1FK7101-5AF71-1 ■■■ 5-Z	B54	G . .	H . .	65.3 (144)
K513	100	1FK7101-5AF71-1 ■■■ 5-Z	B55	G . .	H . .	65.3 (144)
K613	100	1FK7101-5AF71-1 ■■■ 5-Z	B65	G . .	H . .	86.8 (191)
K613	100	1FK7101-5AF71-1 ■■■ 5-Z	B66	G . .	H . .	86.8 (191)
K713	100	1FK7101-5AF71-1 ■■■ 5-Z	B76	G . .	H . .	115.1 (254)
K713	100	1FK7101-5AF71-1 ■■■ 5-Z	B77	G . .	H . .	115.1 (254)
K713	100	1FK7101-5AF71-1 ■■■ 5-Z	B78	G . .	H . .	115.1 (254)
K813	100	1FK7101-5AF71-1 ■■■ 5-Z	B88	G . .	H . .	168.5 (372)
K402	100	1FK7103-5AF71-1 ■■■ 5-Z	B41	G . .	H . .	66.1 (146)
K402	100	1FK7103-5AF71-1 ■■■ 5-Z	B42	G . .	H . .	66.1 (146)
K402	100	1FK7103-5AF71-1 ■■■ 5-Z	B43	G . .	H . .	66.1 (146)
K513	100	1FK7103-5AF71-1 ■■■ 5-Z	B53	G . .	H . .	71.9 (159)
K513	100	1FK7103-5AF71-1 ■■■ 5-Z	B54	G . .	H . .	71.9 (159)
K613	100	1FK7103-5AF71-1 ■■■ 5-Z	B64	G . .	H . .	93.4 (206)
K513	100	1FK7103-5AF71-1 ■■■ 5-Z	B55	G . .	H . .	71.9 (159)
K613	100	1FK7103-5AF71-1 ■■■ 5-Z	B65	G . .	H . .	93.4 (206)
K613	100	1FK7103-5AF71-1 ■■■ 5-Z	B66	G . .	H . .	93.4 (206)
K713	100	1FK7103-5AF71-1 ■■■ 5-Z	B76	G . .	H . .	121.7 (268)
K713	100	1FK7103-5AF71-1 ■■■ 5-Z	B77	G . .	H . .	121.7 (268)
K813	100	1FK7103-5AF71-1 ■■■ 5-Z	B87	G . .	H . .	175.1 (386)
K713	100	1FK7103-5AF71-1 ■■■ 5-Z	B78	G . .	H . .	121.7 (268)
K813	100	1FK7103-5AF71-1 ■■■ 5-Z	B88	G . .	H . .	175.1 (386)
K402	100	1FK7105-5AF71-1 ■■■ 5-Z	B41	G . .	H . .	76.1 (168)
K402	100	1FK7105-5AF71-1 ■■■ 5-Z	B42	G . .	H . .	76.1 (168)
K513	100	1FK7105-5AF71-1 ■■■ 5-Z	B53	G . .	H . .	82.0 (181)
K402	100	1FK7105-5AF71-1 ■■■ 5-Z	B43	G . .	H . .	76.1 (168)
K613	100	1FK7105-5AF71-1 ■■■ 5-Z	B64	G . .	H . .	103 (227)
K513	100	1FK7105-5AF71-1 ■■■ 5-Z	B54	G . .	H . .	82.0 (181)
K613	100	1FK7105-5AF71-1 ■■■ 5-Z	B65	G . .	H . .	103 (227)
K713	100	1FK7105-5AF71-1 ■■■ 5-Z	B75	G . .	H . .	132 (291)
K713	100	1FK7105-5AF71-1 ■■■ 5-Z	B76	G . .	H . .	132 (291)
K813	100	1FK7105-5AF71-1 ■■■ 5-Z	B86	G . .	H . .	185 (408)
K813	100	1FK7105-5AF71-1 ■■■ 5-Z	B87	G . .	H . .	185 (408)
K713	100	1FK7105-5AF71-1 ■■■ 5-Z	B77	G . .	H . .	132 (291)
K813	100	1FK7105-5AF71-1 ■■■ 5-Z	B88	G . .	H . .	185 (408)

<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder AM32S/R encoder Multi-pole resolver 2-pole resolver	A E G S T	. .	. .
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder AM16DQ encoder R15DQ resolver R14DQ resolver	D F K U P		
<b>Holding brake:</b>	Motor without holding brake Motor with holding brake	U V		

Order codes for type/gear shaft extension and type of construction/  
mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 worm geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{rperm}$ N (lb <sub>f</sub> )	$f_B$
<b>Natural cooling – SH 36/SH 48/SH 63</b>							
<b>0.28 (0.38)</b>	312 172	8.5 (6.27) 15.3 (11.3)	43 (31.7) 73 (53.8)	9.6 17.5	1107/115 297/17	1689 (380) 1938 (436)	4.1 3.9
<b>0.27 (0.36)</b>	128 86	20.2 (14.9) 30.0 (22.1)	82 (60.5) 125 (92.2)	23 35	117/5 873/25	2271 (511) 2441 (549)	3.3 3.4
<b>0.24 (0.32)</b>	51 52	45.6 (33.6) 45.8 (33.8)	88 (64.9) 172 (126.9)	59 58	117/2 405/7	3082 (693) 2889 (649)	1.6 3.1
	40 43	57.7 (42.6) 54.8 (40.4)	96 (70.8) 184 (136)	75 70	747/10 279/4	3343 (752) 3075 (691)	1.4 2.7
<b>0.38 (0.51)</b>	172 86	21.2 (15.6) 41.6 (30.7)	110 (81.1) 150 (111)	17.5 35	297/17 873/25	1938 (436) 2441 (549)	4.4 3.0
<b>0.35 (0.47)</b>	52 43	63.4 (46.8) 75.9 (56.0)	172 (127) 184 (136)	58 70	405/7 279/4	2889 (649) 3075 (691)	2.3 2.0
<b>0.73 (0.98)</b>	172 130	40.8 (30.1) 53.6 (39.5)	110 (81.1) 132 (97.4)	17.5 23	297/17 162/7	1938 (436) 2128 (478)	2.3 2.1
<b>0.72 (0.97)</b>	86 86	80.1 (59.1) 79.9 (58.9)	150 (111) 252 (186)	35 35	873/25 243/7	2441 (549) 3411 (767)	1.6 2.7
<b>0.66 (0.89)</b>	52	122 (90.0)	172 (127)	58	405/7	2889 (649)	1.2
<b>0.69 (0.93)</b>	52	126 (92.9)	302 (223)	58	1863/32	4053 (911)	2.1
<b>0.66 (0.89)</b>	43	146 (108)	184 (136)	70	279/4	3075 (691)	1.1
<b>0.68 (0.91)</b>	43	151 (111)	324 (239)	70	351/5	4314 (970)	1.9
<b>1.35 (1.81)</b>	326	39.5 (29.1)	74 (54.6)	9.2	46/5	1565 (352)	1.5
<b>1.33 (1.78)</b>	172 171	73.7 (54.4) 74.4 (54.9)	110 (81.1) 217 (160)	17.5 17.5	297/17 351/20	1938 (436) 2717 (611)	1.2 2.3
<b>1.31 (1.76)</b>	129 86 86	97.9 (72.2) 144 (106) 146 (108)	259 (191) 310 (229) 498 (367)	23 35 35	1863/80 243/7 2268/65	2986 (671) 3411 (767) 4881 (1097)	2.1 1.7 2.7
<b>1.24 (1.66)</b>	52 51	227 (167) 232 (171)	302 (233) 561 (414)	58 59	1863/32 117/2	4053 (911) 5799 (1304)	1.0 1.9
	43 43	275 (203) 277 (204)	609 (449) 791 (583)	70 70	2241/32 279/4	6157 (1384) 7994 (1797)	1.7 2.2



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 worm geared motors

Gearbox size	Motor shaft height	1FK7 worm geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Gearbox type	Type/gear shaft extension Type of construction/ mounting position/ connector mounting position	
SH						
S002	36	1FK7032-5AK71-1 ■■■ 5-Z	E03	G . .	H . .	6.6 (14.6)
S102	36	1FK7032-5AK71-1 ■■■ 5-Z	E14	G . .	H . .	12.9 (28.4)
S002	36	1FK7032-5AK71-1 ■■■ 5-Z	E05	G . .	H . .	6.6 (14.6)
S102	36	1FK7032-5AK71-1 ■■■ 5-Z	E16	G . .	H . .	12.9 (28.4)
S002	36	1FK7032-5AK71-1 ■■■ 5-Z	E07	G . .	H . .	6.6 (14.6)
S102	36	1FK7032-5AK71-1 ■■■ 5-Z	E17	G . .	H . .	12.9 (28.4)
S002	36	1FK7032-5AK71-1 ■■■ 5-Z	E08	G . .	H . .	6.6 (14.6)
S102	36	1FK7032-5AK71-1 ■■■ 5-Z	E18	G . .	H . .	12.9 (28.4)
S102	48	1FK7040-5AK71-1 ■■■ 5-Z	E14	G . .	H . .	13.7 (30.2)
S102	48	1FK7040-5AK71-1 ■■■ 5-Z	E16	G . .	H . .	13.7 (30.2)
S102	48	1FK7040-5AK71-1 ■■■ 5-Z	E17	G . .	H . .	13.7 (30.2)
S102	48	1FK7040-5AK71-1 ■■■ 5-Z	E18	G . .	H . .	13.7 (30.2)
S102	48	1FK7042-5AF71-1 ■■■ 5-Z	E14	G . .	H . .	15.0 (33.1)
S102	48	1FK7042-5AF71-1 ■■■ 5-Z	E15	G . .	H . .	15.0 (33.1)
S102	48	1FK7042-5AF71-1 ■■■ 5-Z	E16	G . .	H . .	15.0 (33.1)
S202	48	1FK7042-5AF71-1 ■■■ 5-Z	E26	G . .	H . .	22.5 (49.6)
S102	48	1FK7042-5AF71-1 ■■■ 5-Z	E17	G . .	H . .	15.0 (33.1)
S202	48	1FK7042-5AF71-1 ■■■ 5-Z	E27	G . .	H . .	22.5 (49.6)
S102	48	1FK7042-5AF71-1 ■■■ 5-Z	E18	G . .	H . .	15.0 (33.1)
S202	48	1FK7042-5AF71-1 ■■■ 5-Z	E28	G . .	H . .	22.5 (49.6)
S102	63	1FK7060-5AF71-1 ■■■ 5-Z	E13	G . .	H . .	17.7 (39.0)
S102	63	1FK7060-5AF71-1 ■■■ 5-Z	E14	G . .	H . .	17.7 (39.0)
S202	63	1FK7060-5AF71-1 ■■■ 5-Z	E24	G . .	H . .	25.2 (55.6)
S202	63	1FK7060-5AF71-1 ■■■ 5-Z	E25	G . .	H . .	25.2 (55.6)
S202	63	1FK7060-5AF71-1 ■■■ 5-Z	E26	G . .	H . .	25.2 (55.6)
S302	63	1FK7060-5AF71-1 ■■■ 5-Z	E36	G . .	H . .	34.4 (75.9)
S202	63	1FK7060-5AF71-1 ■■■ 5-Z	E27	G . .	H . .	25.2 (55.6)
S302	63	1FK7060-5AF71-1 ■■■ 5-Z	E37	G . .	H . .	34.4 (75.9)
S302	63	1FK7060-5AF71-1 ■■■ 5-Z	E38	G . .	H . .	34.4 (75.9)
S402	63	1FK7060-5AF71-1 ■■■ 5-Z	E48	G . .	H . .	43.6 (96.1)

**Encoder systems for motors without DRIVE-CLiQ interface:** IC2048S/R encoder  
AM2048S/R encoder (from shaft height 48)  
AM512S/R encoder (shaft height 36 only)  
AM32S/R encoder (from shaft height 48)  
AM16S/R encoder (shaft height 36 only)  
Multi-pole resolver  
2-pole resolver

**Encoder systems for motors with DRIVE-CLiQ interface:** IC22DQ encoder  
AM22DQ encoder (from shaft height 48)  
AM20DQ encoder (shaft height 36 only)  
AM16DQ encoder (from shaft height 48)  
AM15DQ encoder (shaft height 36 only)  
R15DQ resolver  
R14DQ resolver

**Holding brake:** Motor without holding brake  
Motor with holding brake

A  
E  
H  
G  
J  
S  
TD  
F  
L  
K  
V  
U  
PU  
V

Order codes for type/gear shaft extension and type of construction/mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 worm geared motors

#### Selection and ordering data

Power at duty type S3-60 %	Output speed at the gear shaft	Rated output torque gearbox at duty type S3-60 %	Acceleration torque, max. gearbox	Nominal ratio	Exact ratio	Cantilever force, perm. gear shaft extension	Overload factor
$P_2$ kW (HP)	$n_2$ rpm	$M_2$ Nm (lb <sub>r</sub> -ft)	$M_{2max}$ Nm (lb <sub>r</sub> -ft)	$i_{nom}$	$i_{exact}$	$F_{rperm}$ N (lb <sub>f</sub> )	$f_B$
<b>Natural cooling – SH 63/SH 80/SH 100</b>							
<b>2.11 (2.83)</b>	325	61.9 (45.7)	126 (92.9)	9.2	1431/155	2194 (493)	1.4
<b>2.08 (2.79)</b>	171	116 (85.6)	217 (160)	17.5	351/20	2717 (611)	1.2
<b>2.05 (2.75)</b>	129	152 (112)	259 (191)	23	1863/80	2986 (671)	1.1
	86	227 (167)	498 (367)	35	2268/65	4881 (1097)	1.5
<b>1.92 (2.57)</b>	51	360 (266)	561 (414)	59	117/2	5799 (1304)	1.0
<b>1.94 (2.60)</b>	43	430 (317)	791 (583)	70	279/4	7994 (1797)	1.2
<b>1.93 (2.59)</b>	171	108 (79.7)	217 (160)	17.5	351/20	2717 (611)	1.7
	173	107 (78.9)	373 (275)	17.5	1998/115	3869 (870)	3.0
	129	142 (105)	259 (191)	23	1863/80	2986 (671)	1.6
	128 86	144 (106) 213 (157)	458 (338) 720 (531)	23 35	117/5 873/25	4273 (961) 6347 (1427)	2.7 2.9
<b>1.79 (2.40)</b>	51	335 (247)	561 (414)	59	117/2	5799 (1304)	1.4
	43	399 (294)	609 (449)	70	2241/32	6157 (1384)	1.3
<b>3.05 (4.09)</b>	322	90.5 (66.8)	216 (159)	9.3	270/29	3143 (707)	1.6
<b>3.01 (4.04)</b>	173	166 (122)	373 (275)	17.5	1998/115	3869 (870)	1.5
<b>3.03 (4.06)</b>	172	168 (124)	557 (411)	17.5	612/35	5040 (1133)	2.2
<b>2.98 (4.00)</b>	128	222 (164)	458 (338)	23	117/5	4273 (961)	1.4
	128	222 (164)	685 (505)	23	117/5	5554 (1249)	2.0
<b>2.95 (3.96)</b>	86	328 (242)	720 (531)	35	873/25	6347 (1427)	1.4
<b>3.47 (4.65)</b>	259	128 (94.4)	371 (274)	11.5	81/7	4392 (987)	1.9
<b>3.44 (4.61)</b>	172	191 (141)	557 (411)	17.5	612/35	5040 (1133)	1.9
<b>4.50 (6.03)</b>	259	166 (122)	371 (274)	11.5	81/7	4392 (987)	1.3
<b>4.45 (5.97)</b>	172	247 (182)	557 (411)	17.5	612/35	5040 (1133)	1.3

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors 1FK7 worm geared motors

Gearbox size	Motor shaft height	1FK7 worm geared motors				Gearbox weight, approx. kg (lb)
		Order No.	Order codes	Gearbox type	Type/gear shaft extension Type of construction/ mounting position/ connector mounting position	
SH						
S202	63	1FK7063-5AF71-1 ■■■ 5-Z	E23	G . .	H . .	28.9 (63.7)
S202	63	1FK7063-5AF71-1 ■■■ 5-Z	E24	G . .	H . .	28.9 (63.7)
S202	63	1FK7063-5AF71-1 ■■■ 5-Z	E25	G . .	H . .	28.9 (63.7)
S302	63	1FK7063-5AF71-1 ■■■ 5-Z	E36	G . .	H . .	38.1 (84.0)
S302	63	1FK7063-5AF71-1 ■■■ 5-Z	E37	G . .	H . .	38.1 (84.0)
S402	63	1FK7063-5AF71-1 ■■■ 5-Z	E48	G . .	H . .	47.3 (104)
S202	80	1FK7080-5AF71-1 ■■■ 5-Z	E24	G . .	H . .	28.6 (63.1)
S302	80	1FK7080-5AF71-1 ■■■ 5-Z	E34	G . .	H . .	37.8 (83.4)
S202	80	1FK7080-5AF71-1 ■■■ 5-Z	E25	G . .	H . .	28.6 (63.1)
S302	80	1FK7080-5AF71-1 ■■■ 5-Z	E35	G . .	H . .	37.8 (83.4)
S402	80	1FK7080-5AF71-1 ■■■ 5-Z	E46	G . .	H . .	47 (104)
S302	80	1FK7080-5AF71-1 ■■■ 5-Z	E37	G . .	H . .	37.8 (83.4)
S302	80	1FK7080-5AF71-1 ■■■ 5-Z	E38	G . .	H . .	37.8 (83.4)
S302	80	1FK7083-5AF71-1 ■■■ 5-Z	E33	G . .	H . .	43 (94.8)
S302	80	1FK7083-5AF71-1 ■■■ 5-Z	E34	G . .	H . .	43 (94.8)
S402	80	1FK7083-5AF71-1 ■■■ 5-Z	E44	G . .	H . .	52.2 (115)
S302	80	1FK7083-5AF71-1 ■■■ 5-Z	E35	G . .	H . .	43 (94.8)
S402	80	1FK7083-5AF71-1 ■■■ 5-Z	E45	G . .	H . .	52.2 (115)
S402	80	1FK7083-5AF71-1 ■■■ 5-Z	E46	G . .	H . .	52.2 (115)
S402	100	1FK7100-5AF71-1 ■■■ 5-Z	E43	G . .	H . .	54.4 (120)
S402	100	1FK7100-5AF71-1 ■■■ 5-Z	E44	G . .	H . .	54.4 (120)
S402	100	1FK7101-5AF71-1 ■■■ 5-Z	E43	G . .	H . .	60 (132)
S402	100	1FK7101-5AF71-1 ■■■ 5-Z	E44	G . .	H . .	60 (132)
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>	IC2048S/R encoder AM2048S/R encoder AM32S/R encoder Multi-pole resolver 2-pole resolver	A E G S T				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>	IC22DQ encoder AM22DQ encoder AM16DQ encoder R15DQ resolver R14DQ resolver	D F K U P				
<b>Holding brake:</b>	Motor <u>without</u> holding brake Motor <u>with</u> holding brake	U V				

Order codes for type/gear shaft extension and type of construction/mounting position/connector mounting position, see page 4/92.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Order No. supplements – Order codes

When ordering a geared servomotor with options, **-Z** should be added to the order number. The order code should also be specified for each additional required option. The description of the option must not be repeated in plain text in the order.

#### 1st order code: Gearbox type

- Bevel gearbox K102 to K813
- Parallel shaft gearbox F202 to F602
- Helical gearbox C002 to C812
- Worm gearbox S002 to S402

B..  
C..  
D..  
E..

[Complete order code for gearbox type, refer to selection and ordering data](#)

#### 2nd order code, 1st and 2nd positions: Type

- Foot-mounted
- Tapped hole group
- Flange (round)
- Foot-mounted and flange (round)
- Foot-mounted and tapped hole group

G 1 ■  
G 2 ■  
G 3 ■  
G 5 ■  
G 6 ■

#### 2nd order code, 3rd position: Gear shaft extension

##### Helical gearbox:

- Solid shaft with feather key

##### Parallel shaft gearbox:

- Solid shaft with feather key, gearbox side 5
- Hollow shaft with keyway, insertion side 5
- Hollow shaft with clamping element, shrink disk side 6, insertion side 5

##### Bevel and worm gearboxes:

- Solid shaft with feather key, gearbox side 4
- Hollow shaft with keyway, insertion side 4
- Hollow shaft with clamping element, shrink disk side 4, insertion side 3
- Solid shaft with feather key, gearbox side 3
- Hollow shaft with keyway, insertion side 3
- Hollow shaft with clamping element, shrink disk side 3, insertion side 4

1  
3  
4  
5  
7  
8

#### 3rd order code, 1st and 2nd positions: Type of construction/mounting position

##### Type of construction for helical gearboxes:

- IM B3 / IM B5 / IM B14 / IM B34 / IM B35
- IM B7
- IM B8
- IM B6
- IM V1
- IM V3 / IM V6 / IM V19
- IM V5
- IM V18

##### Mounting position for parallel shaft, bevel and worm gearboxes:

- EL 1
- EL 2
- EL 3
- EL 4
- EL 5
- EL 6
- 
- 

H 1 ■  
H 2 ■  
H 3 ■  
H 4 ■  
H 5 ■  
H 6 ■  
H 7 ■  
H 8 ■

#### 3rd order code, 3rd position: Connector mounting position

- Connector position on gearbox side 2, top
- Connector position on gearbox side 4, right
- Connector position on gearbox side 1, below
- Connector position on gearbox side 3, left

1  
2  
3  
4

[See page 4/94 for a diagram of the connector mounting position.](#)

4

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Order No. supplements – Order codes

#### Permissible combinations for option Q.. with G2.

#### 4th order code: Torque bracket for bevel and worm gearboxes

<u>Torque bracket position</u>	<u>Gearbox type and size</u>					
Side 1, eye side 4	K102/S102	Q12	and	G23	or	G28
Side 1, eye side 3	K102/S102	Q13		G27		G24
Side 5, eye side 4	K102/S102	Q14		G23		G28
Side 5, eye side 3	K102/S102	Q15		G27		G24
Side 2, eye side 4	K102	Q16		G23		G28
Side 2, eye side 3	K102	Q17		G27		G24
Side 1, eye side 4	K202/S202	Q22		G23		G28
Side 1, eye side 3	K202/S202	Q23		G27		G24
Side 5, eye side 4	K202/S202	Q24		G23		G28
Side 5, eye side 3	K202/S202	Q25		G27		G24
Side 1, eye side 4	K302/S302	Q32		G23		G28
Side 1, eye side 3	K302/S302	Q33		G27		G24
Side 5, eye side 4	K302/S302	Q34		G23		G28
Side 5, eye side 3	K302/S302	Q35		G27		G24
Side 1, eye side 4	K402/S402	Q42		G23		G28
Side 1, eye side 3	K402/S402	Q43		G27		G24
Side 5, eye side 4	K402/S402	Q44		G23		G28
Side 5, eye side 3	K402/S402	Q45		G27		G24
Side 1, eye side 4	K513	Q52		G23		G28
Side 1, eye side 3	K513	Q53		G27		G24
Side 5, eye side 4	K513	Q54		G23		G28
Side 5, eye side 3	K513	Q55		G27		G24
Side 1, eye side 4	K613	Q62		G23		G28
Side 1, eye side 3	K613	Q63		G27		G24
Side 5, eye side 4	K613	Q64		G23		G28
Side 5, eye side 3	K613	Q65		G27		G24
Side 1, eye side 4	K713	Q72		G23		G28
Side 1, eye side 3	K713	Q73		G27		G24
Side 5, eye side 4	K713	Q74		G23		G28
Side 5, eye side 3	K713	Q75		G27		G24
Side 1, eye side 4	K813	Q82		G23		G28
Side 1, eye side 3	K813	Q83		G27		G24
Side 5, eye side 4	K813	Q84		G23		G28
Side 5, eye side 3	K813	Q85		G27		G24

See page 4/94 for diagram showing position of the torque arm and position of the mounting bracket.

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Order No. supplements – Order codes

##### 5th order code, other options

Paint finish: Jet black, matt RAL 9005

Paint finish: Cream white RAL 9001

Paint finish: Reseda green RAL 6011

Paint finish: Pebble gray RAL 7032

Paint finish: Sky blue RAL 5015

Paint finish: Light ivory RAL 1015

Paint finish: Squirrel gray RAL 7000

Paint finish: White aluminum RAL 9006

Paint finish: Gentian blue RAL 5010

Paint finish: Pure orange RAL 2004

Food-grade gear oil

X01

X02

X03

X04

X05

X06

X07

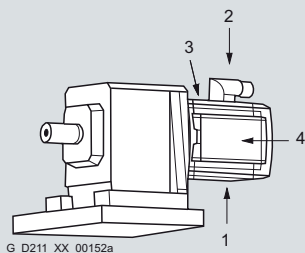
X08

X12

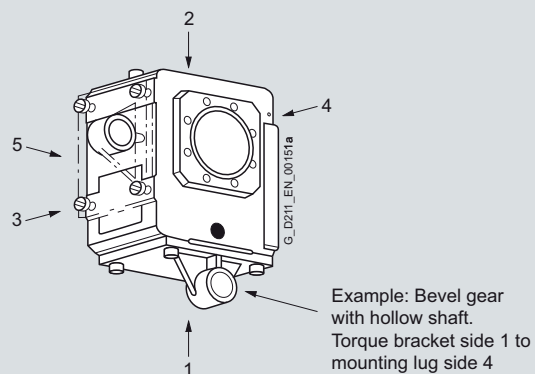
X19

Q90

For option Q90, the Order No. for the geared servomotor must also be changed in the 16th position from 5 to 7: 1FK7...-5A.71-1..7-Z



Connector mounting position



Gearbox sides shown with position of the torque bracket and position of the fixing eye

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Order No. supplements – Order codes

#### Permissible combinations for option G.. with H.. and Q..

Order code	Description	Permissible G options for gearbox type			Permissible H-Q options for gearbox type		
		Helical gear	Parallel shaft	Bevel gear/worm	Helical gear	Parallel shaft	Bevel gear/worm
G11	Foot-mounted, solid shaft with feather key	✓			H1. to H4. H6./H7.		
G13	Footed-mounted, hollow shaft with keyway (insertion gearbox side 4)						
G14	Footed-mounted, hollow shaft with shrink disk (insertion gearbox side 4)						
G15	Foot-mounted, solid shaft with feather key (gearbox side 3)						
G17	Footed-mounted, hollow shaft with keyway (insertion gearbox side 3)						
G18	Footed-mounted, hollow shaft with shrink disk (gearbox side 3)						
G21	Tapped hole group, solid shaft with keyway (gearbox side 4 for bevel and worm)	✓		✓ 1)	H1./H6./H8.		H1. to H6.
G23	Tapped hole group, solid shaft with keyway (insertion gearbox side 5 for parallel shaft gearbox, insertion gearbox side 4 for bevel and worm)		✓	✓ 1)		H1. to H6.	H1. to H6. Q..
G24	Tapped hole group, hollow shaft with shrink disk (shrink disk on gearbox side 6 and insertion side 5 for parallel shaft gearbox; shrink disk on gearbox side 4 and insertion side 3 for bevel and worm)		✓	✓ 1)			
G25	Tapped hole group, solid shaft with feather key (gearbox side 3)			✓ 1)			H1. to H6.
G27	Tapped hole group, hollow shaft with feather key (insertion gearbox side 3)			✓ 1)			H1. to H6. Q..
G28	Tapped hole group, hollow shaft with shrink disk (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)			✓ 1)			
G31	Flange (round), solid shaft with feather key (gearbox side 5 for parallel shaft gearbox; side 4 for bevel and worm)	✓	✓	✓ 1)	H1./H5./H6.	H1. to H6.	H1. to H6.
G33	Flange (round), hollow shaft with keyway (insertion gearbox side 4)		✓	✓ 1)			
G34	Flange (round), hollow shaft with shrink disk, shrink disk on gearbox side 6 and insertion side 5 for parallel shaft gearbox; shrink disk on gearbox side 4 and insertion side 3 for bevel and worm)		✓	✓ 1)			
G35	Flange (round), solid shaft with feather key (gearbox side 3)			✓ 1)			
G37	Flange (round), hollow shaft with keyway (insertion gearbox side 3)			✓ 1)			
G38	Flange (round), hollow shaft with shrink disk (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)			✓			

<sup>1)</sup> Not for worm gear of gearbox size S002 (gearbox type E0.).

# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Order No. supplements – Order codes

##### Permissible combinations for option G.. with H..

Order code	Description	Permissible G options for gearbox type		Permissible H options for gearbox type	
		Helical gear	Bevel gear/worm	Helical gear	Bevel gear/worm
<b>G51</b>	Foot-mounted and flange (round), solid shaft with feather key (gearbox side 4 for bevel and worm)	✓ 1)	✓ 2)	H1./H2.	H1. to H6.
<b>G53</b>	Foot-mounted and flange (round), hollow shaft with keyway (insertion gearbox side 4)		✓ 2)		
<b>G54</b>	Foot-mounted and flange (round), hollow shaft with shrink disk (shrink disk on gearbox side 4 and insertion side 4 for bevel and worm)		✓ 2)		
<b>G55</b>	Foot-mounted and flange (round), solid shaft with feather key (gearbox side 3)		✓ 2)		
<b>G57</b>	Foot-mounted and flange (round), hollow shaft with keyway (insertion gearbox side 3)		✓ 2)		
<b>G58</b>	Foot-mounted and flange (round), hollow shaft with shrink disk (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)		✓ 2)		
<b>G61</b>	Foot-mounted and tapped hole group, solid shaft with feather key (gearbox side 4 for bevel and worm)	✓	✓	H1./H2.	H1. to H6.
<b>G63</b>	Foot-mounted and tapped hole group, hollow shaft with keyway (insertion gearbox side 4)		✓		
<b>G64</b>	Foot-mounted and tapped hole group, hollow shaft with shrink disk (shrink disk on gearbox side 4 and insertion side 4 for bevel and worm)		✓		
<b>G65</b>	Foot-mounted and tapped hole group, solid shaft with feather key (gearbox side 3)		✓		
<b>G67</b>	Foot-mounted and tapped hole group, hollow shaft with keyway (insertion gearbox side 3)		✓		
<b>G68</b>	Foot-mounted and tapped hole group, hollow shaft with shrink disk (shrink disk on gearbox side 3 and insertion side 4 for bevel and worm)		✓		

<sup>1)</sup> The flange diameter for helical gearboxes with foot mounting and flange is one diameter grade smaller in each case than the diameter for helical gearboxes with flange only (without foot mounting).

<sup>2)</sup> Only for 1FK706 to 1FK710 with gearbox sizes K513 to K813 (gearbox types B5. to B8.).



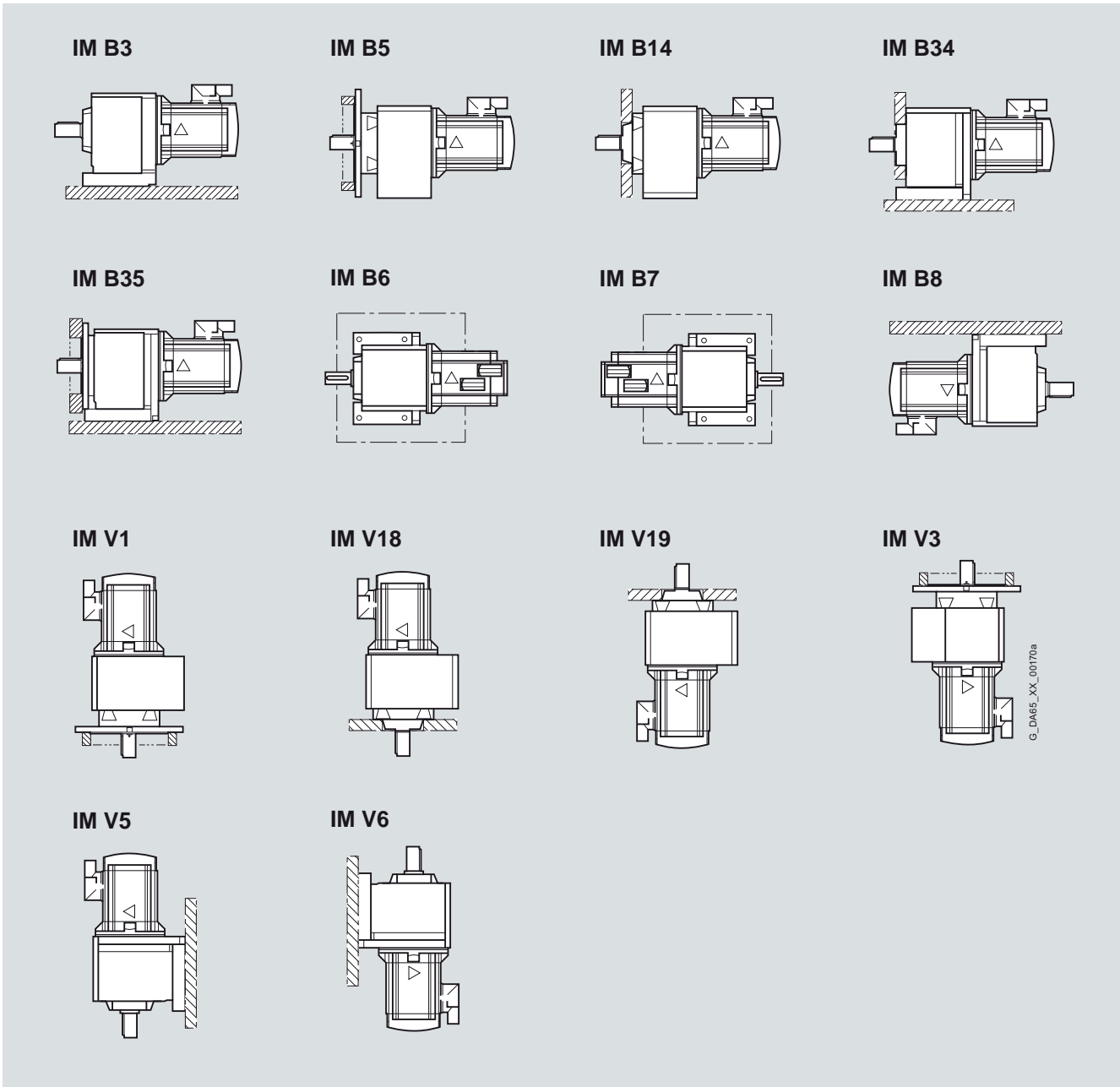
# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Selection guides

#### Helical geared motors – Types of construction



# SIMOTICS servomotors

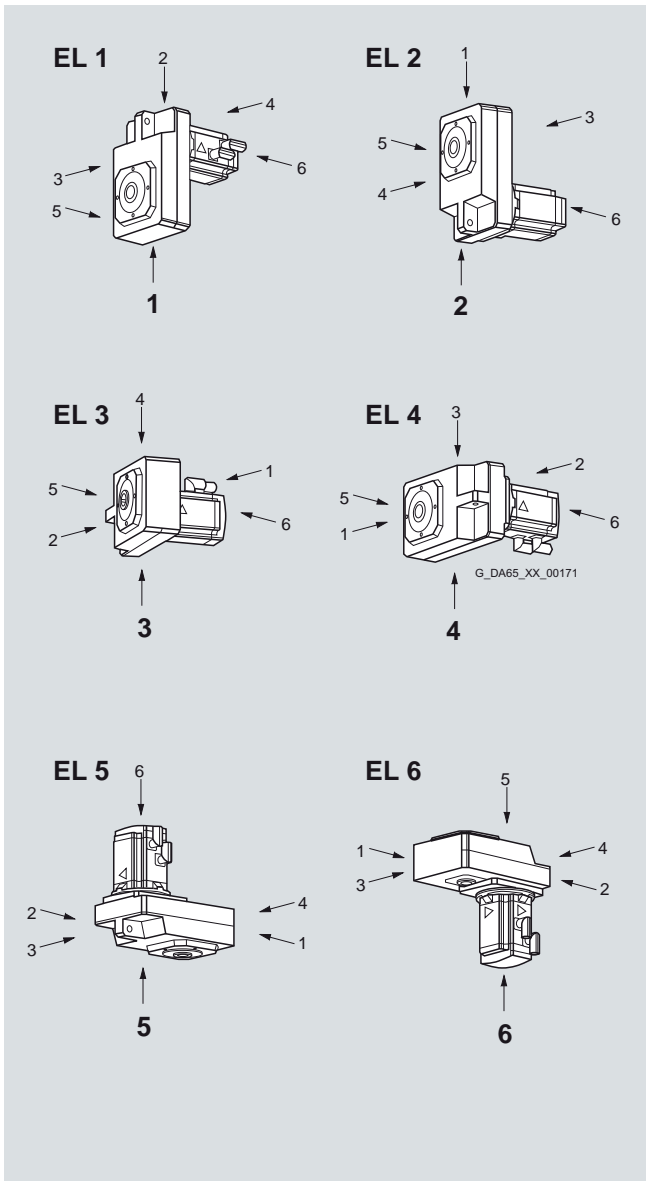
## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

#### Selection guides

#### Parallel shaft geared motors – Mounting positions EL 1 to EL 6

4



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

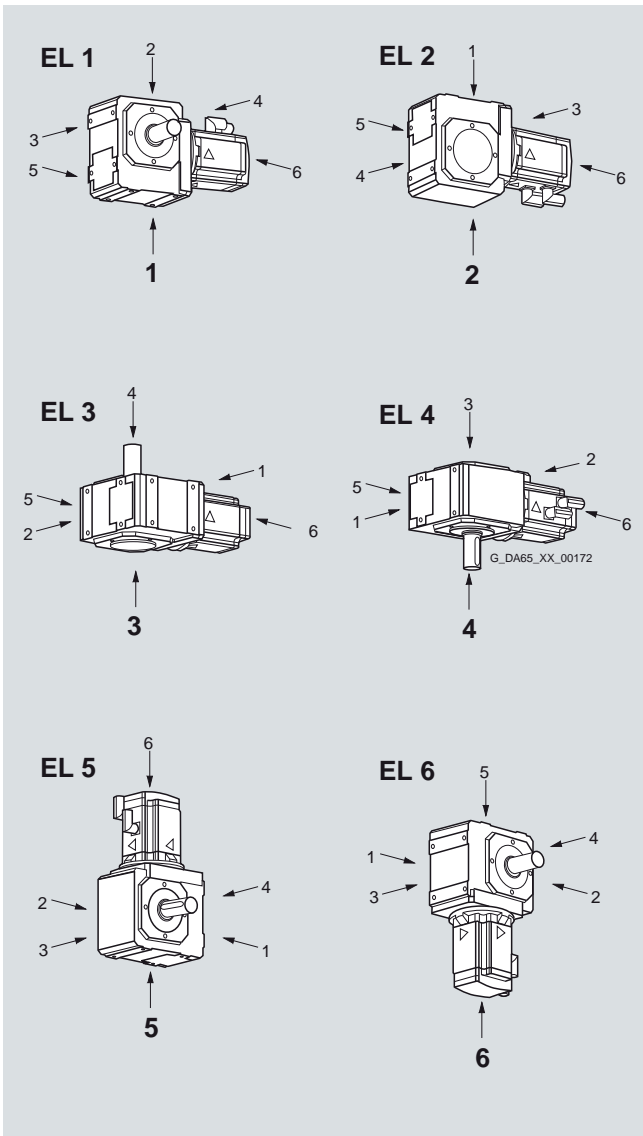
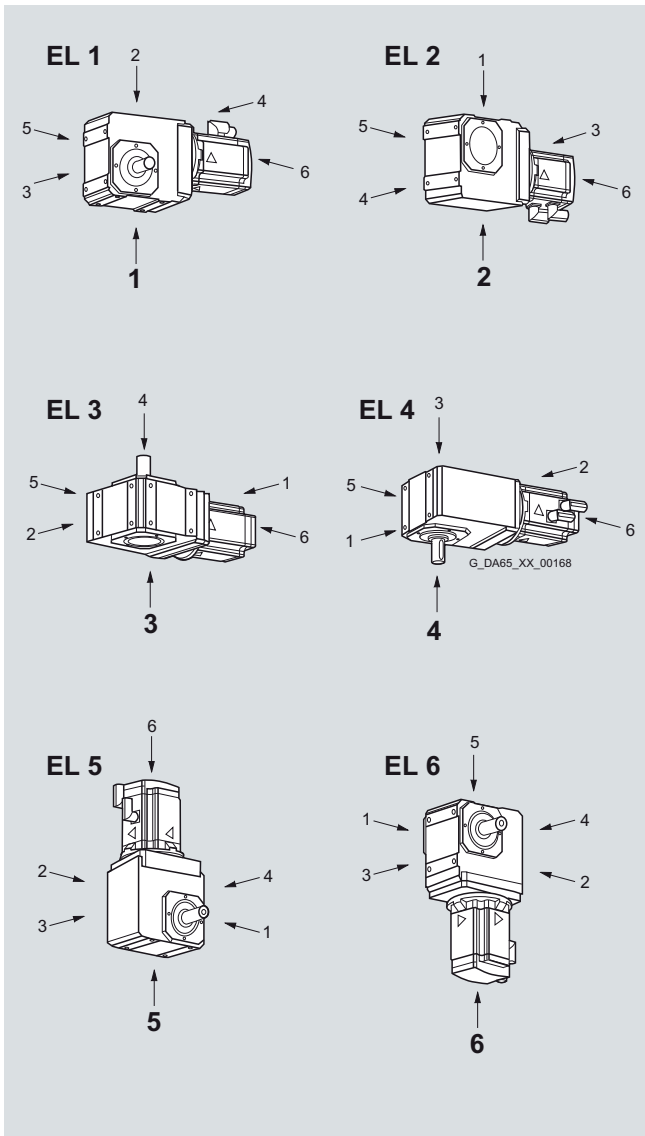
### SIMOTICS S-1FK7 geared servomotors

#### Selection guides

#### Bevel geared motors – Mounting positions EL 1 to EL 6

Gearbox sizes K102 to K402

Gearbox sizes K513 to K813



# SIMOTICS servomotors

## SIMOTICS S synchronous motors for SINAMICS S120

### SIMOTICS S-1FK7 geared servomotors

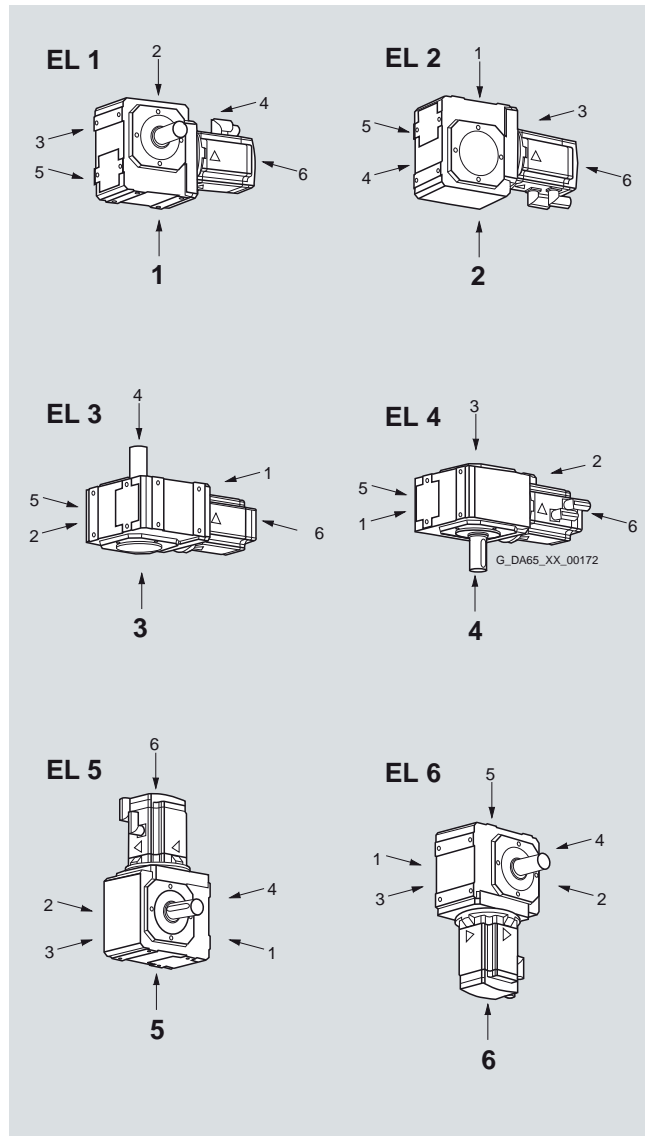
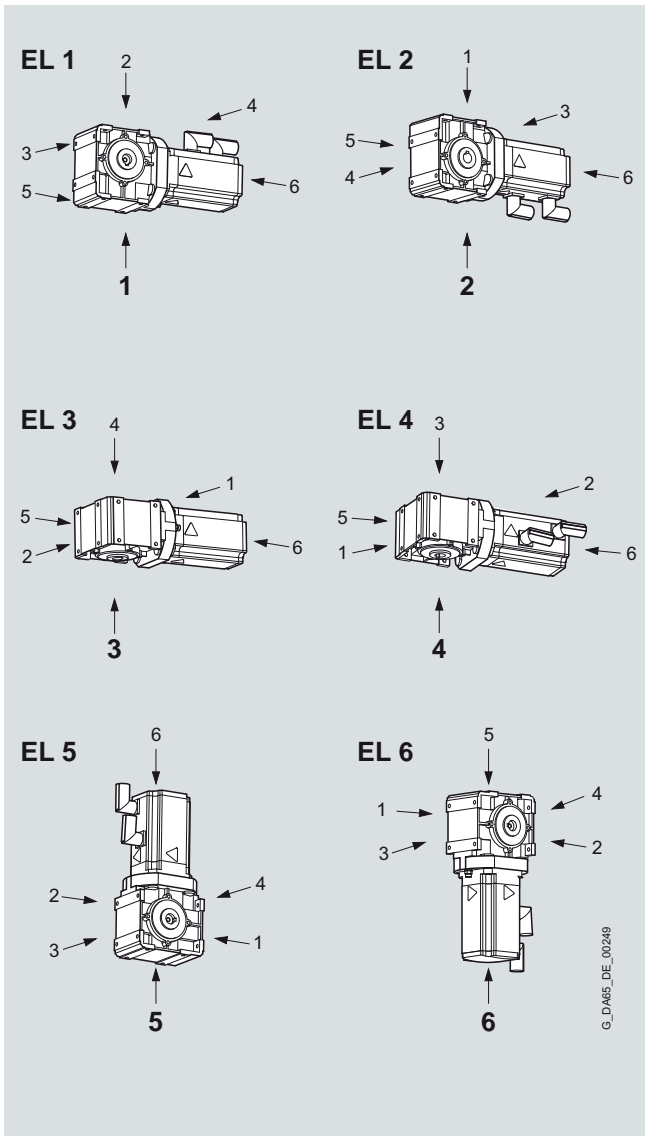
#### Selection guides

##### Worm geared motors – Mounting positions EL 1 to EL 6

Gearbox size S002

Gearbox sizes S102 to S402

4





# SIMOTICS servomotors

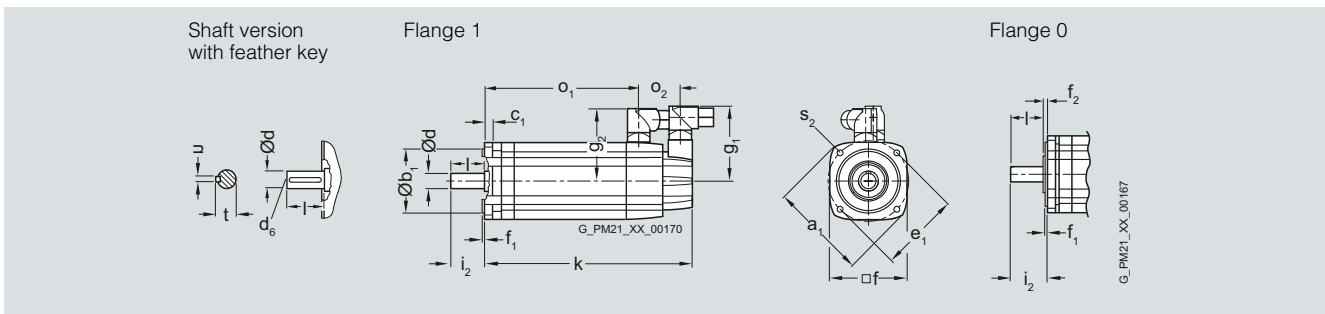
## Dimensional drawings

### 1FT7 without DRIVE-CLiQ – Natural cooling

#### Dimensional drawings

For motor		Dimensions in mm (inches)											Connector size		Shaft extension DE					
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	o <sub>2</sub> –	s <sub>2</sub> S	g <sub>1</sub> –	Size 1		Size 1.5		d D	d <sub>6</sub> –	l E	t GA	u F
												g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –					
<b>1FT7 natural cooling, with connector, without/with brake</b>																				
36	1FT703.-5A		90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	48 (1.89)	6.5 (0.26)	77 (3.03)	80 (3.15)	–	–	–	<b>14</b> (0.55)	M5	30 (1.18)	16 (0.63)	5 (0.20)
48	1FT704.-5A		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	53 (2.09)	6.5 (0.26)	93 (3.66)	90 (3.54)	–	–	–	<b>19</b> (0.75)	M6	40 (1.57)	21.5 (0.85)	6 (0.24)
63	1FT706.-5A		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	53 (2.09)	9 (0.35)	93 (3.66)	104 (4.09)	–	–	–	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)
80	1FT708.-5A		195 (7.68)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	51 (2.01)	11 (0.43)	93 (3.66)	119 (4.69)	140 (5.51)	–	–	<b>32</b> (1.26)	M12	58 (2.28)	35 (1.38)	10 (0.39)
100	1FT710.-5A		245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	56 (2.20)	14 (0.55)	93 (3.66)	–	160 (6.30)	–	–	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)

Shaft height	Type	DIN IEC	Flange 0				Flange 1 (1FT6-compatible)						
			f <sub>2</sub> –	i <sub>2</sub> –	k LB	o <sub>1</sub> –	k LB	o <sub>1</sub> –	i <sub>2</sub> –	k LB	o <sub>1</sub> –	k LB	o <sub>1</sub> –
36	1FT7034		5.5 (0.22)	36.5 (1.44)	189 (7.44)	127 (5.00)	216 (8.50)	154 (6.06)	30 (1.18)	195 (7.68)	133 (5.24)	222 (8.74)	160 (6.30)
	1FT7036				237 (9.33)	175 (6.89)	264 (10.39)	202 (7.95)		243 (9.57)	181 (7.13)	270 (10.63)	208 (8.19)
48	1FT7042		5.5 (0.22)	46 (1.81)	163 (6.42)	96 (3.78)	195 (7.68)	128 (5.04)	40 (1.57)	169 (6.65)	102 (4.02)	201 (7.91)	134 (5.28)
	1FT7044				213 (8.39)	146 (5.75)	245 (9.65)	178 (7.01)		219 (8.62)	152 (5.98)	251 (9.88)	184 (7.24)
	1FT7046				253 (9.96)	186 (7.32)	285 (11.22)	218 (8.58)		259 (10.20)	192 (7.56)	291 (11.46)	224 (8.82)
63	1FT7062		6 (0.24)	56.5 (2.22)	167 (6.57)	99 (3.90)	202 (7.95)	135 (5.31)	50 (1.97)	173 (6.81)	106 (4.17)	208 (8.19)	141 (5.55)
	1FT7064				198 (7.80)	131 (5.16)	233 (9.17)	166 (6.54)		205 (8.07)	137 (5.39)	240 (9.45)	173 (6.81)
	1FT7066				230 (9.06)	162 (6.38)	265 (10.43)	198 (7.80)		236 (9.29)	169 (6.65)	272 (10.71)	204 (8.03)
	1FT7068				277 (10.91)	210 (8.27)	312 (12.28)	245 (9.65)		284 (11.18)	216 (8.50)	319 (12.56)	252 (9.92)
80	1FT7082		6 (0.24)	64.5 (2.54)	184 (7.24)	124 (4.88)	241 (9.49)	176 (6.93)	58 (2.28)	196 (7.72)	130 (5.12)	248 (9.76)	183 (7.20)
	1FT7084				236 (9.29)	175 (6.89)	293 (11.54)	228 (8.98)		247 (9.72)	182 (7.17)	299 (11.77)	234 (9.21)
	1FT7086				287 (11.30)	227 (8.94)	345 (13.58)	279 (10.98)		299 (11.77)	234 (9.21)	351 (13.82)	286 (11.26)
100	1FT7102		6.5 (0.26)	87 (3.43)	209 (8.23)	144 (5.67)	266 (10.47)	196 (7.72)	80 (3.15)	221 (8.70)	151 (5.94)	273 (10.75)	203 (7.99)
	1FT7105				296 (11.65)	231 (9.09)	353 (13.90)	283 (11.14)		307 (12.09)	238 (9.37)	360 (14.17)	290 (11.42)
	1FT7108				365 (14.37)	300 (11.81)	422 (16.61)	352 (13.86)		377 (14.84)	307 (12.09)	429 (16.89)	359 (14.13)



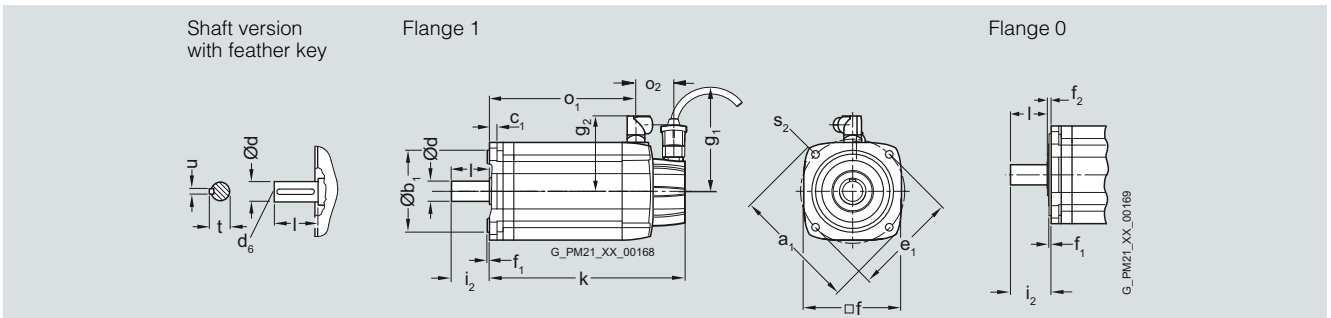
### 1FT7 with DRIVE-CLiQ – Natural cooling

4

#### Dimensional drawings

For motor		Dimensions in mm (inches)														Connector size		Shaft extension DE			
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	o <sub>2</sub> -	s <sub>2</sub> S	g <sub>1</sub> -	Size 1		Size 1.5		d D	d <sub>6</sub> -	l E	t GA	u F	
												g <sub>2</sub> -	g <sub>2</sub> -	g <sub>2</sub> -	g <sub>2</sub> -						
<b>1FT7 natural cooling, with connector, without/with brake</b>																					
36	1FT703.-5A		90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	48 (1.89)	6.5 (0.26)	77 (3.03)	80 (3.15)	-	<b>14</b> (0.55)	M5	30 (1.18)	16 (0.63)	5 (0.20)			
48	1FT704.-5A		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	53 (2.09)	6.5 (0.26)	93 (3.66)	90 (3.54)	-	<b>19</b> (0.75)	M6	40 (1.57)	21.5 (0.85)	6 (0.24)			
63	1FT706.-5A		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	53 (2.09)	9 (0.35)	93 (3.66)	104 (4.09)	-	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)			
80	1FT708.-5A		195 (7.68)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	51 (2.01)	11 (0.43)	93 (3.66)	119 (4.69)	140 (5.51)	<b>32</b> (1.26)	M12	58 (2.28)	35 (1.38)	10 (0.39)			
100	1FT710.-5A		245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	56 (2.20)	14 (0.55)	93 (3.66)	-	160 (6.30)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)			

Shaft height	Type	DIN IEC	Flange 0				Flange 1 (1FT6-compatible)						
			f <sub>2</sub> -	i <sub>2</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -	i <sub>2</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -
36	1FT7034		5.5 (0.22)	36.5 (1.44)	189 (7.44)	127 (5.00)	216 (8.50)	154 (6.06)	30 (1.18)	196 (7.72)	133 (5.24)	223 (8.78)	160 (6.30)
	1FT7036				237 (9.33)	175 (6.89)	264 (10.39)	202 (7.95)		244 (9.61)	181 (7.13)	271 (10.67)	208 (8.19)
48	1FT7042		5.5 (0.22)	46 (1.81)	158 (6.22)	96 (3.78)	190 (7.48)	128 (5.04)	40 (1.57)	164 (6.46)	102 (4.02)	196 (7.72)	134 (5.28)
	1FT7044				208 (8.19)	146 (5.75)	240 (9.45)	178 (7.01)		214 (8.43)	152 (5.98)	246 (9.69)	184 (7.24)
	1FT7046				248 (9.76)	186 (7.32)	280 (11.02)	218 (8.58)		254 (10.00)	192 (7.56)	286 (11.26)	224 (8.82)
63	1FT7062		6 (0.24)	56.5 (2.22)	161 (6.34)	99 (3.90)	197 (7.76)	135 (5.31)	50 (1.97)	168 (6.61)	106 (4.17)	203 (7.99)	141 (5.55)
	1FT7064				193 (7.60)	131 (5.16)	228 (8.98)	166 (6.54)		200 (7.87)	137 (5.39)	235 (9.25)	173 (6.81)
	1FT7066				225 (8.86)	162 (6.38)	260 (10.24)	198 (7.80)		231 (9.09)	169 (6.65)	267 (10.51)	204 (8.03)
	1FT7068				272 (10.71)	210 (8.27)	307 (12.09)	245 (9.65)		279 (10.98)	216 (8.50)	314 (12.36)	252 (9.92)
80	1FT7082		6 (0.24)	64.5 (2.54)	189 (7.44)	124 (4.88)	236 (9.29)	176 (6.93)	58 (2.28)	191 (7.52)	130 (5.12)	243 (9.57)	183 (7.20)
	1FT7084				236 (9.29)	175 (6.89)	288 (11.34)	228 (8.98)		242 (9.53)	182 (7.17)	294 (11.57)	234 (9.21)
	1FT7086				287 (11.30)	227 (8.94)	340 (13.39)	279 (10.98)		294 (11.57)	234 (9.21)	346 (13.62)	286 (11.26)
100	1FT7102		6.5 (0.26)	87 (3.43)	209 (8.23)	144 (5.67)	261 (10.28)	196 (7.72)	80 (3.15)	216 (8.50)	151 (5.94)	268 (10.55)	203 (7.99)
	1FT7105				296 (11.65)	231 (9.09)	348 (13.70)	283 (11.14)		303 (11.93)	238 (9.37)	355 (13.98)	290 (11.42)
	1FT7108				365 (14.37)	300 (11.81)	417 (16.42)	352 (13.86)		372 (14.65)	307 (12.09)	424 (16.69)	359 (14.13)



# SIMOTICS servomotors

## Dimensional drawings

### 1FT7 without DRIVE-CLiQ – Water cooling

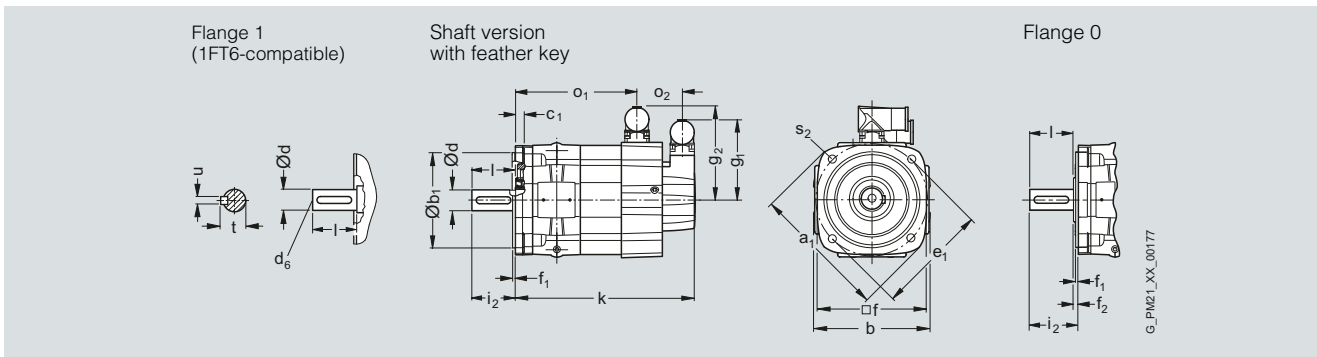
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a <sub>1</sub> P	b	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	s <sub>2</sub> S	Signal connector			Power connector			Connector		
											g <sub>1</sub>	g <sub>2</sub>	g <sub>3</sub>	Size 1	Size 1.5	Size 3	Size 1	Size 1.5	Size 3
<b>1FT7 water cooling, with connector, without/with brake</b>																			
63	1FT706.-.W		155 (6.10)	135 (5.31)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	9 (0.35)	93 (3.66)	108 (4.25)	132.5 (5.22)	-	52 (2.05)	57 (2.24)	-		
80	1FT708.-.W		194 (7.68)	165 (6.50)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	11 (0.43)	93 (3.66)	-	140.5 (5.53)	168.5 (6.63)	-	50 (1.97)	67 (2.64)		
100	1FT710.-5W		245 (9.65)	206 (8.11)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	14 (0.55)	93 (3.66)	-	159.5 (6.28)	187.5 (7.38)	-	55 (2.17)	72 (2.83)		

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Shaft height	Type	DIN IEC	Flange 1 (1FT6-compatible) without/with brake					Flange 0 without/with brake					Shaft extension DE					
			i <sub>2</sub>	k LB	o <sub>1</sub>	o <sub>1</sub>	o <sub>1</sub>	f <sub>2</sub>	i <sub>2</sub>	k LB	o <sub>1</sub>	o <sub>1</sub>	o <sub>1</sub>	d D	d <sub>6</sub>	l E	t GA	u F
63	1FT7062		50 (1.97)	208 (8.19)	141 (5.55)	-	-	6 (0.24)	56.5 (2.22)	202 (7.95)	135 (5.31)	-	-	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FT7064			240 (9.45)	173 (6.81)	-	-			233 (9.17)	166 (6.54)	-	-					
	1FT7065			292 (11.50)	220 (8.66)	-	-			286 (11.26)	214 (8.43)	-	-					
	1FT7066			272 (10.71)	204 (8.03)	-	-			265 (10.43)	198 (7.80)	-	-					
	1FT7067			332 (13.07)	260 (10.24)	-	-			325 (12.80)	254 (10.00)	-	-					
	1FT7068			319 (12.56)	252 (9.92)	-	-			312 (12.28)	245 (9.65)	-	-					
80	1FT7082		58 (2.28)	248 (9.76)	-	183 (7.20)	-	6 (0.24)	64.5 (2.54)	241 (9.49)	-	176 (6.93)	-	<b>32</b> (1.26)	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7084			299 (11.77)	-	234 (9.21)	-			293 (11.54)	-	228 (8.98)	-					
	1FT7085			319 (12.56)	-	254 (10.00)	237 (9.33)			312.5 (12.30)	-	247 (9.72)	231 (9.09)					
	1FT7086			351 (13.82)	-	286 (11.26)	-			345 (13.58)	-	279 (10.98)	-					
	1FT7087			379 (14.92)	-	314 (12.36)	297 (11.69)			372.5 (14.67)	-	307 (12.09)	291 (11.46)					
100	1FT7102		80 (3.15)	273 (10.75)	-	203 (7.99)	187 (7.36)	6.5 (0.26)	87 (3.43)	266 (10.47)	-	196 (7.72)	180 (7.09)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FT7105			360 (14.17)	-	290 (11.42)	273 (10.75)			353 (13.90)	-	283 (11.14)	266 (10.47)					
	1FT7108			429 (16.89)	-	359 (14.13)	342 (13.46)			422 (16.61)	-	352 (13.86)	335 (13.19)					



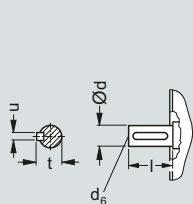


#### Dimensional drawings

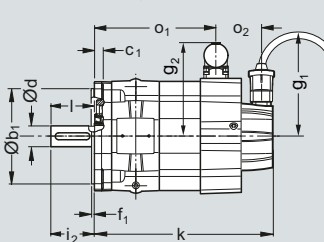
For motor		Dimensions in mm (inches)										Signal connector			Power connector			Connector			
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b –	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	s <sub>2</sub> S	g <sub>1</sub> –	g <sub>2</sub> –	Size 1			Size 1.5			Size 3		
													g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –	g <sub>2</sub> –
<b>1FT7 water cooling, with connector, without/with brake</b>																					
63	1FT706.-.W		155 (6.10)	135 (5.31)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	9 (0.35)	93 (3.66)	108 (4.25)	132.5 (5.22)	–	50 (1.97)	55 (2.17)	–	–	–	–	–
80	1FT708.-.W		194 (7.68)	165 (6.50)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	11 (0.43)	93 (3.66)	–	140.5 (5.53)	168.5 (6.63)	–	48 (1.89)	63 (2.48)	–	–	–	–
100	1FT710.-5W		245 (9.65)	206 (8.11)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	14 (0.55)	93 (3.66)	–	159.5 (6.28)	187.5 (7.38)	–	53 (2.09)	69 (2.72)	–	–	–	–

Shaft height	Type	DIN IEC	Flange 1 (1FT6-compatible) without/with brake					Flange 0 without/with brake					Shaft extension DE						
			i <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>1</sub> –	o <sub>1</sub> –	f <sub>2</sub> –	i <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>1</sub> –	o <sub>1</sub> –	d D	d <sub>6</sub> –	l E	t GA	u F	
63	1FT7062		50 (1.97)	204 (8.03)	141 (5.55)	–	–	6 (0.24)	56.5 (2.22)	197 (7.76)	135 (5.31)	–	–	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)	
	1FT7064			235 (9.25)	173 (6.81)	–	–			229 (9.02)	166 (6.54)	–	–						
	1FT7065			287 (11.30)	220 (8.66)	–	–			281 (11.06)	214 (8.43)	–	–						
	1FT7066			267 (10.51)	204 (8.03)	–	–			260 (10.24)	198 (7.80)	–	–						
	1FT7067			327 (12.87)	260 (10.24)	–	–			321 (12.64)	254 (10.00)	–	–						
	1FT7068			314 (12.36)	252 (9.92)	–	–			308 (12.13)	245 (9.65)	–	–						
80	1FT7082		58 (2.28)	243 (9.57)	–	183 (7.20)	–	6 (0.24)	64.5 (2.54)	237 (9.33)	–	–	176 (6.93)	–	<b>32</b> (1.26)	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7084			295 (11.61)	–	234 (9.21)	–			288 (11.34)	–	–	228 (8.98)	–					
	1FT7085			314 (12.36)	–	254 (10.00)	237 (9.33)			308 (12.13)	–	–	247 (9.72)	231 (9.09)					
	1FT7086			346 (13.62)	–	286 (11.26)	–			340 (13.39)	–	–	279 (10.98)	–					
	1FT7087			374 (14.72)	–	314 (12.36)	297 (11.69)			368 (14.49)	–	–	307 (12.09)	291 (11.46)					
100	1FT7102		80 (3.15)	267 (10.51)	–	203 (7.99)	187 (7.36)	6.5 (0.26)	87 (3.43)	262 (10.31)	–	–	196 (7.72)	180 (7.09)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FT7105			355 (13.98)	–	290 (11.42)	273 (10.75)			348 (13.70)	–	–	283 (11.14)	266 (10.47)					
	1FT7108			424 (16.69)	–	359 (14.13)	342 (13.46)			417 (16.42)	–	–	352 (13.86)	335 (13.19)					

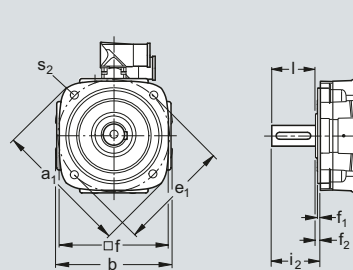
Flange 1 (1FT6-compatible)



Shaft version with feather key



Flange 0



G\_PM21\_XX\_00181

# SIMOTICS servomotors

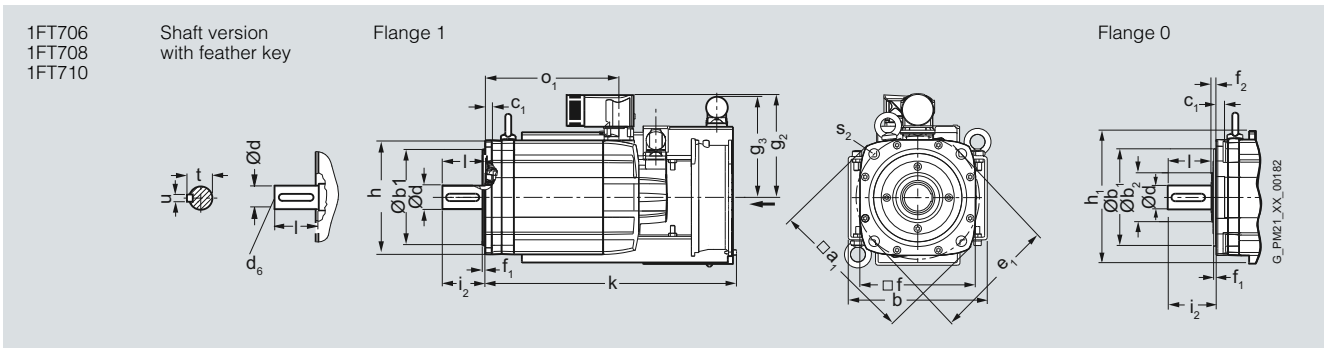
## Dimensional drawings

### 1FT7 without/with DRIVE-CLiQ – Forced ventilation

#### Dimensional drawings

For motor		Dimensions in mm (inches)										Connector size			Fan			
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b –	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	s <sub>2</sub> S	Size 1.5		Size 3		h H	h <sub>1</sub> –	h <sub>2</sub> –	
											g <sub>2</sub> –	g <sub>2</sub> –	g <sub>3</sub> –	g <sub>3</sub> –				
<b>1FT7 forced ventilation, with connector, without/with brake</b>																		
63	1FT706.-.S		155 (6.10)	158 (6.22)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	11 (0.43)	125 (4.92)	–	102 (4.02)	26 (1.02)	143 (5.36)	135 (5.31)		
80	1FT708.-.S		194 (7.68)	186 (7.32)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	11 (0.43)	139 (5.47)	167 (6.57)	137.5 (5.41)	27 (1.06)	177 (6.97)	186.5 (7.34)		
100	1FT710.-5S		245 (9.65)	224 (8.82)	180 (7.09)	13 (0.51)	215 (8.46)	196 (7.72)	4 (0.16)	14 (0.55)	159 (6.26)	187 (7.36)	151 (5.94)	27 (1.06)	220 (8.66)	222 (8.74)		

Shaft height	Type	DIN IEC	Flange 1 (1FT6-compatible)					Flange 0					Shaft extension DE					
			without brake		with brake			without brake		with brake			d D	d <sub>6</sub> –	l E	t GA	u F	
			i <sub>2</sub> –	k LB	o <sub>1</sub> –	k LB	o <sub>1</sub> –	f <sub>2</sub> –	i <sub>2</sub> –	k LB	o <sub>1</sub> –	k LB						o <sub>1</sub> –
63	1FT7065-7S		50 (1.97)	380 (14.96)	220 (8.66)	380 (14.96)	220 (8.66)	6 (0.24)	56.5 (2.22)	373.5 (14.70)	214 (8.43)	373.5 (14.70)	214 (8.43)	<b>24</b> (0.94)	M8	50 (1.97)	27 (1.06)	8 (0.31)
	1FT7067-7S			420 (16.54)	260 (10.24)	420 (16.54)	260 (10.24)			413.5 (16.28)	254 (10.00)	413.5 (16.28)	254 (10.00)					
80	1FT7084-5S		58 (2.28)	342 (13.46)	182 (7.17)	394 (15.51)	234 (9.21)	6 (0.24)	64.5 (2.54)	336 (13.23)	175 (6.89)	387 (15.24)	228 (8.98)	<b>32</b> (1.26)	M12	58 (2.28)	35 (1.38)	10 (0.39)
	1FT7085-7S			414 (16.30)	254 (10.00)	414 (16.30)	254 (10.00)			408 (16.06)	247 (9.72)	408 (16.06)	247 (9.72)					
	1FT7086-5S			394 (15.51)	234 (9.21)	446 (17.56)	286 (11.26)			387 (15.24)	227 (8.94)	440 (17.32)	379 (14.92)					
	1FT7087-7S			474 (18.66)	314 (12.36)	474 (18.66)	314 (12.36)			468 (18.43)	307 (12.09)	468 (18.43)	307 (12.09)					
100	1FT7105		80 (3.15)	404 (15.91)	238 (9.37)	456 (17.95)	290 (11.42)	6.5 (0.26)	87 (3.43)	397 (15.63)	231 (9.09)	449 (17.68)	283 (11.14)	<b>38</b> (1.50)	M12	80 (3.15)	41 (1.61)	10 (0.39)
	1FT7108			473 (18.62)	307 (12.09)	525 (20.67)	359 (14.13)			466 (18.35)	300 (11.81)	518 (20.39)	352 (13.86)					

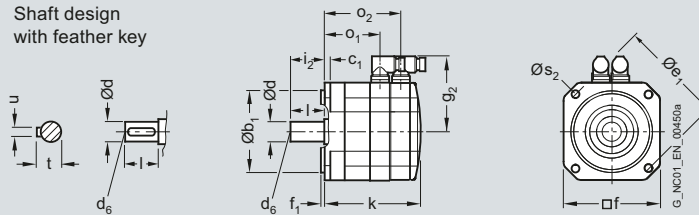


#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> –	i <sub>2</sub> –	s <sub>2</sub> S	Shaft extension DE				
											d D	d <sub>6</sub> –	l E	t GA	u F
<b>1FK7 natural cooling, without/with brake</b>															
20	1FK701		30 (1.18)	7 (0.28)	46 (1.81)	40 (1.57)	2.5 (0.10)	66 (2.60)	18 (0.71)	4.5 (0.18)	<b>8</b> <b>(0.31)</b>	–	18 (0.71)	8.8 (0.35)	2 (0.08)
28	1FK702		40 (1.57)	10 (0.39)	63 (2.48)	55 (2.17)	2.5 (0.10)	75 (2.95)	20 (0.79)	5.4 (0.21)	<b>9</b> <b>(0.35)</b>	M3	20 (0.79)	10.2 (0.40)	3 (0.12)

Shaft height	Type	Encoder system: Resolver Absolute encoders AM16S/R / AM15DQ						Encoder system: Incremental encoders IC2048S/R / IC22DQ Absolute encoders AM2048S/R / AM22DQ AM512S/R / AM20DQ AM32S/R / AM16DQ					
		without brake						with brake					
		k LB	o <sub>1</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>2</sub> –
20	1FK7011	140 (5.51)	89 (3.50)	118 (4.65)	140 (5.51)	89 (3.50)	118 (4.65)	155 (6.10)	89 (3.50)	118 (4.65)	155 (6.10)	89 (3.50)	118 (4.65)
	1FK7015	165 (6.50)	114 (4.59)	143 (5.63)	165 (6.50)	114 (4.49)	143 (5.63)	180 (7.09)	114 (4.49)	143 (5.63)	180 (7.09)	114 (4.49)	143 (5.63)
28	1FK7022	153 (6.02)	95 (3.74)	128 (5.04)	175 (6.89)	95 (3.74)	150 (5.91)	178 (7.01)	95 (3.74)	128 (5.04)	200 (7.87)	95 (3.74)	150 (5.91)

1FK701  
1FK702Shaft design  
with feather key

# SIMOTICS servomotors

## Dimensional drawings

### 1FK7 – Natural cooling

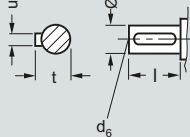
#### Dimensional drawings

For motor DQI encoder with DRIVE-CLiQ interface (without resolver)/  
Encoder system without DRIVE-CLiQ interface (without resolver)  
Dimensions in mm (inches)

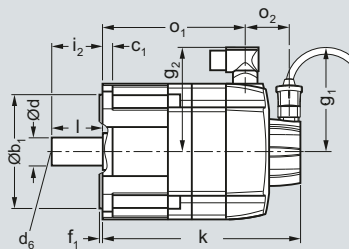
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	i <sub>2</sub> –	s <sub>2</sub> S	Shaft extension DE					
											d D	d <sub>6</sub> –	l E	t GA	u F	
<b>1FK7 Compact/High Dynamic, without/with brake</b>																
36	1FK703		90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	30 (1.18)	6.5 (0.26)	<b>14</b> <b>(0.55)</b>	M5	30 (1.18)	16 (0.63)	5 (0.20)	
<b>1FK7 Compact/High Dynamic/High Inertia, without/with brake</b>																
48	1FK704		120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	40 (1.57)	6.5 (0.26)	<b>19</b> <b>(0.75)</b>	M6	40 (1.57)	21.5 (0.85)	6 (0.24)	
63	1FK706		155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	50 (1.97)	9 (0.35)	<b>24</b> <b>(0.94)</b>	M8	50 (1.97)	27 (1.06)	8 (0.31)	
80	1FK708		194 (7.64)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	58 (2.28)	11 (0.43)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)	
<b>1FK7 Compact, without/with brake</b>																
100	1FK710		245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	80 (3.15)	14 (0.55)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)	

1FK703  
1FK704  
1FK706  
1FK708  
1FK710

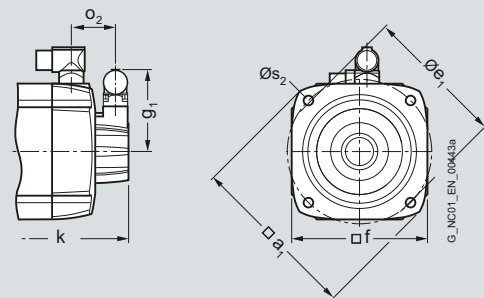
Shaft design  
with feather key



Version  
with DRIVE-CLiQ interface



Version  
without DRIVE-CLiQ interface



#### Dimensional drawings

For motor		DQI encoder with DRIVE-CLiQ interface (without resolver)								Encoder system without DRIVE-CLiQ interface (without resolver)							
Shaft height	Type	Dimensions in mm (inches)															
		without brake				with brake				without brake				with brake			
		g <sub>1</sub>	g <sub>2</sub>	o <sub>2</sub>	k	o <sub>1</sub>	k	o <sub>1</sub>	g <sub>1</sub>	g <sub>2</sub>	o <sub>2</sub>	k	o <sub>1</sub>	k	o <sub>1</sub>		
		–	–	–	LB	–	LB	–	–	–	–	LB	–	LB	–		
<b>1FK7 Compact</b>																	
36	1FK7032-2A	104.5 (4.11)	78 (3.07)	50 (1.97)	173 (6.81)	111 (4.37)	200 (7.87)	138 (5.43)	77 (3.03)	78 (3.07)	47 (1.85)	173 (6.81)	111 (4.37)	200 (7.87)	138 (5.43)		
	1FK7034-2A				198 (7.80)	136 (5.35)	225 (8.86)	263 (6.42)				198 (7.80)	136 (5.35)	225 (8.86)	263 (6.42)		
48	1FK7040-2A	104.5 (4.11)	90 (4.09)	50 (1.97)	147 (6.61)	85 (4.17)	179 (7.99)	117 (5.55)	93 (3.66)	90 (4.09)	52 (2.05)	152 (6.81)	85 (4.17)	184 (8.19)	117 (5.55)		
	1FK7042-2A				174 (6.85)	112 (4.41)	206 (8.11)	144 (5.67)				179 (7.05)	112 (4.41)	211 (8.31)	144 (5.57)		
63	1FK7060-2A	104.5 (4.11)	104 (4.09)	50 (1.97)	168 (6.61)	106 (4.17)	203 (7.99)	141 (5.55)	93 (3.66)	104 (4.09)	52 (2.05)	173 (6.81)	106 (4.17)	208 (8.19)	141 (5.55)		
	1FK7062-2A				190 (7.48)	128 (5.04)	226 (8.90)	163 (6.42)				195 (7.68)	128 (5.04)	231 (9.09)	163 (6.42)		
	1FK7063-2A				213 (8.39)	151 (5.94)	248 (9.76)	186 (7.32)				218 (8.58)	151 (5.94)	253 (9.96)	186 (7.32)		
80	1FK7080-2A	104.5 (4.11)	119 (4.69)	48 (1.89)	171 (6.73)	111 (4.37)	223 (8.78)	163 (6.42)	93 (3.66)	119 (4.69)	50 (1.97)	176 (6.93)	111 (4.37)	228 (8.98)	163 (6.42)		
	1FK7081-2A				190 (7.48)	130 (5.12)	242 (9.53)	182 (7.17)				196 (7.68)	130 (5.12)	247 (9.72)	182 (7.17)		
	1FK7083-2A				209 (8.23)	149 (5.87)	261 (10.28)	201 (7.91)				214 (8.43)	149 (5.87)	266 (10.47)	201 (7.91)		
	1FK7084-2A				229 (9.02)	168 (6.61)	281 (11.06)	221 (8.70)				234 (9.21)	168 (6.61)	286 (11.26)	221 (8.70)		
100	1FK7100-2A	104.5 (4.11)	137 (5.39)	53 (2.09)	183 (7.20)	118 (4.65)	220 (8.66)	170 (6.69)	93 (3.66)	137 (5.39)	55 (2.17)	188 (7.40)	118 (4.65)	225 (8.86)	170 (6.69)		
	1FK7101-2A		158 (6.22)		209 (8.23)	144 (5.67)	261 (10.28)	196 (7.72)		158 (6.22)		214 (8.43)	144 (5.67)	266 (10.47)	196 (7.72)		
	1FK7103-2A				235 (9.25)	170 (6.69)	287 (11.30)	222 (8.74)				240 (9.45)	170 (6.69)	292 (11.50)	222 (8.74)		
	1FK7105-2A				287 (11.30)	222 (8.74)	339 (13.35)	274 (10.79)				292 (11.50)	222 (8.74)	344 (13.54)	274 (10.79)		
<b>1FK7 High Dynamic</b>																	
36	1FK7033-4C	104.5 (4.11)	78 (3.07)	50 (1.97)	183 (7.20)	121 (4.76)	210 (8.27)	148 (5.83)	77 (3.03)	78 (3.07)	47 (1.85)	183 (7.20)	121 (4.76)	210 (8.27)	148 (5.83)		
48	1FK7043-4C	104.5 (4.11)	90 (3.54)	56 (2.20)	200 (7.87)	132 (5.20)	232 (9.13)	164 (6.46)	93 (3.66)	90 (3.54)	58 (2.28)	205 (8.07)	132 (5.20)	237 (9.33)	164 (6.46)		
	1FK7044-4C				225 (8.86)	157 (6.18)	257 (10.12)	189 (7.44)				230 (9.06)	157 (6.18)	262 (10.31)	189 (7.44)		
63	1FK7061-4C	104.5 (4.11)	104 (4.09)	50 (1.97)	203 (7.99)	141 (5.55)	238 (9.37)	176 (6.93)	93 (3.66)	104 (4.09)	52 (2.05)	208 (8.19)	141 (5.55)	243 (9.57)	176 (6.93)		
	1FK7064-4C				267 (10.51)	205 (8.07)	302 (11.89)	240 (9.45)				272 (10.71)	205 (8.07)	307 (12.09)	240 (9.45)		
80	1FK708.-4CC	104.5 (4.11)	119 (4.69)	48 (1.89)	257 (10.12)	197 (7.76)	309 (12.17)	249 (9.80)	93 (3.66)	119 (4.69)	50 (1.97)	262 (10.31)	197 (7.76)	314 (12.36)	249 (9.80)		
	1FK708.-4CF		139 (5.47)							139 (5.47)							
<b>1FK7 High Inertia</b>																	
48	1FK7042-3B	104.5 (4.11)	90 (3.54)	50 (1.97)	187 (7.36)	125 (4.92)	219 (8.62)	157 (6.18)	93 (3.66)	90 (3.54)	52 (2.05)	192 (7.56)	125 (4.92)	224 (8.82)	157 (6.18)		
63	1FK7060-3B	104.5 (4.11)	104 (4.09)	50 (1.97)	182 (7.17)	120 (4.72)	217 (8.54)	155 (6.10)	93 (3.66)	104 (4.09)	52 (2.05)	187 (7.36)	120 (4.72)	222 (8.74)	155 (6.10)		
	1FK7062-3B				216 (8.50)	153 (6.02)	251 (9.88)	189 (7.44)				221 (8.70)	153 (6.02)	256 (10.08)	189 (7.44)		
80	1FK7081-3B	104.5 (4.11)	119 (4.69)	48 (1.89)	211 (8.31)	151 (5.94)	264 (10.39)	203 (7.99)	93 (3.66)	119 (4.69)	50 (1.97)	216 (8.50)	151 (5.94)	269 (10.59)	203 (7.99)		
	1FK7084-3B				270 (10.63)	209 (8.23)	322 (12.68)	262 (10.31)				275 (10.83)	209 (8.23)	327 (12.87)	262 (10.31)		

# SIMOTICS servomotors

## Dimensional drawings

### 1FK7 – Natural cooling

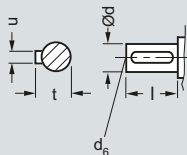
#### Dimensional drawings

For motor Resolver with/without DRIVE-CLiQ interface  
Dimensions in mm (inches)

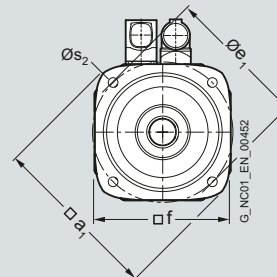
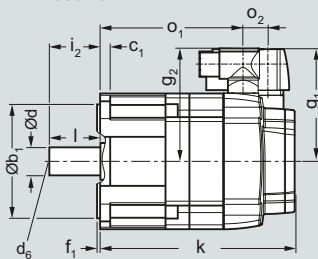
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	i <sub>2</sub> –	s <sub>2</sub> S	Shaft extension DE				
											d D	d <sub>6</sub> –	l E	t GA	u F
<b>1FK7 Compact/High Dynamic, with/without brake</b>															
36	1FK703	90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	30 (1.18)	6.5 (0.26)	<b>14</b> <b>(0.55)</b>	M5	30 (1.18)	16 (0.63)	5 (0.20)	
48	1FK704	120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	40 (1.57)	6.5 (0.26)	<b>19</b> <b>(0.75)</b>	M6	40 (1.57)	21.5 (0.85)	6 (0.24)	
63	1FK706	155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	50 (1.97)	9 (0.35)	<b>24</b> <b>(0.94)</b>	M8	50 (1.97)	27 (1.06)	8 (0.31)	
80	1FK708	194 (7.64)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	58 (2.28)	11 (0.43)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	35 (1.38)	10 (0.39)	
<b>1FK7 Compact, without/with brake</b>															
100	1FK710	245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	80 (3.15)	14 (0.55)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	41 (1.61)	10 (0.39)	

1FK703  
1FK704  
1FK706  
1FK708  
1FK710

Shaft design  
with feather key



Version  
with resolver



### Dimensional drawings

For motor		Resolver with/without DRIVE-CLiQ interface						
		Dimensions in mm (inches)						
Shaft height	Type	g <sub>1</sub>	g <sub>2</sub>	o <sub>2</sub>	without brake		with brake	
					k LB	o <sub>1</sub>	k LB	o <sub>1</sub>
<b>1FK7 Compact</b>								
36	1FK7032-2A	80 (3.15)	80 (3.15)	15 (0.59)	153 (6.02)	117 (4.61)	180 (7.09)	144 (5.67)
	1FK7034-2A				178 (7.01)	142 (5.59)	205 (8.07)	169 (6.65)
48	1FK7040-2A	90 (3.54)	90 (3.54)	23 (0.91)	132 (5.20)	85 (3.35)	164 (6.46)	117 (4.61)
	1FK7042-2A				160 (6.30)	112 (4.41)	192 (7.56)	144 (5.67)
63	1FK7060-2A	103 (4.06)	104 (4.09)	23 (0.91)	153 (6.02)	106 (4.17)	189 (7.44)	141 (5.55)
	1FK7062-2A				176 (6.93)	128 (5.04)	211 (8.31)	163 (6.42)
	1FK7063-2A				198 (7.80)	151 (5.94)	234 (9.21)	186 (7.32)
80	1FK7080-2A	118 (4.65)	119 (4.69)	21 (0.83)	157 (6.18)	111 (4.37)	209 (8.23)	163 (6.42)
	1FK7081-2A				176 (6.93)	130 (5.12)	228 (8.98)	182 (7.17)
	1FK7083-2A				195 (7.68)	149 (5.87)	247 (9.72)	201 (7.91)
	1FK7084-2A				214 (8.43)	168 (6.61)	266 (10.47)	221 (8.70)
100	1FK7100-2A	136 (5.35)	137 (5.39)	26 (1.02)	169 (6.65)	118 (4.65)	206 (8.11)	155 (6.10)
	1FK7101-2A		158 (6.22)		195 (7.68)	144 (5.67)	247 (9.72)	196 (7.72)
	1FK7103-2A				221 (8.70)	170 (6.69)	273 (10.75)	222 (8.74)
	1FK7105-2A				273 (10.75)	222 (8.74)	325 (12.80)	274 (10.79)
<b>1FK7 High Dynamic</b>								
36	1FK7033-4C	81 (3.19)	80 (3.15)	15 (0.59)	163 (6.42)	127 (5.00)	190 (7.48)	154 (6.06)
48	1FK7043-4C	90 (3.54)	90 (3.54)	23 (0.9)	186 (7.32)	138 (5.43)	218 (8.58)	170 (6.69)
	1FK7044-4C				211 (8.31)	163 (6.42)	243 (9.57)	195 (7.68)
63	1FK7061-4C	103 (4.06)	104 (4.09)	23 (0.9)	188 (7.40)	141 (5.55)	224 (8.82)	176 (6.93)
	1FK7064-4C				252 (9.92)	205 (8.07)	288 (11.34)	240 (9.45)
80	1FK708.-4CC	118 (4.65)	119 (4.69)	21 (0.83)	243 (9.57)	197 (7.76)	295 (11.61)	250 (9.84)
	1FK708.-4CF		139 (5.47)					

# SIMOTICS servomotors

## Dimensional drawings

### 1FT7/1FK7 with SP+ planetary gearbox

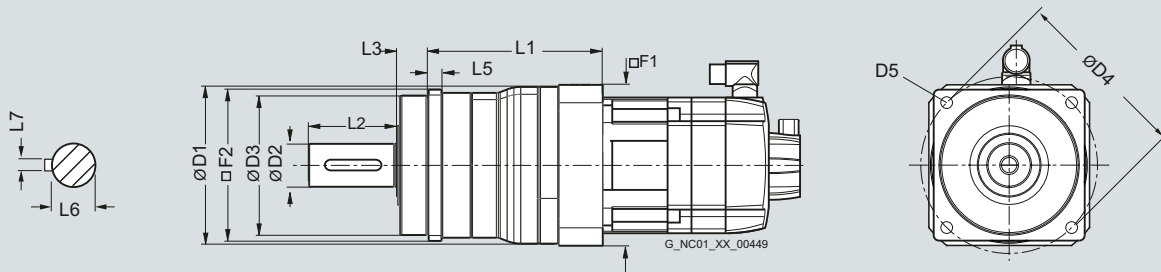
#### Dimensional drawings

For SP+ planetary gearboxes on SIMOTICS S-1FT7/-1FK7 motors

Dimensions in mm (inches)

Planetary gearbox

Type	D2	D3	D4	D5	F2	L2	L3	L5	L6	L7
<b>1FT7/1FK7 with SP+ planetary gearbox single-stage/two-stage</b>										
SP060S-MF1/-MF2	16 (0.63)	60 (2.36)	68 (2.68)	5.5 (0.22)	62 (2.48)	28 (1.10)	20 (0.79)	6 (0.24)	18 (0.71)	5 (0.20)
SP075S-MF1/-MF2	22 (0.87)	70 (2.76)	85 (3.35)	6.6 (0.26)	76 (2.99)	36 (1.42)	20 (0.79)	7 (0.28)	24.5 (0.96)	6 (0.24)
SP100S-MF1/-MF2	32 (1.26)	90 (3.54)	120 (4.72)	9 (0.35)	101 (3.98)	58 (2.28)	30 (1.18)	10 (0.39)	35 (1.38)	10 (0.39)
SP140S-MF1/-MF2	40 (1.57)	130 (5.12)	165 (6.50)	11 (0.43)	141 (5.55)	82 (3.23)	30 (1.18)	12 (0.47)	43 (1.69)	12 (0.47)
SP180S-MF1/-MF2	55 (2.17)	160 (6.30)	215 (8.46)	13.5 (0.53)	182 (7.17)	82 (3.23)	30 (1.18)	15 (0.59)	59 (2.32)	16 (0.63)
SP210S-MF1/-MF2	75 (2.95)	180 (7.09)	250 (9.84)	17 (0.67)	215 (8.46)	105 (4.13)	38 (1.50)	17 (0.67)	79.5 (3.13)	20 (0.79)
SP240S-MF1/-MF2	85 (3.35)	200 (7.87)	290 (11.42)	17 (0.67)	245 (9.65)	130 (5.12)	40 (1.57)	20 (0.79)	90 (3.54)	22 (0.87)





#### Dimensional drawings

For SP+ planetary gearboxes on SIMOTICS S-1FT7/-1FK7 motors

Planetary gearbox Type	Motor Type	Dimensions in mm (inches)					
		SP+ planetary gearbox single-stage -MF1			SP+ planetary gearbox two-stage -MF2		
		D1	F1	L1	D1	F1	L1
<b>1FT7/1FK7 with SP+ planetary gearbox single-stage/two-stage</b>							
SP060S-	1FT702/1FK702	68 (2.68)	70 (2.76)	89.3 (3.52)	70 (2.76)	60 (2.36)	108 (4.25)
	1FT703/1FK703	68 (2.68)	70 (2.76)	94 (3.70)	68 (2.68)	70 (2.76)	116 (4.57)
	1FT704/1FK704	91 (3.58)	90 (3.54)	106 (4.17)	–	–	–
SP075S-	1FT702/1FK702	91 (3.58)	90 (3.54)	107.8 (4.24)	95 (3.74)	70 (2.76)	119 (4.69)
	1FT703/1FK703	91 (3.58)	90 (3.54)	107.8 (4.24)	95 (3.74)	70 (2.76)	123.4 (4.86)
	1FT704/1FK704	91 (3.58)	90 (3.54)	111.5 (4.39)	91 (3.58)	90 (3.54)	135.6 (5.34)
SP100S-	1FT702/1FK702	–	–	–	118 (4.65)	90 (3.54)	142.3 (5.60)
	1FT703/1FK703	–	–	–	118 (4.65)	90 (3.54)	142.3 (5.60)
	1FT704/1FK704	115 (4.53)	120 (4.72)	122 (4.80)	118 (4.65)	90 (3.54)	146 (5.75)
	1FT706/1FK706	115 (4.53)	120 (4.72)	129 (5.08)	115 (4.53)	120 (4.72)	164 (6.46)
SP140S-	1FT704/1FK704	–	–	–	152 (5.98)	120 (4.72)	186.3 (7.33)
	1FT706/1FK706	146 (5.75)	150 (5.91)	162.3 (6.39)	152 (5.98)	120 (4.72)	193.3 (7.61)
	1FT708/1FK708	146 (5.75)	150 (5.91)	171.3 (6.74)	146 (5.75)	150 (5.91)	220 (8.66)
	1FT710/1FK710	146 (5.75)	190 (7.48)	171.3 (6.74)	–	–	–
SP180S-	1FT706/1FK706	–	–	–	212 (8.35)	150 (5.91)	234 (9.21)
	1FT708/1FK708	207 (8.15)	210 (8.27)	198 (7.80)	212 (8.35)	150 (5.91)	242.9 (9.56)
	1FT710/1FK710	207 (8.15)	210 (8.27)	203.5 (8.01)	212 (8.35)	190 (7.48)	242.9 (9.56)
SP210S-	1FT708/1FK708	–	–	–	215 (8.46)	210 (8.27)	272 (10.71)
	1FT710/1FK710	215 (8.46)	190 (7.48)	242 (9.53)	215 (8.46)	210 (8.27)	272 (10.71)
SP240S-	1FT708/1FK708	–	–	–	245 (9.65)	210 (8.27)	297.5 (11.71)
	1FT710/1FK710	245 (9.65)	240 (9.45)	273 (10.75)	245 (9.65)	210 (8.27)	297.5 (11.71)

# SIMOTICS servomotors

## Dimensional drawings

### 1FK7 with LP+ planetary gearbox

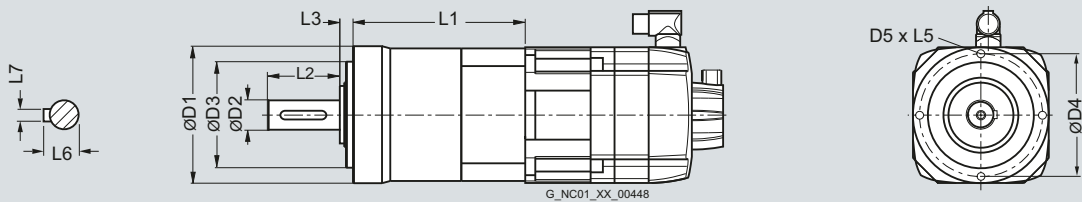
#### Dimensional drawings

For LP+ planetary gearboxes on SIMOTICS S-1FK7 motors

Dimensions in mm (inches)

Planetary gearbox Type	Motor Type	L1	L2	L3	L5	L6	L7	D1	D2	D3	D4	D5
<b>1FK7 with LP+ planetary gearbox</b>												
LP050-MO1	1FK702	63 (2.48)	18 (0.71)	6.5 (0.26)	8 (0.31)	13.5 (0.53)	4 (0.16)	50 (1.97)	12 (0.47)	35 (1.38)	44 (1.73)	M4
LP070-MO1	1FK702	83 (3.27)	28 (1.10)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	70 (2.76)	16 (0.63)	52 (2.05)	62 (2.44)	M5
	1FK703	90 (3.54)										
LP090-MO1	1FK704	112 (4.41)	36 (1.42)	10 (0.39)	12 (0.47)	24.5 (0.96)	6 (0.24)	90 (3.54)	22 (0.87)	68 (2.68)	80 (3.15)	M6
	1FK706	122 (4.80)										
	1FK708	132 (5.20)										
LP120-MO1	1FK706	140 (5.51)	58 (2.28)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	120 (4.72)	32 (1.26)	90 (3.54)	108 (4.25)	M8
	1FK708	150 (5.91)										
LP155-MO1	1FK708	168.5 (6.63)	82 (3.23)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	155 (6.10)	40 (1.57)	120 (4.72)	140 (5.51)	M10
	1FK710	188.5 (7.42)										

1FK703  
1FK704  
1FK706  
1FK708  
1FK710



# SIMOTICS servomotors

## Dimensional drawings

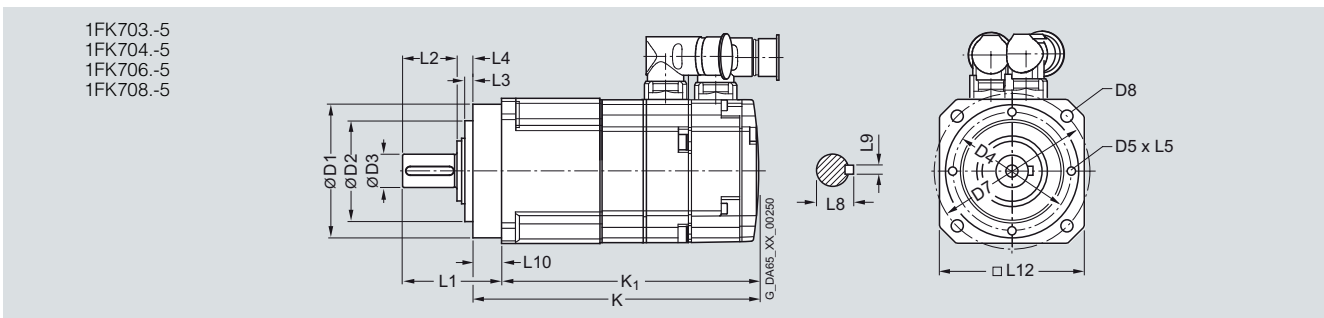
**1FK7-DYA without/with DRIVE-CLiQ with planetary gearbox, single-stage**

4

**Dimensional drawings**

For motor		Dimensions in mm (inches)																
Shaft height	Type	Planetary gearbox	D1	D2	D3	D4	D5	D7	D8	L1	L2	L3	L4	L5	L8	L9	L10	L12
<b>1FK7-DYA with planetary gearbox, single-stage, type of construction IM B5, natural cooling, with connector, with/without brake</b>																		
36	1FK7032-5	DYA70-10	70 (2.76)	52 (2.05)	16 (0.63)	62 (2.44)	M5	82 (3.23)	5.5 (0.22)	56 (2.20)	28 (1.10)	5 (0.20)	8 (0.31)	10 (0.39)	18 (0.71)	5 (0.20)	76 (2.99)	
	1FK7034-5	DYA70-5																
48	1FK7040-5	DYA90-10	90 (3.54)	68 (2.68)	22 (0.87)	80 (3.15)	M6	105 (4.13)	7 (0.28)	66 (2.60)	36 (1.42)	5 (0.20)	10 (0.39)	12 (0.47)	24.5 (0.96)	6 (0.24)	20 (0.79)	101 (3.98)
	1FK7042-5	DYA90-5																
63	1FK7060-5	DYA120-10	120 (4.72)	90 (3.54)	32 (1.26)	108 (4.25)	M8	140 (5.51)	9 (0.35)	95 (3.74)	58 (2.28)	6 (0.24)	12 (0.47)	16 (0.63)	35 (1.38)	10 (0.39)	25 (0.98)	128 (5.04)
	1FK7063-5	DYA120-5																
80	1FK7080-5	DYA155-10	155 (6.10)	120 (4.72)	40 (1.57)	140 (5.51)	M10	170 (6.69)	11 (0.43)	127 (5.00)	82 (3.23)	8 (0.31)	15 (0.59)	20 (0.79)	43 (1.69)	12 (0.47)	30 (1.18)	161 (6.34)
	1FK7083-5	DYA155-5																

Shaft height	Type	Encoder system:				Incremental encoder				Absolute encoder			
		Resolver				Absolute encoder				AM2048S/R / AM22DQ			
		without brake		with brake		without brake		with brake		without brake		with brake	
		K	K1	K	K1	K	K1	K	K1	K	K1	K	K1
36	1FK7032-5	197 (7.76)	177 (6.97)	222 (8.74)	202 (7.95)	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)
	1FK7034-5	222 (8.74)	202 (7.95)	247 (9.72)	227 (8.94)	247 (9.72)	227 (8.94)	272 (10.71)	252 (9.92)	247 (9.72)	227 (8.94)	272 (10.71)	252 (9.92)
48	1FK7040-5	194 (7.64)	174 (6.85)	223 (8.78)	203 (7.99)	214 (8.43)	194 (7.64)	243 (9.57)	223 (8.78)	223 (8.78)	203 (7.99)	252 (9.92)	232 (9.13)
	1FK7042-5	221 (8.70)	201 (7.91)	250 (9.84)	230 (9.06)	242 (9.53)	222 (8.74)	271 (10.67)	251 (9.88)	250 (9.84)	230 (9.06)	279 (10.98)	259 (10.20)
63	1FK7060-5	233 (9.17)	208 (8.19)	261 (10.28)	236 (9.29)	256 (10.08)	231 (9.09)	284 (11.18)	259 (10.20)	264 (10.39)	239 (9.41)	292 (11.50)	267 (10.51)
	1FK7063-5	278 (10.94)	253 (9.96)	306 (12.05)	281 (11.06)	301 (11.85)	276 (10.87)	329 (12.95)	304 (11.97)	309 (12.17)	284 (11.18)	337 (13.27)	312 (12.28)
80	1FK7080-5	250 (9.84)	220 (8.66)	278 (10.94)	248 (9.76)	273 (10.75)	243 (9.57)	300 (11.81)	270 (10.63)	281 (11.06)	251 (9.88)	309 (12.17)	279 (10.98)
	1FK7083-5	288 (11.34)	258 (10.16)	339 (13.35)	309 (12.17)	311 (12.24)	281 (11.06)	362 (14.25)	332 (13.07)	319 (12.56)	289 (11.38)	370 (14.57)	340 (13.39)





## SIMOTICS main motors



## 5/2 Overview

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5/8 Forced ventilation, IP55 degree of protection

5/30 Forced ventilation, IP23 degree of protection

5/46 Water cooling, IP65 degree of protection

5/52 Water cooling, IP55 degree of protection

5/60 SIMOTICS M-1PH8 synchronous motors

5/60 Forced ventilation, IP55 degree of protection

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5/70 Water cooling, IP55 degree of protection

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5/104 SIMOTICS M-1PH8 asynchronous and synchronous motors

5/104 Shaft height 132 – Forced ventilation

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Shaft height 160 – Forced ventilation

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Shaft height 160 – Forced ventilation

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Shaft height 160 – Water cooling

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Shaft heights 80 to 160

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Shaft heights 132 and 160

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5/117 Shaft heights 80 to 160 – Forced ventilation with pipe connection

5/118 Shaft height 180 – Forced ventilation

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5/136 Shaft height 280 – Water cooling

5/138 Shaft height 355 – Forced ventilation



Part 4 **Technical definitions for AC motors**Part 14 **CAD CREATOR**

Dimension drawing and 2D/3D CAD generator

[www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)

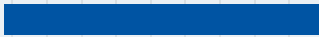




# SIMOTICS main motors

## Overview

Motor type	Features	Degree of protection	Cooling method
<b>SIMOTICS M-1PH8 asynchronous motor</b> 	Three-phase squirrel-cage motor without housing High power density with small motor dimensions	IP55  IP23  IP55/IP65	Forced ventilation  Forced ventilation  Water cooling
<b>SIMOTICS M-1PH8 synchronous motor</b> 	Permanent-magnet synchronous motor Excellent performance features Extremely high power density with small motor dimensions	IP55  IP55/IP65	Forced ventilation  Water cooling

The selection and ordering data for the SINAMICS S120 Motor Modules are based on the booksize format by way of example. Other formats are also possible. The SIZER for Siemens Drives engineering tool is available for detailed configuration.

**For technical definitions for AC motors, see SIMOTICS servomotors.**

Shaft height	Rated power $P_{\text{rated}}$ for S1 duty kW [HP]	Rated torque $M_{\text{rated}}$	Page
SH 80/SH 100/SH 132/SH 160/ SH 180/SH 225/SH 280/SH 355	 <b>2.8 [3.75]</b> <b>590 (730)<sup>1)</sup> [791 (979)<sup>1)</sup></b>	13 ... 5900 Nm (13 ... 6860 Nm) <sup>1)</sup> [9.6 ... 4352 lb <sub>f</sub> -ft (9.6 ... 5060 lb <sub>f</sub> -ft) <sup>1)</sup>	<b>5/8</b>
SH 180/SH 225/SH 280/SH 355	 <b>24.5 [32.8]</b> <b>1230 (1340)<sup>1)</sup> [1649 (1797)<sup>1)</sup></b>	317 ... 11640 Nm (317 ... 12435 Nm) <sup>1)</sup> [234 ... 8586 lb <sub>f</sub> -ft (234 ... 9172 lb <sub>f</sub> -ft) <sup>1)</sup>	<b>5/30</b>
SH 80/SH 100/SH 132/SH 160/ SH 180/SH 225/SH 280	 <b>3.5 [4.70]</b> <b>460 [617]</b>	20 ... 2610 Nm [14.8 ... 1925 lb <sub>f</sub> -ft]	<b>5/46</b>
SH 132/SH 160/SH 180/SH 225	 <b>15.7 [21.0]</b> <b>196 [263]</b>	94 ... 1091 Nm [69.3 ... 805 lb <sub>f</sub> -ft]	<b>5/60</b>
SH 132/SH 160/SH 180/SH 225	 <b>15 [20.1]</b> <b>310 [416]</b>	107 ... 1650 Nm [78.9 ... 1217 lb <sub>f</sub> -ft]	<b>5/66</b>

<sup>1)</sup> Information in round brackets refers to data for shaft height 355 at 85 dB, for selection and ordering data see Catalog CR 1.

# SIMOTICS main motors

## SIMOTICS M asynchronous and synchronous motors for SINAMICS S120

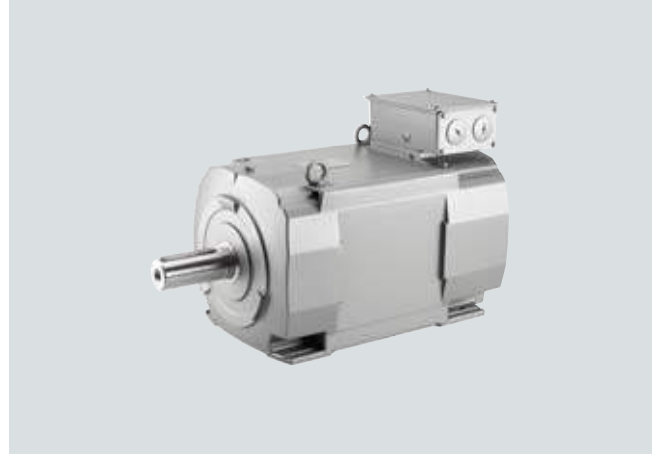
### SIMOTICS M-1PH8 asynchronous and synchronous motors

#### Overview

5



1PH8 motors, forced ventilation, shaft heights 80 to 160



1PH8 motors, water cooling, shaft heights 180 to 280



1PH8 motors, water cooling, shaft heights 80 to 160

The SIMOTICS M-1PH8 motor series is a new motor generation for universal implementation in plants and machines that have been developed with Motion Control applications. The motors are available as an asynchronous variant as well as a compact synchronous variant with either forced ventilation or water cooling, based on a flexible building block principle. Comprehensive function expansions such as different bearing concepts expand the application range.

In comparison to the freely selectable performance of vector and servo control with the SINAMICS S120 drive system, it is possible to select between asynchronous or synchronous variants in the case of the 1PH8 motor series. This flexible interoperation of converter and motor makes it even easier to master extreme duty cycles, short control rise times and high precision in terms of speed, torque and positioning.

Because the 1PH8 motors are often used as the largest and central drive in the machine, they are known as "main motors".

**Main motor = High performance +  
Highly dynamic response +  
High degree of precision**



1PH8 motors, forced ventilation, shaft height 355

When developing the new 1PH8 motor series, we took special care to ensure maximum compatibility with the SINAMICS S120 drive system. For example, the specially harmonized power components, electronic rating plates, and the ability to integrate the motors via the DRIVE-CLiQ system interface ensure quick and easy commissioning as well as problem-free operation.



**SIMOTICS M asynchronous and synchronous motors for SINAMICS S120****Benefits**

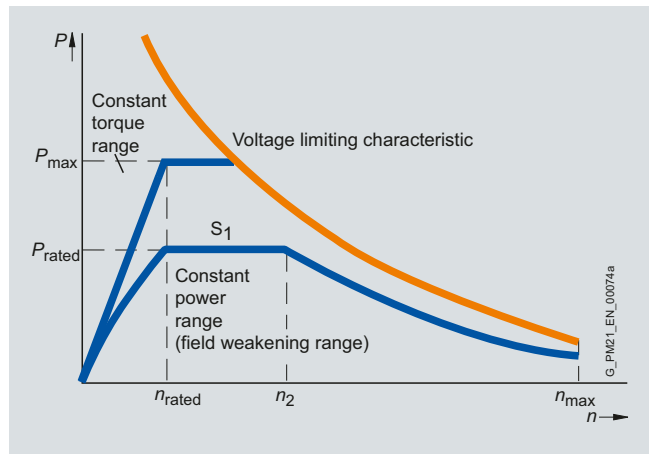
- High power density with small motor dimensions
- Wide speed control ranges
- High degree of flexibility due to the choice of
  - Asynchronous or synchronous design
  - Forced ventilation or water cooling
  - Mechanical designs
- Long-life bearings
- High rotational accuracy, even at the lowest speeds
- Maximum thermal utilization over the complete speed range
- Low sound pressure level
- Optimized for the SINAMICS S120 drive system

**Application**

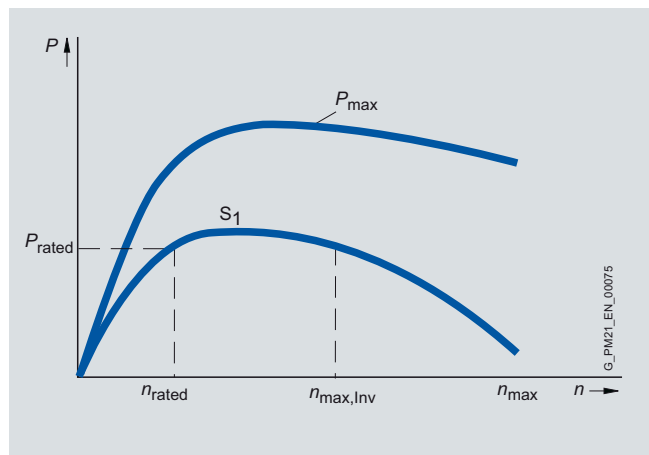
The application spectrum reaches across all industries and comprises, for example:

- Main drives in presses and extruders
- Converting applications
- Rotary axes in the paper and printing industry
- Use in crane systems

The 1PH8 motors are suitable for installation in dry indoor areas without corrosive atmospheres.

**Characteristic curves****1PH8 asynchronous motor**

Typical speed/power characteristic for 1PH8 asynchronous motors

**1PH8 synchronous motor**

Typical speed/power characteristic for 1PH8 synchronous motors

The characteristic curves show the typical relationship between motor speed and drive power for 1PH8 motors for duty type S1 (continuous duty) in accordance with IEC 60034-1.

The detailed characteristic curves for the corresponding voltage and winding variants can be found in the 1PH8 Configuration Manual.

# SIMOTICS main motors

## SIMOTICS M asynchronous and synchronous motors for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous and synchronous motors Forced ventilation/open-circuit cooling

#### Technical specifications

SIMOTICS M-1PH8 motor forced ventilation/open-circuit cooling	
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	For an ambient temperature of up to 40 °C (104°F) Temperature class 180 (H)
<b>Cooling according to EN 60034-6 (IEC 60034-6)</b> • 1PH808 ... 1PH822 • 1PH828/1PH835	Forced ventilation  Fan mounted axially at NDE Fan mounted radially at NDE
<b>Temperature monitoring</b>	KTY temperature sensor in the stator winding 1PH818 ... 1PH835 additional KTY 84 as reserve
<b>Motor fan ratings</b> • 1PH808 • 1PH810 ... 1PH816 • 1PH818/1PH822 • 1PH828/1PH835	230 V 1 AC 50/60 Hz, 265 V 1 AC 60 Hz 400 V 3 AC 50/60 Hz, 480 V 3 AC 60 Hz 200 ... 277 V 1 AC, 50/60 Hz (EC fan) 400 V 3 AC 50/60 Hz, 480 V 3 AC 60 Hz
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b> • 1PH808 • 1PH810 ... 1PH835	IM B3, IM B5 IM B3, IM B5, IM B35
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b> • 1PH808 ... 1PH835 • 1PH818 ... 1PH835	IP55 IP23
<b>Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60034-5)</b>	Plain shaft or feather key full-key or half-key balancing for feather key
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b> • 1PH808 ... 1PH816 • 1PH818 ... 1PH835	Tolerance R (reduced) Tolerance N (normal)
<b>Vibration severity in accordance with Siemens/EN 60034-14 (IEC 60034-14)<sup>1)</sup></b> • 1PH808 ... 1PH816 • 1PH818 ... 1PH835	Grade R/A Grade A
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b> Tolerance +3 dB <u>Forced ventilation (IP55)</u> • 1PH808 ... 1PH813 • 1PH816 • 1PH818 • 1PH822 • 1PH828 • 1PH835 <u>Open-circuit cooling (IP23)</u> • 1PH818 • 1PH822 • 1PH828 • 1PH835	70 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 73 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 73 dB at a rated pulse frequency of 2 kHz and a speed range up to 5000 rpm 73 dB at a rated pulse frequency of 2 kHz and a speed range up to 3500 rpm 74 dB at a rated pulse frequency of 2 kHz and a speed range up to 3300 rpm 77 dB at a rated pulse frequency of 2.5 kHz and a speed range up to 2800 rpm  73 dB at a rated pulse frequency of 2 kHz and a speed range up to 3000 rpm 73 dB at a rated pulse frequency of 2 kHz and a speed range up to 2000 rpm 74 dB at a rated pulse frequency of 2 kHz and a speed range up to 2800 rpm 77 dB at a rated pulse frequency of 2.5 kHz and a speed range up to 2800 rpm
<b>Built-in encoder systems</b> • Without DRIVE-CLiQ interface  • With DRIVE-CLiQ interface	<ul style="list-style-type: none"> <li>Absolute encoder EnDat 2048 S/R (AM2048 S/R encoder)</li> <li>Incremental encoder sin/cos 1 <math>V_{pp}</math> 2048 S/R with C and D tracks (encoder IC2048 S/R)</li> <li>Incremental encoder sin/cos 1 <math>V_{pp}</math> 512 S/R without C and D tracks (encoder IN512 S/R)</li> <li>Incremental encoder sin/cos 1 <math>V_{pp}</math> 256 S/R without C and D tracks (encoder IN256 S/R)</li> <li>Incremental encoder HTL 1024 S/R (encoder HTL 1024 S/R)</li> <li>Incremental encoder HTL 2048 S/R (encoder HTL 2048 S/R)</li> </ul> <ul style="list-style-type: none"> <li>Absolute encoder, 22 bit single-turn + 12 bit multi-turn (encoder AM22DQ)</li> <li>Incremental encoder 22 bit with commutation position (encoder IC22DQ)</li> <li>Incremental encoder 20 bit without commutation position (encoder IC20DQ)</li> <li>Incremental encoder 19 bit without commutation position (encoder IC19DQ)</li> </ul>
<b>Connection</b> • 1PH808 ... 1PH813 • 1PH816 ... 1PH822 • 1PH828/1PH835	Connector for signals or DRIVE-CLiQ-interface (mating connector not included in the scope of supply)  Terminal box NDE top/power connector Terminal box top Terminal box NDE right
<b>Rating plate</b>	1 attached to motor 1 supplied separately with terminal box
<b>Paint finish</b>	Standard paint finish in anthracite RAL 7016
<b>Approvals, according to</b>	cURus

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

## SIMOTICS M asynchronous and synchronous motors for SINAMICS S120

## SIMOTICS M-1PH8 asynchronous and synchronous motors – Water cooling

## Technical specifications (continued)

SIMOTICS M-1PH8 motor water cooling	
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	For a cooling water inlet temperature of up to 30 °C (86°F) Temperature class 180 (H) <sup>2)</sup>
<b>Cooling according to EN 60034-6 (IEC 60034-6)</b>	Water cooling Max. cooling water pressure at inlet: 6 bar Connecting thread at NDE
<b>Temperature monitoring</b> • 1PH808 ... 1PH816 • 1PH818 ... 1PH828	KTY temperature sensor in the stator winding 1 additional KTY84 as reserve
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b> • 1PH808 • 1PH810 ... 1PH828	IM B3, IM B5 IM B3, IM B5, IM B35
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b> • 1PH808 ... 1PH816 • 1PH818 ... 1PH828	IP65 IP55
<b>Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft or feather key full-key or half-key balancing for feather key
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b> • 1PH808 ... 1PH816 • 1PH818 ... 1PH828	Tolerance R (reduced) Tolerance N (normal)
<b>Vibration severity in accordance with Siemens/EN 60034-14 (IEC 60034-14)<sup>1)</sup></b> • 1PH808 ... 1PH816 • 1PH818 ... 1PH828	Grade R/A Grade A
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b> Tolerance +3 dB • 1PH808 ... 1PH813 • 1PH816 • 1PH818 • 1PH822 • 1PH828	68 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 69 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 rpm 70 dB at a rated pulse frequency of 2 or 4 kHz and a speed range up to 5000 rpm 70 dB at a rated pulse frequency of 2 or 4 kHz and a speed range up to 4500 rpm 72 dB at a rated pulse frequency of 2 kHz and a speed range up to 3300 rpm
<b>Built-in encoder systems</b> • Without DRIVE-CLiQ interface  • With DRIVE-CLiQ interface	<ul style="list-style-type: none"> <li>• Absolute encoder EnDat 2048 S/R (AM2048 S/R encoder)</li> <li>• Incremental encoder sin/cos 1 <math>V_{pp}</math> 2048 S/R with C and D tracks (encoder IC2048 S/R)</li> <li>• Incremental encoder sin/cos 1 <math>V_{pp}</math> 512 S/R without C and D tracks (encoder IN512 S/R)</li> <li>• Incremental encoder sin/cos 1 <math>V_{pp}</math> 256 S/R without C and D tracks (encoder IN256 S/R)</li> <li>• Incremental encoder HTL 1024 S/R (encoder HTL 1024 S/R)</li> <li>• Incremental encoder HTL 2048 S/R (encoder HTL 2048 S/R)</li> </ul> <ul style="list-style-type: none"> <li>• Absolute encoder, 22 bit single-turn + 12 bit multi-turn (encoder AM22DQ)</li> <li>• Incremental encoder 22 bit with commutation position (encoder IC22DQ)</li> <li>• Incremental encoder 20 bit without commutation position (encoder IC20DQ)</li> <li>• Incremental encoder 19 bit without commutation position (encoder IC19DQ)</li> </ul>
<b>Connection</b>  • 1PH808 ... 1PH813 • 1PH816 ... 1PH828	Connector for signals or DRIVE-CLiQ interface (mating connector is not included in the scope of supply)  Terminal box NDE top/power connector Terminal box NDE top
<b>Paint finish</b>	Standard paint finish in anthracite RAL 7016
<b>Approvals, according to</b>	cURus

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

<sup>2)</sup> The following motors are designed to conform to temperature class 155 (F):  
1PH8107-1.F2/1PH8107-1.M2  
1PH8138-2.F2/1PH8138-2.G2  
1PH8164/1PH8166/1PH8168

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.	
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>										
<b>400</b>	160	9.5 (12.7)	227 (167)	30	260	14.3	2150	6500	1PH8163- <b>B</b> -...1	
		13 (17.4)	310 (229)	36	300	14.1	1750	6500	1PH8165- <b>B</b> -...1	
	180	16.3 (21.8)	389 (287)	49	271	14.1	2800	5000	1PH8184- <b>B</b> -...1	
		21.2 (28.4)	506 (373)	65	268	13.9	3000	5000	1PH8186- <b>B</b> -...1	
	225	30.4 (40.8)	726 (535)	86	268	13.9	2400	4500	1PH8224- <b>B</b> -...1	
		39.2 (52.6)	936 (690)	112	264	13.9	2500	4500	1PH8226- <b>B</b> -...1	
	280	48 (64.4)	1146 (845)	132	272	13.8	2600	4500	1PH8228- <b>B</b> -...1	
		63 (84.5)	1504 (1109)	154	325	13.6	1100	3300	1PH8284-1 <b>B</b> 1-...1	
		80 (107)	1910 (1409)	186	325	13.6	1200	3300	1PH8286-1 <b>B</b> 1-...1	
		103 (138)	2459 (1814)	245	325	13.6	1300	3300	1PH8288-1 <b>B</b> 1-...1	
	<b>700</b>	180	27 (36.2)	368 (271)	65	320	24.0	3300	5000	1PH8184- <b>C</b> -...1
			35 (46.9)	478 (352)	83	330	23.9	3700	5000	1PH8186- <b>C</b> -...1
225		55 (73.8)	750 (553)	136	310	23.8	2900	4500	1PH8224- <b>C</b> -...1	
		68 (91.2)	928 (684)	162	310	23.8	3100	4500	1PH8226- <b>C</b> -...1	
280		82 (109)	1119 (825)	188	315	23.8	3300	4500	1PH8228- <b>C</b> -...1	
		110 (147)	1501 (1107)	240	330	23.7	2100	3300	1PH8284-1 <b>C</b> 1-...1	
		138 (185)	1883 (1389)	295	325	23.7	2100	3300	1PH8286-1 <b>C</b> 1-...1	
		166 (223)	2265 (1671)	365	325	23.6	2100	3300	1PH8288-1 <b>C</b> 1-...1	
<b>1000</b>	100	3.7 (4.96)	35 (25.8)	10	333	35.8	2550	9000	1PH8103- <b>D</b> -...1	
		6.3 (8.45)	60 (44.3)	17.5	307	35.5	4300	9000	1PH8107- <b>D</b> -...1	
	132	12 (16.1)	115 (84.8)	30	319	35.0	3000	8000	1PH8133- <b>D</b> -...1	
		17 (22.8)	162 (119)	43	307	34.8	4300	8000	1PH8137- <b>D</b> -...1	
	160	22 (29.5)	210 (155)	55	300	34.2	2800	6500	1PH8163- <b>D</b> -...1	
		28 (37.5)	267 (197)	71	292	34.2	4600	6500	1PH8165- <b>D</b> -...1	
	180	39 (52.3)	372 (274)	87	340	34.0	4200	5000	1PH8184- <b>D</b> -...1	
		51 (68.4)	487 (359)	112	340	34.0	4400	5000	1PH8186- <b>D</b> -...1	
	225	71 (95.2)	678 (500)	158	335	33.8	3300	4500	1PH8224- <b>D</b> -...1	
		92 (123)	879 (648)	194	340	33.8	3300	4500	1PH8226- <b>D</b> -...1	
	280	113 (151)	1079 (796)	235	340	33.9	3300	4500	1PH8228- <b>D</b> -...1	
		150 (201)	1433 (1057)	315	335	33.7	2100	3300	1PH8284-1 <b>D</b> 1-...1	
		182 (244)	1738 (1282)	410	330	33.6	2100	3300	1PH8286-1 <b>D</b> 1-...1	
		226 (303)	2158 (1592)	495	335	33.6	2100	3300	1PH8288-1 <b>D</b> 1-...1	

Asynchronous variant  
Asynchronous variant with holding brake

1  
3

Forced ventilation DE → NDE  
Forced ventilation NDE → DE

0  
1

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8163-...B...	0.91	8.1	0.823	0.2160 (1.912)	196 (432)	gk863	30	<b>6SL312-1TE23-0AA3</b>
1PH8165-...B...	0.86	14.9	0.826	0.2320 (2.053)	230 (507)	gk863	45	<b>6SL312-1TE24-5AA3</b>
1PH8184-...B...	0.85	23	0.834	0.489 (4.328)	350 (772)	1XB7322-P05	60	<b>6SL312-1TE26-0AA3</b>
1PH8186-...B...	0.83	34	0.850	0.652 (5.771)	422 (930)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8224-...B...	0.87	34	0.872	1.48 (13.1)	610 (1345)	1XB7322-P05	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8226-...B...	0.87	46	0.887	1.93 (17.1)	740 (1632)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8228-...B...	0.86	58	0.896	2.33 (20.6)	870 (1918)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8284-1.B...	0.79	86	0.924	4.20 (37.2)	1200 (2646)	1XB7700-P02	200	<b>6SL312-1TE32-0AA3</b>
1PH8286-1.B...	0.82	98	0.928	5.20 (46.0)	1400 (3087)	1XB7700-P02	200	<b>6SL312-1TE32-0AA3</b>
1PH8288-1.B...	0.80	136	0.931	6.30 (55.8)	1650 (3638)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8184-...C...	0.84	30	0.889	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-...C...	0.81	44	0.909	0.652 (5.771)	422 (930)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8224-...C...	0.82	67	0.925	1.48 (13.1)	610 (1345)	1XB7322-P05	132 <sup>4)</sup>	<b>6SL312-1TE31-3AA3</b>
1PH8226-...C...	0.84	76	0.932	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...C...	0.86	80	0.933	2.33 (20.6)	870 (1918)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8284-1.C...	0.85	106	0.947	4.20 (37.2)	1200 (2646)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8286-1.C...	0.87	121	0.949	5.20 (46.0)	1400 (3087)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8288-1.C...	0.85	171	0.953	6.30 (55.8)	1650 (3638)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8103-...D...	0.82	4.6	0.814	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-...D...	0.82	8.2	0.834	0.0289 (0.256)	73 (161)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8133-...D...	0.88	10.1	0.871	0.0760 (0.673)	106 (234)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8137-...D...	0.88	15.1	0.881	0.1090 (0.965)	141 (311)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8163-...D...	0.89	17.3	0.909	0.2160 (1.912)	196 (432)	gk863	60	<b>6SL312-1TE26-0AA3</b>
1PH8165-...D...	0.89	22.2	0.914	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-...D...	0.83	42	0.920	0.489 (4.328)	350 (772)	1XB7322-P05	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8186-...D...	0.83	56	0.926	0.652 (5.771)	422 (930)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8224-...D...	0.82	77	0.942	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-...D...	0.85	86	0.944	1.93 (17.1)	740 (1631)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...D...	0.87	97	0.948	2.33 (20.6)	870 (1918)	1XB7422-P06	260	<b>6SL332-1TE32-6AA3</b>
1PH8284-1.D...	0.85	143	0.958	4.20 (37.2)	1200 (2646)	1XB7700-P02	310 <sup>4)</sup>	<b>6SL3320-1TE33-1AA3</b>
1PH8286-1.D...	0.81	215	0.960	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.D...	0.82	252	0.962	6.30 (55.7)	1650 (3638)	1XB7700-P02	490 <sup>4)</sup>	<b>6SL3320-1TE35-0AA3</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{\text{max}}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{\text{rated}}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module (continued)</b>									
<b>1500</b>	80	2.8 (3.75)	18 (13.3)	7.5	346	53.3	4700	10000	1PH8083-■F■-...1
		3.7 (4.96)	24 (17.7)	10	336	53.2	5200	10000	1PH8087-■F■-...1
100	100	3.7 (4.96)	24 (17.7)	12.5	265	52.4	5000	9000	1PH8101-■F■-...1
		5.5 (7.38)	35 (25.8)	13.5	368	52.4	4200	9000	1PH8103-■F■-...1
		7 (9.39)	45 (33.2)	17.5	348	51.9	5250	9000	1PH8105-■F■-...1
		9 (12.1)	57 (42.0)	23.5	330	52.2	4500	9000	1PH8107-■F■-...1
132	132	11 (14.7)	70 (51.6)	24	360	51.4	4800	8000	1PH8131-■F■-...1
		15 (20.1)	96 (70.8)	34	342	51.3	5500	8000	1PH8133-■F■-...1
		18.5 (24.8)	118 (87.0)	43	330	51.3	6150	8000	1PH8135-■F■-...1
		22 (29.5)	140 (103)	56	308	51.3	4300	8000	1PH8137-■F■-...1
160	160	30 (40.2)	191 (141)	71	319	50.8	3500	6500	1PH8163-■F■-...1
		37 (49.6)	236 (174)	78	350	50.8	2800	6500	1PH8165-■F■-...1
180	180	51 (68.4)	325 (240)	116	335	50.6	5000	5000	1PH8184-■F■-...1
		74 (99.2)	471 (347)	166	330	50.6	5000	5000	1PH8186-■F■-...1
225	225	95 (127)	605 (446)	200	340	50.5	3300	4500	1PH8224-■F■-...1
		130 (174)	828 (611)	270	340	50.5	3300	4500	1PH8226-■F■-...1
		160 (214)	1019 (752)	340	340	50.4	3300	4500	1PH8228-■F■-...1
280	280	196 (263)	1248 (920)	390	345	50.4	1900	3300	1PH8284-1■F1■-...1
		250 (335)	1592 (1174)	490	345	50.4	2000	3300	1PH8286-1■F1■-...1
		320 (429)	2037 (1502)	620	345	50.4	2100	3300	1PH8288-1■F1■-...1
<b>2000</b>	80	3.7 (4.96)	18 (13.3)	11.6	293	70.2	9200	10000	1PH8083-■G■-...1
		4.9 (6.57)	23 (17.0)	14.1	320	69.8	8400	10000	1PH8087-■G■-...1
100	100	7 (9.39)	33 (24.3)	17.5	345	69.0	6000	9000	1PH8103-■G■-...1
		10.5 (14.1)	50 (36.9)	26	355	68.6	4000	9000	1PH8107-■G■-...1
132	132	20 (26.8)	96 (70.8)	45	350	68.1	4000	8000	1PH8133-■G■-...1
		28 (37.5)	134 (98.8)	60	350	68.1	4000	8000	1PH8137-■G■-...1
160	160	36 (48.3)	172 (126)	83	324	67.5	3000	6500	1PH8163-■G■-...1
		41 (55.0)	196 (144)	88	350	67.4	2750	6500	1PH8165-■G■-...1
<b>2500</b>	180	78 (105)	298 (220)	166	340	84.0	5000	5000	1PH8184-■L■-...1
		106 (142)	405 (299)	230	335	83.9	5000	5000	1PH8186-■L■-...1
	225	142 (190)	542 (400)	295	340	83.9	3200	4500	1PH8224-■L■-...1
		168 (225)	642 (473)	350	335	83.8	3200	4500	1PH8226-■L■-...1
205 (275)	783 (577)	420	340	83.8	3200	4500	1PH8228-■L■-...1		
	<b>3000</b>	80	4.1 (5.50)	13 (9.59)	13.6	298	102.6	10000	10000
4.8 (6.44)			15 (11.1)	17.3	284	102.2	10000	10000	1PH8087-■M■-...1
100	100	8.4 (11.3)	27 (19.9)	25.7	297	102.1	14250	9000	1PH8103-■M■-...1
		12 (16.1)	38 (28.0)	38	294	101.6	16500	9000	1PH8107-■M■-...1

Asynchronous variant  
Asynchronous variant with holding brake

1  
3

Forced ventilation DE → NDE  
Forced ventilation NDE → DE

0  
1

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module (continued)</b>								
1PH8083-... F ...	0.80	3.8	0.809	0.0064 (0.057)	32 (70.6)	gk803	9	<b>6SL312-1TE21-0AA3</b>
1PH8087-... F ...	0.81	4.9	0.817	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-... F ...	0.80	6.0	0.835	0.0138 (0.122)	42 (92.6)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-... F ...	0.80	6.5	0.852	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8105-... F ...	0.79	8.8	0.867	0.0252 (0.223)	65 (143)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-... F ...	0.81	10.8	0.869	0.0289 (0.256)	73 (161)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8131-... F ...	0.84	10.4	0.899	0.0590 (0.522)	89 (196)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-... F ...	0.85	14.2	0.899	0.0760 (0.673)	106 (234)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-... F ...	0.85	18.1	0.898	0.0940 (0.832)	125 (276)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-... F ...	0.84	24.2	0.904	0.1090 (0.965)	141 (311)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8163-... F ...	0.87	25.6	0.923	0.2160 (1.912)	196 (432)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-... F ...	0.88	27.0	0.926	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-... F ...	0.80	63	0.940	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-... F ...	0.83	82	0.945	0.652 (5.771)	422 (930)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8224-... F ...	0.85	87	0.953	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-... F ...	0.85	119	0.957	1.93 (17.1)	740 (1632)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-... F ...	0.83	170	0.959	2.33 (20.6)	870 (1918)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8284-1.F ...	0.87	162	0.963	4.20 (37.2)	1200 (2646)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1.F ...	0.89	182	0.965	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.F ...	0.89	233	0.966	6.30 (55.8)	1650 (3638)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8083-... G ...	0.79	5.7	0.832	0.0064 (0.057)	32 (70.6)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-... G ...	0.78	7.3	0.853	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-... G ...	0.79	8.7	0.877	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-... G ...	0.78	12.9	0.897	0.0289 (0.256)	73 (161)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-... G ...	0.85	18.1	0.919	0.0760 (0.673)	106 (234)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-... G ...	0.87	21.5	0.924	0.1090 (0.965)	141 (311)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8163-... G ...	0.88	28.1	0.929	0.2160 (1.912)	196 (432)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-... G ...	0.87	32.4	0.927	0.2320 (2.053)	230 (507)	gk863	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8184-... L ...	0.84	75	0.952	0.489 (4.328)	350 (772)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8186-... L ...	0.84	107	0.955	0.652 (5.771)	422 (930)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-... L ...	0.86	113	0.958	1.48 (13.1)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-... L ...	0.86	151	0.961	1.93 (17.1)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-... L ...	0.86	181	0.963	2.33 (20.6)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8083-... M ...	0.74	7.3	0.869	0.0064 (0.057)	32 (70.6)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-... M ...	0.72	9.6	0.871	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-... M ...	0.78	12.2	0.900	0.0172 (0.155)	51 (112)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8107-... M ...	0.76	19.2	0.900	0.0289 (0.256)	73 (161)	gk813	45	<b>6SL312-1TE24-5AA3</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module</b>									
<b>480</b>	355	160 (214)	3183 (2348)	315	400	24.2	1150	2800	<b>1PH8350-1</b> ■ B 1 ■ -...0
		190 (255)	3780 (2788)	375	400	24.2	1150	2800	<b>1PH8352-1</b> ■ B 1 ■ -...0
		225 (302)	4477 (3302)	420	400	24.2	1150	2800	<b>1PH8354-1</b> ■ B 1 ■ -...0
		255 (342)	5073 (3742)	485	400	24.2	1150	2800	<b>1PH8356-1</b> ■ B 1 ■ -...0
		295 (396)	5869 (4329)	560	400	24.2	1150	2800	<b>1PH8358-1</b> ■ B 1 ■ -...0
<b>500</b>	160	12 (16.1)	229 (169)	30	325	17.6	2200	6500	<b>1PH8163-</b> ■ B ■ -...1
		16 (21.5)	306 (226)	36	365	17.5	1850	6500	<b>1PH8165-</b> ■ B ■ -...1
	180	20.5 (27.5)	392 (289)	49	335	17.4	2900	5000	<b>1PH8184-</b> ■ B ■ -...1
		26.5 (35.5)	506 (373)	65	335	17.2	3100	5000	<b>1PH8186-</b> ■ B ■ -...1
	225	38 (51.0)	726 (535)	85	335	17.2	2500	4500	<b>1PH8224-</b> ■ B ■ -...1
		49 (65.7)	936 (690)	110	330	17.2	2600	4500	<b>1PH8226-</b> ■ B ■ -...1
		60 (80.5)	1146 (845)	132	340	17.2	2700	4500	<b>1PH8228-</b> ■ B ■ -...1
	280	80 (107)	1529 (1128)	154	395	17.0	1600	3300	<b>1PH8284-1</b> ■ B 1 ■ -...1
		100 (134)	1909 (1408)	188	400	17.0	1600	3300	<b>1PH8286-1</b> ■ B 1 ■ -...1
		130 (174)	2481 (1830)	245	395	17.0	1600	3300	<b>1PH8288-1</b> ■ B 1 ■ -...1
<b>640</b>	355	210 (282)	3134 (2312)	405	400	32.2	1150	2800	<b>1PH8350-1</b> ■ Q 1 ■ -...0
		250 (335)	3730 (2751)	475	400	32.2	1150	2800	<b>1PH8352-1</b> ■ Q 1 ■ -...0
		290 (389)	4327 (3192)	560	400	32.2	1150	2800	<b>1PH8354-1</b> ■ Q 1 ■ -...0
		335 (449)	4999 (3687)	640	400	32.2	1150	2800	<b>1PH8356-1</b> ■ Q 1 ■ -...0
		385 (516)	5745 (4237)	700	400	32.2	1150	2800	<b>1PH8358-1</b> ■ Q 1 ■ -...0
<b>800</b>	180	31 (41.6)	370 (273)	65	365	27.4	3800	5000	<b>1PH8184-</b> ■ C ■ -...1
		40 (53.6)	478 (352)	83	360	27.3	4100	5000	<b>1PH8186-</b> ■ C ■ -...1
	225	57 (76.4)	681 (502)	126	350	27.1	3400	4500	<b>1PH8224-</b> ■ C ■ -...1
		73 (97.9)	872 (643)	154	350	27.1	3600	4500	<b>1PH8226-</b> ■ C ■ -...1
		92 (123)	1098 (810)	182	360	27.2	3800	4500	<b>1PH8228-</b> ■ C ■ -...1
	280	125 (168)	1492 (1100)	235	400	27.0	2300	3300	<b>1PH8284-1</b> ■ C 1 ■ -...1
		155 (208)	1850 (1364)	285	385	27.0	2300	3300	<b>1PH8286-1</b> ■ C 1 ■ -...1
		190 (255)	2268 (1673)	365	370	27.0	2300	3300	<b>1PH8288-1</b> ■ C 1 ■ -...1
	355	250 (335)	2984 (2201)	490	400	40.2	1200	2800	<b>1PH8350-1</b> ■ C 1 ■ -...0
		305 (409)	3641 (2686)	570	400	40.2	1200	2800	<b>1PH8352-1</b> ■ C 1 ■ -...0
355 (476)		4238 (3126)	650	400	40.2	1200	2800	<b>1PH8354-1</b> ■ C 1 ■ -...0	
410 (550)		4894 (3610)	750	400	40.2	1300	2800	<b>1PH8356-1</b> ■ C 1 ■ -...0	
<b>830</b>	355	475 (637)	5444 (4015)	920	400	41.9	1350	2800	<b>1PH8358-1</b> ■ C 1 ■ -...0

Asynchronous variant  
Asynchronous variant with holding brake

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Forced ventilation DE → NDE  
Forced ventilation NDE → DE

0  
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For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8350-1.B ...	0.76	194	0.955	14.74 (130)	2235 (4928)	1XB7712-P01	380	<b>6SL3320-1TE33-8AA3</b>
1PH8352-1.B ...	0.77	223	0.957	17.40 (154)	2560 (5645)	1XB7712-P01	490	<b>6SL3320-1TE35-0AA3</b>
1PH8354-1.B ...	0.79	236	0.959	20.66 (183)	2889 (6370)	1XB7712-P03	490	<b>6SL3320-1TE35-0AA3</b>
1PH8356-1.B ...	0.78	285	0.961	24.22 (214)	3256 (7179)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8358-1.B ...	0.79	316	0.962	27.79 (246)	3629 (8002)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8163-...B ...	0.90	8.9	0.819	0.2160 (1.912)	196 (432)	gk863	30	<b>6SL312-1TE23-0AA3</b>
1PH8165-...B ...	0.85	14.8	0.830	0.2320 (2.053)	230 (507)	gk863	45	<b>6SL312-1TE24-5AA3</b>
1PH8184-...B ...	0.84	23	0.861	0.489 (4.328)	350 (772)	1XB7322-P05	60	<b>6SL312-1TE26-0AA3</b>
1PH8186-...B ...	0.80	36	0.875	0.652 (5.771)	422 (930)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8224-...B ...	0.86	36	0.896	1.48 (13.1)	610 (1345)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8226-...B ...	0.86	48	0.908	1.93 (17.1)	740 (1632)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8228-...B ...	0.85	59	0.914	2.33 (20.6)	870 (1918)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8284-1.B ...	0.81	81	0.935	4.20 (37.1)	1200 (2646)	1XB7700-P02	200	<b>6SL312-1TE32-0AA3</b>
1PH8286-1.B ...	0.82	96	0.939	5.20 (46.0)	1400 (3087)	1XB7700-P02	200	<b>6SL312-1TE32-0AA3</b>
1PH8288-1.B ...	0.82	127	0.941	6.30 (55.8)	1650 (3638)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8350-1.Q ...	0.77	235	0.961	14.74 (130)	2235 (4928)	1XB7712-P01	490	<b>6SL3320-1TE35-0AA3</b>
1PH8352-1.Q ...	0.78	267	0.964	17.40 (154)	2560 (5645)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8354-1.Q ...	0.77	334	0.965	20.66 (183)	2889 (6370)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.Q ...	0.78	380	0.966	24.22 (214)	3256 (7179)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8358-1.Q ...	0.82	359	0.967	27.79 (246)	3629 (8002)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8184-...C ...	0.84	30	0.901	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-...C ...	0.84	41	0.916	0.652 (5.771)	422 (930)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8224-...C ...	0.80	67	0.934	1.48 (13.1)	610 (1345)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8226-...C ...	0.83	75	0.940	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...C ...	0.86	80	0.941	2.33 (20.6)	870 (1918)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8284-1.C ...	0.81	124	0.952	4.20 (37.2)	1200 (2646)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8286-1.C ...	0.85	133	0.955	5.20 (46.0)	1400 (3087)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8288-1.C ...	0.85	171	0.957	6.30 (55.8)	1650 (3638)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8350-1.C ...	0.76	294	0.965	14.74 (130)	2235 (4928)	1XB7712-P01	745	<b>6SL3320-1TE37-5AA3</b>
1PH8352-1.C ...	0.80	302	0.967	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.C ...	0.81	328	0.968	20.66 (183)	2889 (6370)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.C ...	0.80	410	0.969	24.22 (214)	3256 (7179)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8358-1.C ...	0.76	567	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>

**Cooling:**

Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160), 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module (continued)</b>									
<b>1080</b>	355	270 (362)	2388 (1761)	495	400	54.2	1450	2800	<b>1PH8350-1 D 1 -...0</b>
		330 (442)	2918 (2152)	620	400	54.2	1450	2800	<b>1PH8352-1 D 1 -...0</b>
		375 (503)	3316 (2446)	670	400	54.2	1400	2800	<b>1PH8354-1 D 1 -...0</b>
		440 (590)	3891 (2870)	810	400	54.2	1400	2800	<b>1PH8356-1 D 1 -...0</b>
		470 (630)	4156 (3065)	880	400	54.2	1400	2800	<b>1PH8358-1 D 1 -...0</b>
<b>1150</b>	100	4.3 (5.77)	36 (26.5)	10	380	40.7	2450	9000	<b>1PH8103- D -...1</b>
		7.2 (9.66)	60 (44.3)	17.5	348	40.6	4750	9000	<b>1PH8107- D -...1</b>
	132	13.5 (18.1)	112 (82.6)	29	361	40.0	3000	8000	<b>1PH8133- D -...1</b>
		19.5 (26.1)	162 (119)	43	350	39.8	4000	8000	<b>1PH8137- D -...1</b>
	160	25 (33.5)	208 (153)	55	343	39.2	3550	6500	<b>1PH8163- D -...1</b>
		31 (41.6)	257 (189)	69	333	39.2	4850	6500	<b>1PH8165- D -...1</b>
	180	44 (59.0)	365 (269)	86	390	39.0	4800	5000	<b>1PH8184- D -...1</b>
		58 (77.8)	482 (355)	112	390	38.9	5000	5000	<b>1PH8186- D -...1</b>
	225	81 (109)	673 (496)	156	385	38.8	3400	4500	<b>1PH8224- D -...1</b>
		105 (141)	872 (643)	192	390	38.8	3400	4500	<b>1PH8226- D -...1</b>
		129 (173)	1071 (790)	235	390	38.8	3400	4500	<b>1PH8228- D -...1</b>
	280	170 (228)	1414 (1043)	310	400	38.6	2200	3300	<b>1PH8284-1 D 1 -...1</b>
		210 (282)	1745 (1287)	410	380	38.6	2200	3300	<b>1PH8286-1 D 1 -...1</b>
260 (349)		2160 (1593)	495	385	38.6	2200	3300	<b>1PH8288-1 D 1 -...1</b>	

Asynchronous variant  
Asynchronous variant with holding brake

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Forced ventilation DE → NDE  
Forced ventilation NDE → DE

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For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magne- tizing current	Effi- ciency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system  Order No.
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{\text{rated}}$ A	
<b>Line voltage 400 V 3 AC, Active Line Module (continued)</b>								
1PH8350-1.D...	0.82	235	0.968	14.74 (130)	2235 (4928)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8352-1.D...	0.79	338	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.D...	0.83	314	0.970	20.66 (183)	2889 (6370)	1XB7712-P03	840 <sup>4)</sup>	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.D...	0.80	433	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8358-1.D...	0.79	489	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8103-...D...	0.81	4.8	0.824	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-...D...	0.82	8.2	0.852	0.0289 (0.256)	73 (161)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8133-...D...	0.87	10.7	0.884	0.0760 (0.673)	106 (234)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8137-...D...	0.87	16.1	0.891	0.1090 (0.965)	141 (311)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8163-...D...	0.88	17.5	0.915	0.2160 (1.912)	196 (432)	gk863	60	<b>6SL312-1TE26-0AA3</b>
1PH8165-...D...	0.89	20.9	0.921	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-...D...	0.82	42	0.928	0.489 (4.328)	350 (772)	1XB7322-P05	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8186-...D...	0.82	57	0.933	0.652 (5.771)	422 (930)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8224-...D...	0.82	78	0.946	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-...D...	0.85	86	0.949	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...D...	0.86	97	0.953	2.33 (20.6)	870 (1918)	1XB7422-P06	260	<b>6SL332-1TE32-6AA3</b>
1PH8284-1.D...	0.82	157	0.960	4.20 (37.2)	1200 (2646)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8286-1.D...	0.81	217	0.962	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.D...	0.82	253	0.964	6.30 (55.8)	1650 (3638)	1XB7700-P02	490 <sup>4)</sup>	<b>6SL3320-1TE35-0AA3</b>

**Cooling:**

Internal air cooling  
External air cooling

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<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{\text{max}}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{\text{rated}}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160), 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>r</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module (continued)</b>									
<b>1750</b>	80	3.3 (4.43)	18 (13.3)	7.5	398	61.7	5200	10000	<b>1PH8083- F ■■■-...1</b>
		4.3 (5.77)	23 (17.0)	10	396	61.3	5850	10000	<b>1PH8087- F ■■■-...1</b>
100	100	4.3 (5.77)	23 (17.0)	12.5	304	60.8	5000	9000	<b>1PH8101- F ■■■-...1</b>
		6.3 (8.45)	34 (25.1)	13.1	412	60.8	4000	9000	<b>1PH8103- F ■■■-...1</b>
		8 (10.7)	44 (32.4)	17.5	400	60.2	5900	9000	<b>1PH8105- F ■■■-...1</b>
		10 (13.4)	55 (40.6)	22	380	60.4	5000	9000	<b>1PH8107- F ■■■-...1</b>
132	132	13 (17.4)	71 (52.4)	24	416	59.8	5150	8000	<b>1PH8131- F ■■■-...1</b>
		17.5 (23.5)	96 (70.8)	34	392	59.7	5000	8000	<b>1PH8133- F ■■■-...1</b>
		21.5 (28.8)	117 (86.3)	43	383	59.6	5500	8000	<b>1PH8135- F ■■■-...1</b>
		25 (33.5)	136 (100)	56	353	59.6	5000	8000	<b>1PH8137- F ■■■-...1</b>
160	160	34 (45.6)	186 (137)	70	366	59.2	3050	6500	<b>1PH8163- F ■■■-...1</b>
		41 (55.0)	224 (165)	76	400	59.1	2650	6500	<b>1PH8165- F ■■■-...1</b>
180	180	60 (80.5)	327 (241)	120	390	58.9	5000	5000	<b>1PH8184- F ■■■-...1</b>
		85 (114)	464 (342)	164	385	58.9	5000	5000	<b>1PH8186- F ■■■-...1</b>
225	225	110 (147)	600 (442)	198	395	58.9	3200	4500	<b>1PH8224- F ■■■-...1</b>
		135 (181)	737 (544)	250	395	58.8	3300	4500	<b>1PH8226- F ■■■-...1</b>
		179 (240)	977 (721)	330	395	58.7	3400	4500	<b>1PH8228- F ■■■-...1</b>
280	280	225 (302)	1228 (906)	390	400	58.7	2200	3300	<b>1PH8284-1 F ■■-...1</b>
		270 (362)	1474 (1087)	460	400	58.7	2200	3300	<b>1PH8286-1 F ■■-...1</b>
		340 (456)	1856 (1369)	580	400	58.7	2200	3300	<b>1PH8288-1 F ■■-...1</b>
<b>2300</b>	80	4.1 (5.50)	17 (12.5)	11.3	332	80.0	10000	10000	<b>1PH8083- G ■■■-...1</b>
		5.4 (7.24)	22 (16.2)	13.7	353	79.8	9650	10000	<b>1PH8087- G ■■■-...1</b>
100	100	7.5 (10.1)	31 (22.9)	17	382	78.9	6000	9000	<b>1PH8103- G ■■■-...1</b>
		12.0 (16.1)	50 (36.9)	26	406	78.6	4600	9000	<b>1PH8107- G ■■■-...1</b>
132	132	22.5 (30.2)	93 (68.6)	44	400	78.1	5000	8000	<b>1PH8133- G ■■■-...1</b>
		29 (38.9)	120 (88.5)	56	400	77.9	5000	8000	<b>1PH8137- G ■■■-...1</b>
160	160	38 (51.0)	158 (116)	78	370	77.4	3200	6500	<b>1PH8163- G ■■■-...1</b>
		44 (59.0)	183 (135)	85	394	77.4	3000	6500	<b>1PH8165- G ■■■-...1</b>
<b>2900</b>	180	81 (109)	267 (197)	152	395	97.3	5000	5000	<b>1PH8184- L ■■■-...1</b>
		101 (135)	333 (246)	198	385	97.2	5000	5000	<b>1PH8186- L ■■■-...1</b>
	225	225	149 (200)	491 (362)	270	395	97.2	3300	4500
185 (248)			609 (449)	335	390	97.1	3300	4500	<b>1PH8226- L ■■■-...1</b>
215 (288)			708 (522)	390	395	97.1	3300	4500	<b>1PH8228- L ■■■-...1</b>
<b>3300</b>	80	4.5 (6.03)	13 (9.59)	13.5	327	112.6	10000	10000	<b>1PH8083- M ■■■-...1</b>
		5.2 (6.97)	15 (11.1)	17.1	303	112.3	10000	10000	<b>1PH8087- M ■■■-...1</b>
	100	9.3 (12.5)	27 (19.9)	25.7	326	112.1	16000	9000	<b>1PH8103- M ■■■-...1</b>
		13 (17.4)	38 (28.0)	38	314	111.7	18000	9000	<b>1PH8107- M ■■■-...1</b>

Asynchronous variant  
Asynchronous variant with holding brake

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Forced ventilation DE → NDE  
Forced ventilation NDE → DE

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For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module (continued)</b>								
1PH8083-...F...	0.80	3.8	0.831	0.0064 (0.057)	32 (70.6)	gk803	9	<b>6SL312-1TE21-0AA3</b>
1PH8087-...F...	0.78	5.3	0.838	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-...F...	0.80	6.0	0.852	0.0138 (0.122)	42 (92.6)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-...F...	0.81	6.0	0.859	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8105-...F...	0.78	8.8	0.878	0.0252 (0.223)	65 (143)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-...F...	0.80	10.9	0.878	0.0289 (0.256)	73 (161)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8131-...F...	0.84	10.3	0.914	0.0590 (0.522)	89 (196)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-...F...	0.85	13.6	0.913	0.0760 (0.673)	106 (234)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-...F...	0.84	18.3	0.909	0.0940 (0.832)	125 (276)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-...F...	0.86	23.1	0.907	0.1090 (0.965)	141 (311)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8163-...F...	0.87	24.6	0.926	0.2160 (1.912)	196 (432)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-...F...	0.88	25.8	0.934	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-...F...	0.79	64	0.944	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-...F...	0.82	83	0.949	0.652 (5.771)	422 (930)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8224-...F...	0.85	87	0.956	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-...F...	0.83	119	0.960	1.93 (17.1)	740 (1632)	1XB7422-P06	310	<b>6SL332 0-1TE33-1AA3</b>
1PH8228-...F...	0.82	170	0.961	2.33 (20.6)	870 (1918)	1XB7700-P02	380	<b>6SL332 0-1TE33-8AA3</b>
1PH8284-1.F...	0.86	162	0.964	4.20 (37.2)	1200 (2646)	1XB7700-P02	490	<b>6SL332 0-1TE35-0AA3</b>
1PH8286-1.F...	0.88	183	0.966	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL332 0-1TE35-0AA3</b>
1PH8288-1.F...	0.88	233	0.967	6.30 (55.8)	1650 (3638)	1XB7712-P03	745	<b>6SL332 0-1TE37-5AA3</b>
1PH8083-...G...	0.78	5.7	0.852	0.0064 (0.057)	32 (70.6)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-...G...	0.79	6.8	0.859	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-...G...	0.79	8.1	0.891	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-...G...	0.78	13.0	0.909	0.0289 (0.256)	73 (161)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-...G...	0.84	18.1	0.933	0.0760 (0.673)	106 (234)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-...G...	0.86	21.9	0.929	0.1090 (0.965)	141 (311)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8163-...G...	0.87	28.2	0.935	0.2160 (1.912)	196 (432)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-...G...	0.86	31.0	0.932	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-...L...	0.82	76	0.952	0.489 (4.328)	350 (772)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8186-...L...	0.80	106	0.954	0.652 (5.771)	422 (930)	1XB7422-P06	260	<b>6SL332 0-1TE32-6AA3</b>
1PH8224-...L...	0.85	115	0.957	1.48 (13.1)	610 (1345)	1XB7700-P02	310	<b>6SL332 0-1TE33-1AA3</b>
1PH8226-...L...	0.85	152	0.960	1.93 (17.1)	740 (1632)	1XB7700-P02	380	<b>6SL332 0-1TE33-8AA3</b>
1PH8228-...L...	0.84	183	0.961	2.33 (20.6)	870 (1918)	1XB7700-P02	490	<b>6SL332 0-1TE35-0AA3</b>
1PH8083-...M...	0.74	7.3	0.875	0.0064 (0.057)	32 (70.6)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-...M...	0.73	9.2	0.878	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-...M...	0.78	12.2	0.900	0.0172 (0.152)	51 (112)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8107-...M...	0.78	12.2	0.900	0.0289 (0.256)	73 (161)	gk813	45	<b>6SL312-1TE24-5AA3</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>f</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>									
<b>550</b>	355	185 (248)	3212 (2369)	320	460	27.7	1400	2800	<b>1PH8350-1 ■ B 1 ■-...0</b>
		220 (295)	3820 (2818)	375	460	27.7	1400	2800	<b>1PH8352-1 ■ B 1 ■-...0</b>
		255 (342)	4428 (3266)	420	460	27.7	1400	2800	<b>1PH8354-1 ■ B 1 ■-...0</b>
		295 (396)	5122 (3778)	490	460	27.7	1400	2800	<b>1PH8356-1 ■ B 1 ■-...0</b>
		340 (456)	5904 (4355)	560	460	27.7	1400	2800	<b>1PH8358-1 ■ B 1 ■-...0</b>
<b>600</b>	160	14.5 (19.4)	231 (170)	30	370	21.0	2150	6500	<b>1PH8163- ■ B ■-...1</b>
		19 (25.5)	302 (223)	35	420	20.8	1800	6500	<b>1PH8165- ■ B ■-...1</b>
	180	25 (33.5)	398 (293)	49	410	20.7	3000	5000	<b>1PH8184- ■ B ■-...1</b>
		32 (42.9)	509 (375)	66	400	20.6	3200	5000	<b>1PH8186- ■ B ■-...1</b>
	225	45 (60.3)	716 (528)	83	405	20.5	2600	4500	<b>1PH8224- ■ B ■-...1</b>
		59 (79.1)	939 (693)	110	395	20.5	2700	4500	<b>1PH8226- ■ B ■-...1</b>
		72 (96.5)	1146 (845)	130	410	20.5	2800	4500	<b>1PH8228- ■ B ■-...1</b>
	280	95 (127)	1519 (1120)	154	460	20.3	1800	3300	<b>1PH8284- 1 ■ B 1 ■-...1</b>
		120 (161)	1916 (1413)	188	460	20.3	1800	3300	<b>1PH8286- 1 ■ B 1 ■-...1</b>
		155 (208)	2474 (1825)	245	460	20.3	1800	3300	<b>1PH8288- 1 ■ B 1 ■-...1</b>
<b>750</b>	355	245 (329)	3120 (2301)	405	465	37.7	1400	2800	<b>1PH8350-1 ■ Q 1 ■-...0</b>
		295 (396)	3756 (2770)	475	465	37.7	1400	2800	<b>1PH8352-1 ■ Q 1 ■-...0</b>
		340 (456)	4329 (3193)	560	465	37.7	1400	2800	<b>1PH8354-1 ■ Q 1 ■-...0</b>
		395 (530)	5030 (3710)	640	465	37.7	1400	2800	<b>1PH8356-1 ■ Q 1 ■-...0</b>
		450 (603)	5730 (4226)	700	465	37.7	1400	2800	<b>1PH8358-1 ■ Q 1 ■-...0</b>
<b>900</b>	355	280 (375)	2971 (2191)	490	450	45.2	1500	2800	<b>1PH8350-1 ■ C 1 ■-...0</b>
		340 (456)	3608 (2661)	560	450	45.2	1500	2800	<b>1PH8352-1 ■ C 1 ■-...0</b>
		400 (536)	4244 (3130)	650	450	45.2	1500	2800	<b>1PH8354-1 ■ C 1 ■-...0</b>
		460 (617)	4881 (3600)	760	450	45.2	1600	2800	<b>1PH8356-1 ■ C 1 ■-...0</b>
		515 (691)	5465 (4031)	920	430	45.2	1600	2800	<b>1PH8358-1 ■ C 1 ■-...0</b>

Asynchronous variant  
Asynchronous variant with holding brake

1  
3

Forced ventilation DE → NDE  
Forced ventilation NDE → DE

0  
1

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8350-1.B...	0.75	197	0.958	14.74 (130)	2235 (4928)	1XB7712-P01	380	<b>6SL3320-1TE33-8AA3</b>
1PH8352-1.B...	0.77	225	0.960	17.40 (154)	2560 (5645)	1XB7712-P01	490	<b>6SL3320-1TE35-0AA3</b>
1PH8354-1.B...	0.79	238	0.962	20.66 (183)	2889 (6370)	1XB7712-P03	490	<b>6SL3320-1TE35-0AA3</b>
1PH8356-1.B...	0.78	287	0.963	24.22 (214)	3256 (7179)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8358-1.B...	0.79	321	0.965	27.79 (246)	3629 (8002)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8163-...B...	0.90	8.1	0.851	0.2160 (1.912)	196 (432)	gk863	30	<b>6SL312-1TE23-0AA3</b>
1PH8165-...B...	0.88	12.0	0.850	0.2320 (2.053)	230 (507)	gk863	45	<b>6SL312-1TE24-5AA3</b>
1PH8184-...B...	0.81	26	0.882	0.489 (4.328)	350 (772)	1XB7322-P05	60	<b>6SL312-1TE26-0AA3</b>
1PH8186-...B...	0.79	37	0.892	0.652 (5.771)	422 (930)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8224-...B...	0.85	37	0.912	1.48 (13.1)	610 (1345)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8226-...B...	0.85	49	0.921	1.93 (17.1)	740 (1632)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8228-...B...	0.84	62	0.927	2.33 (20.6)	870 (1918)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8284-1.B...	0.82	77	0.943	4.20 (37.2)	1200 (2646)	1XB7700-P02	200	<b>6SL312-1TE32-0AA3</b>
1PH8286-1.B...	0.85	88	0.945	5.20 (46.0)	1400 (3087)	1XB7700-P02	200	<b>6SL312-1TE32-0AA3</b>
1PH8288-1.B...	0.84	121	0.948	6.30 (55.8)	1650 (3638)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8350-1.Q...	0.77	231	0.964	14.74 (130)	2235 (4928)	1XB7712-P01	490	<b>6SL3320-1TE35-0AA3</b>
1PH8352-1.Q...	0.79	262	0.966	17.40 (154)	2560 (5645)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8354-1.Q...	0.78	328	0.967	20.66 (183)	2889 (6370)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.Q...	0.78	372	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8358-1.Q...	0.82	351	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8350-1.C...	0.76	295	0.966	14.74 (130)	2235 (4928)	1XB7712-P01	745	<b>6SL3320-1TE37-5AA3</b>
1PH8352-1.C...	0.80	303	0.968	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.C...	0.81	328	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.C...	0.80	410	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8358-1.C...	0.77	557	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>

**Cooling:**

Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160), 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.	
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module (continued)</b>										
<b>1000</b>	180	39 (52.3)	372 (274)	65	460	34.0	3700	5000	1PH8184- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		50 (67.0)	478 (352)	83	450	33.9	4000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	225	71 (95.2)	678 (500)	126	425	33.8	3700	4500	1PH8224- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		92 (123)	879 (648)	156	440	33.8	3900	4500	1PH8226- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		115 (154)	1098 (810)	182	450	33.8	4000	4500	1PH8228- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	280	150 (201)	1433 (1057)	230	455	33.7	2300	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		185 (248)	1767 (1303)	280	460	33.7	2300	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		230 (308)	2197 (1620)	355	460	33.6	2300	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	<b>1250</b>	355	315 (422)	2407 (1775)	495	460	62.7	1800	2800	1PH8350-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...0
			380 (509)	2903 (2141)	620	460	62.7	1800	2800	1PH8352-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...0
435 (583)			3323 (2451)	670	460	62.7	1700	2800	1PH8354-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...0	
510 (684)			3896 (2874)	810	460	62.7	1700	2800	1PH8356-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...0	
545 (731)			4164 (3071)	880	460	62.7	1700	2800	1PH8358-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...0	
<b>1350</b>	100	4.7 (6.30)	33 (24.3)	9.7	423	47.3	3500	9000	1PH8103- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		8.0 (10.7)	57 (42.0)	17	400	47.1	5045	9000	1PH8107- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	132	15 (20.1)	106 (78.2)	28	417	46.5	3500	8000	1PH8133- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		22 (29.5)	156 (115)	42	404	46.4	4000	8000	1PH8137- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	160	28 (37.5)	198 (146)	52	400	45.8	4000	6500	1PH8163- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		34 (45.6)	241 (178)	66	387	45.8	5600	6500	1PH8165- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	180	50 (67.0)	354 (261)	84	450	45.7	5000	5000	1PH8184- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		67 (89.8)	474 (350)	112	450	45.6	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	225	92 (123)	651 (480)	154	450	45.5	3400	4500	1PH8224- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		120 (161)	849 (626)	188	460	45.5	3400	4500	1PH8226- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		147 (197)	1040 (767)	225	460	45.5	3400	4500	1PH8228- <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
	280	200 (268)	1416 (1044)	315	460	45.3	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		245 (328)	1733 (1278)	410	445	45.3	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	
		305 (409)	2158 (1592)	495	450	45.3	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> <span style="color:blue">■</span> -...1	

Asynchronous variant  
Asynchronous variant with holding brake

1  
3

Forced ventilation DE → NDE  
Forced ventilation NDE → DE

0  
1

For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magnetizing current $I_{\mu}$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module (continued)</b>								
1PH8184-...C...	0.82	32	0.917	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-...C...	0.83	42	0.929	0.652 (5.771)	422 (930)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8224-...C...	0.81	64	0.943	1.48 (13.1)	610 (1345)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8226-...C...	0.82	77	0.948	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...C...	0.85	82	0.949	2.33 (20.6)	870 (1918)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8284-1.C...	0.86	101	0.957	4.20 (37.2)	1200 (2646)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8286-1.C...	0.86	122	0.960	5.20 (46.0)	1400 (3087)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8288-1.C...	0.84	172	0.962	6.30 (55.8)	1650 (3638)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8350-1.D...	0.82	232	0.969	14.74 (130)	2235 (4928)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8352-1.D...	0.79	329	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.D...	0.83	311	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	840 <sup>4)</sup>	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.D...	0.81	427	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8358-1.D...	0.80	484	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8103-...D...	0.82	4.4	0.848	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-...D...	0.80	8.2	0.867	0.0289 (0.256)	73 (161)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8133-...D...	0.86	10.7	0.904	0.0760 (0.673)	106 (234)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8137-...D...	0.86	15.9	0.902	0.1090 (0.965)	141 (311)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8163-...D...	0.88	17.7	0.924	0.2160 (1.912)	196 (432)	gk863	60	<b>6SL312-1TE26-0AA3</b>
1PH8165-...D...	0.86	22.5	0.928	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-...D...	0.82	41	0.936	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-...D...	0.82	55	0.939	0.652 (5.771)	422 (930)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8224-...D...	0.81	78	0.951	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-...D...	0.84	88	0.954	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...D...	0.86	99	0.957	2.33 (20.6)	870 (1918)	1XB7422-P06	260	<b>6SL332-1TE32-6AA3</b>
1PH8284-1.D...	0.83	151	0.962	4.20 (37.2)	1200 (2646)	1XB7700-P02	310 <sup>4)</sup>	<b>6SL3320-1TE33-1AA3</b>
1PH8286-1.D...	0.81	217	0.963	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.D...	0.82	251	0.965	6.30 (55.8)	1650 (3638)	1XB7700-P02	490 <sup>4)</sup>	<b>6SL3320-1TE35-0AA3</b>

**Cooling:**

Internal air cooling  
External air cooling

**0**  
**1**

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160), 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>F</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module (continued)</b>									
<b>2000</b>	80	3.7 (4.96)	18 (13.3)	7.6	447	70.0	5550	10000	1PH8083- ■■■ F ■■■-...1
		4.9 (6.57)	23 (17.0)	10	435	69.9	6100	10000	1PH8087- ■■■ F ■■■-...1
100	100	4.7 (6.30)	22 (16.2)	12.5	343	69.0	7500	9000	1PH8101- ■■■ F ■■■-...1
		7 (9.39)	33 (24.3)	12.7	460	69.1	4100	9000	1PH8103- ■■■ F ■■■-...1
		9 (12.1)	43 (31.7)	17	453	68.5	6180	9000	1PH8105- ■■■ F ■■■-...1
132	132	11 (14.7)	53 (39.1)	21.5	428	68.6	5500	9000	1PH8107- ■■■ F ■■■-...1
		15 (20.1)	72 (53.1)	24	460	68.2	5300	8000	1PH8131- ■■■ F ■■■-...1
		20 (26.8)	96 (70.8)	34	445	68.0	6200	8000	1PH8133- ■■■ F ■■■-...1
160	160	24 (32.2)	115 (84.8)	43	434	67.9	7100	8000	1PH8135- ■■■ F ■■■-...1
		28 (37.5)	134 (98.8)	55	401	67.9	4000	8000	1PH8137- ■■■ F ■■■-...1
		37 (49.6)	177 (130)	68	416	67.4	3550	6500	1PH8163- ■■■ F ■■■-...1
180	180	45 (60.3)	215 (158)	75	440	67.5	3300	6500	1PH8165- ■■■ F ■■■-...1
		68 (91.2)	325 (240)	118	450	67.2	5000	5000	1PH8184- ■■■ F ■■■-...1
225	225	94 (126)	449 (331)	160	445	67.2	5000	5000	1PH8186- ■■■ F ■■■-...1
		124 (166)	592 (437)	196	460	67.2	2900	4500	1PH8224- ■■■ F ■■■-...1
280	280	153 (205)	731 (539)	245	450	67.1	3100	4500	1PH8226- ■■■ F ■■■-...1
		196 (263)	936 (690)	325	450	67.1	3200	4500	1PH8228- ■■■ F ■■■-...1
		255 (342)	1218 (898)	390	455	67.0	2200	3300	1PH8284- 1 ■■■ F 1 ■■■-...1
2650	80	310 (416)	1481 (1092)	460	455	67.0	2200	3300	1PH8286- 1 ■■■ F 1 ■■■-...1
		385 (516)	1838 (1356)	570	455	67.0	2200	3300	1PH8288- 1 ■■■ F 1 ■■■-...1
		4.6 (6.17)	17 (12.5)	11.2	376	91.6	10000	10000	1PH8083- ■■■ G ■■■-...1
100	100	6 (8.05)	22 (16.2)	13.6	390	91.6	10000	10000	1PH8087- ■■■ G ■■■-...1
		8 (10.7)	29 (21.4)	16	434	90.4	7500	9000	1PH8103- ■■■ G ■■■-...1
132	132	13.0 (17.4)	47 (34.7)	24	460	90.0	7000	9000	1PH8107- ■■■ G ■■■-...1
		24 (32.2)	86 (63.4)	41	456	89.6	7000	8000	1PH8133- ■■■ G ■■■-...1
160	160	30 (40.2)	108 (79.7)	52	460	89.4	4250	8000	1PH8137- ■■■ G ■■■-...1
		40 (53.6)	144 (106)	76	390	89.2	3500	6500	1PH8163- ■■■ G ■■■-...1
3400	180	50 (67.0)	180 (133)	85	440	89.0	3250	6500	1PH8165- ■■■ G ■■■-...1
		65 (87.2)	183 (135)	120	460	113.7	5000	5000	1PH8184- ■■■ L ■■■-...1
2650	225	81 (109)	228 (168)	158	455	113.7	5000	5000	1PH8186- ■■■ L ■■■-...1
		85 (114)	239 (176)	168	460	113.6	3600	4500	1PH8224- ■■■ L ■■■-...1
		90 (121)	253 (187)	205	460	113.5	3600	4500	1PH8226- ■■■ L ■■■-...1
3400	225	95 (127)	267 (197)	225	460	113.5	3600	4500	1PH8228- ■■■ L ■■■-...1
		4.9 (6.57)	13 (9.59)	14	355	122.6	10000	10000	1PH8083- ■■■ M ■■■-...1
3600	100	5.7 (7.64)	15 (11.1)	17.1	329	122.4	10000	10000	1PH8087- ■■■ M ■■■-...1
		10 (13.4)	27 (19.9)	25.4	355	122.1	17650	9000	1PH8103- ■■■ M ■■■-...1
		14 (18.8)	37 (27.3)	37.5	350	121.6	18000	9000	1PH8107- ■■■ M ■■■-...1

Asynchronous variant  
Asynchronous variant with holding brake

Forced ventilation DE → NDE  
Forced ventilation NDE → DE

1  
3

0  
1

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system
	cos $\varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module (continued)</b>								
1PH8083-... F ...	0.79	3.7	0.850	0.0064 (0.057)	32 (70.6)	gk803	9	<b>6SL312-1TE21-0AA3</b>
1PH8087-... F ...	0.80	4.9	0.864	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-... F ...	0.79	6.0	0.871	0.0138 (0.122)	42 (92.6)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-... F ...	0.81	5.8	0.894	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8105-... F ...	0.78	8.7	0.911	0.0252 (0.223)	65 (143)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-... F ...	0.79	10.8	0.901	0.0289 (0.256)	73 (161)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8131-... F ...	0.86	9.2	0.931	0.0590 (0.522)	89 (196)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-... F ...	0.85	13.5	0.933	0.0760 (0.673)	106 (234)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-... F ...	0.84	18.1	0.929	0.0940 (0.832)	125 (276)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-... F ...	0.84	23.1	0.931	0.1090 (0.965)	141 (311)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8163-... F ...	0.86	24.6	0.932	0.2160 (1.912)	196 (432)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-... F ...	0.89	23.6	0.936	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-... F ...	0.78	65	0.947	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-... F ...	0.80	86	0.952	0.652 (5.771)	422 (930)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8224-... F ...	0.83	90	0.957	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-... F ...	0.83	119	0.961	1.93 (17.1)	740 (1632)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-... F ...	0.81	169	0.962	2.33 (20.6)	870 (1918)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8284-1. F ...	0.86	162	0.965	4.20 (37.2)	1200 (2646)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1. F ...	0.88	182	0.967	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1. F ...	0.88	232	0.967	6.30 (55.8)	1650 (3638)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8083-... G ...	0.78	5.7	0.862	0.0064 (0.057)	32 (70.6)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-... G ...	0.79	6.5	0.884	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-... G ...	0.78	8.1	0.913	0.0172 (0.152)	51 (112)	gk813	18	<b>6SL312-1TE21-8AA3</b>
1PH8107-... G ...	0.77	12.8	0.932	0.0289 (0.256)	73 (161)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-... G ...	0.83	18.1	0.949	0.0760 (0.673)	106 (234)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-... G ...	0.83	22.4	0.941	0.1090 (0.965)	141 (311)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8163-... G ...	0.89	23.1	0.936	0.2160 (1.912)	196 (432)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-... G ...	0.87	28.9	0.932	0.2320 (2.053)	230 (507)	gk863	85	<b>6SL312-1TE28-5AA3</b>
1PH8184-... L ...	0.72	77	0.944	0.489 (4.328)	350 (772)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8186-... L ...	0.69	109	0.943	0.652 (5.771)	422 (930)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-... L ...	0.68	115	0.934	1.48 (13.1)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-... L ...	0.60	156	0.926	1.93 (17.1)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-... L ...	0.57	183	0.922	2.33 (20.6)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8083-... M ...	0.74	7.3	0.881	0.0064 (0.057)	32 (70.6)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-... M ...	0.73	9.2	0.878	0.0089 (0.079)	39 (86.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-... M ...	0.77	12.3	0.910	0.0172 (0.152)	51 (112)	gk813	30	<b>6SL312-1TE23-0AA3</b>
1PH8107-... M ...	0.77	12.3	0.910	0.0289 (0.256)	73 (161)	gk813	45	<b>6SL312-1TE24-5AA3</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Active Line Module</b>									
<b>600</b>	355	200 (268)	3183 (2348)	315	500	30.2	1400	2800	<b>1PH8350-1■B1■-...0</b>
		240 (322)	3820 (2818)	375	500	30.2	1400	2800	<b>1PH8352-1■B1■-...0</b>
		280 (375)	4457 (3287)	420	500	30.2	1400	2800	<b>1PH8354-1■B1■-...0</b>
		320 (429)	5093 (3757)	485	500	30.2	1400	2800	<b>1PH8356-1■B1■-...0</b>
		370 (496)	5889 (4344)	560	500	30.2	1400	2800	<b>1PH8358-1■B1■-...0</b>
<b>800</b>	355	260 (349)	3104 (2289)	405	500	40.2	1400	2800	<b>1PH8350-1■Q1■-...0</b>
		315 (422)	3760 (2773)	475	500	40.2	1400	2800	<b>1PH8352-1■Q1■-...0</b>
		365 (489)	4357 (3214)	560	500	40.2	1400	2800	<b>1PH8354-1■Q1■-...0</b>
		420 (563)	5014 (3698)	640	500	40.2	1400	2800	<b>1PH8356-1■Q1■-...0</b>
		480 (644)	5730 (4226)	700	500	40.2	1400	2800	<b>1PH8358-1■Q1■-...0</b>
<b>1000</b>	355	310 (416)	2961 (2184)	490	500	50.2	1500	2800	<b>1PH8350-1■C1■-...0</b>
		380 (509)	3629 (2677)	570	500	50.2	1500	2800	<b>1PH8352-1■C1■-...0</b>
		445 (597)	4250 (3135)	650	500	50.2	1500	2800	<b>1PH8354-1■C1■-...0</b>
		510 (684)	4871 (3593)	750	500	50.2	1600	2800	<b>1PH8356-1■C1■-...0</b>
		570 (764)	5444 (4015)	920	480	50.2	1600	2800	<b>1PH8358-1■C1■-...0</b>
<b>1350</b>	355	340 (456)	2405 (1774)	495	500	67.7	1800	2800	<b>1PH8350-1■D1■-...0</b>
		410 (550)	2900 (2139)	620	500	67.7	1800	2800	<b>1PH8352-1■D1■-...0</b>
		470 (630)	3325 (2452)	670	500	67.7	1700	2800	<b>1PH8354-1■D1■-...0</b>
		550 (737)	3891 (2870)	810	500	67.7	1700	2800	<b>1PH8356-1■D1■-...0</b>
		590 (791)	4174 (3079)	880	500	67.7	1700	2800	<b>1PH8358-1■D1■-...0</b>

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor  $\cos \varphi$	Magne- tizing current  $I_{\mu}$ A	Effi- ciency  $\eta$	Moment of inertia  $J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	Weight, approx.  kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>  $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
<b>Line voltage 480 V 3 AC, Active Line Module</b>								
1PH8350-1.B1...	0.75	194	0.960	14.74 (130)	2235 (4928)	1XB7712-P01	380	<b>6SL3320-1TE33-8AA3</b>
1PH8352-1.B1...	0.77	223	0.962	17.40 (154)	2560 (5645)	1XB7712-P01	490	<b>6SL3320-1TE35-0AA3</b>
1PH8354-1.B1...	0.79	236	0.964	20.66 (183)	2889 (6370)	1XB7712-P03	490	<b>6SL3320-1TE35-0AA3</b>
1PH8356-1.B1...	0.78	285	0.965	24.22 (214)	3256 (7179)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8358-1.B1...	0.79	316	0.966	27.79 (246)	3629 (8002)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8350-1.Q1...	0.77	235	0.965	14.74 (130)	2235 (4928)	1XB7712-P01	490	<b>6SL3320-1TE35-0AA3</b>
1PH8352-1.Q1...	0.78	267	0.967	17.40 (154)	2560 (5645)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8354-1.Q1...	0.77	334	0.967	20.66 (183)	2889 (6370)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.Q1...	0.78	380	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8358-1.Q1...	0.82	359	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8350-1.C1...	0.75	294	0.967	14.74 (130)	2235 (4928)	1XB7712-P01	745	<b>6SL3320-1TE37-5AA3</b>
1PH8352-1.C1...	0.80	302	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.C1...	0.81	328	0.970	20.66 (183)	2889 (6370)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.C1...	0.80	410	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8358-1.C1...	0.76	567	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8350-1.D1...	0.82	235	0.969	14.74 (130)	2235 (4928)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8352-1.D1...	0.79	338	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.D1...	0.83	314	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	840 <sup>4)</sup>	<b>6SL3320-1TE38-4AA3</b>
1PH8356-1.D1...	0.80	433	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8358-1.D1...	0.79	489	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2.5 kHz (SH 355).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 690 V 3 AC, Basic Line Module</b>									
<b>400</b>	280	61 (81.8)	1456 (1074)	82	555	13.7	1100	3300	<b>1PH8284-1H1-...1</b>
		77 (103)	1838 (1356)	100	555	13.7	1200	3300	<b>1PH8286-1H1-...1</b>
		100 (134)	2388 (1761)	130	555	13.7	1300	3300	<b>1PH8288-1H1-...1</b>
<b>550</b>	355	185 (248)	3212 (2369)	230	635	27.7	1400	2800	<b>1PH8350-1H1-...0</b>
		220 (295)	3820 (2818)	265	635	27.7	1400	2800	<b>1PH8352-1H1-...0</b>
		255 (342)	4428 (3266)	305	635	27.7	1400	2800	<b>1PH8354-1H1-...0</b>
		295 (396)	5122 (3778)	355	635	27.7	1400	2800	<b>1PH8356-1H1-...0</b>
		340 (456)	5904 (4355)	410	635	27.7	1400	2800	<b>1PH8358-1H1-...0</b>
<b>700</b>	280	100 (134)	1364 (1006)	118	605	23.7	2100	3300	<b>1PH8284-1K1-...1</b>
		127 (170)	1733 (1278)	158	605	23.6	2100	3300	<b>1PH8286-1K1-...1</b>
		162 (217)	2210 (1630)	186	605	23.7	2100	3300	<b>1PH8288-1K1-...1</b>
<b>750</b>	355	245 (328)	3120 (2301)	290	650	37.7	1400	2800	<b>1PH8350-1K1-...0</b>
		295 (396)	3756 (2770)	350	650	37.7	1400	2800	<b>1PH8352-1K1-...0</b>
		340 (456)	4329 (3193)	390	650	37.7	1400	2800	<b>1PH8354-1K1-...0</b>
		395 (530)	5030 (3710)	455	650	37.7	1400	2800	<b>1PH8356-1K1-...0</b>
		450 (603)	5730 (4226)	510	650	37.7	1400	2800	<b>1PH8358-1K1-...0</b>
<b>900</b>	355	280 (375)	2971 (2191)	355	620	45.2	1500	2800	<b>1PH8350-1U1-...0</b>
		340 (456)	3608 (2661)	415	620	45.2	1500	2800	<b>1PH8352-1U1-...0</b>
		400 (536)	4244 (3130)	480	620	45.2	1500	2800	<b>1PH8354-1U1-...0</b>
		460 (617)	4881 (3600)	540	620	45.2	1600	2800	<b>1PH8356-1U1-...0</b>
		515 (691)	5465 (4031)	620	620	45.2	1600	2800	<b>1PH8358-1U1-...0</b>
<b>1000</b>	280	143 (192)	1366 (1008)	176	600	33.6	2100	3300	<b>1PH8284-1U1-...1</b>
		176 (236)	1681 (1240)	230	570	33.6	2100	3300	<b>1PH8286-1U1-...1</b>
		218 (292)	2082 (1536)	275	580	33.6	2100	3300	<b>1PH8288-1U1-...1</b>
<b>1250</b>	355	315 (422)	2407 (1775)	360	640	62.7	1800	2800	<b>1PH8350-1V1-...0</b>
		380 (509)	2903 (2141)	430	640	62.7	1800	2800	<b>1PH8352-1V1-...0</b>
		435 (583)	3323 (2451)	480	640	62.7	1700	2800	<b>1PH8354-1V1-...0</b>
		510 (684)	3896 (2874)	590	640	62.7	1700	2800	<b>1PH8356-1V1-...0</b>
		545 (731)	4164 (3071)	620	640	62.7	1700	2800	<b>1PH8358-1V1-...0</b>
<b>1500</b>	280	186 (249)	1184 (873)	220	590	50.3	1900	3300	<b>1PH8284-1W1-...1</b>
		224 (300)	1426 (1052)	260	590	50.3	2000	3300	<b>1PH8286-1W1-...1</b>
		282 (378)	1795 (1324)	325	590	50.3	2100	3300	<b>1PH8288-1W1-...1</b>

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	
<b>Line voltage 690 V 3 AC, Basic Line Module</b>								
1PH8284-1.H 1...	0.84	39	0.920	4.20 (37.2)	1200 (2646)	1XB7700-P02	100	<b>6SL3320-1TG31-0AA3</b>
1PH8286-1.H 1...	0.87	43	0.921	5.20 (46.0)	1400 (3087)	1XB7700-P02	120	<b>6SL3320-1TG31-2AA3</b>
1PH8288-1.H 1...	0.87	55	0.924	6.30 (55.8)	1650 (3638)	1XB7700-P02	150	<b>6SL3320-1TG31-5AA3</b>
1PH8350-1.H 1...	0.76	140	0.959	14.74 (130)	2235 (4928)	1XB7712-P01	260 <sup>4)</sup>	<b>6SL3320-1TG32-6AA3</b>
1PH8352-1.H 1...	0.78	151	0.960	17.40 (154)	2560 (5645)	1XB7712-P01	330	<b>6SL3320-1TG33-3AA3</b>
1PH8354-1.H 1...	0.78	178	0.962	20.66 (183)	2889 (6370)	1XB7712-P01	410	<b>6SL3320-1TG34-1AA3</b>
1PH8356-1.H 1...	0.78	211	0.964	24.22 (214)	3256 (7179)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8358-1.H 1...	0.78	247	0.964	27.79 (246)	3629 (8002)	1XB7712-P01	465 <sup>4)</sup>	<b>6SL3320-1TG34-7AA3</b>
1PH8284-1.K 1...	0.85	53	0.945	4.20 (37.2)	1200 (2646)	1XB7700-P02	150	<b>6SL3320-1TG31-5AA3</b>
1PH8286-1.K 1...	0.81	83	0.951	5.20 (46.0)	1400 (3087)	1XB7700-P02	175	<b>6SL3320-1TG31-8AA3</b>
1PH8288-1.K 1...	0.88	75	0.949	6.30 (55.8)	1650 (3638)	1XB7700-P02	215	<b>6SL3320-1TG32-2AA3</b>
1PH8350-1.K 1...	0.78	164	0.964	14.74 (130)	2235 (4928)	1XB7712-P01	410	<b>6SL3320-1TG34-1AA3</b>
1PH8352-1.K 1...	0.77	210	0.965	17.40 (154)	2560 (5645)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8354-1.K 1...	0.79	218	0.967	20.66 (183)	2889 (6370)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8356-1.K 1...	0.80	252	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8358-1.K 1...	0.81	275	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8350-1.U 1...	0.75	216	0.966	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8352-1.U 1...	0.79	231	0.968	17.40 (154)	2560 (5645)	1XB7712-P01	575	<b>6SL3320-1TG35-8AA3</b>
1PH8354-1.U 1...	0.79	268	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8356-1.U 1...	0.81	283	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8358-1.U 1...	0.80	338	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8284-1.U 1...	0.82	89	0.956	4.20 (37.2)	1200 (2646)	1XB7700-P02	215	<b>6SL3320-1TG32-2AA3</b>
1PH8286-1.U 1...	0.81	124	0.959	5.20 (46.0)	1400 (3087)	1XB7700-P02	260	<b>6SL3320-1TG32-6AA3</b>
1PH8288-1.U 1...	0.82	145	0.961	6.30 (55.8)	1650 (3638)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8350-1.V 1...	0.81	179	0.969	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8352-1.V 1...	0.82	208	0.970	17.40 (154)	2560 (5645)	1XB7712-P01	575	<b>6SL3320-1TG35-8AA3</b>
1PH8354-1.V 1...	0.83	220	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8356-1.V 1...	0.80	319	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	735 <sup>4)</sup>	<b>6SL3320-1TG37-4AA3</b>
1PH8358-1.V 1...	0.81	322	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8284-1.W 1...	0.86	92	0.962	4.20 (37.2)	1200 (2646)	1XB7700-P02	260	<b>6SL3320-1TG32-6AA3</b>
1PH8286-1.W 1...	0.88	104	0.965	5.20 (46.0)	1400 (3087)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8288-1.W 1...	0.88	133	0.966	6.30 (55.8)	1650 (3638)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded.

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 690 V 3 AC, Active Line Module</b>									
<b>500</b>	280	77 (103)	1471 (1085)	82	690	17.0	1600	3300	<b>1PH8284-1H1-...1</b>
		96 (129)	1834 (1353)	100	690	17.0	1600	3300	<b>1PH8286-1H1-...1</b>
		125 (168)	2388 (1761)	128	690	17.0	1600	3300	<b>1PH8288-1H1-...1</b>
<b>600</b>	355	200 (268)	3183 (2348)	230	690	30.2	1400	2800	<b>1PH8350-1H1-...0</b>
		240 (322)	3820 (2818)	265	690	30.2	1400	2800	<b>1PH8352-1H1-...0</b>
		280 (375)	4457 (3287)	310	690	30.2	1400	2800	<b>1PH8354-1H1-...0</b>
		320 (429)	5093 (3757)	355	690	30.2	1400	2800	<b>1PH8356-1H1-...0</b>
		370 (496)	5889 (4344)	410	690	30.2	1400	2800	<b>1PH8358-1H1-...0</b>
<b>800</b>	280	115 (154)	1373 (1013)	120	690	27.0	2300	3300	<b>1PH8284-1K1-...1</b>
		145 (194)	1731 (1277)	158	690	26.9	2300	3300	<b>1PH8286-1K1-...1</b>
		185 (248)	2208 (1629)	184	690	27.0	2300	3300	<b>1PH8288-1K1-...1</b>
	355	260 (349)	3104 (2290)	290	690	40.2	1400	2800	<b>1PH8350-1K1-...0</b>
		315 (422)	3760 (2773)	350	690	40.2	1400	2800	<b>1PH8352-1K1-...0</b>
		365 (489)	4357 (3214)	395	690	40.2	1400	2800	<b>1PH8354-1K1-...0</b>
		420 (563)	5014 (3698)	453	690	40.2	1400	2800	<b>1PH8356-1K1-...0</b>
		480 (643)	5730 (4226)	510	690	40.2	1400	2800	<b>1PH8358-1K1-...0</b>
<b>1000</b>	355	310 (416)	2961 (2184)	355	690	50.2	1500	2800	<b>1PH8350-1U1-...0</b>
		380 (509)	3629 (2677)	415	690	50.2	1500	2800	<b>1PH8352-1U1-...0</b>
		445 (597)	4250 (3135)	480	690	50.2	1500	2800	<b>1PH8354-1U1-...0</b>
		510 (684)	4871 (3593)	540	690	50.2	1600	2800	<b>1PH8356-1U1-...0</b>
		570 (764)	5444 (4015)	610	690	50.2	1600	2800	<b>1PH8358-1U1-...0</b>
<b>1150</b>	280	164 (220)	1362 (1005)	174	690	38.6	2200	3300	<b>1PH8284-1U1-...1</b>
		203 (272)	1686 (1244)	230	655	38.6	2200	3300	<b>1PH8286-1U1-...1</b>
		251 (336)	2084 (1537)	275	665	38.6	2200	3300	<b>1PH8288-1U1-...1</b>
<b>1350</b>	355	340 (456)	2405 (1774)	360	690	67.7	1800	2800	<b>1PH8350-1V1-...0</b>
		410 (550)	2900 (2139)	430	690	67.7	1800	2800	<b>1PH8352-1V1-...0</b>
		470 (630)	3325 (2453)	485	690	67.7	1700	2800	<b>1PH8354-1V1-...0</b>
		550 (737)	3891 (2870)	590	690	67.7	1700	2800	<b>1PH8356-1V1-...0</b>
		590 (791)	4174 (3079)	620	690	67.7	1700	2800	<b>1PH8358-1V1-...0</b>
<b>1750</b>	280	217 (291)	1184 (873)	220	690	58.7	2200	3300	<b>1PH8284-1W1-...1</b>
		261 (350)	1424 (1050)	260	690	58.7	2200	3300	<b>1PH8286-1W1-...1</b>
		329 (441)	1795 (1324)	325	690	58.7	2200	3300	<b>1PH8288-1W1-...1</b>

For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magnetizing current $I_{\mu}$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 690 V 3 AC, Active Line Module</b>								
1PH8284-1.H1...	0.84	39	0.932	4.20 (37.2)	1200 (2646)	1XB7700-P02	100	<b>6SL3320-1TG31-0AA3</b>
1PH8286-1.H1...	0.86	43	0.934	5.20 (46.0)	1400 (3087)	1XB7700-P02	120	<b>6SL3320-1TG31-2AA3</b>
1PH8288-1.H1...	0.87	56	0.937	6.30 (55.8)	1650 (3638)	1XB7700-P02	150	<b>6SL3320-1TG31-5AA3</b>
1PH8350-1.H1...	0.76	139	0.961	14.74 (130)	2235 (4928)	1XB7712-P01	260 <sup>4)</sup>	<b>6SL3320-1TG32-6AA3</b>
1PH8352-1.H1...	0.78	149	0.961	17.40 (154)	2560 (5645)	1XB7712-P01	330	<b>6SL3320-1TG33-3AA3</b>
1PH8354-1.H1...	0.79	176	0.964	20.66 (183)	2889 (6370)	1XB7712-P01	410	<b>6SL3320-1TG34-1AA3</b>
1PH8356-1.H1...	0.78	209	0.965	24.22 (214)	3256 (7179)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8358-1.H1...	0.78	242	0.966	27.79 (246)	3629 (8002)	1XB7712-P01	465 <sup>4)</sup>	<b>6SL3320-1TG34-7AA3</b>
1PH8284-1.K1...	0.85	53	0.950	4.20 (37.2)	1200 (2646)	1XB7700-P02	150	<b>6SL3320-1TG31-5AA3</b>
1PH8286-1.K1...	0.81	83	0.954	5.20 (46.0)	1400 (3087)	1XB7700-P02	175	<b>6SL3320-1TG31-8AA3</b>
1PH8288-1.K1...	0.88	76	0.953	6.30 (55.8)	1650 (3638)	1XB7700-P02	215	<b>6SL3320-1TG32-2AA3</b>
1PH8350-1.K1...	0.78	162	0.965	14.74 (130)	2235 (4928)	1XB7712-P01	410	<b>6SL3320-1TG34-1AA3</b>
1PH8352-1.K1...	0.77	207	0.966	17.40 (154)	2560 (5645)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8354-1.K1...	0.80	215	0.968	20.66 (183)	2889 (6370)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8356-1.K1...	0.80	249	0.969	24.22 (214)	3256 (7179)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8358-1.K1...	0.81	272	0.970	27.79 (246)	3629 (8002)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8350-1.U1...	0.75	216	0.967	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8352-1.U1...	0.78	232	0.968	17.40 (154)	2560 (5645)	1XB7712-P01	575	<b>6SL3320-1TG35-8AA3</b>
1PH8354-1.U1...	0.79	269	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8356-1.U1...	0.81	283	0.971	24.22 (214)	3256 (7179)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8358-1.U1...	0.80	339	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8284-1.U1...	0.82	90	0.959	4.20 (37.2)	1200 (2646)	1XB7700-P02	215	<b>6SL3320-1TG32-2AA3</b>
1PH8286-1.U1...	0.81	124	0.961	5.20 (46.0)	1400 (3087)	1XB7700-P02	260	<b>6SL3320-1TG32-6AA3</b>
1PH8288-1.U1...	0.82	145	0.963	6.30 (55.8)	1650 (3638)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8350-1.V1...	0.81	178	0.969	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8352-1.V1...	0.82	208	0.970	17.40 (154)	2560 (5645)	1XB7712-P01	575	<b>6SL3320-1TG35-8AA3</b>
1PH8354-1.V1...	0.84	219	0.971	20.66 (183)	2889 (6370)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8356-1.V1...	0.80	317	0.970	24.22 (214)	3256 (7179)	1XB7712-P03	735 <sup>4)</sup>	<b>6SL3320-1TG37-4AA3</b>
1PH8358-1.V1...	0.81	322	0.971	27.79 (246)	3629 (8002)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8284-1.W1...	0.86	93	0.963	4.20 (37.2)	1200 (2646)	1XB7700-P02	260	<b>6SL3320-1TG32-6AA3</b>
1PH8286-1.W1...	0.87	105	0.966	5.20 (46.0)	1400 (3087)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8288-1.W1...	0.87	134	0.967	6.30 (55.8)	1650 (3638)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded.

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>									
<b>400</b>	180	24.5 (32.8)	585 (431)	67	300	14.3	1900	5000	<b>1PH8184-■ B ■■-...1</b>
		31.5 (42.2)	752 (555)	88	290	14.2	2100	5000	<b>1PH8186-■ B ■■-...1</b>
	225	45 (60.3)	1074 (792)	114	300	14.1	1800	4500	<b>1PH8224-■ B ■■-...1</b>
		57 (76.4)	1361 (1004)	144	305	13.9	2100	4500	<b>1PH8226-■ B ■■-...1</b>
		72 (96.5)	1719 (1268)	176	305	14.0	2200	4500	<b>1PH8228-■ B ■■-...1</b>
<b>700</b>	180	40 (53.6)	546 (403)	94	320	24.5	2200	5000	<b>1PH8184-■ C ■■-...1</b>
		52 (69.7)	709 (523)	116	330	24.3	2400	5000	<b>1PH8186-■ C ■■-...1</b>
	225	80 (107)	1091 (805)	188	310	24.1	2200	4500	<b>1PH8224-■ C ■■-...1</b>
		106 (142)	1446 (1067)	240	310	24.2	2200	4500	<b>1PH8226-■ C ■■-...1</b>
		120 (161)	1637 (1207)	265	315	24.1	2300	4500	<b>1PH8228-■ C ■■-...1</b>
	280	171 (229)	2333 (1721)	355	330	23.9	1200	3300	<b>1PH8284-1 ■ C 4 ■-...1</b>
		219 (294)	2988 (2204)	455	325	23.9	1300	3300	<b>1PH8286-1 ■ C 4 ■-...1</b>
		272 (365)	3711 (2737)	570	325	23.9	1400	3300	<b>1PH8288-1 ■ C 4 ■-...1</b>
<b>1000</b>	180	57 (76.4)	544 (401)	120	340	34.4	2800	5000	<b>1PH8184-■ D ■■-...1</b>
		74 (99.2)	707 (521)	156	340	34.3	3000	5000	<b>1PH8186-■ D ■■-...1</b>
	225	105 (141)	1003 (740)	220	335	34.1	2700	4500	<b>1PH8224-■ D ■■-...1</b>
		135 (181)	1289 (951)	275	340	34.1	2700	4500	<b>1PH8226-■ D ■■-...1</b>
		165 (221)	1576 (1162)	330	340	34.1	2700	4500	<b>1PH8228-■ D ■■-...1</b>
	280	243 (326)	2321 (1712)	490	335	33.9	1900	3300	<b>1PH8284-1 ■ D 4 ■-...1</b>
		309 (414)	2951 (2177)	630	330	33.8	2000	3300	<b>1PH8286-1 ■ D 4 ■-...1</b>
		379 (508)	3619 (2669)	760	335	33.8	2100	3300	<b>1PH8288-1 ■ D 4 ■-...1</b>
<b>1500</b>	180	76 (102)	484 (357)	162	335	50.9	4300	5000	<b>1PH8184-■ F ■■-...1</b>
		108 (145)	688 (507)	225	330	50.9	4300	5000	<b>1PH8186-■ F ■■-...1</b>
	225	142 (190)	904 (667)	290	340	50.8	3000	4500	<b>1PH8224-■ F ■■-...1</b>
		175 (235)	1114 (822)	350	340	50.7	3000	4500	<b>1PH8226-■ F ■■-...1</b>
		230 (308)	1464 (1080)	465	340	50.6	3000	4500	<b>1PH8228-■ F ■■-...1</b>
	280	319 (428)	2031 (1498)	620	345	50.6	1900	3300	<b>1PH8284-1 ■ F 4 ■-...1</b>
		382 (512)	2432 (1794)	730	345	50.6	2000	3300	<b>1PH8286-1 ■ F 4 ■-...1</b>
		480 (644)	3056 (2254)	910	345	50.6	2100	3300	<b>1PH8288-1 ■ F 4 ■-...1</b>
<b>2500</b>	180	100 (134)	382 (282)	205	340	84.2	5000	5000	<b>1PH8184-■ L ■■-...1</b>
		130 (174)	497 (367)	270	335	84.1	5000	5000	<b>1PH8186-■ L ■■-...1</b>
	225	178 (239)	680 (502)	355	340	84.1	3500	4500	<b>1PH8224-■ L ■■-...1</b>
		235 (315)	898 (662)	475	335	84.0	3500	4500	<b>1PH8226-■ L ■■-...1</b>
		265 (355)	1012 (746)	530	340	83.9	3500	4500	<b>1PH8228-■ L ■■-...1</b>

Asynchronous variant

Asynchronous variant with holding brake (only for air-flow direction NDE → DE – 11th position of Order No.: 4)

1  
3

Forced ventilation (open-circuit cooling) DE → NDE

Forced ventilation (open-circuit cooling) NDE → DE

3  
4For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8184-... B ...	0.88	25	0.801	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-... B ...	0.87	37	0.822	0.652 (5.771)	422 (930)	1XB7322-P05	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8224-... B ...	0.89	39	0.849	1.48 (13.1)	610 (1345)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8226-... B ...	0.86	61	0.875	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-... B ...	0.88	69	0.878	2.33 (20.6)	870 (1918)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8184-... C ...	0.90	27	0.852	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-... C ...	0.89	41	0.885	0.652 (5.771)	422 (930)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8224-... C ...	0.88	63	0.904	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-... C ...	0.90	71	0.907	1.93 (17.1)	740 (1632)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-... C ...	0.91	75	0.911	2.33 (20.6)	870 (1918)	1XB7422-P06	260 <sup>4)</sup>	<b>6SL3320-1TE32-6AA3</b>
1PH8284-1. C ...	0.91	101	0.930	4.20 (37.2)	1200 (2646)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8286-1. C ...	0.92	115	0.931	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1. C ...	0.91	161	0.939	6.30 (55.8)	1650 (3638)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-... D ...	0.89	39	0.899	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-... D ...	0.89	53	0.908	0.652 (5.771)	422 (930)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8224-... D ...	0.88	73	0.926	1.48 (13.1)	610 (1345)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-... D ...	0.90	82	0.929	1.93 (17.1)	740 (1632)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-... D ...	0.91	93	0.933	2.33 (20.6)	870 (1918)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8284-1. D ...	0.90	137	0.947	4.20 (37.2)	1200 (2646)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1. D ...	0.90	207	0.952	5.20 (46.0)	1400 (3087)	1XB7700-P02	840	<b>6SL3320-1TE38-4AA3</b>
1PH8288-1. D ...	0.90	242	0.955	6.30 (55.8)	1650 (3638)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8184-... F ...	0.87	61	0.931	0.489 (4.328)	350 (772)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8186-... F ...	0.89	79	0.936	0.652 (5.771)	422 (930)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-... F ...	0.89	84	0.942	1.48 (13.1)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-... F ...	0.89	117	0.950	1.93 (17.1)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-... F ...	0.88	166	0.953	2.33 (20.6)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8284-1. F ...	0.91	157	0.957	4.20 (37.2)	1200 (2646)	1XB7700-P02	745 <sup>4)</sup>	<b>6SL3320-1TE37-5AA3</b>
1PH8286-1. F ...	0.92	177	0.959	5.20 (46.0)	1400 (3087)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8288-1. F ...	0.92	229	0.961	6.30 (55.8)	1650 (3638)	1XB7712-P03	985 <sup>4)</sup>	<b>6SL3320-1TE41-0AA3</b>
1PH8184-... L ...	0.87	74	0.949	0.489 (4.328)	350 (772)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8186-... L ...	0.87	105	0.954	0.652 (5.771)	422 (930)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8224-... L ...	0.89	112	0.954	1.48 (13.1)	610 (1345)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-... L ...	0.89	149	0.957	1.93 (17.1)	740 (1632)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-... L ...	0.89	180	0.960	2.33 (20.6)	870 (1918)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>

**Cooling:**  
Internal air cooling **0**  
External air cooling **1**

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No.: A to F).

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>r</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module</b>									
<b>480</b>	355	275 (369)	5471 (4035)	495	400	24.4	850	2800	<b>1PH8350-1 ■ B 4 ■-...0</b>
		310 (416)	6168 (4550)	550	400	24.5	850	2800	<b>1PH8351-1 ■ B 4 ■-...0</b>
		370 (496)	7361 (5429)	650	400	24.5	800	2800	<b>1PH8352-1 ■ B 4 ■-...0</b>
		435 (583)	8655 (6384)	750	400	24.5	800	2800	<b>1PH8354-1 ■ B 4 ■-...0</b>
		510 (684)	10147 (7484)	880	400	24.4	700	2800	<b>1PH8356-1 ■ B 4 ■-...0</b>
		585 (784)	11639 (8585)	990	400	24.4	700	2800	<b>1PH8358-1 ■ B 4 ■-...0</b>
<b>500</b>	180	30 (40.2)	573 (423)	65	370	17.6	2000	5000	<b>1PH8184- ■ B ■■-...1</b>
		40 (53.6)	764 (563)	88	355	17.5	2200	5000	<b>1PH8186- ■ B ■■-...1</b>
	225	55 (73.8)	1051 (775)	112	370	17.4	1800	4500	<b>1PH8224- ■ B ■■-...1</b>
		72 (96.5)	1375 (1014)	144	375	17.3	2200	4500	<b>1PH8226- ■ B ■■-...1</b>
<b>640</b>	355	340 (456)	5073 (3742)	600	400	32.4	1100	2800	<b>1PH8350-1 ■ Q 4 ■-...0</b>
		375 (503)	5596 (4128)	660	400	32.4	1100	2800	<b>1PH8351-1 ■ Q 4 ■-...0</b>
		455 (610)	6789 (5008)	790	400	32.4	1000	2800	<b>1PH8352-1 ■ Q 4 ■-...0</b>
		535 (717)	7983 (5888)	930	400	32.4	1000	2800	<b>1PH8354-1 ■ Q 4 ■-...0</b>
		625 (838)	9326 (6879)	1060	400	32.4	950	2800	<b>1PH8356-1 ■ Q 4 ■-...0</b>
		705 (945)	10520 (7760)	1180	400	32.4	950	2800	<b>1PH8358-1 ■ Q 4 ■-...0</b>
<b>800</b>	180	45 (60.3)	537 (396)	91	365	27.8	2300	5000	<b>1PH8184- ■ C ■■-...1</b>
		60 (80.5)	716 (528)	120	360	27.7	2500	5000	<b>1PH8186- ■ C ■■-...1</b>
	225	90 (121)	1074 (792)	184	350	27.4	2300	4500	<b>1PH8224- ■ C ■■-...1</b>
		118 (158)	1409 (1039)	235	350	27.5	2300	4500	<b>1PH8226- ■ C ■■-...1</b>
		135 (181)	1612 (1189)	260	360	27.4	2400	4500	<b>1PH8228- ■ C ■■-...1</b>
	280	195 (261)	2328 (1717)	335	400	27.2	1350	3300	<b>1PH8284-1 ■ C 4 ■-...1</b>
		250 (335)	2984 (2201)	435	385	27.2	1500	3300	<b>1PH8286-1 ■ C 4 ■-...1</b>
		310 (416)	3701 (2730)	560	370	27.2	1550	3300	<b>1PH8288-1 ■ C 4 ■-...1</b>
	355	435 (583)	5193 (3830)	770	400	40.4	1200	2800	<b>1PH8350-1 ■ C 4 ■-...0</b>
		490 (657)	5849 (4314)	860	400	40.4	1200	2800	<b>1PH8351-1 ■ C 4 ■-...0</b>
		570 (764)	6804 (5019)	980	400	40.5	1100	2800	<b>1PH8352-1 ■ C 4 ■-...0</b>
		665 (892)	7938 (5855)	1120	400	40.4	1000	2800	<b>1PH8354-1 ■ C 4 ■-...0</b>
760 (1019)		9073 (6692)	1280	400	40.4	950	2800	<b>1PH8356-1 ■ C 4 ■-...0</b>	
<b>830</b>	355	915 (1227)	10486 (7734)	1560	400	42.0	1000	2800	<b>1PH8358-1 ■ C 4 ■-...0</b>

Asynchronous variant

Asynchronous variant with holding brake (only for air-flow direction NDE → DE – 11th position of Order No.: 4)

Forced ventilation (open-circuit cooling) DE → NDE

Forced ventilation (open-circuit cooling) NDE → DE

1  
33  
4For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8350-1.B...	0.84	194	0.944	14.74 (130)	2235 (4928)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8351-1.B...	0.85	194	0.938	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8352-1.B...	0.86	223	0.942	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.B...	0.88	236	0.943	20.66 (183)	2889 (6370)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8356-1.B...	0.88	285	0.946	24.22 (214)	3256 (7179)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8358-1.B...	0.89	316	0.948	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8184-...B...	0.86	27	0.840	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-...B...	0.87	38	0.850	0.652 (5.771)	422 (930)	1XB7322-P05	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8224-...B...	0.88	41	0.878	1.48 (13.1)	610 (1345)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8226-...B...	0.86	60	0.895	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...B...	0.87	73	0.899	2.33 (20.6)	870 (1918)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8350-1.Q...	0.84	235	0.956	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8351-1.Q...	0.85	235	0.953	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8352-1.Q...	0.86	267	0.955	17.40 (154)	2560 (5645)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8354-1.Q...	0.86	334	0.958	20.66 (183)	2889 (6370)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8356-1.Q...	0.87	380	0.959	24.22 (214)	3256 (7179)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8358-1.Q...	0.89	359	0.958	27.79 (246)	3629 (8002)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8184-...C...	0.90	28	0.872	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-...C...	0.90	38	0.891	0.652 (5.771)	422 (930)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8224-...C...	0.88	63	0.914	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-...C...	0.90	71	0.918	1.93 (17.1)	740 (1632)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-...C...	0.91	77	0.922	2.33 (20.6)	870 (1918)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8284-1.C...	0.89	117	0.942	4.20 (37.2)	1200 (2646)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8286-1.C...	0.91	126	0.942	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.C...	0.91	164	0.945	6.30 (55.8)	1650 (3638)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>
1PH8350-1.C...	0.84	294	0.961	14.74 (130)	2235 (4928)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8351-1.C...	0.85	294	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	985 <sup>4)</sup>	<b>6SL3320-1TE41-0AA3</b>
1PH8352-1.C...	0.87	302	0.960	17.40 (154)	2560 (5645)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8354-1.C...	0.88	328	0.961	20.66 (183)	2889 (6370)	1XB7712-P03	1260 <sup>4)</sup>	<b>6SL3320-1TE41-2AA3</b>
1PH8356-1.C...	0.88	410	0.964	24.22 (214)	3256 (7179)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8358-1.C...	0.87	567	0.967	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985	<b>2 × 6SL3320-1TE41-0AA3</b>

**Cooling:**

Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No.: A to F).

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>r</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module (continued)</b>									
<b>1080</b>	355	485 (650)	4289 (3164)	830	400	54.4	1350	2800	<b>1PH8350-1 D 4 -...0</b>
		545 (731)	4819 (3554)	940	400	54.5	1350	2800	<b>1PH8351-1 D 4 -...0</b>
		655 (878)	5792 (4272)	1120	400	54.4	1350	2800	<b>1PH8352-1 D 4 -...0</b>
		760 (1019)	6720 (4957)	1280	400	54.5	1100	2800	<b>1PH8354-1 D 4 -...0</b>
		855 (1147)	7560 (5576)	1440	400	54.4	1100	2800	<b>1PH8356-1 D 4 -...0</b>
		985 (1321)	8710 (6424)	1640	400	54.4	1100	2800	<b>1PH8358-1 D 4 -...0</b>
<b>1150</b>	180	65 (87.2)	540 (398)	120	390	39.4	3000	5000	<b>1PH8184- D -...1</b>
		85 (114)	706 (521)	154	390	39.3	3200	5000	<b>1PH8186- D -...1</b>
	225	120 (161)	997 (735)	220	385	39.1	2900	4500	<b>1PH8224- D -...1</b>
		155 (208)	1287 (949)	270	390	39.1	2800	4500	<b>1PH8226- D -...1</b>
		190 (255)	1578 (1164)	330	390	39.1	2800	4500	<b>1PH8228- D -...1</b>
	280	280 (375)	2325 (1715)	475	400	38.9	2200	3300	<b>1PH8284-1 D 4 -...1</b>
		355 (476)	2944 (2171)	630	380	38.8	2200	3300	<b>1PH8286-1 D 4 -...1</b>
435 (583)		3607 (2660)	760	385	38.8	2200	3300	<b>1PH8288-1 D 4 -...1</b>	
<b>1750</b>	180	89 (119)	486 (358)	162	390	59.3	4300	5000	<b>1PH8184- F -...1</b>
		125 (168)	682 (503)	225	385	59.2	4300	5000	<b>1PH8186- F -...1</b>
	225	165 (221)	900 (664)	285	395	59.2	2900	4500	<b>1PH8224- F -...1</b>
		200 (268)	1091 (805)	350	390	59.0	2900	4500	<b>1PH8226- F -...1</b>
		265 (355)	1446 (1067)	460	390	59.0	2900	4500	<b>1PH8228- F -...1</b>
	280	370 (496)	2019 (1489)	610	400	58.9	2200	3300	<b>1PH8284-1 F 4 -...1</b>
		445 (597)	2429 (1792)	730	400	58.9	2200	3300	<b>1PH8286-1 F 4 -...1</b>
560 (751)		3055 (2253)	910	400	58.9	2200	3300	<b>1PH8288-1 F 4 -...1</b>	
<b>2900</b>	180	113 (151)	372 (274)	200	395	97.5	5000	5000	<b>1PH8184- L -...1</b>
		150 (201)	494 (364)	270	385	97.4	5000	5000	<b>1PH8186- L -...1</b>
	225	205 (275)	675 (498)	355	395	97.4	3500	4500	<b>1PH8224- L -...1</b>
		270 (362)	889 (656)	470	390	97.3	3500	4500	<b>1PH8226- L -...1</b>
		300 (402)	988 (729)	510	395	97.3	3500	4500	<b>1PH8228- L -...1</b>

Asynchronous variant

Asynchronous variant with holding brake (only for air-flow direction NDE → DE – 11th position of Order No.: 4)

1

3

Forced ventilation (open-circuit cooling) DE → NDE

Forced ventilation (open-circuit cooling) NDE → DE

3

4

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{\text{rated}}$ A	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module (continued)</b>								
1PH8350-1.D...	0.86	235	0.965	14.74 (130)	2235 (4928)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8351-1.D...	0.86	235	0.963	14.74 (130)	2235 (4928)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8352-1.D...	0.87	338	0.967	17.40 (154)	2560 (5645)	1XB7712-P03	1260 <sup>4)</sup>	<b>6SL3320-1TE41-2AA3</b>
1PH8354-1.D...	0.88	314	0.966	20.66 (183)	2889 (6370)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8356-1.D...	0.88	433	0.970	24.22 (214)	3256 (7179)	1XB7820-P00	2 × 985	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8358-1.D...	0.89	489	0.971	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985 <sup>4)</sup>	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8184-...D...	0.88	39	0.911	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-...D...	0.89	54	0.918	0.652 (5.771)	422 (930)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8224-...D...	0.88	74	0.934	1.48 (13.1)	610 (1345)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-...D...	0.90	83	0.936	1.93 (17.1)	740 (1632)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-...D...	0.91	94	0.940	2.33 (20.6)	870 (1918)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8284-1.D...	0.89	150	0.953	4.20 (37.2)	1200 (2646)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1.D...	0.89	209	0.956	5.20 (46.0)	1400 (3087)	1XB7700-P02	840	<b>6SL3320-1TE38-4AA3</b>
1PH8288-1.D...	0.90	244	0.958	6.30 (55.8)	1650 (3638)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8184-...F...	0.87	61	0.937	0.489 (4.328)	350 (772)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8186-...F...	0.88	80	0.942	0.652 (5.771)	422 (930)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-...F...	0.89	84	0.946	1.48 (13.1)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-...F...	0.89	114	0.954	1.93 (17.1)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-...F...	0.89	162	0.956	2.33 (20.6)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8284-1.F...	0.91	158	0.960	4.20 (37.2)	1200 (2646)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>
1PH8286-1.F...	0.92	178	0.962	5.20 (46.0)	1400 (3087)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8288-1.F...	0.92	228	0.963	6.30 (55.8)	1650 (3638)	1XB7712-P03	985 <sup>4)</sup>	<b>6SL3320-1TE41-0AA3</b>
1PH8184-...L...	0.87	75	0.952	0.489 (4.328)	350 (772)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8186-...L...	0.87	105	0.955	0.652 (5.771)	422 (930)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8224-...L...	0.89	113	0.955	1.48 (13.1)	610 (1345)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-...L...	0.89	150	0.958	1.93 (17.1)	740 (1632)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-...L...	0.89	182	0.960	2.33 (20.6)	870 (1918)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>

**Cooling:**

Internal air cooling      **0**  
External air cooling      **1**

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{\text{max}}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No.: A to F).

3)  $I_{\text{rated}}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>									
<b>550</b>	355	315 (422)	5470 (4035)	490	460	27.9	1100	2800	<b>1PH8350-1 ■ B 4 ■-...0</b>
		355 (476)	6164 (4547)	550	460	28.0	1100	2800	<b>1PH8351-1 ■ B 4 ■-...0</b>
		420 (563)	7293 (5379)	640	460	27.9	1000	2800	<b>1PH8352-1 ■ B 4 ■-...0</b>
		500 (671)	8682 (6404)	750	460	28.0	1000	2800	<b>1PH8354-1 ■ B 4 ■-...0</b>
		585 (784)	10158 (7493)	870	460	27.9	900	2800	<b>1PH8356-1 ■ B 4 ■-...0</b>
		670 (898)	11634 (8581)	990	460	27.9	900	2800	<b>1PH8358-1 ■ B 4 ■-...0</b>
<b>600</b>	180	36 (48.3)	573 (423)	64	440	20.9	2100	5000	<b>1PH8184-■ B ■-...1</b>
		48 (64.4)	764 (563)	88	430	20.8	2300	5000	<b>1PH8186-■ B ■-...1</b>
	225	67 (89.8)	1066 (786)	118	410	20.9	1800	4500	<b>1PH8224-■ B ■-...1</b>
		87 (117)	1385 (1022)	152	410	20.8	2300	4500	<b>1PH8226-■ B ■-...1</b>
		108 (145)	1719 (1268)	188	410	20.8	2200	4500	<b>1PH8228-■ B ■-...1</b>
<b>750</b>	355	400 (536)	5093 (3757)	610	465	37.9	1400	2800	<b>1PH8350-1 ■ Q 4 ■-...0</b>
		440 (590)	5603 (4133)	670	465	37.9	1400	2800	<b>1PH8351-1 ■ Q 4 ■-...0</b>
		535 (717)	6812 (5025)	800	465	37.9	1300	2800	<b>1PH8352-1 ■ Q 4 ■-...0</b>
		630 (845)	8022 (5917)	930	465	37.9	1300	2800	<b>1PH8354-1 ■ Q 4 ■-...0</b>
		730 (979)	9295 (6856)	1080	465	37.9	1200	2800	<b>1PH8356-1 ■ Q 4 ■-...0</b>
		825 (1106)	10505 (7748)	1200	465	37.9	1200	2800	<b>1PH8358-1 ■ Q 4 ■-...0</b>
<b>900</b>	355	490 (657)	5199 (3835)	770	450	45.4	1500	2800	<b>1PH8350-1 ■ C 4 ■-...0</b>
		550 (738)	5836 (4305)	860	450	45.4	1500	2800	<b>1PH8351-1 ■ C 4 ■-...0</b>
		640 (858)	6791 (5009)	980	450	45.5	1400	2800	<b>1PH8352-1 ■ C 4 ■-...0</b>
		745 (999)	7905 (5831)	1120	450	45.4	1300	2800	<b>1PH8354-1 ■ C 4 ■-...0</b>
		855 (1147)	9073 (6692)	1280	450	45.4	1200	2800	<b>1PH8356-1 ■ C 4 ■-...0</b>
		990 (1328)	10505 (7748)	1560	430	45.4	1200	2800	<b>1PH8358-1 ■ C 4 ■-...0</b>
<b>1000</b>	180	57 (76.4)	544 (401)	90	460	34.4	2400	5000	<b>1PH8184-■ C ■-...1</b>
		74 (99.2)	707 (521)	116	450	34.3	2600	5000	<b>1PH8186-■ C ■-...1</b>
	225	105 (141)	1003 (740)	174	425	34.1	2300	4500	<b>1PH8224-■ C ■-...1</b>
		146 (196)	1394 (1028)	230	440	34.1	2300	4500	<b>1PH8226-■ C ■-...1</b>
		165 (221)	1576 (1162)	250	450	34.1	2400	4500	<b>1PH8228-■ C ■-...1</b>
	280	235 (315)	2244 (1655)	345	455	33.9	1700	3300	<b>1PH8284-1 ■ C 4 ■-...1</b>
		310 (416)	2961 (2184)	450	460	33.9	2000	3300	<b>1PH8286-1 ■ C 4 ■-...1</b>
		385 (516)	3677 (2712)	560	460	33.9	2050	3300	<b>1PH8288-1 ■ C 4 ■-...1</b>

Asynchronous variant

Asynchronous variant with holding brake (only for air-flow direction NDE → DE – 11th position of Order No.: 4)

Forced ventilation (open-circuit cooling) DE → NDE

Forced ventilation (open-circuit cooling) NDE → DE

1  
33  
4For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8350-1.B...	0.84	197	0.950	14.74 (130)	2235 (4928)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8351-1.B...	0.85	197	0.945	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8352-1.B...	0.86	225	0.949	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.B...	0.88	238	0.949	20.66 (183)	2889 (6370)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8356-1.B...	0.88	287	0.952	24.22 (214)	3256 (7179)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8358-1.B...	0.88	321	0.953	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8184-...B...	0.85	28	0.863	0.489 (4.328)	350 (772)	1XB7322-P05	85	<b>6SL312-1TE28-5AA3</b>
1PH8186-...B...	0.84	41	0.874	0.652 (5.771)	422 (930)	1XB7322-P05	85 <sup>4)</sup>	<b>6SL312-1TE28-5AA3</b>
1PH8224-...B...	0.90	35	0.883	1.48 (13.1)	610 (1345)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8226-...B...	0.90	49	0.899	1.93 (17.1)	740 (1632)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8228-...B...	0.90	57	0.902	2.33 (20.6)	870 (1918)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8350-1.Q...	0.84	231	0.960	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8351-1.Q...	0.85	231	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	840 <sup>4)</sup>	<b>6SL3320-1TE38-4AA3</b>
1PH8352-1.Q...	0.86	262	0.959	17.40 (154)	2560 (5645)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8354-1.Q...	0.87	328	0.962	20.66 (183)	2889 (6370)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8356-1.Q...	0.87	372	0.963	24.22 (214)	3256 (7179)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8358-1.Q...	0.89	351	0.962	27.79 (246)	3629 (8002)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8350-1.C...	0.84	295	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8351-1.C...	0.85	295	0.961	14.74 (130)	2235 (4928)	1XB7712-P03	985 <sup>4)</sup>	<b>6SL3320-1TE41-0AA3</b>
1PH8352-1.C...	0.87	303	0.963	17.40 (154)	2560 (5645)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8354-1.C...	0.88	328	0.964	20.66 (183)	2889 (6370)	1XB7712-P03	1260 <sup>4)</sup>	<b>6SL3320-1TE41-2AA3</b>
1PH8356-1.C...	0.88	410	0.966	24.22 (214)	3256 (7179)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8358-1.C...	0.87	557	0.968	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8184-...C...	0.89	30	0.896	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-...C...	0.89	39	0.912	0.652 (5.771)	422 (930)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8224-...C...	0.88	61	0.929	1.48 (13.1)	610 (1345)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8226-...C...	0.89	74	0.932	1.93 (17.1)	740 (1632)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-...C...	0.90	79	0.936	2.33 (20.6)	870 (1918)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8284-1.C...	0.91	97	0.946	4.20 (37.2)	1200 (2646)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8286-1.C...	0.91	117	0.948	5.20 (46.0)	1400 (3087)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.C...	0.91	164	0.953	6.30 (55.8)	1650 (3638)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>

**Cooling:**

Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No.: A to F).

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module (continued)</b>									
<b>1250</b>	355	560 (751)	4278 (3155)	840	460	62.9	1700	2800	<b>1PH8350-1 D 4 -...0</b>
		630 (845)	4813 (3550)	940	460	63.0	1700	2800	<b>1PH8351-1 D 4 -...0</b>
		760 (1019)	5806 (4283)	1120	460	62.9	1700	2800	<b>1PH8352-1 D 4 -...0</b>
		880 (1180)	6723 (4959)	1280	460	63.0	1400	2800	<b>1PH8354-1 D 4 -...0</b>
		990 (1328)	7564 (5579)	1440	460	62.9	1400	2800	<b>1PH8356-1 D 4 -...0</b>
		1140 (1529)	8710 (6424)	1660	460	62.9	1400	2800	<b>1PH8358-1 D 4 -...0</b>
<b>1350</b>	180	74 (99.2)	523 (386)	118	450	46.0	3100	5000	<b>1PH8184- D -...1</b>
		98 (131)	693 (511)	152	450	45.9	3300	5000	<b>1PH8186- D -...1</b>
	225	137 (184)	969 (715)	215	450	45.7	3000	4500	<b>1PH8224- D -...1</b>
		172 (231)	1217 (898)	255	460	45.7	2900	4500	<b>1PH8226- D -...1</b>
		218 (292)	1542 (1137)	320	460	45.7	2800	4500	<b>1PH8228- D -...1</b>
		280	325 (436)	2299 (1696)	475	460	45.5	2200	3300
	280	410 (550)	2901 (2140)	620	445	45.5	2200	3300	<b>1PH8286-1 D 4 -...1</b>
		505 (677)	3573 (2635)	750	450	45.5	2200	3300	<b>1PH8288-1 D 4 -...1</b>
<b>2000</b>	180	98 (131)	468 (345)	156	450	67.5	4300	5000	<b>1PH8184- F -...1</b>
		135 (181)	645 (476)	210	445	67.5	4300	5000	<b>1PH8186- F -...1</b>
	225	178 (239)	850 (627)	265	460	67.4	2900	4500	<b>1PH8224- F -...1</b>
		220 (295)	1051 (775)	335	450	67.3	2900	4500	<b>1PH8226- F -...1</b>
		288 (386)	1375 (1014)	440	450	67.3	2900	4500	<b>1PH8228- F -...1</b>
	280	415 (556)	1981 (1461)	600	455	67.3	2200	3300	<b>1PH8284-1 F 4 -...1</b>
		500 (670)	2387 (1761)	720	455	67.2	2200	3300	<b>1PH8286-1 F 4 -...1</b>
		630 (845)	3009 (2219)	900	455	67.2	2200	3300	<b>1PH8288-1 F 4 -...1</b>
<b>3400</b>	180	113 (151)	317 (234)	176	460	114.1	4500	5000	<b>1PH8184- L -...1</b>
		130 (174)	365 (269)	210	455	113.9	4500	5000	<b>1PH8186- L -...1</b>
	225	205 (275)	576 (425)	310	460	114.0	3500	4500	<b>1PH8224- L -...1</b>
		270 (362)	758 (559)	405	460	113.9	3500	4500	<b>1PH8226- L -...1</b>
		300 (402)	843 (622)	450	460	113.8	3500	4500	<b>1PH8228- L -...1</b>

Asynchronous variant

Asynchronous variant with holding brake (only for air-flow direction NDE → DE – 11th position of Order No.: 4)

1

3

Forced ventilation (open-circuit cooling) DE → NDE

Forced ventilation (open-circuit cooling) NDE → DE

3

4

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module (continued)</b>								
1PH8350-1.D...	0.86	232	0.968	14.74 (130)	2235 (4928)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8351-1.D...	0.86	232	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8352-1.D...	0.87	329	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	1260 <sup>4)</sup>	<b>6SL3320-1TE41-2AA3</b>
1PH8354-1.D...	0.88	311	0.969	20.66 (183)	2889 (6370)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8356-1.D...	0.88	427	0.972	24.22 (214)	3256 (7179)	1XB7820-P00	2 × 985	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8358-1.D...	0.89	484	0.972	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985 <sup>4)</sup>	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8184-...D...	0.88	39	0.922	0.489 (4.328)	350 (772)	1XB7322-P05	132	<b>6SL312-1TE31-3AA3</b>
1PH8186-...D...	0.89	53	0.928	0.652 (5.771)	422 (930)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8224-...D...	0.87	75	0.941	1.48 (13.1)	610 (1345)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-...D...	0.89	85	0.945	1.93 (17.1)	740 (1632)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-...D...	0.90	96	0.947	2.33 (20.6)	870 (1918)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8284-1.D...	0.90	146	0.957	4.20 (37.2)	1200 (2646)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1.D...	0.89	210	0.960	5.20 (46.0)	1400 (3087)	1XB7700-P02	840	<b>6SL3320-1TE38-4AA3</b>
1PH8288-1.D...	0.90	243	0.962	6.30 (55.8)	1650 (3638)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8184-...F...	0.85	63	0.943	0.489 (4.328)	350 (772)	1XB7322-P05	200	<b>6SL312-1TE32-0AA3</b>
1PH8186-...F...	0.87	83	0.948	0.652 (5.771)	422 (930)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-...F...	0.88	88	0.952	1.48 (13.1)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-...F...	0.88	117	0.957	1.93 (17.1)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-...F...	0.88	166	0.959	2.33 (20.6)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8284-1.F...	0.91	157	0.962	4.20 (37.2)	1200 (2646)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>
1PH8286-1.F...	0.92	178	0.963	5.20 (46.0)	1400 (3087)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8288-1.F...	0.92	227	0.965	6.30 (55.8)	1650 (3638)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8184-...L...	0.85	75	0.953	0.489 (4.328)	350 (772)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8186-...L...	0.82	108	0.954	0.652 (5.771)	422 (930)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8224-...L...	0.87	113	0.954	1.48 (13.1)	610 (1345)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-...L...	0.87	153	0.957	1.93 (17.1)	740 (1632)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-...L...	0.87	181	0.958	2.33 (20.6)	870 (1918)	1XB7700-P02	745	<b>6SL3320-1TE37-5AA3</b>

**Cooling:**

Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard; 14th position of Order No.: A to F).

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Active Line Module</b>									
<b>600</b>	355	345 (463)	5491 (4050)	495	500	30.4	1100	2800	<b>1PH8350-1■B4■-...0</b>
		385 (516)	6128 (4520)	550	500	30.5	1100	2800	<b>1PH8351-1■B4■-...0</b>
		460 (617)	7322 (5401)	650	500	30.4	1000	2800	<b>1PH8352-1■B4■-...0</b>
		545 (731)	8675 (6399)	750	500	30.5	1000	2800	<b>1PH8354-1■B4■-...0</b>
		640 (858)	10187 (7514)	880	500	30.4	900	2800	<b>1PH8356-1■B4■-...0</b>
		730 (979)	11619 (8570)	990	500	30.4	900	2800	<b>1PH8358-1■B4■-...0</b>
<b>800</b>	355	425 (570)	5073 (3742)	600	500	40.4	1400	2800	<b>1PH8350-1■Q4■-...0</b>
		470 (630)	5611 (4139)	660	500	40.4	1400	2800	<b>1PH8351-1■Q4■-...0</b>
		570 (764)	6804 (5019)	790	500	40.4	1300	2800	<b>1PH8352-1■Q4■-...0</b>
		670 (898)	7998 (5899)	930	500	40.4	1300	2800	<b>1PH8354-1■Q4■-...0</b>
		780 (1046)	9311 (6868)	1060	500	40.4	1200	2800	<b>1PH8356-1■Q4■-...0</b>
		880 (1180)	10505 (7748)	1180	500	40.4	1200	2800	<b>1PH8358-1■Q4■-...0</b>
<b>1000</b>	355	545 (731)	5205 (3839)	770	500	50.4	1500	2800	<b>1PH8350-1■C4■-...0</b>
		610 (818)	5826 (4297)	860	500	50.4	1500	2800	<b>1PH8351-1■C4■-...0</b>
		710 (952)	6781 (5002)	980	500	50.5	1400	2800	<b>1PH8352-1■C4■-...0</b>
		830 (1113)	7927 (5847)	1120	500	50.4	1300	2800	<b>1PH8354-1■C4■-...0</b>
		950 (1274)	9073 (6692)	1280	500	50.4	1200	2800	<b>1PH8356-1■C4■-...0</b>
		1100 (1475)	10505 (7748)	1560	480	50.4	1200	2800	<b>1PH8358-1■C4■-...0</b>
<b>1350</b>	355	605 (811)	4280 (3157)	830	500	67.9	1700	2800	<b>1PH8350-1■D4■-...0</b>
		680 (912)	4810 (3548)	940	500	68.0	1700	2800	<b>1PH8351-1■D4■-...0</b>
		820 (1100)	5801 (4279)	1120	500	67.9	1700	2800	<b>1PH8352-1■D4■-...0</b>
		950 (1274)	6720 (4957)	1280	500	68.0	1400	2800	<b>1PH8354-1■D4■-...0</b>
		1070 (1435)	7569 (5583)	1440	500	67.9	1400	2800	<b>1PH8356-1■D4■-...0</b>
		1230 (1649)	8701 (6418)	1640	500	67.9	1400	2800	<b>1PH8358-1■D4■-...0</b>

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	Order No.
<b>Line voltage 480 V 3 AC, Active Line Module (noise value 77 dB)</b>								
1PH8350-1.B4...	0.84	194	0.953	14.74 (130)	2235 (4928)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8351-1.B4...	0.85	194	0.949	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8352-1.B4...	0.86	223	0.951	17.40 (154)	2560 (5645)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8354-1.B4...	0.87	236	0.952	20.66 (183)	2889 (6370)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8356-1.B4...	0.88	285	0.954	24.22 (214)	3256 (7179)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8358-1.B4...	0.88	316	0.956	27.79 (246)	3629 (8002)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8350-1.Q4...	0.84	235	0.962	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8351-1.Q4...	0.85	235	0.960	14.74 (130)	2235 (4928)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8352-1.Q4...	0.86	267	0.961	17.40 (154)	2560 (5645)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8354-1.Q4...	0.86	334	0.964	20.66 (183)	2889 (6370)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8356-1.Q4...	0.87	380	0.965	24.22 (214)	3256 (7179)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8358-1.Q4...	0.89	359	0.964	27.79 (246)	3629 (8002)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8350-1.C4...	0.84	294	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8351-1.C4...	0.85	294	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	985 <sup>4)</sup>	<b>6SL3320-1TE41-0AA3</b>
1PH8352-1.C4...	0.86	302	0.965	17.40 (154)	2560 (5645)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8354-1.C4...	0.88	328	0.966	20.66 (183)	2889 (6370)	1XB7712-P03	1260 <sup>4)</sup>	<b>6SL3320-1TE41-2AA3</b>
1PH8356-1.C4...	0.88	410	0.968	24.22 (214)	3256 (7179)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8358-1.C4...	0.87	567	0.970	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8350-1.D4...	0.86	235	0.969	14.74 (130)	2235 (4928)	1XB7712-P03	985	<b>6SL3320-1TE41-0AA3</b>
1PH8351-1.D4...	0.86	235	0.967	14.74 (130)	2235 (4928)	1XB7712-P03	1260	<b>6SL3320-1TE41-2AA3</b>
1PH8352-1.D4...	0.87	338	0.970	17.40 (154)	2560 (5645)	1XB7712-P03	1260 <sup>4)</sup>	<b>6SL3320-1TE41-2AA3</b>
1PH8354-1.D4...	0.88	314	0.970	20.66 (183)	2889 (6370)	1XB7820-P00	1405	<b>6SL3320-1TE41-4AA3</b>
1PH8356-1.D4...	0.88	433	0.973	24.22 (214)	3256 (7179)	1XB7820-P00	2 × 985	<b>2 × 6SL3320-1TE41-0AA3</b>
1PH8358-1.D4...	0.89	489	0.973	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 985 <sup>4)</sup>	<b>2 × 6SL3320-1TE41-0AA3</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E or F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2.5 kHz (SH 355).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>f</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 690 V 3 AC, Basic Line Module</b>									
<b>550</b>	355	315 (422)	5470 (4035)	355	635	28.0	1100	2800	<b>1PH8350-1H4-...0</b>
		355 (476)	6164 (4547)	400	635	28.0	1100	2800	<b>1PH8351-1H4-...0</b>
		420 (563)	7293 (5379)	465	635	28.0	1000	2800	<b>1PH8352-1H4-...0</b>
		500 (671)	8682 (6404)	550	635	28.0	1000	2800	<b>1PH8354-1H4-...0</b>
		585 (784)	10158 (7493)	630	635	27.9	900	2800	<b>1PH8356-1H4-...0</b>
		670 (898)	11634 (8581)	720	635	27.9	900	2800	<b>1PH8358-1H4-...0</b>
<b>700</b>	280	162 (217)	2210 (1630)	184	605	23.9	1200	3300	<b>1PH8284-1K4-...1</b>
		210 (282)	2865 (2113)	235	605	23.8	1300	3300	<b>1PH8286-1K4-...1</b>
		263 (353)	3588 (2646)	295	605	23.9	1400	3300	<b>1PH8288-1K4-...1</b>
<b>750</b>	355	400 (536)	5093 (3757)	435	650	37.9	1400	2800	<b>1PH8350-1K4-...0</b>
		440 (590)	5603 (4133)	475	650	37.9	1400	2800	<b>1PH8351-1K4-...0</b>
		535 (717)	6812 (5025)	580	650	37.9	1300	2800	<b>1PH8352-1K4-...0</b>
		630 (845)	8022 (5917)	660	650	37.9	1300	2800	<b>1PH8354-1K4-...0</b>
		730 (979)	9295 (6856)	760	650	37.9	1200	2800	<b>1PH8356-1K4-...0</b>
		825 (1106)	10505 (7748)	880	650	37.8	1200	2800	<b>1PH8358-1K4-...0</b>
<b>900</b>	355	490 (657)	5199 (3835)	560	620	45.4	1500	2800	<b>1PH8350-1U4-...0</b>
		550 (738)	5836 (4305)	620	620	45.4	1500	2800	<b>1PH8351-1U4-...0</b>
		640 (858)	6791 (5009)	710	620	45.4	1400	2800	<b>1PH8352-1U4-...0</b>
		745 (999)	7905 (5831)	820	620	45.4	1300	2800	<b>1PH8354-1U4-...0</b>
		855 (1147)	9073 (6692)	930	620	45.4	1200	2800	<b>1PH8356-1U4-...0</b>
		990 (1328)	10505 (7748)	1080	620	45.4	1200	2800	<b>1PH8358-1U4-...0</b>
<b>1000</b>	280	236 (316)	2254 (1663)	265	600	33.9	1900	3300	<b>1PH8284-1U4-...1</b>
		299 (401)	2855 (2106)	355	570	33.8	2000	3300	<b>1PH8286-1U4-...1</b>
		367 (492)	3505 (2585)	425	580	33.8	2100	3300	<b>1PH8288-1U4-...1</b>
<b>1250</b>	355	560 (751)	4278 (3155)	600	640	63.0	1700	2800	<b>1PH8350-1V4-...0</b>
		630 (845)	4813 (3550)	680	640	63.0	1700	2800	<b>1PH8351-1V4-...0</b>
		760 (1019)	5806 (4283)	810	640	63.0	1700	2800	<b>1PH8352-1V4-...0</b>
		880 (1180)	6723 (4959)	920	640	63.0	1400	2800	<b>1PH8354-1V4-...0</b>
		990 (1328)	7564 (5579)	1040	640	62.9	1400	2800	<b>1PH8356-1V4-...0</b>
		1140 (1529)	8710 (6424)	1180	640	62.9	1400	2800	<b>1PH8358-1V4-...0</b>
<b>1500</b>	280	307 (412)	1955 (1442)	345	590	50.6	1900	3300	<b>1PH8284-1W4-...1</b>
		370 (496)	2356 (1738)	410	590	50.6	2000	3300	<b>1PH8286-1W4-...1</b>
		465 (623)	2961 (2184)	520	590	50.5	2100	3300	<b>1PH8288-1W4-...1</b>

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne-tizing current $I_{\mu}$ A	Effi-ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 690 V 3 AC, Basic Line Module</b>								
1PH8350-1.H4...	0.85	140	0.946	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8351-1.H4...	0.85	140	0.946	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8352-1.H4...	0.87	151	0.946	17.40 (154)	2560 (5645)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8354-1.H4...	0.87	178	0.949	20.66 (183)	2889 (6370)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8356-1.H4...	0.88	211	0.952	24.22 (214)	3256 (7179)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8358-1.H4...	0.88	247	0.954	27.79 (246)	3629 (8002)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8284-1.K4...	0.91	50	0.927	4.20 (37.2)	1200 (2646)	1XB7700-P02	215	<b>6SL3320-1TG32-2AA3</b>
1PH8286-1.K4...	0.90	79	0.938	5.20 (46.0)	1400 (3087)	1XB7700-P02	260	<b>6SL3320-1TG32-6AA3</b>
1PH8288-1.K4...	0.92	71	0.929	6.30 (55.8)	1650 (3638)	1XB7700-P02	330 <sup>4)</sup>	<b>6SL3320-1TG33-3AA3</b>
1PH8350-1.K4...	0.85	164	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8351-1.K4...	0.85	164	0.958	14.74 (130)	2235 (4928)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8352-1.K4...	0.85	210	0.960	17.40 (154)	2560 (5645)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8354-1.K4...	0.87	218	0.961	20.66 (183)	2889 (6370)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8356-1.K4...	0.88	252	0.963	24.22 (214)	3256 (7179)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8358-1.K4...	0.86	275	0.966	27.79 (246)	3629 (8002)	1XB7712-P03	1025	<b>6SL3320-1TG41-0AA3</b>
1PH8350-1.U4...	0.85	216	0.962	14.74 (130)	2235 (4928)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8351-1.U4...	0.85	216	0.962	14.74 (130)	2235 (4928)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8352-1.U4...	0.86	231	0.963	17.40 (154)	2560 (5645)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8354-1.U4...	0.87	268	0.965	20.66 (183)	2889 (6370)	1XB7712-P03	1025	<b>6SL3320-1TG41-0AA3</b>
1PH8356-1.U4...	0.88	283	0.966	24.22 (214)	3256 (7179)	1XB7712-P03	1270	<b>6SL3320-1TG41-3AA3</b>
1PH8358-1.U4...	0.88	338	0.967	27.79 (246)	3629 (8002)	1XB7712-P03	2 × 735	<b>2 × 6SL3320-1TG37-4AA3</b>
1PH8284-1.U4...	0.90	85	0.947	4.20 (37.2)	1200 (2646)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8286-1.U4...	0.89	119	0.952	5.20 (46.0)	1400 (3087)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8288-1.U4...	0.90	140	0.954	6.30 (55.8)	1650 (3638)	1XB7700-P02	465	<b>6SL3320-1TG34-7AA0</b>
1PH8350-1.V4...	0.86	179	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	735 <sup>4)</sup>	<b>6SL3320-1TG37-4AA3</b>
1PH8351-1.V4...	0.86	179	0.966	14.74 (130)	2235 (4928)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8352-1.V4...	0.87	208	0.968	17.40 (154)	2560 (5645)	1XB7712-P03	910 <sup>4)</sup>	<b>6SL3320-1TG38-8AA3</b>
1PH8354-1.V4...	0.88	220	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	1270	<b>6SL3320-1TG41-3AA3</b>
1PH8356-1.V4...	0.88	319	0.972	24.22 (214)	3256 (7179)	1XB7712-P03	1270 <sup>4)</sup>	<b>6SL3320-1TG41-3AA3</b>
1PH8358-1.V4...	0.89	322	0.972	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 810	<b>2 × 6SL3320-1TG38-1AA3</b>
1PH8284-1.W4...	0.91	89	0.956	4.20 (37.2)	1200 (2646)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8286-1.W4...	0.92	101	0.958	5.20 (46.0)	1400 (3087)	1XB7700-P02	465	<b>6SL3320-1TG34-7AA0</b>
1PH8288-1.W4...	0.92	130	0.960	6.30 (55.8)	1650 (3638)	1XB7700-P02	575	<b>6SL3320-1TG35-8AA0</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{max}$ : Maximum speed that must not be exceeded.

3)  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Forced ventilation, IP23 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 690 V 3 AC, Active Line Module</b>									
<b>600</b>	355	345 (463)	5491 (4050)	355	690	30.5	1100	2800	<b>1PH8350-1H4-...0</b>
		385 (516)	6128 (4520)	395	690	30.5	1100	2800	<b>1PH8351-1H4-...0</b>
		460 (617)	7322 (5401)	465	690	30.5	1000	2800	<b>1PH8352-1H4-...0</b>
		545 (731)	8675 (6399)	550	690	30.5	1000	2800	<b>1PH8354-1H4-...0</b>
		640 (858)	10187 (7514)	640	690	30.4	900	2800	<b>1PH8356-1H4-...0</b>
		730 (979)	11619 (8570)	720	690	30.4	900	2800	<b>1PH8358-1H4-...0</b>
<b>800</b>	280	185 (248)	2208 (1629)	182	690	27.2	1500	3300	<b>1PH8284-1K4-...1</b>
		240 (322)	2865 (2113)	235	690	27.2	1600	3300	<b>1PH8286-1K4-...1</b>
		300 (402)	3581 (2641)	290	690	27.3	1600	3300	<b>1PH8288-1K4-...1</b>
	355	425 (570)	5073 (3742)	435	690	40.4	1400	2800	<b>1PH8350-1K4-...0</b>
		470 (630)	5611 (4139)	480	690	40.4	1400	2800	<b>1PH8351-1K4-...0</b>
		570 (764)	6804 (5019)	580	690	40.4	1300	2800	<b>1PH8352-1K4-...0</b>
		670 (898)	7998 (5899)	660	690	40.4	1300	2800	<b>1PH8354-1K4-...0</b>
		780 (1046)	9311 (6868)	770	690	40.4	1200	2800	<b>1PH8356-1K4-...0</b>
		880 (1180)	10505 (7748)	880	690	40.3	1200	2800	<b>1PH8358-1K4-...0</b>
		<b>1000</b>	355	545 (731)	5205 (3839)	560	690	50.4	1500
610 (818)	5826 (4297)			620	690	50.4	1500	2800	<b>1PH8351-1U4-...0</b>
710 (952)	6781 (5002)			710	690	50.4	1400	2800	<b>1PH8352-1U4-...0</b>
830 (1113)	7927 (5847)			820	690	50.4	1300	2800	<b>1PH8354-1U4-...0</b>
950 (1274)	9073 (6692)			930	690	50.4	1200	2800	<b>1PH8356-1U4-...0</b>
1100 (1475)	10505 (7748)			1080	690	50.4	1200	2800	<b>1PH8358-1U4-...0</b>
<b>1150</b>	280	272 (365)	2255 (1663)	270	690	38.9	2200	3300	<b>1PH8284-1U4-...1</b>
		344 (461)	2860 (2109)	355	655	38.8	2200	3300	<b>1PH8286-1U4-...1</b>
		422 (566)	3504 (2585)	425	665	38.8	2200	3300	<b>1PH8288-1U4-...1</b>
<b>1350</b>	355	605 (811)	4280 (3157)	600	690	68.0	1700	2800	<b>1PH8350-1V4-...0</b>
		680 (912)	4810 (3548)	680	690	68.0	1700	2800	<b>1PH8351-1V4-...0</b>
		820 (1100)	5801 (4279)	810	690	68.0	1700	2800	<b>1PH8352-1V4-...0</b>
		950 (1274)	6720 (4957)	920	690	68.0	1400	2800	<b>1PH8354-1V4-...0</b>
		1070 (1435)	7569 (5583)	1040	690	67.9	1400	2800	<b>1PH8356-1V4-...0</b>
		1230 (1649)	8701 (6418)	1180	690	67.9	1400	2800	<b>1PH8358-1V4-...0</b>
<b>1750</b>	280	359 (481)	1959 (1445)	345	690	58.9	2200	3300	<b>1PH8284-1W4-...1</b>
		432 (579)	2356 (1738)	410	690	58.9	2200	3300	<b>1PH8286-1W4-...1</b>
		543 (728)	2964 (2186)	510	690	58.9	2200	3300	<b>1PH8288-1W4-...1</b>

For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Forced ventilation, IP23 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>F</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
<b>Line voltage 690 V 3 AC, Active Line Module</b>								
1PH8350-1.H4...	0.85	139	0.949	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8351-1.H4...	0.85	139	0.949	14.74 (130)	2235 (4928)	1XB7712-P01	465	<b>6SL3320-1TG34-7AA3</b>
1PH8352-1.H4...	0.87	149	0.949	17.40 (154)	2560 (5645)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8354-1.H4...	0.87	176	0.952	20.66 (183)	2889 (6370)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8356-1.H4...	0.88	209	0.955	24.22 (214)	3256 (7179)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8358-1.H4...	0.88	245	0.957	27.79 (246)	3629 (8002)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8284-1.K4...	0.91	51	0.934	4.20 (37.2)	1200 (2646)	1XB7700-P02	215	<b>6SL3320-1TG32-2AA3</b>
1PH8286-1.K4...	0.90	79	0.944	5.20 (46.0)	1400 (3087)	1XB7700-P02	260	<b>6SL3320-1TG32-6AA3</b>
1PH8288-1.K4...	0.92	72	0.936	6.30 (55.8)	1650 (3638)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8350-1.K4...	0.85	162	0.959	14.74 (130)	2235 (4928)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8351-1.K4...	0.85	162	0.959	14.74 (130)	2235 (4928)	1XB7712-P03	575	<b>6SL3320-1TG35-8AA3</b>
1PH8352-1.K4...	0.86	207	0.961	17.40 (154)	2560 (5645)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8354-1.K4...	0.87	215	0.962	20.66 (183)	2889 (6370)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8356-1.K4...	0.88	249	0.964	24.22 (214)	3256 (7179)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8358-1.K4...	0.86	272	0.967	27.79 (246)	3629 (8002)	1XB7712-P03	1025	<b>6SL3320-1TG41-0AA3</b>
1PH8350-1.U4...	0.85	216	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	735	<b>6SL3320-1TG37-4AA3</b>
1PH8351-1.U4...	0.85	216	0.964	14.74 (130)	2235 (4928)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8352-1.U4...	0.86	232	0.965	17.40 (154)	2560 (5645)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8354-1.U4...	0.87	269	0.967	20.66 (183)	2889 (6370)	1XB7712-P03	1025	<b>6SL3320-1TG41-0AA3</b>
1PH8356-1.U4...	0.88	283	0.968	24.22 (214)	3256 (7179)	1XB7712-P03	1270	<b>6SL3320-1TG41-3AA3</b>
1PH8358-1.U4...	0.88	339	0.969	27.79 (246)	3629 (8002)	1XB7712-P03	2 × 735	<b>2 × 6SL3320-1TG37-4AA3</b>
1PH8284-1.U4...	0.89	86	0.951	4.20 (37.2)	1200 (2646)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8286-1.U4...	0.89	119	0.956	5.20 (46.0)	1400 (3087)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8288-1.U4...	0.90	140	0.958	6.30 (55.8)	1650 (3638)	1XB7700-P02	465	<b>6SL3320-1TG34-7AA0</b>
1PH8350-1.V4...	0.86	178	0.967	14.74 (130)	2235 (4928)	1XB7712-P03	735 <sup>4)</sup>	<b>6SL3320-1TG37-4AA3</b>
1PH8351-1.V4...	0.86	178	0.967	14.74 (130)	2235 (4928)	1XB7712-P03	810	<b>6SL3320-1TG38-1AA3</b>
1PH8352-1.V4...	0.87	208	0.969	17.40 (154)	2560 (5645)	1XB7712-P03	910 <sup>4)</sup>	<b>6SL3320-1TG38-8AA3</b>
1PH8354-1.V4...	0.88	219	0.969	20.66 (183)	2889 (6370)	1XB7712-P03	1270	<b>6SL3320-1TG41-3AA3</b>
1PH8356-1.V4...	0.88	317	0.973	24.22 (214)	3256 (7179)	1XB7712-P03	1270 <sup>4)</sup>	<b>6SL3320-1TG41-3AA3</b>
1PH8358-1.V4...	0.89	322	0.973	27.79 (246)	3629 (8002)	1XB7820-P00	2 × 810	<b>2 × 6SL3320-1TG38-1AA3</b>
1PH8284-1.W4...	0.91	91	0.959	4.20 (37.2)	1200 (2646)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8286-1.W4...	0.92	102	0.961	5.20 (46.0)	1400 (3087)	1XB7700-P02	465	<b>6SL3320-1TG34-7AA0</b>
1PH8288-1.W4...	0.92	131	0.963	6.30 (55.8)	1650 (3638)	1XB7700-P02	575	<b>6SL3320-1TG35-8AA0</b>

1)  $n_2$ : Maximum permissible thermal speed at constant power.

2)  $n_{\text{max}}$ : Maximum speed that must not be exceeded.

3)  $I_{\text{rated}}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280) or 2.5 kHz (SH 355).

4) The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP65 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.	
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>										
<b>1500</b>	80	3.5 (4.69)	22 (16.2)	8.9	357	54.5	3550	10000	1PH8083-■F 2■-...1	
		4.6 (6.17)	29 (21.4)	13.7	316	53.3	6000	10000	1PH8087-■F 2■-...1	
	100	5 (6.71)	32 (23.6)	12.8	357	53.1	2500	9000	1PH8101-■F 2■-...1	
		7.1 (9.52)	45 (33.2)	19.7	317	53.0	4000	9000	1PH8103-■F 2■-...1	
		11 (14.8)	70 (51.6)	28.5	340	52.8	3500	9000	1PH8105-■F 2■-...1	
		14 (18.8)	89 (65.6)	43.7	277	53.3	5600	9000	1PH8107-■F 2■-...1	
	132	15 (20.1)	96 (70.8)	30	380	52.3	2500	8000	1PH8131-■F 2■-...1	
		17 (22.8)	108 (79.7)	38	345	51.5	3500	8000	1PH8133-■F 2■-...1	
		22 (29.5)	140 (103)	51	342	51.5	4000	8000	1PH8135-■F 2■-...1	
		27 (36.2)	172 (127)	67	315	51.6	4000	8000	1PH8137-■F 2■-...1	
		30 (40.2)	191 (141)	80	289	51.9	5000	8000	1PH8138-■F 2■-...1	
	160	37 (49.62)	236 (174)	84	328	51.1	3000	6500	1PH8163-■F 2■-...1	
		46 (61.7)	293 (216)	104	330	50.9	3050	6500	1PH8165-■F 2■-...1	
		52 (69.7)	331 (224)	116	332	51.2	3050	6500	1PH8166-■F 2■-...1	
	<b>2000</b>	80	4.3 (5.77)	21 (15.5)	12	322	70.4	7200	10000	1PH8083-■G 2■-...1
6.1 (8.18)			29 (21.4)	17.5	312	70.3	7950	10000	1PH8087-■G 2■-...1	
100		6.4 (8.58)	31 (22.9)	16.8	335	69.8	4000	9000	1PH8101-■G 2■-...1	
		9.5 (12.7)	45 (33.2)	23.8	343	69.8	3000	9000	1PH8103-■G 2■-...1	
		13.0 (17.4)	62 (45.7)	34.5	326	69.3	4000	9000	1PH8105-■G 2■-...1	
132		18 (24.1)	86 (63.4)	40	352	69.1	4000	8000	1PH8131-■G 2■-...1	
		22 (29.5)	105 (77.4)	52	336	68.2	5000	8000	1PH8133-■G 2■-...1	
		29 (38.9)	138 (102)	64	348	68.3	4500	8000	1PH8135-■G 2■-...1	
160		42 (56.3)	201 (148)	93	335	67.6	5000	6500	1PH8163-■G 2■-...1	
		53 (71.1)	253 (187)	110	352	67.6	3500	6500	1PH8165-■G 2■-...1	
		64 (85.8)	306 (221)	125	376	67.8	3000	6500	1PH8166-■G 2■-...1	
<b>3000</b>		100	10.6 (14.2)	34 (25.1)	30	309	102.4	11900	9000	1PH8103-■M 2■-...1
			16.8 (22.5)	53 (39.1)	45	324	102.3	8050	9000	1PH8105-■M 2■-...1
			18 (24.1)	57 (42.0)	60	264	102.2	17000	9000	1PH8107-■M 2■-...1

Asynchronous variant

Asynchronous variant with holding brake (IP55 degree of protection)

1  
3For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP65 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8083-..F2...	0.84	3.6	0.784	0.0064 (0.057)	36 (79.4)	gk803	9	<b>6SL312-1TE21-0AA3</b>
1PH8087-..F2...	0.78	7.2	0.814	0.0089 (0.079)	44 (97.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-..F2...	0.81	6.0	0.813	0.0138 (0.122)	51 (112)	gk823	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-..F2...	0.82	8.6	0.827	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..F2...	0.81	13.3	0.843	0.0252 (0.223)	74 (163)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8107-..F2...	0.83	17.8	0.829	0.0289 (0.256)	83 (183)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8131-..F2...	0.89	9.2	0.883	0.0590 (0.522)	105 (232)	gk843	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-..F2...	0.86	14.2	0.897	0.0760 (0.673)	123 (271)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F2...	0.85	20.3	0.901	0.0940 (0.832)	141 (311)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..F2...	0.86	25.3	0.900	0.1090 (0.965)	157 (346)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8138-..F2...	0.88	27.1	0.882	0.1090 (0.965)	157 (346)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8163-..F2...	0.88	27.4	0.916	0.2160 (1.912)	229 (505)	gk873	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-..F2...	0.87	37.2	0.930	0.2320 (2.053)	264 (582)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..F2...	0.88	36.7	0.936	0.2320 (2.053)	269 (593)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8083-..G2...	0.80	5.9	0.833	0.0064 (0.057)	36 (79.4)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-..G2...	0.80	8.4	0.843	0.0089 (0.079)	44 (97.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-..G2...	0.81	7.6	0.857	0.0138 (0.122)	51 (112)	gk823	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-..G2...	0.82	10.3	0.857	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..G2...	0.81	15.6	0.879	0.0252 (0.223)	74 (163)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8131-..G2...	0.85	15.5	0.908	0.0590 (0.522)	105 (232)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..G2...	0.84	22.2	0.909	0.0760 (0.673)	123 (271)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8135-..G2...	0.86	23.9	0.924	0.0940 (0.832)	141 (311)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8163-..G2...	0.88	30.8	0.937	0.2160 (1.912)	229 (505)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8165-..G2...	0.89	32.1	0.938	0.2320 (2.053)	264 (582)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..G2...	0.88	39.3	0.937	0.2320 (2.053)	269 (593)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8103-..M2...	0.80	13.0	0.900	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..M2...	0.80	20.3	0.900	0.0252 (0.223)	74 (163)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8107-..M2...	0.80	26.0	0.900	0.0289 (0.256)	83 (183)	gk823	60	<b>6SL312-1TE26-0AA3</b>

**Cooling:**

Internal air cooling  
External air cooling

**0**  
**1**

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position in Order No. B to D).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP65 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Active Line Module</b>									
<b>1750</b>	80	4.0 (5.36)	22 (16.2)	8.7	416	62.4	4100	10000	1PH8083-■F 2■-...1
		5.4 (7.24)	29 (21.4)	13.7	358	61.8	6600	10000	1PH8087-■F 2■-...1
	100	5.8 (7.78)	32 (23.6)	12.8	400	61.7	2500	9000	1PH8101-■F 2■-...1
		8.2 (11.0)	45 (33.2)	19.7	364	61.4	5000	9000	1PH8103-■F 2■-...1
		12.5 (16.8)	68 (50.2)	28.5	380	61.2	3400	9000	1PH8105-■F 2■-...1
		15.5 (20.8)	85 (62.7)	42	314	61.4	4500	9000	1PH8107-■F 2■-...1
	132	17 (22.8)	93 (68.6)	30	425	60.7	2500	8000	1PH8131-■F 2■-...1
		19.5 (26.1)	106 (78.2)	38	403	59.8	3500	8000	1PH8133-■F 2■-...1
		25.5 (34.2)	139 (103)	51	395	59.8	4000	8000	1PH8135-■F 2■-...1
		31.5 (42.2)	172 (127)	67	365	59.9	4500	8000	1PH8137-■F 2■-...1
		33 (44.3)	180 (133)	77	332	60.0	5000	8000	1PH8138-■F 2■-...1
	160	43 (57.7)	235 (173)	84	380	59.4	3500	6500	1PH8163-■F 2■-...1
53 (71.1)		289 (213)	104	374	59.3	3050	6500	1PH8165-■F 2■-...1	
61 (81.8)		333 (246)	116	381	59.5	3050	6500	1PH8166-■F 2■-...1	
<b>2300</b>	80	4.9 (6.57)	20 (14.8)	12	362	80.5	8150	10000	1PH8083-■G 2■-...1
		7.0 (9.39)	29 (21.4)	17.7	355	80.3	8850	10000	1PH8087-■G 2■-...1
	100	7.3 (9.79)	30 (22.1)	16.8	382	79.7	5000	9000	1PH8101-■G 2■-...1
		10.9 (14.6)	45 (33.2)	23.8	390	79.8	3000	9000	1PH8103-■G 2■-...1
		15 (20.1)	62 (45.7)	34	370	79.3	3500	9000	1PH8105-■G 2■-...1
	132	20 (26.8)	83 (61.2)	39	400	78.5	4000	8000	1PH8131-■G 2■-...1
		25 (33.5)	104 (76.7)	52	373	78.3	6000	8000	1PH8133-■G 2■-...1
		31 (41.6)	129 (95.2)	61	397	78.1	4500	8000	1PH8135-■G 2■-...1
	160	48 (64.4)	199 (147)	93	382	77.6	4000	6500	1PH8163-■G 2■-...1
		60 (80.5)	249 (184)	107	410	77.6	3000	6500	1PH8165-■G 2■-...1
		72 (96.6)	299 (221)	124	420	77.8	3000	6500	1PH8166-■G 2■-...1
	<b>3300</b>	100	11.7 (15.7)	34 (25.1)	30	340	112.4	13550	9000
18.5 (24.81)			54 (39.8)	45	355	112.4	9050	9000	1PH8105-■M 2■-...1
20 (26.82)			58 (42.8)	60	290	112.6	18050	9000	1PH8107-■M 2■-...1

Asynchronous variant

Asynchronous variant with holding brake (IP55 degree of protection)

1  
3For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP65 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8083-..F2...	0.82	4.0	0.808	0.0064 (0.057)	36 (79.4)	gk803	9	<b>6SL312-1TE21-0AA3</b>
1PH8087-..F2...	0.80	6.8	0.831	0.0089 (0.079)	44 (97.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-..F2...	0.83	5.4	0.834	0.0138 (0.122)	51 (112)	gk823	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-..F2...	0.82	8.6	0.851	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..F2...	0.81	12.1	0.862	0.0252 (0.223)	74 (163)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8107-..F2...	0.83	17.5	0.847	0.0289 (0.256)	83 (183)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8131-..F2...	0.89	8.2	0.897	0.0590 (0.522)	105 (232)	gk843	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-..F2...	0.85	14.9	0.913	0.0760 (0.673)	123 (271)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F2...	0.85	20.1	0.914	0.0940 (0.832)	141 (311)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..F2...	0.86	24.8	0.911	0.1090 (0.965)	157 (346)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8138-..F2...	0.87	27.1	0.898	0.1090 (0.965)	157 (346)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8163-..F2...	0.88	27.3	0.924	0.2160 (1.912)	229 (505)	gk873	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-..F2...	0.88	33.8	0.935	0.2320 (2.053)	264 (582)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..F2...	0.89	35.2	0.940	0.2320 (2.053)	269 (593)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8083-..G2...	0.80	5.8	0.846	0.0064 (0.057)	36 (79.4)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-..G2...	0.79	8.6	0.860	0.0089 (0.079)	44 (97.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-..G2...	0.80	7.8	0.874	0.0138 (0.122)	51 (112)	gk823	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-..G2...	0.82	10.3	0.883	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..G2...	0.81	15.1	0.891	0.0252 (0.223)	74 (163)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8131-..G2...	0.85	15.4	0.920	0.0590 (0.522)	105 (232)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..G2...	0.86	19.4	0.923	0.0760 (0.673)	123 (271)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8135-..G2...	0.85	24.1	0.933	0.0940 (0.832)	141 (311)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8163-..G2...	0.88	30.2	0.939	0.2160 (1.912)	229 (505)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8165-..G2...	0.88	33.7	0.946	0.2320 (2.053)	264 (582)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..G2...	0.89	35.5	0.946	0.2320 (2.053)	269 (593)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8103-..M2...	0.80	13.2	0.900	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..M2...	0.80	20.2	0.910	0.0252 (0.223)	74 (163)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8107-..M2...	0.80	26.1	0.900	0.0289 (0.256)	83 (183)	gk823	60	<b>6SL312-1TE26-0AA3</b>

**Cooling:**

Internal air cooling  
External air cooling

**0**  
**1**

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position in Order No. B to D).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP65 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.	
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>										
<b>2000</b>	80	4.6 (6.17)	22 (16.2)	8.7	457	71.0	4250	10000	1PH8083-■F 2■-...1	
		6.1 (8.18)	29 (21.4)	13.7	402	70.0	6950	10000	1PH8087-■F 2■-...1	
	100	6.6 (8.85)	32 (23.6)	12.5	450	69.9	2500	9000	1PH8101-■F 2■-...1	
		9.4 (12.6)	45 (33.2)	19.7	411	69.7	5000	9000	1PH8103-■F 2■-...1	
		14 (18.8)	67 (49.4)	27.5	426	69.5	3000	9000	1PH8105-■F 2■-...1	
	132	18 (24.1)	86 (63.4)	42.6	363	69.7	3000	9000	1PH8107-■F 2■-...1	
		18.5 (24.8)	88 (64.9)	30	460	68.7	2500	8000	1PH8131-■F 2■-...1	
		22.5 (30.2)	107 (78.9)	38	452	68.2	4000	8000	1PH8133-■F 2■-...1	
		29 (38.9)	138 (102)	52	448	68.2	4500	8000	1PH8135-■F 2■-...1	
	160	36 (48.3)	172 (127)	67	415	68.3	4000	8000	1PH8137-■F 2■-...1	
		37 (49.62)	177 (131)	76	380	68.4	6000	8000	1PH8138-■F 2■-...1	
		49 (65.7)	234 (173)	84	430	67.7	3500	6500	1PH8163-■F 2■-...1	
		60 (80.5)	287 (212)	103	426	67.6	3050	6500	1PH8165-■F 2■-...1	
	2650	80	68 (91.2)	325 (240)	116	426	67.9	3050	6500	1PH8166-■F 2■-...1
			5.6 (7.51)	20 (14.8)	12	425	91.8	8500	10000	1PH8083-■G 2■-...1
100		8.1 (10.9)	29 (21.4)	17.8	415	91.8	9150	10000	1PH8087-■G 2■-...1	
	8.4 (11.3)	30 (22.1)	16.8	435	91.4	4000	9000	1PH8101-■G 2■-...1		
	12.5 (16.8)	45 (33.2)	23.5	454	91.2	4000	9000	1PH8103-■G 2■-...1		
132	17 (22.8)	61 (45.0)	33.5	424	90.9	4500	9000	1PH8105-■G 2■-...1		
	23 (30.8)	83 (61.2)	39	458	90.1	4500	8000	1PH8131-■G 2■-...1		
	28 (37.5)	101 (74.5)	50	427	89.9	6000	8000	1PH8133-■G 2■-...1		
160	32 (42.9)	115 (84.8)	58	448	89.6	5500	8000	1PH8135-■G 2■-...1		
	55 (73.8)	198 (146)	90	450	89.2	5000	6500	1PH8163-■G 2■-...1		
	65 (87.2)	234 (173)	100	460	89.2	4000	6500	1PH8165-■G 2■-...1		
3600	100	83 (111)	299 (221)	125	460	89.6	3000	6500	1PH8166-■G 2■-...1	
		12.7 (17.0)	34 (25.1)	29.7	368	122.5	17650	9000	1PH8103-■M 2■-...1	
		20 (26.8)	53 (39.1)	45	375	122.5	10000	9000	1PH8105-■M 2■-...1	
		21 (28.2)	56 (41.3)	59	315	122.1	17650	9000	1PH8107-■M 2■-...1	

Asynchronous variant

Asynchronous variant with holding brake (IP55 degree of protection)

1  
3For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP65 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magnetizing current $I_{\mu}$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8083-..F2...	0.83	3.8	0.839	0.0064 (0.057)	36 (79.4)	gk803	9	<b>6SL312-1TE21-0AA3</b>
1PH8087-..F2...	0.79	6.8	0.868	0.0089 (0.079)	44 (97.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-..F2...	0.82	4.4	0.858	0.0138 (0.122)	51 (112)	gk823	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-..F2...	0.82	8.5	0.869	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..F2...	0.82	11.7	0.894	0.0252 (0.223)	74 (163)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8107-..F2...	0.81	19.1	0.873	0.0289 (0.256)	83 (183)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8131-..F2...	0.90	7.2	0.912	0.0590 (0.522)	105 (232)	gk843	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-..F2...	0.86	14.4	0.938	0.0760 (0.673)	123 (271)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F2...	0.85	19.9	0.931	0.0940 (0.832)	141 (311)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..F2...	0.86	25.4	0.928	0.1090 (0.965)	157 (346)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8138-..F2...	0.86	28.4	0.920	0.1090 (0.965)	157 (346)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8163-..F2...	0.88	26.9	0.925	0.2160 (1.912)	229 (505)	gk873	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-..F2...	0.88	34.0	0.940	0.2320 (2.053)	264 (582)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..F2...	0.89	32.8	0.941	0.2320 (2.053)	269 (593)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8083-..G2...	0.76	6.5	0.862	0.0064 (0.057)	36 (79.4)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8087-..G2...	0.77	9.3	0.871	0.0089 (0.079)	44 (97.0)	gk803	18	<b>6SL312-1TE21-8AA3</b>
1PH8101-..G2...	0.80	7.7	0.888	0.0138 (0.122)	51 (112)	gk823	18	<b>6SL312-1TE21-8AA3</b>
1PH8103-..G2...	0.79	11.3	0.904	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..G2...	0.81	15.3	0.911	0.0252 (0.223)	74 (163)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8131-..G2...	0.85	15.4	0.938	0.0590 (0.522)	105 (232)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..G2...	0.85	19.5	0.933	0.0760 (0.673)	123 (271)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8135-..G2...	0.84	23.0	0.942	0.0940 (0.832)	141 (311)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8163-..G2...	0.86	33.6	0.940	0.2160 (1.912)	229 (505)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8165-..G2...	0.89	31.9	0.948	0.2320 (2.053)	264 (582)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..G2...	0.90	35.7	0.948	0.2320 (2.053)	269 (593)	gk873	132	<b>6SL312-1TE31-3AA3</b>
1PH8103-..M2...	0.80	13.0	0.910	0.0172 (0.152)	60 (132)	gk823	30	<b>6SL312-1TE23-0AA3</b>
1PH8105-..M2...	0.81	18.6	0.920	0.0252 (0.223)	74 (163)	gk823	45	<b>6SL312-1TE24-5AA3</b>
1PH8107-..M2...	0.79	26.1	0.910	0.0289 (0.256)	83 (183)	gk823	60	<b>6SL312-1TE26-0AA3</b>

**Cooling:**

Internal air cooling  
External air cooling

**0**  
**1**

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position in Order No. B to D).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>									
<b>400</b>	180	17 (22.8)	406 (299)	50	271	14.0	1500	5000	1PH8184- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
		23 (30.8)	549 (405)	68	268	13.9	1800	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
	225	36 (48.3)	859 (634)	100	268	14.0	1400	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
		47 (63.0)	1122 (828)	130	264	14.0	1600	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
		58 (77.8)	1385 (1022)	154	272	13.9	1700	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
	280	71 (95.2)	1695 (1250)	170	295	13.8	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
		89 (119)	2125 (1567)	210	300	13.7	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
		109 (146)	2602 (1919)	260	295	13.7	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> B 2 <span style="color:blue">■</span> -...1
	<b>700</b>	180	33 (44.3)	450 (332)	77	320	24.2	2500	5000
43 (57.7)			587 (433)	97	330	23.9	3000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
225		61 (81.8)	832 (614)	128	340	24.0	2100	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
		81 (109)	1105 (815)	184	310	23.9	2300	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
		96 (129)	1310 (966)	210	315	23.9	2500	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
280		123 (165)	1678 (1238)	260	330	23.7	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
		153 (205)	2087 (1539)	320	325	23.7	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
		188 (252)	2565 (1892)	400	324	23.6	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> C 2 <span style="color:blue">■</span> -...1
<b>1000</b>		180	47 (63.0)	449 (331)	114	300	34.2	5000	5000
	64 (85.8)		611 (451)	148	320	34.0	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
	225	89 (119)	850 (627)	188	335	33.9	2800	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
		115 (154)	1098 (810)	235	340	33.9	2400	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
		141 (189)	1346 (993)	280	340	33.9	2300	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
	280	172 (231)	1643 (1212)	350	335	33.7	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
		214 (287)	2044 (1508)	460	330	33.6	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
		264 (354)	2521 (1859)	550	335	33.6	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> D 2 <span style="color:blue">■</span> -...1
	<b>1500</b>	180	70 (93.9)	446 (329)	150	335	51.0	5000	5000
93 (125)			592 (437)	198	330	51.0	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
225		119 (160)	758 (559)	240	340	50.6	3500	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
		145 (194)	923 (681)	295	340	50.5	3700	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
		192 (257)	1222 (901)	390	340	50.5	3700	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
280		227 (304)	1445 (1066)	445	343	50.4	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
		281 (377)	1789 (1320)	540	343	50.4	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
		345 (463)	2197 (1621)	660	345	50.3	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> F 2 <span style="color:blue">■</span> -...1
<b>2500</b>		180	95 (127)	363 (268)	196	340	85.2	5000	5000
	120 (161)		458 (338)	250	335	83.9	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> L 2 <span style="color:blue">■</span> -...1
	225	153 (205)	584 (431)	310	340	83.8	3200	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> L 2 <span style="color:blue">■</span> -...1
		185 (248)	707 (521)	380	335	83.8	3200	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> L 2 <span style="color:blue">■</span> -...1
	280	226 (303)	863 (637)	455	340	83.7	3200	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> <span style="color:blue">■</span> L 2 <span style="color:blue">■</span> -...1

Asynchronous variant  
Asynchronous variant with holding brake (IP55 degree of protection)

1  
3

For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magne- tizing current $I_{\mu}$ A	Effi- ciency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8184-...B2...	0.87	28	0.831	0.489 (4.328)	340 (750)	1XB7322-P05	60	<b>6SL3120-1TE26-0AA3</b>
1PH8186-...B2...	0.86	42	0.845	0.652 (5.771)	410 (904)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8224-...B2...	0.91	37	0.858	1.45 (12.8)	610 (1345)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...B2...	0.90	49	0.875	1.90 (16.8)	740 (1632)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8228-...B2...	0.90	62	0.886	2.35 (20.8)	870 (1918)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8284-1.B2...	0.89	70	0.914	4.21 (37.3)	1280 (2822)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8286-1.B2...	0.89	83	0.916	5.16 (45.7)	1490 (3285)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8288-1.B2...	0.89	110	0.925	6.29 (55.7)	1750 (3859)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8184-...C2...	0.89	33	0.872	0.489 (4.328)	340 (750)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8186-...C2...	0.86	49	0.898	0.652 (5.771)	410 (904)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8224-...C2...	0.89	48	0.914	1.45 (12.8)	610 (1345)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...C2...	0.88	79	0.928	1.90 (16.8)	740 (1632)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8228-...C2...	0.90	82	0.930	2.35 (20.8)	870 (1918)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8284-1.C2...	0.87	108	0.945	4.21 (37.3)	1280 (2822)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8286-1.C2...	0.89	123	0.948	5.16 (45.7)	1490 (3285)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8288-1.C2...	0.88	172	0.952	6.29 (55.7)	1750 (3859)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8184-...D2...	0.88	45	0.904	0.489 (4.328)	340 (750)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-...D2...	0.85	78	0.920	0.652 (5.771)	410 (904)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...D2...	0.87	79	0.937	1.45 (12.8)	610 (1345)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-...D2...	0.89	87	0.938	1.90 (16.8)	740 (1632)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-...D2...	0.91	98	0.943	2.35 (20.8)	870 (1918)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8284-1.D2...	0.88	144	0.957	4.21 (37.3)	1280 (2822)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8286-1.D2...	0.85	215	0.960	5.16 (45.7)	1490 (3285)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.D2...	0.86	251	0.962	6.29 (55.7)	1750 (3859)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-...F2...	0.87	66	0.928	0.489 (4.328)	340 (750)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...F2...	0.88	85	0.935	0.652 (5.771)	410 (904)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...F2...	0.89	87	0.951	1.45 (12.8)	610 (1345)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-...F2...	0.87	119	0.957	1.90 (16.8)	740 (1632)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-...F2...	0.87	169	0.959	2.35 (20.8)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8284-1.F2...	0.89	161	0.964	4.21 (37.3)	1280 (2822)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1.F2...	0.90	181	0.966	5.16 (45.7)	1490 (3285)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8288-1.F2...	0.90	234	0.967	6.29 (55.7)	1750 (3859)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8184-...L2...	0.87	75	0.945	0.489 (4.328)	340 (750)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...L2...	0.87	109	0.948	0.652 (5.771)	410 (904)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-...L2...	0.87	113	0.961	1.45 (12.8)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-...L2...	0.87	151	0.963	1.90 (16.8)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-...L2...	0.87	181	0.964	2.35 (20.8)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14h position of Order No. A to D, E and F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.	
<b>Line voltage 400 V 3 AC, Active Line Module</b>										
<b>500</b>	180	23 (30.8)	439 (324)	54	335	17.4	1800	5000	1PH8184- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
		30 (40.2)	573 (423)	70	335	17.3	2200	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
	225	46 (61.7)	879 (648)	100	335	17.3	1500	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
		59 (79.1)	1127 (831)	128	330	17.3	1700	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
		72 (96.6)	1375 (1014)	150	340	17.2	1800	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
	280	89 (119)	1700 (1254)	172	365	17.1	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
		111 (149)	2120 (1564)	205	375	17.0	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
		136 (182)	2598 (1916)	260	365	17.0	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> B 2 <span style="color:blue">■</span> -...1	
	<b>800</b>	180	38 (51.0)	454 (335)	77	365	27.5	2900	5000	1PH8184- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1
			49 (65.7)	585 (431)	99	360	27.4	3500	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1
		225	70 (93.9)	836 (617)	130	380	27.3	2300	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1
			93 (125)	1110 (819)	186	350	27.2	2500	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1
110 (148)			1313 (968)	210	360	27.2	2700	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1	
280		141 (189)	1683 (1241)	260	375	27.0	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1	
		175 (235)	2089 (1541)	320	375	27.0	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1	
		215 (288)	2567 (1893)	405	370	27.0	2200	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> C 2 <span style="color:blue">■</span> -...1	
<b>1150</b>	180	54 (72.4)	448 (330)	112	350	39.2	5000	5000	1PH8184- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
		74 (99.2)	615 (454)	148	370	38.9	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
	225	101 (135)	839 (619)	186	385	38.9	3000	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
		131 (176)	1088 (803)	230	390	38.9	2700	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
		161 (216)	1337 (986)	280	390	38.9	2500	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
	280	198 (266)	1644 (1213)	355	385	38.7	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
		246 (330)	2043 (1507)	455	380	38.6	2200	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
		304 (408)	2525 (1862)	550	385	38.6	2300	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> D 2 <span style="color:blue">■</span> -...1	
<b>1750</b>	180	82 (110)	447 (330)	150	390	59.3	5000	5000	1PH8184- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
		111 (149)	606 (447)	200	385	59.3	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
	225	138 (185)	753 (555)	240	395	58.9	3800	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
		169 (227)	922 (680)	295	390	58.8	3900	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
		221 (296)	1206 (890)	390	390	58.8	3900	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
	280	265 (355)	1446 (1067)	445	400	58.7	2200	3300	1PH8284-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
		328 (440)	1790 (1320)	540	400	58.7	2300	3300	1PH8286-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
		403 (540)	2199 (1622)	670	400	58.7	2400	3300	1PH8288-1 <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> F 2 <span style="color:blue">■</span> -...1	
<b>2900</b>	180	102 (137)	336 (248)	182	395	97.5	5000	5000	1PH8184- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> L 2 <span style="color:blue">■</span> -...1	
		135 (181)	445 (328)	245	385	97.3	5000	5000	1PH8186- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> L 2 <span style="color:blue">■</span> -...1	
	225	164 (220)	540 (398)	285	395	97.1	3600	4500	1PH8224- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> L 2 <span style="color:blue">■</span> -...1	
		204 (274)	672 (496)	360	390	97.1	3600	4500	1PH8226- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> L 2 <span style="color:blue">■</span> -...1	
		237 (318)	780 (575)	415	395	97.0	3600	4500	1PH8228- <span style="color:blue">■</span> <span style="color:red">■</span> <span style="color:green">■</span> L 2 <span style="color:blue">■</span> -...1	

Asynchronous variant  
Asynchronous variant with holding brake (IP55 degree of protection)

1  
3

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{\text{rated}}$ A	
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8184-...B2...	0.86	27	0.850	0.489 (4.328)	340 (750)	1XB7322-P05	60	<b>6SL3120-1TE26-0AA3</b>
1PH8186-...B2...	0.85	43	0.868	0.652 (5.771)	410 (904)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8224-...B2...	0.90	38	0.883	1.45 (12.8)	610 (1345)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...B2...	0.90	50	0.899	1.90 (16.8)	740 (1632)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8228-...B2...	0.90	63	0.908	2.35 (20.8)	870 (1918)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8284-1.B2...	0.88	69	0.929	4.21 (37.3)	1280 (2822)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8286-1.B2...	0.89	84	0.931	5.16 (45.7)	1490 (3285)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8288-1.B2...	0.88	109	0.938	6.29 (55.7)	1750 (3859)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8184-...C2...	0.88	33	0.885	0.489 (4.328)	340 (750)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8186-...C2...	0.88	44	0.904	0.652 (5.771)	410 (904)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8224-...C2...	0.89	46	0.920	1.45 (12.8)	610 (1345)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...C2...	0.88	77	0.934	1.90 (16.8)	740 (1632)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8228-...C2...	0.90	82	0.937	2.35 (20.8)	870 (1918)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8284-1.C2...	0.88	108	0.950	4.21 (37.3)	1280 (2822)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8286-1.C2...	0.88	126	0.953	5.16 (45.7)	1490 (3285)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8288-1.C2...	0.87	172	0.956	6.29 (55.7)	1750 (3859)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8184-...D2...	0.87	46	0.915	0.489 (4.328)	340 (750)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-...D2...	0.84	80	0.927	0.652 (5.771)	410 (904)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...D2...	0.86	79	0.944	1.45 (12.8)	610 (1345)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-...D2...	0.89	87	0.945	1.90 (16.8)	740 (1632)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-...D2...	0.90	98	0.948	2.35 (20.8)	870 (1918)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8284-1.D2...	0.87	144	0.960	4.21 (37.3)	1280 (2822)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8286-1.D2...	0.85	216	0.962	5.16 (45.7)	1490 (3285)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.D2...	0.86	251	0.964	6.29 (55.7)	1750 (3859)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-...F2...	0.87	65	0.933	0.489 (4.328)	340 (750)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...F2...	0.89	85	0.939	0.652 (5.771)	410 (904)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...F2...	0.88	87	0.954	1.45 (12.8)	610 (1345)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-...F2...	0.88	116	0.959	1.90 (16.8)	740 (1632)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-...F2...	0.87	165	0.961	2.35 (20.8)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8284-1.F2...	0.89	161	0.966	4.21 (37.3)	1280 (2822)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1.F2...	0.90	182	0.967	5.16 (45.7)	1490 (3285)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8288-1.F2...	0.90	232	0.968	6.29 (55.7)	1750 (3859)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8184-...L2...	0.87	77	0.945	0.489 (4.328)	340 (750)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...L2...	0.87	108	0.948	0.652 (5.771)	410 (904)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-...L2...	0.88	114	0.961	1.45 (12.8)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-...L2...	0.87	152	0.962	1.90 (16.8)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-...L2...	0.87	182	0.963	2.35 (20.8)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{\text{max}}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E and F).

<sup>3)</sup>  $I_{\text{rated}}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>f</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_2$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>									
<b>600</b>	180	29 (38.9)	462 (341)	55	405	20.8	1800	5000	1PH8184-■B2■-...1
		38 (51.0)	605 (446)	73	405	20.6	2500	5000	1PH8186-■B2■-...1
	225	53 (71.1)	844 (623)	94	410	20.6	1900	4500	1PH8224-■B2■-...1
		70 (93.9)	1114 (822)	122	410	20.5	2000	4500	1PH8226-■B2■-...1
	280	85 (114)	1353 (998)	148	410	20.5	2100	4500	1PH8228-■B2■-...1
		107 (143)	1703 (1256)	170	440	20.4	2200	3300	1PH8284-1■B2■-...1
<b>1000</b>	180	133 (178)	2117 (1561)	205	445	20.4	2200	3300	1PH8286-1■B2■-...1
		164 (220)	2610 (1925)	260	440	20.3	2200	3300	1PH8288-1■B2■-...1
	225	48 (64.4)	458 (338)	77	460	34.1	3100	5000	1PH8184-■C2■-...1
		61 (81.8)	583 (430)	98	450	34.0	3700	5000	1PH8186-■C2■-...1
	280	87 (117)	831 (613)	132	460	34.0	2500	4500	1PH8224-■C2■-...1
		116 (156)	1108 (817)	184	440	33.9	2700	4500	1PH8226-■C2■-...1
<b>1350</b>	180	138 (185)	1318 (972)	210	450	33.9	2900	4500	1PH8228-■C2■-...1
		176 (236)	1681 (1240)	265	455	33.7	2200	3300	1PH8284-1■C2■-...1
	225	219 (294)	2091 (1542)	325	455	33.7	2200	3300	1PH8286-1■C2■-...1
		269 (361)	2569 (1895)	405	460	33.6	2200	3300	1PH8288-1■C2■-...1
<b>2000</b>	180	64 (85.8)	453 (334)	112	410	45.8	5000	5000	1PH8184-■D2■-...1
		86 (115)	608 (448)	148	420	45.7	5000	5000	1PH8186-■D2■-...1
	225	115 (154)	813 (600)	180	450	45.5	3400	4500	1PH8224-■D2■-...1
		150 (201)	1061 (783)	225	460	45.5	3200	4500	1PH8226-■D2■-...1
	280	184 (247)	1302 (960)	270	460	45.5	3000	4500	1PH8228-■D2■-...1
		232 (311)	1641 (1210)	355	450	45.4	2200	3300	1PH8284-1■D2■-...1
<b>3400</b>	180	289 (388)	2044 (1508)	460	445	45.3	2300	3300	1PH8286-1■D2■-...1
		357 (479)	2525 (1862)	550	450	45.3	2400	3300	1PH8288-1■D2■-...1
	225	95 (127)	454 (335)	152	450	67.3	5000	5000	1PH8184-■F2■-...1
		126 (169)	602 (444)	200	445	67.3	5000	5000	1PH8186-■F2■-...1
	280	155 (208)	740 (546)	235	460	67.2	4200	4500	1PH8224-■F2■-...1
		191 (256)	912 (673)	290	450	67.1	4100	4500	1PH8226-■F2■-...1
<b>5000</b>	180	245 (329)	1170 (863)	380	450	67.1	4100	4500	1PH8228-■F2■-...1
		303 (406)	1447 (1067)	445	455	67.0	2300	3300	1PH8284-1■F2■-...1
	225	375 (503)	1791 (1321)	550	455	67.0	2400	3300	1PH8286-1■F2■-...1
		460 (617)	2197 (1621)	670	455	67.0	2500	3300	1PH8288-1■F2■-...1
<b>7500</b>	180	100 (134)	281 (207)	158	460	114.0	5000	5000	1PH8184-■L2■-...1
		121 (162)	340 (251)	200	455	113.5	5000	5000	1PH8186-■L2■-...1
	225	164 (220)	461 (340)	255	460	114.0	4100	4500	1PH8224-■L2■-...1
		199 (267)	559 (412)	310	460	114.0	4100	4500	1PH8226-■L2■-...1
280	237 (318)	666 (491)	370	460	114.0	4100	4500	1PH8228-■L2■-...1	

Asynchronous variant  
Asynchronous variant with holding brake (IP55 degree of protection)

1  
3

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8184-...B2...	0.86	28	0.869	0.489 (4.328)	340 (750)	1XB7322-P05	60	<b>6SL3120-1TE26-0AA3</b>
1PH8186-...B2...	0.84	44	0.883	0.652 (5.771)	410 (904)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8224-...B2...	0.87	40	0.908	1.45 (12.8)	610 (1345)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...B2...	0.88	55	0.919	1.90 (16.8)	740 (1632)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8228-...B2...	0.88	64	0.923	2.35 (20.8)	870 (1918)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8284-1.B2...	0.88	71	0.939	4.21 (37.3)	1280 (2822)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8286-1.B2...	0.89	83	0.940	5.16 (45.7)	1490 (3285)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8288-1.B2...	0.88	111	0.946	6.29 (55.7)	1750 (3859)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8184-...C2...	0.86	34	0.905	0.489 (4.328)	340 (750)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8186-...C2...	0.87	44	0.920	0.652 (5.771)	410 (904)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8224-...C2...	0.89	44	0.931	1.45 (12.8)	610 (1345)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...C2...	0.88	79	0.944	1.90 (16.8)	740 (1632)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8228-...C2...	0.89	83	0.946	2.35 (20.8)	870 (1918)	1XB7322-P05	210	<b>6SL3320-1TE32-1AA3</b>
1PH8284-1.C2...	0.88	102	0.956	4.21 (37.3)	1280 (2822)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8286-1.C2...	0.89	120	0.958	5.16 (45.7)	1490 (3285)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8288-1.C2...	0.87	171	0.961	6.29 (55.7)	1750 (3859)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8184-...D2...	0.87	46	0.924	0.489 (4.328)	340 (750)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-...D2...	0.86	73	0.933	0.652 (5.771)	410 (904)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...D2...	0.86	79	0.950	1.45 (12.8)	610 (1345)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-...D2...	0.88	88	0.951	1.90 (16.8)	740 (1632)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-...D2...	0.90	99	0.954	2.35 (20.8)	870 (1918)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8284-1.D2...	0.87	143	0.963	4.21 (37.3)	1280 (2822)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8286-1.D2...	0.85	216	0.964	5.16 (45.7)	1490 (3285)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8288-1.D2...	0.86	249	0.966	6.29 (55.7)	1750 (3859)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-...F2...	0.85	68	0.938	0.489 (4.328)	340 (750)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...F2...	0.87	89	0.943	0.652 (5.771)	410 (904)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...F2...	0.86	90	0.958	1.45 (12.8)	610 (1345)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-...F2...	0.88	118	0.961	1.90 (16.8)	740 (1632)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8228-...F2...	0.86	169	0.963	2.35 (20.8)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8284-1.F2...	0.89	160	0.967	4.21 (37.3)	1280 (2822)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8286-1.F2...	0.90	180	0.968	5.16 (45.7)	1490 (3285)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8288-1.F2...	0.90	230	0.969	6.29 (55.7)	1750 (3859)	1XB7712-P03	840	<b>6SL3320-1TE38-4AA3</b>
1PH8184-...L2...	0.84	76	0.944	0.489 (4.328)	340 (750)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...L2...	0.81	110	0.942	0.652 (5.771)	410 (904)	1XB7422-P06	260	<b>6SL3320-1TE32-6AA3</b>
1PH8224-...L2...	0.84	113	0.959	1.45 (12.8)	610 (1345)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8226-...L2...	0.84	153	0.958	1.90 (16.8)	740 (1632)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-...L2...	0.84	180	0.959	2.35 (20.8)	870 (1918)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A to D, E and F).

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors Water cooling, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed during field weakening, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous motor Water cooling
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 690 V 3 AC, Basic Line Module</b>									
<b>400</b>	280	68 (91.2)	1624 (1198)	89	555	13.7	2000	3300	<b>1PH8284-1H 2 -...1</b>
		85 (114)	2029 (1497)	108	555	13.7	2000	3300	<b>1PH8286-1H 2 -...1</b>
		105 (141)	2507 (1849)	134	555	13.7	2000	3300	<b>1PH8288-1H 2 -...1</b>
<b>700</b>	280	119 (160)	1624 (1197)	136	605	23.7	2200	3300	<b>1PH8284-1K 2 -...1</b>
		148 (198)	2019 (1489)	174	605	23.6	2200	3300	<b>1PH8286-1K 2 -...1</b>
		182 (244)	2483 (1831)	205	605	23.7	2200	3300	<b>1PH8288-1K 2 -...1</b>
<b>1000</b>	280	167 (224)	1595 (1176)	196	600	33.6	2200	3300	<b>1PH8284-1U 2 -...1</b>
		208 (279)	1986 (1465)	260	570	33.6	2200	3300	<b>1PH8286-1U 2 -...1</b>
		256 (343)	2445 (1803)	310	580	33.6	2200	3300	<b>1PH8288-1U 2 -...1</b>
<b>1500</b>	280	220 (295)	1401 (1033)	250	590	50.4	2200	3300	<b>1PH8284-1W 2 -...1</b>
		273 (366)	1738 (1282)	310	590	50.4	2200	3300	<b>1PH8286-1W 2 -...1</b>
		335 (449)	2133 (1573)	375	590	50.3	2200	3300	<b>1PH8288-1W 2 -...1</b>
<b>Line voltage 690 V 3 AC, Active Line Module</b>									
<b>500</b>	280	85 (114)	1624 (1198)	89	690	17.0	2000	3300	<b>1PH8284-1H 2 -...1</b>
		106 (142)	2025 (1494)	108	690	17.0	2000	3300	<b>1PH8286-1H 2 -...1</b>
		131 (176)	2502 (1845)	134	690	17.0	2000	3300	<b>1PH8288-1H 2 -...1</b>
<b>800</b>	280	137 (184)	1635 (1206)	138	690	27.0	2200	3300	<b>1PH8284-1K 2 -...1</b>
		170 (228)	2029 (1497)	176	690	27.0	2200	3300	<b>1PH8286-1K 2 -...1</b>
		209 (280)	2495 (1840)	205	690	27.0	2200	3300	<b>1PH8288-1K 2 -...1</b>
<b>1150</b>	280	192 (257)	1594 (1176)	198	690	38.6	2200	3300	<b>1PH8284-1U 2 -...1</b>
		239 (320)	1985 (1464)	260	655	38.6	2200	3300	<b>1PH8286-1U 2 -...1</b>
		295 (396)	2450 (1807)	310	665	38.6	2300	3300	<b>1PH8288-1U 2 -...1</b>
<b>1750</b>	280	257 (345)	1401 (1033)	250	690	58.7	2200	3300	<b>1PH8284-1W 2 -...1</b>
		318 (426)	1735 (1280)	305	690	58.7	2300	3300	<b>1PH8286-1W 2 -...1</b>
		391 (524)	2134 (1574)	375	690	58.7	2400	3300	<b>1PH8288-1W 2 -...1</b>

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors**  
Water cooling, IP55 degree of protection

Motor type (repeated)	Power factor $\cos \varphi$	Magnetizing current $I_{\mu}$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 690 V 3 AC, Basic Line Module</b>								
1PH8284-1.H2...	0.87	41	0.917	4.21 (37.3)	1280 (2822)	1XB7322-P05	100	<b>6SL3320-1TG31-0AA3</b>
1PH8286-1.H2...	0.89	45	0.917	5.16 (45.7)	1490 (3285)	1XB7322-P05	120	<b>6SL3320-1TG31-2AA3</b>
1PH8288-1.H2...	0.88	58	0.923	6.29 (55.7)	1750 (3859)	1XB7322-P05	150	<b>6SL3320-1TG31-5AA3</b>
1PH8284-1.K2...	0.88	54	0.942	4.21 (37.3)	1280 (2822)	1XB7322-P05	150	<b>6SL3320-1TG31-5AA3</b>
1PH8286-1.K2...	0.85	84	0.950	5.16 (45.7)	1490 (3285)	1XB7322-P05	215	<b>6SL3320-1TG32-2AA3</b>
1PH8288-1.K2...	0.90	77	0.946	6.29 (55.7)	1750 (3859)	1XB7322-P05	260	<b>6SL3320-1TG32-6AA3</b>
1PH8284-1.U2...	0.86	89	0.956	4.21 (37.3)	1280 (2822)	1XB7322-P05	215	<b>6SL3320-1TG32-2AA3</b>
1PH8286-1.U2...	0.85	123	0.959	5.16 (45.7)	1490 (3285)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8288-1.U2...	0.86	145	0.961	6.29 (55.7)	1750 (3859)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8284-1.W2...	0.89	92	0.963	4.21 (37.3)	1280 (2822)	1XB7422-P06	330	<b>6SL3320-1TG33-3AA3</b>
1PH8286-1.W2...	0.90	104	0.965	5.16 (45.7)	1490 (3285)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8288-1.W2...	0.90	132	0.966	6.29 (55.7)	1750 (3859)	1XB7700-P02	465	<b>6SL3320-1TG34-7AA3</b>
<b>Line voltage 690 V 3 AC, Active Line Module</b>								
1PH8284-1.H2...	0.86	41	0.931	4.21 (37.3)	1280 (2822)	1XB7322-P05	100	<b>6SL3320-1TG31-0AA3</b>
1PH8286-1.H2...	0.88	45	0.931	5.16 (45.7)	1490 (3285)	1XB7322-P05	120	<b>6SL3320-1TG31-2AA3</b>
1PH8288-1.H2...	0.88	58	0.936	6.29 (55.7)	1750 (3859)	1XB7322-P05	150	<b>6SL3320-1TG31-5AA3</b>
1PH8284-1.K2...	0.88	54	0.947	4.21 (37.3)	1280 (2822)	1XB7322-P05	150	<b>6SL3320-1TG31-5AA3</b>
1PH8286-1.K2...	0.85	84	0.954	5.16 (45.7)	1490 (3285)	1XB7322-P05	215	<b>6SL3320-1TG32-2AA3</b>
1PH8288-1.K2...	0.90	77	0.951	6.29 (55.7)	1750 (3859)	1XB7322-P05	260	<b>6SL3320-1TG32-6AA3</b>
1PH8284-1.U2...	0.85	90	0.959	4.21 (37.3)	1280 (2822)	1XB7322-P05	215	<b>6SL3320-1TG32-2AA3</b>
1PH8286-1.U2...	0.85	123	0.962	5.16 (45.7)	1490 (3285)	1XB7700-P02	330	<b>6SL3320-1TG33-3AA3</b>
1PH8288-1.U2...	0.86	144	0.963	6.29 (55.7)	1750 (3859)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8284-1.W2...	0.89	92	0.965	4.21 (37.3)	1280 (2822)	1XB7422-P06	330	<b>6SL3320-1TG33-3AA3</b>
1PH8286-1.W2...	0.90	104	0.967	5.16 (45.7)	1490 (3285)	1XB7700-P02	410	<b>6SL3320-1TG34-1AA3</b>
1PH8288-1.W2...	0.90	133	0.968	6.29 (55.7)	1750 (3859)	1XB7700-P02	465	<b>6SL3320-1TG34-7AA3</b>

<sup>1)</sup>  $n_2$ : Maximum permissible thermal speed at constant power.

<sup>2)</sup>  $n_{\text{max}}$ : Maximum speed that must not be exceeded (applicable to Standard: 14th position of Order No. A and B, E and F).

<sup>3)</sup>  $I_{\text{rated}}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Forced ventilation
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_{\text{max, Inv}}$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>									
<b>700</b>	180	33 (44.2)	450 (332)	80	278	47.0	1450	3800	<b>1PH8184-...C...-...1</b>
		44 (59.0)	600 (443)	108	269	47.0	1450	3800	<b>1PH8186-...C...-...1</b>
	225	48 (64.4)	655 (483)	120	256	47.0	1450	3500	<b>1PH8224-...C...-...1</b>
		64 (85.8)	873 (644)	170	238	47.0	1550	3500	<b>1PH8226-...C...-...1</b>
		80 (107)	1091 (805)	200	254	47.0	1450	3500	<b>1PH8228-...C...-...1</b>
<b>1000</b>	180	46 (61.7)	439 (324)	106	285	67.0	1950	3800	<b>1PH8184-...D...-...1</b>
		62 (83.1)	592 (437)	148	275	67.0	2050	3800	<b>1PH8186-...D...-...1</b>
	225	68 (91.2)	649 (479)	170	254	67.0	2050	3500	<b>1PH8224-...D...-...1</b>
		91 (122)	869 (641)	215	265	67.0	1950	3500	<b>1PH8226-...D...-...1</b>
		113 (151)	1079 (796)	265	271	67.0	1950	3500	<b>1PH8228-...D...-...1</b>
<b>1500</b>	132	15.7 (21.0)	100 (73.8)	29	388	50.0	2550	4500	<b>1PH8131-...F...-...1</b>
		19.9 (26.7)	127 (93.7)	44	316	50.0	3050	4500	<b>1PH8133-...F...-...1</b>
		23.7 (31.8)	151 (111)	43	383	50.0	2450	4500	<b>1PH8135-...F...-...1</b>
		30.6 (41.0)	195 (144)	60	356	50.0	2700	4500	<b>1PH8137-...F...-...1</b>
	160	61 (81.8)	390 (288)	119	340	100.0	2600	4000	<b>1PH8165-...F...-...1</b>
		69 (92.5)	435 (321)	133	345	100.0	2600	4000	<b>1PH8167-...F...-...1</b>
	180	70 (93.9)	446 (329)	148	308	100.0	2700	3800	<b>1PH8184-...F...-...1</b>
		93 (125)	592 (437)	215	282	100.0	2950	3800	<b>1PH8186-...F...-...1</b>
		101 (135)	643 (474)	235	271	100.0	2900	3500	<b>1PH8224-...F...-...1</b>
	225	134 (180)	853 (629)	295	288	100.0	2700	3500	<b>1PH8226-...F...-...1</b>
		168 (225)	1070 (789)	395	270	100.0	2900	3500	<b>1PH8228-...F...-...1</b>
		31.4 (42.1)	150 (111)	59	356	66.7	3500	4500	<b>1PH8135-...G...-...1</b>
	<b>2000</b>	132	25 (33.5)	96 (70.8)	44	371	83.3	4050	4500
31.7 (42.5)			121 (89.2)	55	371	83.3	3950	4500	<b>1PH8133-...L...-...1</b>
48.4 (64.9)			185 (136)	83	371	83.3	3900	4500	<b>1PH8137-...L...-...1</b>
160		84 (113)	320 (236)	148	370	167.0	3900	4000	<b>1PH8165-...L...-...1</b>
		95 (127)	360 (265)	177	350	167.0	4000	4000	<b>1PH8167-...L...-...1</b>
<b>3000</b>	132	57.5 (77.1)	183 (135)	104	370	100.0	4500	4500	<b>1PH8137-...M...-...1</b>
Synchronous variant									2
Synchronous variant with holding brake									4
Forced ventilation DE → NDE									0
Forced ventilation NDE → DE									1

For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Static torque $M_0$ Nm (lb <sub>f</sub> -ft)	Static current $I_0$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8184-...C...	480 (354)	84	93.2	0.46 (4.07)	330 (728)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8186-...C...	640 (472)	115	92.4	0.60 (5.31)	400 (882)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8224-...C...	708 (522)	128	96.1	1.28 (11.3)	580 (1279)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-...C...	944 (696)	183	96.3	1.66 (14.7)	700 (1544)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8228-...C...	1180 (870)	213	96.5	2.02 (17.9)	810 (1786)	1XB7322-P05	200 <sup>4)</sup>	<b>6SL3120-1TE32-0AA3</b>
1PH8184-...D...	480 (354)	115	93.7	0.46 (4.07)	330 (728)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-...D...	640 (472)	157	94.3	0.60 (5.31)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-...D...	708 (522)	183	96.4	1.28 (11.3)	580 (1279)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-...D...	944 (696)	233	96.7	1.66 (14.7)	700 (1544)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8228-...D...	1180 (870)	284	96.8	2.02 (17.9)	810 (1786)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8131-...F...	105 (77.4)	30	0.944	0.0446 (0.395)	85 (187)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-...F...	131 (96.6)	45	0.948	0.0600 (0.531)	103 (227)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-...F...	158 (116)	44	0.952	0.0750 (0.664)	120 (265)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-...F...	203 (150)	62	0.952	0.0885 (0.783)	136 (300)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8165-...F...	440 (324)	126	0.940	0.2160 (1.912)	218 (481)	gk874	132	<b>6SL312-1TE31-3AA3</b>
1PH8167-...F...	500 (369)	143	0.940	0.2440 (2.160)	240 (529)	gk874	132 <sup>4)</sup>	<b>6SL312-1TE31-3AA3</b>
1PH8184-...F...	480 (354)	157	95.1	0.46 (4.07)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-...F...	640 (472)	229	95.2	0.60 (5.31)	405 (893)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8224-...F...	708 (522)	256	96.5	1.28 (11.3)	580 (1279)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8226-...F...	944 (696)	320	96.7	1.66 (14.7)	700 (1544)	1XB7700-P02	310 <sup>4)</sup>	<b>6SL3320-1TE33-1AA3</b>
1PH8228-...F...	1180 (870)	427	96.7	2.02 (17.9)	810 (1786)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8135-...G...	158 (116)	63	0.953	0.0750 (0.664)	120 (265)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8131-...L...	105 (77.4)	48	0.948	0.0446 (0.395)	85 (187)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-...L...	131 (96.6)	59	0.951	0.0600 (0.531)	103 (227)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-...L...	203 (150)	89	0.954	0.0885 (0.783)	136 (300)	gk833	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-...L...	440 (324)	188	0.955	0.2160 (1.912)	218 (481)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8167-...L...	500 (369)	230	0.955	0.2440 (2.160)	240 (529)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8137-...M...	203 (150)	115	0.953	0.0885 (0.783)	136 (300)	gk833	132	<b>6SL312-1TE31-3AA3</b>

Cooling:	
Internal air cooling	0
External air cooling	1

<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced,Inv-voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Forced ventilation	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_{\text{max, Inv}}$ rpm	$n_{\text{max}}$ rpm	Order No.	
<b>Line voltage 400 V 3 AC, Active Line Module</b>										
<b>800</b>	180	38 (51.0)	454 (335)	80	316	53.0	1450	3800	1PH8184-■C■-...1	
		50 (67.0)	597 (440)	108	306	53.0	1450	3800	1PH8186-■C■-...1	
	225	55 (73.8)	657 (485)	120	292	53.0	1450	3500	1PH8224-■C■-...1	
		73 (97.9)	871 (642)	170	271	53.0	1550	3500	1PH8226-■C■-...1	
		91 (122)	1086 (801)	198	290	53.0	1450	3500	1PH8228-■C■-...1	
<b>1150</b>	180	53 (71.1)	440 (325)	106	327	77.0	1950	3800	1PH8184-■D■-...1	
		71 (95.2)	590 (435)	148	315	77.0	2050	3800	1PH8186-■D■-...1	
	225	78 (105)	648 (478)	170	292	77.0	2050	3500	1PH8224-■D■-...1	
		104 (139)	864 (637)	215	304	77.0	1950	3500	1PH8226-■D■-...1	
		129 (173)	1071 (790)	260	311	77.0	1950	3500	1PH8228-■D■-...1	
<b>1750</b>	132	18 (24.1)	98 (72.3)	29	415	58.3	2550	4500	1PH8131-■F■-...1	
		23.1 (31.0)	126 (92.9)	43	366	58.3	3050	4500	1PH8133-■F■-...1	
		27.2 (36.5)	149 (110)	42	415	58.3	2450	4500	1PH8135-■F■-...1	
		35.6 (47.7)	194 (143)	59	412	58.3	2700	4500	1PH8137-■F■-...1	
	160	69 (92.5)	375 (277)	115	395	117.0	2600	4000	1PH8165-■F■-...1	
		77 (103)	420 (310)	128	400	117.0	2600	4000	1PH8167-■F■-...1	
	180	82 (110)	447 (330)	150	359	117.0	2700	3800	1PH8184-■F■-...1	
		109 (146)	595 (439)	215	328	117.0	2950	3800	1PH8186-■F■-...1	
	225	117 (157)	638 (471)	235	315	117.0	2900	3500	1PH8224-■F■-...1	
		156 (209)	851 (628)	295	335	117.0	2700	3500	1PH8226-■F■-...1	
		195 (261)	1064 (785)	390	314	117.0	2900	3500	1PH8228-■F■-...1	
	<b>2300</b>	132	35.6 (47.7)	148 (109)	59	407	76.7	3500	4500	1PH8135-■G■-...1
	<b>2800</b>	132	27.7 (37.1)	95 (70.1)	44	415	93.3	4050	4500	1PH8131-■L■-...1
35.2 (47.2)			120 (88.5)	54	415	93.3	3950	4500	1PH8133-■L■-...1	
53.4 (71.6)			182 (134)	82	415	93.3	3900	4500	1PH8137-■L■-...1	
160		87 (117)	300 (221)	138	410	187.0	3900	4000	1PH8165-■L■-...1	
		98 (131)	335 (247)	164	385	187.0	4000	4000	1PH8167-■L■-...1	
<b>3300</b>	132	62.2 (83.4)	180 (133)	102	405	110.0	4500	4500	1PH8137-■M■-...1	
Synchronous variant									2	
Synchronous variant with holding brake									4	
Forced ventilation DE → NDE									0	
Forced ventilation NDE → DE										1

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Static torque $M_0$ Nm (lb <sub>f</sub> -ft)	Static current $I_0$ A	Efficiency $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	Weight, approx. kg (lb)	Terminal box Type	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup> $I_{rated}$ A	For additional versions and components see SINAMICS S120 drive system Order No.
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8184-..C...	480 (354)	84	92.6	0.46 (4.07)	330 (728)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8186-..C...	640 (472)	115	93.1	0.60 (5.31)	400 (882)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8224-..C...	708 (522)	128	96.2	1.28 (11.3)	580 (1279)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-..C...	944 (696)	183	96.5	1.66 (14.7)	700 (1543)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8228-..C...	1180 (870)	213	96.7	2.02 (17.9)	810 (1786)	1XB7322-P05	200 <sup>4)</sup>	<b>6SL3120-1TE32-0AA3</b>
1PH8184-..D...	480 (354)	115	94.2	0.46 (4.07)	330 (728)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-..D...	640 (472)	157	94.8	0.60 (5.31)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..D...	708 (522)	183	96.5	1.28 (11.3)	580 (1279)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-..D...	944 (696)	233	96.7	1.66 (14.7)	700 (1543)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8228-..D...	1180 (870)	284	96.9	2.02 (17.9)	810 (1786)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8131-..F...	105 (77.4)	30	0.947	0.0446 (0.395)	85 (187)	gk833	30	<b>6SL3120-1TE23-0AA3</b>
1PH8133-..F...	131 (96.6)	45	0.950	0.0600 (0.531)	103 (227)	gk833	45	<b>6SL3120-1TE24-5AA3</b>
1PH8135-..F...	158 (117)	44	0.952	0.0750 (0.664)	120 (265)	gk833	45	<b>6SL3120-1TE24-5AA3</b>
1PH8137-..F...	203 (150)	62	0.953	0.0885 (0.783)	136 (300)	gk833	60	<b>6SL3120-1TE26-0AA3</b>
1PH8165-..F...	440 (324)	126	0.943	0.2160 (1.912)	218 (481)	gk874	132	<b>6SL3120-1TE31-3AA3</b>
1PH8167-..F...	500 (369)	143	0.943	0.2440 (2.160)	240 (529)	gk874	132	<b>6SL3120-1TE31-3AA3</b>
1PH8184-..F...	480 (354)	157	95.4	0.46 (4.07)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..F...	640 (472)	229	95.5	0.60 (5.31)	405 (893)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8224-..F...	708 (522)	256	96.5	1.28 (11.3)	580 (1279)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8226-..F...	944 (696)	320	96.6	1.66 (14.7)	700 (1543)	1XB7700-P02	310 <sup>4)</sup>	<b>6SL3320-1TE33-1AA3</b>
1PH8228-..F...	1180 (870)	427	96.6	2.02 (17.9)	810 (1786)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8135-..G...	158 (117)	63	0.953	0.0750 (0.664)	120 (265)	gk833	60	<b>6SL3120-1TE26-0AA3</b>
1PH8131-..L...	105 (77.4)	48	0.949	0.0446 (0.395)	85 (187)	gk833	45	<b>6SL3120-1TE24-5AA3</b>
1PH8133-..L...	131 (96.6)	59	0.952	0.0600 (0.531)	103 (227)	gk833	60	<b>6SL3120-1TE26-0AA3</b>
1PH8137-..L...	203 (150)	89	0.953	0.0885 (0.783)	136 (300)	gk833	85	<b>6SL3120-1TE28-5AA3</b>
1PH8165-..L...	440 (324)	188	0.959	0.2160 (1.912)	218 (481)	gk874	200	<b>6SL3120-1TE32-0AA3</b>
1PH8167-..L...	500 (369)	230	0.959	0.2440 (2.160)	240 (529)	gk874	200	<b>6SL3120-1TE32-0AA3</b>
1PH8137-..M...	203 (150)	115	0.952	0.0885 (0.783)	136 (300)	gk833	132	<b>6SL3120-1TE31-3AA3</b>

Cooling:	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Forced ventilation, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Forced ventilation	
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>f</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_{max, Inv}$ rpm	$n_{max}$ rpm	Order No.	
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>										
<b>1000</b>	180	46 (61.7)	439 (324)	78	390	67.0	1450	3800	<b>1PH8184-■C■-...1</b>	
		62 (83.1)	592 (437)	108	379	67.0	1450	3800	<b>1PH8186-■C■-...1</b>	
	225	68 (91.2)	649 (479)	118	363	67.0	1450	3500	<b>1PH8224-■C■-...1</b>	
		91 (122)	869 (641)	170	338	67.0	1550	3500	<b>1PH8226-■C■-...1</b>	
		113 (151)	1079 (796)	198	361	67.0	1450	3500	<b>1PH8228-■C■-...1</b>	
<b>1350</b>	180	62 (83.1)	439 (324)	106	382	90.0	1950	3800	<b>1PH8184-■D■-...1</b>	
		83 (111)	587 (433)	146	368	90.0	2050	3800	<b>1PH8186-■D■-...1</b>	
	225	91 (122)	644 (475)	168	342	90.0	2050	3500	<b>1PH8224-■D■-...1</b>	
		121 (162)	856 (631)	215	356	90.0	1950	3500	<b>1PH8226-■D■-...1</b>	
		151 (202)	1068 (788)	260	364	90.0	1950	3500	<b>1PH8228-■D■-...1</b>	
<b>2000</b>	132	19.9 (26.7)	95 (70.1)	29	449	66.7	2550	4500	<b>1PH8131-■F■-...1</b>	
		26.2 (35.1)	125 (92.2)	43	415	66.7	3050	4500	<b>1PH8133-■F■-...1</b>	
		30.2 (40.5)	144 (106)	42	449	66.7	2450	4500	<b>1PH8135-■F■-...1</b>	
		40 (53.6)	191 (141)	59	449	66.7	2700	4500	<b>1PH8137-■F■-...1</b>	
	160	74 (99.2)	355 (262)	110	445	133.0	2600	4000	<b>1PH8165-■F■-...1</b>	
		82 (110)	395 (291)	123	450	133.0	2600	4000	<b>1PH8167-■F■-...1</b>	
	180	86 (115)	411 (303)	138	404	133.0	2700	3800	<b>1PH8184-■F■-...1</b>	
		115 (154)	549 (405)	200	370	133.0	2950	3800	<b>1PH8186-■F■-...1</b>	
		225	118 (158)	563 (415)	210	355	133.0	2900	3500	<b>1PH8224-■F■-...1</b>
			157 (210)	750 (553)	260	378	133.0	2700	3500	<b>1PH8226-■F■-...1</b>
			196 (263)	936 (690)	345	355	133.0	2900	3500	<b>1PH8228-■F■-...1</b>
	<b>2650</b>	132	40.2 (53.9)	145 (107)	58	449	88.3	3500	4500	<b>1PH8135-■G■-...1</b>
<b>3000</b>	132	29.5 (39.6)	94 (69.3)	43	449	100.0	4050	4500	<b>1PH8131-■L■-...1</b>	
		37.4 (50.1)	119 (87.8)	54	449	100.0	3950	4500	<b>1PH8133-■L■-...1</b>	
		56.9 (76.3)	181 (134)	81	449	100.0	3900	4500	<b>1PH8137-■L■-...1</b>	
	160	89 (119)	285 (210)	131	440	200.0	3900	4000	<b>1PH8165-■L■-...1</b>	
		99 (133)	315 (232)	155	410	200.0	4000	4000	<b>1PH8167-■L■-...1</b>	
<b>3600</b>	132	66.7 (89.4)	177 (131)	100	440	120.0	4500	4500	<b>1PH8137-■M■-...1</b>	

Synchronous variant

Synchronous variant with holding brake

Forced ventilation DE → NDE

Forced ventilation NDE → DE

2

4

0

1

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system
	$M_0$	$I_0$	$\eta$	$J$			$I_{rated}$	Order No.
	Nm (lb <sub>f</sub> -ft)	A		kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	Type	A	
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8184-..C...	480 (354)	84	93.7	0.46 (4.07)	330 (728)	1XB7322-P05	85	<b>6SL3120-1TE28-5AA3</b>
1PH8186-..C...	640 (472)	115	94.1	0.60 (5.31)	400 (882)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8224-..C...	708 (522)	128	96.5	1.28 (11.3)	580 (1279)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8226-..C...	944 (696)	183	96.7	1.66 (14.7)	700 (1544)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8228-..C...	1180 (870)	213	96.8	2.02 (17.9)	810 (1786)	1XB7322-P05	200 <sup>4)</sup>	<b>6SL3120-1TE32-0AA3</b>
1PH8184-..D...	480 (354)	115	94.6	0.46 (4.07)	330 (728)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-..D...	640 (472)	157	95.2	0.60 (5.31)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..D...	708 (522)	183	96.5	1.28 (11.3)	580 (1279)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-..D...	944 (696)	233	96.8	1.66 (14.7)	700 (1544)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8228-..D...	1180 (870)	284	96.8	2.02 (17.9)	810 (1786)	1XB7422-P06	310	<b>6SL3320-1TE33-1AA3</b>
1PH8131-..F...	105 (77.4)	30	0.948	0.0446 (0.395)	85 (187)	gk833	30	<b>6SL312-1TE23-0AA3</b>
1PH8133-..F...	131 (96.6)	45	0.951	0.0600 (0.531)	103 (227)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F...	158 (116)	44	0.953	0.0750 (0.664)	120 (265)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8137-..F...	203 (150)	62	0.954	0.0885 (0.783)	136 (300)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8165-..F...	440 (324)	126	0.946	0.2160 (1.912)	218 (481)	gk874	132	<b>6SL312-1TE31-3AA3</b>
1PH8167-..F...	500 (369)	143	0.946	0.2440 (2.160)	240 (529)	gk874	132	<b>6SL312-1TE31-3AA3</b>
1PH8184-..F...	480 (354)	157	95.7	0.46 (4.07)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..F...	640 (472)	229	95.6	0.60 (5.31)	405 (893)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8224-..F...	708 (522)	256	96.3	1.28 (11.3)	580 (1279)	1XB7422-P06	260	<b>6SL3320-1TE32-1AA3</b>
1PH8226-..F...	944 (696)	320	96.4	1.66 (14.7)	700 (1544)	1XB7700-P02	310 <sup>4)</sup>	<b>6SL3320-1TE33-1AA3</b>
1PH8228-..F...	1180 (870)	427	96.4	2.02 (17.9)	810 (1786)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8135-..G...	158 (116)	63	0.952	0.0750 (0.664)	120 (265)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8131-..L...	105 (77.4)	48	0.951	0.0446 (0.395)	85 (187)	gk833	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..L...	131 (96.6)	59	0.952	0.0600 (0.531)	103 (227)	gk833	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..L...	203 (150)	89	0.953	0.0885 (0.783)	136 (300)	gk833	85	<b>6SL312-1TE28-5AA3</b>
1PH8165-..L...	440 (324)	188	0.960	0.2160 (1.912)	218 (481)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8167-..L...	500 (369)	230	0.960	0.2440 (2.160)	240 (529)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8137-..M...	203 (150)	115	0.950	0.0885 (0.783)	136 (300)	gk833	132	<b>6SL312-1TE31-3AA3</b>

<b>Cooling:</b>	
Internal air cooling	<b>0</b>
External air cooling	<b>1</b>

<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160) or 2 kHz (SH 180 to 280).

<sup>4)</sup> The output current of the Motor Module is lower than the rated motor current for the pulse frequency on which it is based.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Water cooling, IP65 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Water cooling
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>F</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_{\text{max, Inv}}$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>									
<b>1500</b>	132	17.6 (23.6)	112 (82.6)	40	326	50.0	3150	4500	<b>1PH8131-■■■F2■-...1</b>
		23.1 (31.0)	147 (108)	42	371	50.0	2450	4500	<b>1PH8133-■■■F2■-...1</b>
		29.7 (39.8)	189 (139)	57	384	50.0	2650	4500	<b>1PH8135-■■■F2■-...1</b>
		32.7 (43.9)	208 (153)	58	371	50.0	2350	4500	<b>1PH8137-■■■F2■-...1</b>
		44.9 (60.2)	286 (211)	118	316	50.0	3500	4500	<b>1PH8138-■■■F2■-...1</b>
	160	59.0 (79.1)	375 (277)	111	380	100.0	2400	4000	<b>1PH8164-■■■F2■-...1</b>
		74.0 (99.2)	475 (350)	148	355	100.0	2600	4000	<b>1PH8166-■■■F2■-...1</b>
		84.0 (113)	530 (391)	169	355	100.0	2600	4000	<b>1PH8168-■■■F2■-...1</b>
<b>2000</b>	132	30.6 (41.0)	146 (108)	57	383	66.7	3450	4500	<b>1PH8133-■■■G2■-...1</b>
		39.0 (52.3)	186 (137)	81	346	66.7	3800	4500	<b>1PH8135-■■■G2■-...1</b>
		44.4 (59.5)	212 (156)	85	371	66.7	3500	4500	<b>1PH8137-■■■G2■-...1</b>
		59.3 (79.5)	283 (209)	131	374	66.7	3900	4500	<b>1PH8138-■■■G2■-...1</b>
<b>2500</b>	132	28.5 (38.2)	109 (80.4)	57	359	83.3	4500	4500	<b>1PH8131-■■■L2■-...1</b>
		88.0 (118)	335 (247)	165	355	167.0	4000	4000	<b>1PH8164-■■■L2■-...1</b>
	160	102 (137)	390 (288)	188	380	167.0	3900	4000	<b>1PH8166-■■■L2■-...1</b>
		119 (160)	455 (336)	225	355	167.0	4000	4000	<b>1PH8168-■■■L2■-...1</b>
<b>Line voltage 400 V 3 AC, Active Line Module</b>									
<b>1750</b>	132	20.4 (27.4)	112 (82.6)	40	377	58.3	3150	4500	<b>1PH8131-■■■F2■-...1</b>
		26.4 (35.4)	144 (106)	42	415	58.3	2450	4500	<b>1PH8133-■■■F2■-...1</b>
		34.1 (45.7)	186 (137)	56	415	58.3	2650	4500	<b>1PH8135-■■■F2■-...1</b>
		37.0 (49.6)	202 (149)	58	415	58.3	2350	4500	<b>1PH8137-■■■F2■-...1</b>
		52.4 (70.3)	286 (211)	118	366	58.3	3500	4500	<b>1PH8138-■■■F2■-...1</b>
	160	67.0 (89.9)	365 (269)	108	440	117.0	2400	4000	<b>1PH8164-■■■F2■-...1</b>
		85.0 (114)	460 (339)	143	410	117.0	2600	4000	<b>1PH8166-■■■F2■-...1</b>
		94.0 (126)	510 (376)	164	410	117.0	2600	4000	<b>1PH8168-■■■F2■-...1</b>
<b>2300</b>	132	34.9 (46.8)	145 (107)	57	415	76.7	3450	4500	<b>1PH8133-■■■G2■-...1</b>
		44.3 (59.4)	184 (136)	80	395	76.7	3800	4500	<b>1PH8135-■■■G2■-...1</b>
		50.5 (67.7)	210 (155)	84	424	76.7	3500	4500	<b>1PH8137-■■■G2■-...1</b>
		67.7 (90.8)	281 (207)	130	415	76.7	3900	4500	<b>1PH8138-■■■G2■-...1</b>
<b>2800</b>	132	31.7 (42.5)	108 (79.7)	56	400	93.3	4500	4500	<b>1PH8131-■■■L2■-...1</b>
		93.0 (125)	315 (232)	156	395	187.0	4000	4000	<b>1PH8164-■■■L2■-...1</b>
	160	109 (146)	375 (277)	177	420	187.0	3900	4000	<b>1PH8166-■■■L2■-...1</b>
		123 (165)	420 (310)	210	395	187.0	4000	4000	<b>1PH8168-■■■L2■-...1</b>

Synchronous variant  
Synchronous variant with holding brake (IP55 degree of protection)

2  
4

For versions, see  
Order No. supplements and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Water cooling, IP65 degree of protection

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$M_0$ Nm (lb <sub>f</sub> -ft)	$I_0$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8131-..F2...	115 (84.8)	41	0.946	0.0446 (0.395)	102 (225)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..F2...	155 (114)	43	0.947	0.0600 (0.531)	120 (265)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F2...	196 (145)	59	0.950	0.0750 (0.663)	138 (304)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..F2...	226 (167)	60	0.951	0.0885 (0.783)	153 (337)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8138-..F2...	290 (214)	120	0.958	0.0885 (0.783)	156 (344)	gk843	132	<b>6SL312-1TE31-3AA3</b>
1PH8164-..F2...	440 (325)	118	0.940	0.1750 (1.549)	224 (494)	gk874	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..F2...	550 (406)	159	0.940	0.2160 (1.912)	257 (567)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8168-..F2...	620 (457)	179	0.940	0.2440 (2.160)	279 (615)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8133-..G2...	155 (114)	61	0.950	0.0600 (0.531)	120 (265)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8135-..G2...	196 (145)	85	0.952	0.0750 (0.663)	138 (304)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8137-..G2...	226 (167)	90	0.954	0.0885 (0.783)	153 (337)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8138-..G2...	290 (214)	133	0.960	0.0885 (0.783)	156 (344)	gk843	132	<b>6SL312-1TE31-3AA3</b>
1PH8131-..L2...	115 (84.8)	60	0.948	0.0446 (0.395)	102 (225)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8164-..L2...	440 (325)	205	0.955	0.1750 (1.549)	224 (494)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8166-..L2...	550 (406)	240	0.955	0.2160 (1.912)	257 (567)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8168-..L2...	520 (384)	240	0.955	0.2440 (2.160)	279 (615)	gk874	260	<b>6SL3320-1TE32-1AA3</b>
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8131-..F2...	115 (84.8)	41	0.947	0.0446 (0.395)	102 (225)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..F2...	155 (114)	43	0.948	0.0600 (0.531)	120 (265)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F2...	196 (145)	59	0.951	0.0750 (0.663)	138 (304)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..F2...	226 (167)	60	0.952	0.0885 (0.783)	153 (337)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8138-..F2...	290 (214)	120	0.959	0.0885 (0.783)	156 (344)	gk843	132	<b>6SL312-1TE31-3AA3</b>
1PH8164-..F2...	440 (325)	118	0.943	0.1750 (1.549)	224 (494)	gk874	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..F2...	550 (406)	159	0.943	0.2160 (1.912)	257 (567)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8168-..F2...	620 (457)	179	0.943	0.2440 (2.160)	279 (615)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8133-..G2...	155 (114)	61	0.951	0.0600 (0.531)	120 (265)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8135-..G2...	196 (145)	85	0.953	0.0750 (0.663)	138 (304)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8137-..G2...	226 (167)	90	0.956	0.0885 (0.783)	153 (337)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8138-..G2...	290 (214)	133	0.961	0.0885 (0.783)	156 (344)	gk843	132	<b>6SL312-1TE31-3AA3</b>
1PH8131-..L2...	115 (84.8)	60	0.949	0.0446 (0.395)	102 (225)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8164-..L2...	440 (325)	205	0.959	0.1750 (1.549)	224 (494)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8166-..L2...	550 (406)	240	0.959	0.2160 (1.912)	257 (567)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8167-..L2...	520 (384)	240	0.959	0.2440 (2.160)	279 (615)	gk874	260	<b>6SL3320-1TE32-1AA3</b>

**Cooling:**  
Internal air cooling    **0**  
External air cooling    **1**

<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Water cooling, IP65 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Water cooling
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_{\text{max, Inv}}$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>									
<b>2000</b>	132	23.2 (31.1)	111 (81.9)	39	427	66.7	3150	4500	<b>1PH8131-■ F2■ -...1</b>
		29 (38.9)	139 (103)	41	449	66.7	2450	4500	<b>1PH8133-■ F2■ -...1</b>
		37.9 (50.8)	181 (134)	56	449	66.7	2650	4500	<b>1PH8135-■ F2■ -...1</b>
		40.6 (54.4)	194 (143)	57	449	66.7	2350	4500	<b>1PH8137-■ F2■ -...1</b>
		59.7 (80.1)	285 (210)	118	416	66.7	3500	4500	<b>1PH8138-■ F2■ -...1</b>
160	70 (93.9)	330 (243)	105	500	133.0	2400	4000	<b>1PH8164-■ F2■ -...1</b>	
	89 (119)	425 (314)	138	465	133.0	2600	4000	<b>1PH8166-■ F2■ -...1</b>	
	100 (134)	480 (354)	157	465	133.0	2600	4000	<b>1PH8168-■ F2■ -...1</b>	
<b>2650</b>	132	39.1 (52.4)	141 (104)	57	449	88.3	3450	4500	<b>1PH8133-■ G2■ -...1</b>
		50.5 (67.7)	182 (134)	79	452	88.3	3800	4500	<b>1PH8135-■ G2■ -...1</b>
		56.8 (76.2)	205 (151)	83	449	88.3	3500	4500	<b>1PH8137-■ G2■ -...1</b>
		76.3 (102)	275 (203)	130	449	88.3	3900	4500	<b>1PH8138-■ G2■ -...1</b>
<b>3000</b>	132	33.6 (45.1)	107 (78.9)	56	427	100.0	4500	4500	<b>1PH8131-■ L2■ -...1</b>
		96 (129)	305 (225)	150	420	200.0	4000	4000	<b>1PH8164-■ L2■ -...1</b>
	160	110 (148)	350 (258)	169	450	200.0	3900	4000	<b>1PH8166-■ L2■ -...1</b>
		125 (168)	395 (291)	197	420	200.0	4000	4000	<b>1PH8168-■ L2■ -...1</b>

Synchronous variant

Synchronous variant with holding brake (IP55 degree of protection)

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4

For versions, see  
Order No. supplements  
and options.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Water cooling, IP65 degree of protection

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$M_0$ Nm (lb <sub>r</sub> -ft)	$I_0$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{rated}$ A	
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8131-..F2...	115 (84.8)	41	0.948	0.0446 (0.395)	102 (225)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8133-..F2...	155 (114)	43	0.949	0.0600 (0.531)	120 (265)	gk843	45	<b>6SL312-1TE24-5AA3</b>
1PH8135-..F2...	196 (145)	59	0.952	0.0750 (0.664)	138 (304)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8137-..F2...	226 (167)	60	0.953	0.0885 (0.783)	153 (337)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8138-..F2...	290 (214)	120	0.960	0.0885 (0.783)	156 (344)	gk843	132	<b>6SL312-1TE31-3AA3</b>
1PH8164-..F2...	440 (325)	118	0.946	0.1750 (1.549)	224 (494)	gk874	132	<b>6SL312-1TE31-3AA3</b>
1PH8166-..F2...	550 (406)	159	0.946	0.2160 (1.912)	257 (567)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8168-..F2...	620 (457)	179	0.946	0.2440 (2.160)	279 (615)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8133-..G2...	155 (114)	61	0.952	0.0600 (0.531)	120 (265)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8135-..G2...	196 (145)	85	0.954	0.0750 (0.663)	138 (304)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8137-..G2...	226 (167)	90	0.958	0.0885 (0.783)	153 (337)	gk843	85	<b>6SL312-1TE28-5AA3</b>
1PH8138-..G2...	290 (214)	133	0.962	0.0885 (0.783)	156 (344)	gk843	132	<b>6SL312-1TE31-3AA3</b>
1PH8131-..L2...	115 (84.8)	60	0.950	0.0446 (0.395)	102 (225)	gk843	60	<b>6SL312-1TE26-0AA3</b>
1PH8164-..L2...	440 (325)	205	0.960	0.1750 (1.549)	224 (494)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8166-..L2...	550 (406)	240	0.960	0.2160 (1.912)	257 (567)	gk874	200	<b>6SL312-1TE32-0AA3</b>
1PH8168-..L2...	520 (384)	240	0.960	0.2440 (2.160)	279 (615)	gk874	260	<b>6SL3320-1TE32-1AA3</b>

**Cooling:**  
Internal air cooling    **0**  
External air cooling    **1**

<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 4 kHz (SH 80 to 160).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Water cooling, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Water cooling
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (HP)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$I_{\text{rated}}$ A	$V_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_{\text{max, Inv}}$ rpm	$n_{\text{max}}$ rpm	Order No.
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>									
<b>700</b>	180	42 (56.3)	573 (423)	100	303	47	1450	3800	1PH8184-■C2■-...1
		58 (77.8)	791 (583)	142	295	47	1450	3800	1PH8186-■C2■-...1
	225	72 (96.6)	982 (724)	180	275	47	1450	3500	1PH8224-■C2■-...1
		95 (127)	1296 (956)	255	255	47	1550	3500	1PH8226-■C2■-...1
		121 (162)	1651 (1218)	305	270	47	1450	3500	1PH8228-■C2■-...1
<b>1000</b>	180	61 (81.8)	583 (430)	140	313	67	1950	3800	1PH8184-■D2■-...1
		80 (107)	764 (564)	190	300	67	2050	3800	1PH8186-■D2■-...1
	225	101 (135)	964 (711)	255	275	67	2050	3500	1PH8224-■D2■-...1
		135 (181)	1289 (951)	325	285	67	1950	3500	1PH8226-■D2■-...1
		169 (227)	1614 (1190)	395	290	67	1950	3500	1PH8228-■D2■-...1
<b>1500</b>	180	90 (121)	573 (423)	190	334	100	2700	3800	1PH8184-■F2■-...1
		119 (160)	758 (559)	275	305	100	2950	3800	1PH8186-■F2■-...1
	225	151 (202)	961 (709)	355	290	100	2900	3500	1PH8224-■F2■-...1
		201 (270)	1280 (944)	445	305	100	2700	3500	1PH8226-■F2■-...1
		251 (337)	1598 (1179)	590	285	100	2900	3500	1PH8228-■F2■-...1
<b>2500</b>	180	127 (170)	485 (358)	260	328	167	3800	3800	1PH8184-■L2■-...1
		168 (225)	642 (474)	370	305	167	3800	3800	1PH8186-■L2■-...1
	225	182 (244)	695 (513)	365	320	167	3500	3500	1PH8224-■L2■-...1
		228 (306)	871 (642)	400	360	167	3500	3500	1PH8226-■L2■-...1
		270 (362)	1031 (760)	570	300	167	3500	3500	1PH8228-■L2■-...1
<b>Line voltage 400 V 3 AC, Active Line Module</b>									
<b>800</b>	180	48 (64.4)	573 (423)	102	342	53	1450	3800	1PH8184-■C2■-...1
		66 (88.5)	788 (581)	142	335	53	1450	3800	1PH8186-■C2■-...1
	225	81 (109)	967 (713)	178	310	53	1450	3500	1PH8224-■C2■-...1
		108 (145)	1289 (951)	255	287	53	1550	3500	1PH8226-■C2■-...1
		138 (185)	1647 (1215)	305	315	53	1450	3500	1PH8228-■C2■-...1
<b>1150</b>	180	70 (93.9)	581 (429)	140	386	77	1950	3800	1PH8184-■D2■-...1
		92 (123)	764 (564)	190	345	77	2050	3800	1PH8186-■D2■-...1
	225	115 (154)	955 (704)	250	310	77	2050	3500	1PH8224-■D2■-...1
		155 (208)	1287 (949)	325	325	77	1950	3500	1PH8226-■D2■-...1
		194 (260)	1611 (1188)	395	330	77	1950	3500	1PH8228-■D2■-...1
<b>1750</b>	180	103 (138)	562 (415)	186	386	117	2700	3800	1PH8184-■F2■-...1
		138 (185)	753 (555)	275	355	117	2950	3800	1PH8186-■F2■-...1
	225	175 (235)	955 (704)	355	335	117	2900	3500	1PH8224-■F2■-...1
		233 (312)	1271 (937)	440	355	117	2700	3500	1PH8226-■F2■-...1
		289 (388)	1577 (1163)	580	335	117	2900	3500	1PH8228-■F2■-...1
<b>2900</b>	180	140 (188)	461 (340)	250	375	193	3800	3800	1PH8184-■L2■-...1
		178 (239)	586 (432)	340	345	193	3800	3800	1PH8186-■L2■-...1
	225	191 (256)	629 (464)	335	370	193	3500	3500	1PH8224-■L2■-...1
		238 (319)	784 (578)	365	413	193	3500	3500	1PH8226-■L2■-...1
		283 (380)	932 (687)	520	345	193	3500	3500	1PH8228-■L2■-...1

Synchronous variant  
Synchronous variant with holding brake (IP55 degree of protection)

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For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Water cooling, IP55 degree of protection

Motor type (repeated)	Static torque	Static current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system Order No.
	$M_0$	$I_0$	$\eta$	$J$			$I_{rated}$	
	Nm (lb <sub>f</sub> -ft)	A		kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	kg (lb)	Type	A	
<b>Line voltage 400 V 3 AC, Smart/Basic Line Module</b>								
1PH8184-..C2...	590 (435)	103	0.919	0.457 (4.045)	330 (728)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-..C2...	800 (590)	143	0.924	0.599 (5.302)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..C2...	1007 (743)	183	0.947	1.28 (11.3)	580 (1279)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-..C2...	1330 (981)	260	0.952	1.66 (14.7)	700 (1544)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-..C2...	1680 (1239)	306	0.955	2.02 (17.9)	810 (1786)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8184-..D2...	600 (443)	143	0.937	0.457 (4.04)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..D2...	800 (590)	196	0.943	0.599 (5.30)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..D2...	1007 (743)	262	0.956	1.28 (11.3)	580 (1279)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-..D2...	1330 (981)	330	0.960	1.66 (14.7)	700 (1544)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-..D2...	1680 (1239)	408	0.962	2.02 (17.9)	810 (1786)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8184-..F2...	600 (443)	196	0.951	0.457 (4.045)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..F2...	800 (590)	285	0.952	0.599 (5.302)	400 (882)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8224-..F2...	1007 (743)	367	0.962	1.28 (11.3)	580 (1279)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-..F2...	1330 (981)	454	0.965	1.66 (14.7)	700 (1544)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-..F2...	1680 (1239)	612	0.964	2.02 (17.9)	810 (1786)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-..L2...	530 (391)	278	0.957	0.457 (4.045)	330 (728)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8186-..L2...	720 (531)	405	0.957	0.599 (5.302)	400 (882)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8224-..L2...	885 (653)	460	0.961	1.28 (11.3)	580 (1279)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-..L2...	1170 (863)	532	0.962	1.66 (14.7)	700 (1544)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-..L2...	1400 (1033)	762	0.963	2.02 (17.9)	810 (1786)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
<b>Line voltage 400 V 3 AC, Active Line Module</b>								
1PH8184-..C2...	590 (435)	103	0.926	0.457 (4.045)	330 (728)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-..C2...	800 (590)	143	0.931	0.599 (5.302)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..C2...	1007 (743)	183	0.952	1.28 (11.3)	580 (1279)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-..C2...	1330 (981)	260	0.956	1.66 (14.7)	700 (1544)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-..C2...	1680 (1239)	306	0.958	2.02 (17.9)	810 (1786)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8184-..D2...	600 (443)	143	0.942	0.457 (4.045)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..D2...	800 (590)	196	0.948	0.599 (5.302)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..D2...	1007 (743)	262	0.959	1.28 (11.3)	580 (1279)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-..D2...	1330 (981)	330	0.962	1.66 (14.7)	700 (1544)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-..D2...	1680 (1239)	408	0.964	2.02 (17.9)	810 (1786)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8184-..F2...	600 (443)	196	0.954	0.457 (4.045)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..F2...	800 (590)	285	0.955	0.599 (5.302)	400 (882)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8224-..F2...	1007 (743)	367	0.963	1.28 (11.3)	580 (1279)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-..F2...	1330 (981)	454	0.965	1.66 (14.7)	700 (1544)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-..F2...	1680 (1239)	612	0.965	2.02 (17.9)	810 (1786)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-..L2...	530 (391)	278	0.956	0.457 (4.045)	330 (728)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8186-..L2...	720 (531)	405	0.955	0.599 (5.302)	400 (882)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8224-..L2...	885 (653)	460	0.958	1.28 (11.3)	580 (1279)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-..L2...	1170 (863)	532	0.958	1.66 (14.7)	700 (1544)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-..L2...	1400 (1033)	762	0.958	2.02 (17.9)	810 (1786)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>

<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 synchronous motors Water cooling, IP55 degree of protection

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Max. operating speed <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 synchronous motor Water cooling
$n_{rated}$ rpm	SH	$P_{rated}$ kW (HP)	$M_{rated}$ Nm (lb <sub>F</sub> -ft)	$I_{rated}$ A	$V_{rated}$ V	$f_{rated}$ Hz	$n_{max, Inv}$ rpm	$n_{max}$ rpm	Order No.
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>									
<b>1000</b>	180	60 (80.5)	573 (423)	102	423	67	1450	3800	1PH8184-■C2■-...1
		82 (110)	783 (578)	140	415	67	1450	3800	1PH8186-■C2■-...1
	225	101 (135)	964 (711)	178	385	67	1450	3500	1PH8224-■C2■-...1
		134 (180)	1280 (944)	255	357	67	1550	3500	1PH8226-■C2■-...1
		172 (231)	1642 (1211)	300	390	67	1450	3500	1PH8228-■C2■-...1
<b>1350</b>	180	82 (110)	580 (428)	140	417	90	1950	3800	1PH8184-■D2■-...1
		107 (143)	757 (558)	190	400	90	2050	3800	1PH8186-■D2■-...1
	225	135 (181)	955 (704)	250	365	90	2050	3500	1PH8224-■D2■-...1
		180 (241)	1273 (939)	320	380	90	1950	3500	1PH8226-■D2■-...1
		226 (303)	1599 (1179)	395	395	90	1950	3500	1PH8228-■D2■-...1
<b>2000</b>	180	110 (148)	525 (387)	176	434	133	2700	3800	1PH8184-■F2■-...1
		154 (207)	735 (542)	265	400	133	2950	3800	1PH8186-■F2■-...1
	225	186 (249)	888 (655)	330	380	133	2900	3500	1PH8224-■F2■-...1
		248 (333)	1184 (873)	410	390	133	2700	3500	1PH8226-■F2■-...1
		310 (416)	1480 (1092)	550	380	133	2900	3500	1PH8228-■F2■-...1
<b>3200</b>	180	142 (190)	424 (313)	230	405	213	3800	3800	1PH8184-■L2■-...1
		183 (245)	546 (403)	315	375	213	3800	3800	1PH8186-■L2■-...1
	225	196 (263)	585 (431)	310	400	213	3500	3500	1PH8224-■L2■-...1
		245 (329)	731 (539)	340	460	213	3500	3500	1PH8226-■L2■-...1
		291 (390)	868 (640)	485	380	213	3500	3500	1PH8228-■L2■-...1

Synchronous variant

Synchronous variant with holding brake (IP55 degree of protection)

2  
4

For versions, see  
Order No. supplements  
and options.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 synchronous motors**  
Water cooling, IP55 degree of protection

Motor type (repeated)	Static torque	Static current	Effi- ciency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S120 Motor Module	
							Rated output current <sup>3)</sup>	For additional versions and components see SINAMICS S120 drive system  Order No.
							$I_{rated}$ A	
$M_0$ Nm (lb <sub>r</sub> -ft)	$I_0$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type			
<b>Line voltage 480 V 3 AC, Smart/Basic/Active Line Module</b>								
1PH8184-..C2...	590 (435)	103	0.937	0.457 (4.045)	330 (728)	1XB7322-P05	132	<b>6SL3120-1TE31-3AA3</b>
1PH8186-..C2...	800 (590)	143	0.941	0.599 (5.302)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..C2...	1007 (743)	183	0.957	1.28 (11.3)	580 (1279)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8226-..C2...	1330 (981)	260	0.960	1.66 (14.7)	700 (1544)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8228-..C2...	1680 (1239)	306	0.961	2.02 (17.9)	810 (1786)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8184-..D2...	600 (443)	143	0.946	0.457 (4.045)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..D2...	800 (590)	196	0.952	0.599 (5.302)	400 (882)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8224-..D2...	1007 (743)	262	0.961	1.28 (11.3)	580 (1279)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8226-..D2...	1330 (981)	330	0.964	1.66 (14.7)	700 (1544)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8228-..D2...	1680 (1239)	408	0.965	2.02 (17.9)	810 (1786)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8184-..F2...	600 (443)	196	0.957	0.457 (4.045)	330 (728)	1XB7322-P05	200	<b>6SL3120-1TE32-0AA3</b>
1PH8186-..F2...	800 (590)	285	0.956	0.599 (5.302)	400 (882)	1XB7700-P02	310	<b>6SL3320-1TE33-1AA3</b>
1PH8224-..F2...	1007 (743)	367	0.964	1.28 (11.3)	580 (1279)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-..F2...	1330 (981)	454	0.965	1.66 (14.7)	700 (1544)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-..F2...	1680 (1239)	612	0.964	2.02 (17.9)	810 (1786)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>
1PH8184-..L2...	530 (391)	278	0.954	0.457 (4.045)	330 (728)	1XB7700-P02	260	<b>6SL3320-1TE32-6AA3</b>
1PH8186-..L2...	720 (531)	405	0.953	0.599 (5.302)	400 (882)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8224-..L2...	885 (653)	460	0.954	1.28 (11.3)	580 (1279)	1XB7700-P02	380	<b>6SL3320-1TE33-8AA3</b>
1PH8226-..L2...	1170 (863)	532	0.954	1.66 (14.7)	700 (1544)	1XB7700-P02	490	<b>6SL3320-1TE35-0AA3</b>
1PH8228-..L2...	1400 (1033)	762	0.954	2.02 (17.9)	810 (1786)	1XB7712-P03	745	<b>6SL3320-1TE37-5AA3</b>

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<sup>1)</sup>  $n_{max,Inv}$ : Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the Motor Module (without protective circuit).

<sup>2)</sup>  $n_{max}$ : Maximum speed that must not be exceeded.

<sup>3)</sup>  $I_{rated}$ : Output current of the Motor Module at rated pulse frequency (see SINAMICS S120 drive system).  
The rated motor data is valid for 2 kHz (SH 180 to 280).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors without holding brake at DE  
Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors**

### Selection and ordering data

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						
<b>Shaft height 80</b>	1	P	H	8	0	8	.	-	1	■	.	■	■	-	■	■	■	1	-	Z		
<b>Shaft height 100</b>	1	P	H	8	1	0	.	-	1	■	.	■	■	-	■	■	■	1	-	Z		
<b>Shaft height 132</b>	1	P	H	8	1	3	.	-	.	■	.	■	■	-	■	■	■	1	-	Z		
<b>Shaft height 160</b>	1	P	H	8	1	6	.	-	.	■	.	■	■	-	■	■	■	1	-	Z		
<b>Overall length<sup>1)</sup></b>									.													
<b>Asynchronous variant</b>									1													
<b>Synchronous variant (1PH813/1PH816)</b>									2													
<b>Encoder systems for motors <u>without</u> DRIVE-CLiQ interface</b>																						
Without encoder <sup>2)</sup>																						
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R) <sup>3)</sup>											A											
Incremental encoder HTL 1024 S/R (encoder HTL1024 S/R) <sup>2)4)</sup>											E											
Incremental encoder HTL 2048 S/R (encoder HTL2048 S/R) <sup>2)5)</sup>											H											
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R) <sup>3)</sup>											J											
<b>Encoder systems for motors <u>with</u> DRIVE-CLiQ interface</b>																						
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ) <sup>3)</sup>											F											
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ) <sup>3)</sup>											D											
<b>Rated speeds at 380 V to 480 V 3 AC (winding design)</b>																						
400 rpm/500 rpm/600 rpm											B											
1000 rpm/1150 rpm/1350 rpm											D											
1500 rpm/1750 rpm/2000 rpm											F											
2000 rpm/2300 rpm/2650 rpm											G											
2500 rpm/2800 rpm/3000 rpm											L											
3000 rpm/3300 rpm/3600 rpm											M											
<b>Cooling</b>		<b>Degree of protection</b>																				
Forced ventilation DE → NDE		IP55																			0	
Forced ventilation NDE → DE		IP55																			1	
Water cooling		IP65																			2	
<b>Type of construction</b>																						
IM B3 (IM V5, IM V6)																						0
IM B5 (IM V1, IM V3)																						2
IM B35 (IM V15, IM V35) <sup>6)</sup>																						3

For 13th to 16th position of the Order No. see following page

- 1) Not selectable. Determined by the choice of rated power.
- 2) Only possible with asynchronous variant.
- 3) Limited to  $n_{max} = 12000$  rpm.
- 4) Limited to  $n_{max} = 9000$  rpm.
- 5) Limited to  $n_{max} = 4600$  rpm.
- 6) Only possible with 1PH810 to 1PH816.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors without holding brake at DE  
Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors**
**Selection and ordering data (continued)**

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						
	<b>1</b>	<b>P</b>	<b>H</b>	<b>8</b>	.	.	.	-	.	■	.	■	■	-	■	■	■	1	-	<b>Z</b>		
<b>Shaft extension DE</b>	<b>Balancing</b>																					
Plain shaft	-													<b>0</b>								
Feather key	Full-key													<b>1</b>								
Feather key	Half-key													<b>2</b>								
<b>Bearing</b>	<b>Vibration severity acc. to Siemens/EN 60034-14<sup>2)</sup></b>												<b>Shaft and flange accuracy<sup>2)</sup></b>									
Standard	Grade R/A												Tolerance R				<b>B</b>					
Standard	Grade S/A												Tolerance R				<b>C</b>					
Standard <sup>1)</sup>	Grade SR/A												Tolerance R				<b>D</b>					
Performance <sup>3)</sup>	Grade SPECIAL/B												Tolerance SPECIAL				<b>L</b>					
Advanced Lifetime <sup>4)</sup>	Grade S/A												Tolerance R				<b>Q</b>					
<b>Cable connection (view of DE)</b>																						
<u>Terminal box</u>	<u>Cable entry</u>					<u>Signal connection</u>																
Top	Right					DE											<b>A</b>					
Top	Left					DE											<b>B</b>					
Top	NDE					Left											<b>C</b>					
<u>Power connector<sup>5)</sup></u>																						
Top	Right					DE											<b>E</b>					
Top	Left					DE											<b>F</b>					
Top	NDE					Left											<b>G</b>					
Top	DE					Left											<b>H</b>					
<b>Version status</b>																<b>1</b>						
<b>Special versions</b>	order codes are required for options, see page 5/83															-						<b>Z</b>

**Ordering example**

Selection criteria	Design	Structure of the Order No.
1PH8 motor	Synchronous variant, water cooling Shaft height 132 Version status 1	<b>1PH8131-2...2...1</b>
Encoder system	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R)	<b>1PH8131-2M.2...1</b>
Rated operating point	1500 rpm, 17.6 kW, 112 Nm	<b>1PH8131-2MF2...1</b>
Type of construction	IM B3 (IM V5, IM V6)	<b>1PH8131-2MF20...1</b>
Shaft extension DE	Plain shaft	<b>1PH8131-2MF20-0...1</b>
Bearing version	Standard Vibration severity grade R/A Shaft and flange accuracy tolerance R	<b>1PH8131-2MF20-0B.1</b>
Connection	Cable connection terminal box top Cable entry on the right Signal connection DE	<b>1PH8131-2MF20-0BA1</b>
<b>Options</b>		<b>1PH8131-2MF20-0BA1-Z</b>
	Additional PTC thermistor chain for alarm and tripping	<b>1PH8131-2MF20-0BA1-Z A12</b>
	Special paint finish worldwide, primer and paint finish: sky blue RAL 5015	<b>1PH8131-2MF20-0BA1-Z A12+K23+X05</b>

<sup>1)</sup> Only possible with asynchronous variant.

<sup>2)</sup> For definition, see 1PH8 Configuration Manual.

<sup>3)</sup> Only possible with asynchronous variant,  
 1PH808: Limited to  $n_{max} = 15000$  rpm  
 1PH810: Limited to  $n_{max} = 12000$  rpm  
 1PH813: Limited to  $n_{max} = 10000$  rpm  
 1PH816: Limited to  $n_{max} = 9000$  rpm. Not possible with 12th position of Order No. 2 (IM B5)

<sup>4)</sup> Limited to  $n_{max} = 5000$  rpm.  
 1PH813: Limited to  $n_{max} = 4500$  rpm  
 1PH816: Limited to  $n_{max} = 4000$  rpm.

<sup>5)</sup> With 1PH810, power connector is only possible up to a maximum static current of  $I_0 = 36$  A.  
 With 1PH813, power connector is only possible up to a maximum static current of  $I_0 = 85$  A.  
 Not possible for 1PH816.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors without holding brake at DE  
Order No. supplements for 1PH818/1PH822/1PH828 motors**

### Selection and ordering data

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
<b>Shaft height 180</b>	1	P	H	8	1	8	.	-	.	■	.	■	■	-	■	■	■	1	-	Z
<b>Shaft height 225</b>	1	P	H	8	2	2	.	-	.	■	.	■	■	-	■	■	■	1	-	Z
<b>Shaft height 280</b> (asynchronous variant and water cooling) <sup>1)</sup>	1	P	H	8	2	8	.	-	1	■	.	2	■	-	■	■	■	1	-	Z
<b>Overall length<sup>2)</sup></b>	.																			
<b>Asynchronous variant</b>									1											
<b>Synchronous variant (1PH818/1PH822)</b>									2											
<b>Encoder systems for motors without DRIVE-CLiQ interface</b>																				
Without encoder <sup>3)</sup>																				
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)																				
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) <sup>3)</sup>																				
Incremental encoder HTL 2048 S/R (encoder HTL2048 S/R) <sup>3)4)</sup>																				
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R)																				
<b>Encoder systems for motors with DRIVE-CLiQ interface</b>																				
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)																				
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)																				
<b>Rated speeds at 380 V to 480 V 3 AC</b> (winding design)																				
400 rpm/500 rpm/600 rpm																				
700 rpm/800 rpm/1000 rpm																				
1000 rpm/1150 rpm/1350 rpm																				
1500 rpm/1750 rpm/2000 rpm																				
2500 rpm/2900 rpm/3200 (3400) rpm																				
<b>Rated speeds at 690 V 3 AC (1PH828)</b> (winding design)																				
400 rpm/500 rpm																				
700 rpm/800 rpm																				
1000 rpm/1150 rpm																				
1500 rpm/1750 rpm																				
<b>Cooling</b>																				
<b>Degree of protection</b>																				
Forced ventilation, DE → NDE																				
IP55																				
0																				
Forced ventilation, NDE → DE																				
IP55																				
1																				
Water cooling																				
IP55																				
2																				
Forced ventilation (open-circuit cooling), DE → NDE <sup>3)</sup>																				
IP23																				
3																				
Forced ventilation (open-circuit cooling), NDE → DE <sup>3)</sup>																				
IP23																				
4																				
<b>Type of construction</b>																				
<b>1PH818</b>																				
<b>1PH822</b>																				
<b>1PH828</b>																				
IM B3 (IM B6, IM B7, IM B8, IM V6)																				
IM B3 (IM B6, IM B7, IM B8, IM V6)																				
IM B3 (IM V6)																				
IM V5																				
IM V5																				
IM V5 <sup>8)</sup>																				
IM B5 with A450 flange (IM V3) <sup>5)</sup>																				
IM B5 with A550 flange (IM V3) <sup>6)</sup>																				
IM B5 with A660 flange (IM V3) <sup>7)8)</sup>																				
IM B35 with A450 flange (IM V35)																				
IM B35 with A550 flange (IM V35)																				
IM B35 with A660 flange (IM V35)																				
IM V15 with A450 flange																				
IM V15 with A550 flange																				
IM V15 with A660 flange <sup>8)</sup>																				
0																				
1																				
2																				
3																				
5																				

For 13th to 16th position of the Order No. see following page

<sup>1)</sup> Shaft height 280 with forced ventilation and open-circuit cooling, see page 5/78.

<sup>2)</sup> Not selectable. Determined by the choice of rated power.

<sup>3)</sup> Only possible with asynchronous variant.

<sup>4)</sup> Limited to  $n_{max} = 4600$  rpm.

<sup>5)</sup> Limited to  $n_{max} = 3000$  rpm, not possible with 14th position of Order No. L (performance).

<sup>6)</sup> Limited to  $n_{max} = 2500$  rpm, not possible with 14th position of Order No. L (performance).

<sup>7)</sup> Limited to  $n_{max} = 2000$  rpm.

<sup>8)</sup> Only possible with 14th position of Order No. A or B (standard bearing).



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors without holding brake at DE**  
**Order No. supplements for 1PH818/1PH822/1PH828 motors**

### Selection and ordering data (continued)

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16											
	<b>1</b>	<b>P</b>	<b>H</b>	<b>8</b>	.	.	.	-	.	■	■	■	-	■	■	■	<b>1</b>	-	<b>Z</b>								
<b>Shaft extension DE</b>	<b>Balancing</b>																										
Plain shaft	-													<b>0</b>													
Feather key	Full-key													<b>1</b>													
Feather key	Half-key													<b>2</b>													
<b>Bearing</b>	<b>Vibration severity acc. to Siemens/EN 60034-14<sup>1)</sup></b>											<b>Shaft and flange accuracy<sup>1)</sup></b>															
Standard	Grade A											Tolerance N					<b>A</b>										
Standard	Grade R/A											Tolerance R					<b>B</b>										
Increased radial forces	Grade A											Tolerance N					<b>E</b>										
Increased radial forces	Grade R/A											Tolerance R					<b>F</b>										
<u>Also possible with 1PH818 and 1PH822:</u>																											
Standard	Grade S/A											Tolerance R					<b>C</b>										
Standard <sup>2)</sup>	Grade SR/A											Tolerance R					<b>D</b>										
Performance <sup>2)3)</sup>	Grade SR/A											Tolerance R					<b>L</b>										
<b>Cable connection (view of DE)</b>																											
<u>Terminal box</u>	<u>Cable entry</u>					<u>Signal connection</u>																					
Top	Right					DE						<b>A</b>															
Top	Left					DE						<b>B</b>															
Top	NDE					Right						<b>C</b>															
Top	DE					Right						<b>D</b>															
<b>Version status</b>																<b>1</b>											
<b>Special versions</b>	order codes are required for options, see page 5/83																										
																											<b>Z</b>

### Ordering example

Selection criteria	Design	Structure of the Order No.
<b>1PH8 motor</b>	Asynchronous variant, water cooling Shaft height 180 Version status 1	<b>1PH8184-1...2.-...1</b>
Encoder system	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R)	<b>1PH8184-1M.2.-...1</b>
Rated operating point	1750 rpm, 82 kW, 447 Nm	<b>1PH8184-1MF2.-...1</b>
Type of construction	IM B3 (IM B6, IM B7, IM B8, IM V6)	<b>1PH8184-1MF20.-...1</b>
Shaft extension DE	Plain shaft	<b>1PH8184-1MF20-0..1</b>
Bearing version	Standard Vibration severity grade R/A Shaft and flange accuracy tolerance R	<b>1PH8184-1MF20-0B.1</b>
Connection	Cable connection terminal box top Cable entry on the right Signal connection DE	<b>1PH8184-1MF20-0BA1</b>
<b>Options</b>		<b>1PH8184-1MF20-0BA1-Z</b>
	Additional PTC thermistor chain for alarm and tripping	<b>1PH8184-1MF20-0BA1-Z A12</b>
	Special paint finish worldwide, primer and paint finish: sky blue RAL 5015	<b>1PH8184-1MF20-0BA1-Z A12+K23+X05</b>

<sup>1)</sup> For definition, see 1PH8 Configuration Manual.

<sup>2)</sup> Only possible with asynchronous variant.

<sup>3)</sup> Only possible with 1PH818: Limited to  $n_{max} = 7500$  rpm, not possible with 12th position of Order No. 2 (IM B5) and 11th position of Order No. 3 and 4.  
 Only possible with 1PH822: Limited to  $n_{max} = 6000$  rpm, not possible with 12th position of Order No. 2 (IM B5) and 11th position of Order No. 3 and 4.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous motors without holding brake at DE Order No. supplements for 1PH828/1PH835 motors

#### Selection and ordering data

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16											
<b>Shaft height 280</b> (forced ventilation and open-circuit cooling) <sup>1)</sup>	1	P	H	8	2	8	.	-	1	■	.	■	■	-	■	■	■	1	-	Z							
<b>Shaft height 355</b>	1	P	H	8	3	5	.	-	1	■	.	■	■	-	■	■	■	0	-	Z							
<b>Overall length</b> <sup>2)</sup>	.																										
<b>Asynchronous variant</b>																											
Forced ventilation with noise value 77 dB <sup>3)</sup>									1																		
<b>Encoder systems for motors without DRIVE-CLiQ interface</b>																											
Without encoder										A																	
Absolute encoder 2048 S/R, 4096 revolutions, multi-turn (encoder AM2048S/R)										E																	
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)										H																	
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)										J																	
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R)										M																	
<b>Encoder systems for motors with DRIVE-CLiQ interface</b>																											
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)										F																	
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)										D																	
<b>Prepared for mounting external encoder systems</b> <sup>4)</sup>																											
Incremental encoder HTL1024 S/R with solid shaft																											
Mounting of incremental encoder POG 10 D 1024																											
Order code required: <b>H56</b>										K											-	Z					
Incremental encoder HTL1024 S/R with solid shaft																											
Incremental encoder POG 10 supplied by customer																											
Order code required: <b>G80</b>										K													-	Z			
Incremental encoder HTL1024 S/R with hollow shaft																											
Incremental encoder HOG 28 supplied by customer																											
Order code required: <b>H75</b>										G															-	Z	
<b>Rated speeds at 400 V to 500 V 3 AC</b> (winding design)																											
<u>1PH828</u>					<u>1PH835</u>																						
400 rpm/500 rpm/600 rpm					480 rpm/550 rpm/600 rpm																						
-					640 rpm/750 rpm/800 rpm																						
700 rpm/800 rpm/1000 rpm					800 rpm/900 rpm/1000 rpm																						
1000 rpm/1150 rpm/1350 rpm					1080 rpm/1250 rpm/1350 rpm																						
1500 rpm/1750 rpm/2000 rpm					-																						
<b>Rated speeds at 690 V 3 AC</b> (winding design)																											
400 rpm/500 rpm																											
700 rpm/800 rpm					550 rpm/600 rpm																						
1000 rpm/1150 rpm					750 rpm/800 rpm																						
-					900 rpm/1000 rpm																						
1500 rpm/1750 rpm					1250 rpm/1350 rpm																						
<b>Cooling</b>																											
Forced ventilation					<b>Degree of protection</b>																						
					IP55																						
Forced ventilation					IP23 (open-circuit cooling)																						
<b>Type of construction</b>																											
<u>1PH828</u>					<u>1PH835</u>																						
IM B3 (IM V6)					IM B3																						
IM V5 <sup>5)</sup>					-																						
IM B5 with A660 flange (IM V3) <sup>5)</sup>					-																						
IM B35 with A660 flange (IM V35)					IM B35 with A800 flange																						
IM V15 with A660 flange <sup>5)</sup>					-																						

For 13th to 16th position of the Order No. see following page

<sup>1)</sup> Shaft height 280 with water cooling, see page 5/76.

<sup>2)</sup> Not selectable. Determined by the choice of rated power.

<sup>3)</sup> 1PH835..7 asynchronous motors with forced ventilation and noise value of 85 dB, see Catalog CR 1.

<sup>4)</sup> For more information on incremental encoders, see: [www.baumerhuebner.com](http://www.baumerhuebner.com)

<sup>5)</sup> Only possible with 14th position of Order No. A and B (standard bearing).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous motors without holding brake at DE  
Order No. supplements for 1PH828/1PH835 motors**
**Selection and ordering data (continued)**

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	1	P	H	8	2	8	.	-	.	■	■	■	-	■	■	■	1 - Z
	1	P	H	8	3	5	.	-	.	■	■	■	-	■	■	■	0 - Z
<b>Shaft extension DE</b>													<b>Balancing</b>				
Plain shaft	-												0				
Feather key	Full-key												1				
Feather key	Half-key												2				
<b>Bearing</b>													<b>Vibration severity acc. to Siemens/ EN 60034-14<sup>1)</sup></b>		<b>Shaft and flange accuracy<sup>1)</sup></b>		
Standard	Grade A												Tolerance N		A		
Standard	Grade R/A												Tolerance R		B		
Increased radial forces	Grade A												Tolerance N		E		
Increased radial forces	Grade R/A												Tolerance R		F		
<b>Cable connection</b>		(View of DE)															
<u>Terminal box</u>	<u>Cable entry</u>	<u>Signal connection</u>	<u>1PH828<sup>2)</sup></u>		<u>External fan NDE with air inlet from NDE</u>		<u>air-flow direction NDE → DE</u>										
NDE right	Bottom	NDE			Top								U				
NDE left	Bottom	NDE			Left		Order code required: <b>G00</b>						U		- Z		
NDE top	Right	NDE			Top								V				
					Right		Order code required: <b>G02</b>						V		- Z		
NDE top	Right	NDE			Left		Order code required: <b>G00</b>						W		- Z		
					Right		Order code required: <b>G02</b>						W		- Z		
DE top <sup>2)</sup>	Right	NDE			Top <sup>3)4)</sup>								X				
					Left <sup>3)</sup>		Order code required: <b>G00</b>						X		- Z		
					Right <sup>3)</sup>		Order code required: <b>G02</b>						X		- Z		
<b>Version status</b>																	
Shaft height 355													0				
Shaft height 280													1				
<b>Special versions</b> <a href="#">order codes are required for options, see page 5/83</a>													- Z				

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<sup>1)</sup> For definition, see 1PH8 Configuration Manual.

<sup>2)</sup> Signal connection for 1PH835 NDE at bearing shield.

<sup>3)</sup> Only possible for 1PH828 with 12th position of Order No. 0 (IM B3) and 1 (IM V5).  
Only possible for 1PH835 with 12th position of Order No. 0 (IM B3).

<sup>4)</sup> Only possible for assignments with terminal box 1XB7712-P.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors with holding brake at DE**  
**Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors**

### Selection and ordering data

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						
<b>Shaft height 80</b>	1	P	H	8	0	8	.	-	3	■	.	■	■	-	■	■	■	1	-	Z		
<b>Shaft height 100</b>	1	P	H	8	1	0	.	-	3	■	.	■	■	-	■	■	■	1	-	Z		
<b>Shaft height 132</b>	1	P	H	8	1	3	.	-	.	■	.	■	■	-	■	■	■	1	-	Z		
<b>Shaft height 160</b>	1	P	H	8	1	6	.	-	.	■	.	■	■	-	■	■	■	1	-	Z		
<b>Overall length<sup>1)</sup></b>									.													
<b>Asynchronous variant with holding brake<sup>2)</sup></b>									3											-	Z	
<b>Synchronous variant with holding brake (1PH813/1PH816)<sup>2)</sup></b>									4												-	Z
<b>Encoder systems for motors <u>without</u> DRIVE-CLiQ interface</b>																						
Without encoder <sup>3)</sup>																						
Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)																						
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) <sup>3)</sup>																						
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) <sup>3)</sup>																						
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R)																						
<b>Encoder systems for motors <u>with</u> DRIVE-CLiQ interface</b>																						
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)																						
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)																						
<b>Rated speed</b> (winding version)																						
<b>Cooling</b>																						
<b>Degree of protection</b>																						
Forced ventilation DE → NDE	IP55																0					
Forced ventilation NDE → DE	IP55																1					
Water cooling	IP55 <sup>4)</sup>																2					
<b>Type of construction</b>																						
IM B5 (IM V1, IM V3) <sup>5)</sup>																						
IM B35 (IM V15, IM V3) <sup>5)</sup>																						

For 13th to 16th  
position of the  
Order No.  
see following page

- 1) Not selectable. Determined by the choice of rated power.  
2) For variant with holding brake, an order code from U60 to U68 is additionally required.  
1PH808: Limited to  $n_{max} = 5000$  rpm  
1PH810: Limited to  $n_{max} = 5000$  rpm  
1PH813: Limited to  $n_{max} = 4500$  rpm  
1PH816: Limited to  $n_{max} = 4000$  rpm.  
3) Only possible with asynchronous variant.  
4) With holding brake, degree of protection is limited to IP55.  
5) Not possible with 1PH816.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors with holding brake at DE**  
**Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors**
**Selection and ordering data (continued)**

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
	1	P	H	8	.	.	.	-	.	.	■	■	■	-	■	■	■
<b>Shaft extension DE</b>	<b>Balancing</b>																
Plain shaft	-													0			
Feather key	Half-key													2			
<b>Bearing</b>	<b>Vibration severity acc. to Siemens/EN 60034-14</b>											<b>Shaft and flange accuracy</b>					
Standard	Grade A											Tolerance N		A			
Advanced lifetime	Grade A											Tolerance N		P			
<b>Cable connection (view of DE)<sup>1)</sup></b>																	
<u>Terminal box</u>			<u>Cable entry</u>				<u>Signal connection</u>										
Top	Right		DE										A				
Top	Left		DE										B				
Top	NDE		Left										C				
<b>Version status</b>															1		
<b>Holding brake type</b>																	
Supply voltage 230 V 1 AC, 50/60 Hz																	
Holding brake DE													Order code required: <b>U60</b>		-	Z	
Holding brake DE with microswitch													Order code required: <b>U61</b>		-	Z	
Holding brake DE with manual brake release lever													Order code required: <b>U62</b>		-	Z	
Holding brake DE with microswitch and manual brake release lever													Order code required: <b>U63</b>		-	Z	
Supply voltage 24 V DC																	
Holding brake DE													Order code required: <b>U65</b>		-	Z	
Holding brake DE with microswitch													Order code required: <b>U66</b>		-	Z	
Holding brake DE with manual brake release lever													Order code required: <b>U67</b>		-	Z	
Holding brake DE with microswitch and manual brake release lever													Order code required: <b>U68</b>		-	Z	
Options K18 and V91 are not possible for variant with holding brake.																	
<b>Special versions</b> order codes are required for options, see page 5/83															-	Z	

<sup>1)</sup> Connection for holding brake is only possible via terminal box (top).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

**SIMOTICS M-1PH8 asynchronous and synchronous motors with holding brake at DE**  
**Order No. supplements for 1PH818/1PH822 motors**

### Selection and ordering data

Position of Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16											
<b>Shaft height 180</b>	1	P	H	8	1	8	.	-	.	■	.	■	■	-	■	■	■	1	-	Z							
<b>Shaft height 225</b>	1	P	H	8	2	2	.	-	.	■	.	■	■	-	■	■	■	1	-	Z							
<b>Overall length<sup>1)</sup></b>	.																										
<b>Asynchronous variant with holding brake<sup>2)</sup></b>								3												-	Z						
<b>Synchronous variant with holding brake<sup>2)</sup></b>								4												-	Z						
<b>Encoder systems for motors without DRIVE-CLiQ interface</b>																											
Without encoder <sup>3)</sup>									A																		
Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)									E																		
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) <sup>3)</sup>									H																		
Incremental encoder HTL 2048 S/R (encoder HTL 2048S/R) <sup>3)</sup>									J																		
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks (encoder IC2048S/R)									M																		
<b>Encoder systems for motors with DRIVE-CLiQ interface</b>																											
Absolute encoder 22 bit (resolution 4194304, internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions) (encoder AM22DQ)									F																		
Incremental encoder 22 bit (resolution 4194304, internal 2048 S/R) + commutation position 11 bit (encoder IC22DQ)									D																		
<b>Rated speed</b> (winding version)																											
<b>Cooling</b>																											
								<b>Degree of protection</b>																			
Forced ventilation, DE → NDE								IP55														0					
Forced ventilation, NDE → DE								IP55														1					
Water cooling								IP55														2					
Open-circuit cooling, NDE → DE (asynchronous motors only)								IP23														4					
<b>Type of construction</b>																											
IM B3 (IM B6, IM B7, IM B8, IM V6)																					0						
<b>Shaft extension DE</b>																											
Feather key								Half-key															2				
<b>Bearing</b>																											
Standard								Grade A				Shaft and flange accuracy										A					
<b>Cable connection</b> (view of DE) <sup>4)</sup>																											
<u>Terminal box</u>				<u>Cable entry</u>				<u>Signal connection</u>																			
Top				Right				DE														A					
Top				Left				DE														B					
Top				NDE				Right														C					
Top				DE				Right														D					
<b>Version status</b>																										1	
<b>Holding brake type</b>																											
Supply voltage 230 V 1 AC, 50/60 Hz																											
Holding brake DE with microswitch and manual brake release lever								Order code required: <b>U63</b>															-				
Options K18 and V91 are not possible for variant with holding brake.																											
<b>Special versions</b> order codes are required for options, see page 5/83																											-

<sup>1)</sup> Not selectable. Determined by the choice of rated power.

<sup>2)</sup> Order code U63 is additionally required for variant with holding brake.

1PH818: Limited to  $n_{max} = 3500$  rpm

1PH822: Limited to  $n_{max} = 3100$  rpm.

<sup>3)</sup> Only possible with asynchronous variant.

<sup>4)</sup> Connection for holding brake is only possible via terminal box (top).

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous and synchronous motors Options

#### Options

Order code	Description	For use with motors		
		1PH808 1PH810 1PH813 1PH816	1PH818 1PH822 1PH828 (water cooling)	1PH828 1PH835 for forced ventilation only (11th position of Order No. 1 or 4)
A12	Additional PTC thermistor chain for alarm and tripping (only possible for version with terminal box)	✓	✓	✓
A25	Additional KTY84 temperature sensor as reserve connected to signal terminal strip (only possible for version with terminal box)	✓	Standard	Standard
B02	Test certificate (for the ordered motor)	✓	Standard	Standard
G00	External fan NDE left (possible if 15th position of Order No. is U, W or X)	-	-	✓
G02	External fan NDE right (possible if 15th position of Order No. is V, W or X)	-	-	✓
G14	With air filter (only possible if 11th position of Order No. is 1 or 4)	✓ For 1PH813/ 1PH816 only	✓	✓
G80	Mounting of a POG 10 incremental encoder supplied by customer (possible if 9th position of Order No. is K)	-	-	✓
H56	Mounting of POG 10 D 1024 incremental encoder (possible if 9th position of Order No. is K)	-	-	✓
H75	Mounting of a HOG 28 incremental encoder supplied by customer (possible if 9th position of Order No. is G)	-	-	✓ For 1PH835 only
K08	Encoder connector mounted opposite (not possible if 15th position of Order No. is X)	-	✓	✓ For 1PH828 only
K09	Terminal box or power connector NDE right	✓ For 1PH810 only <sup>1)</sup> / 1PH813/1PH816	-	-
	Terminal box NDE right, cable entry DE, signal connection top (possible if 15th position of Order No. is A)	-	✓	-
K10	Terminal box or power connector NDE left	✓ For 1PH810 only <sup>1)</sup> / 1PH813/1PH816	-	-
	Terminal box NDE left, cable entry DE, signal connection top (possible if 15th position of Order No. is A)	-	✓	-
K16	Second shaft extension (1PH828 d × l: 95 mm × 170 mm (3.74 in × 6.69 in); 1PH835 d × l: 120 mm × 210 mm (4.72 in × 8.27 in)) (possible if 9th position of Order No. is A or G and 12th position of Order No. is 0 or 3)	-	-	✓
K18	Radial shaft sealing ring DE <sup>2)</sup>	✓	✓	-
K40	Regreasing system, DE and NDE	-	✓ For 1PH818/ 1PH822 only	Standard
K45	Anti-condensation heating 230 V AC	-	-	✓
K69	Pipe connection prepared NDE right (only possible with forced ventilation, not for G00 or G02)	-	-	✓ For 1PH828 only
K70	Pipe connection prepared NDE left (only possible with forced ventilation, not for G00 or G02)	-	-	✓ For 1PH828 only
K71	Pipe connection prepared NDE top (only possible with forced ventilation, not for G00 or G02)	-	-	✓ For 1PH828 only
K80	Axial pipe connection NDE (only possible with forced ventilation)	✓	✓ For 1PH818/ 1PH822 only	-

✓ Option available

- Option not available

<sup>1)</sup> Not possible with 12th position of Order No. 2 (IM B5 type of construction).

<sup>2)</sup> Only appropriate if oil spray or oil vapor is occasionally deposited on the sealing ring. Radial shaft sealing ring is not possible with: 14th position of Order No. E, F and L, 8th position of Order No. 3 and 4. Not possible in combination with options U60 to U68.

# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous and synchronous motors Options

#### Options (continued)

Order code	Description	For use with motors		
		1PH808 1PH810 1PH813 1PH816	1PH818 1PH822 1PH828 (water cooling)	1PH828 1PH835 for forced ventilation only (11th position of Order No. 1 or 4)
<b>K83</b>	Terminal box rotated by +90 degrees (possible in combination with options K09 or K10 or 15th position of Order No. U, W or X)	–	✓ <sup>1)</sup>	✓
<b>K84</b>	Terminal box rotated by -90 degrees (possible in combination with options K09 or K10 or 15th position of Order No. U, W or X)	–	✓ <sup>1)</sup>	✓
<b>K85</b>	Terminal box rotated by +180 degrees (possible in combination with options K09 or K10 or 15th position of Order No. U, W or X)	–	✓	✓
<b>K90</b>	Variant with flange size A400 (possible with 12th position of Order No. 2, 3 and 5; not possible in combination with holding brake (8th position of Order No. 3 or 4)	–	For 1PH818 only	–
<b>L00</b>	Replace terminal box (standard) with the next largest terminal box (note dimension implications in CAD Creator)	–	✓	✓
<b>L12</b>	Condensate drain hole	–	Standard for water cooling	With 11th position of Order No. "1" only
<b>L27</b>	NDE bearing in insulated version	–	For 1PH818 only	Standard
<b>L72</b>	Shaft of special steel	–	–	✓
<b>L74</b>	Fan version in IP65 degree of protection <sup>2)</sup>	✓	–	–
<b>M83</b>	Additional back-off thread on motor feet (Only possible with 12th position of Order No. 0 or 3)	–	–	✓
<b>P00</b>	Undrilled cable entry plate	–	✓	✓ Not for 1XB7820-P00
<b>P01</b>	Cable entry plate 3 × M63 × 1.5	–	✓ Only for 1XB7700-P02 1XB7712-P03	✓ Only for 1XB7712-P03
<b>P02</b>	Cable entry plate 3 × M75 × 1.5	–	✓ Only for 1XB7712-P03	✓ Only for 1XB7712-P01 1XB7712-P03
<b>P03</b>	Cable entry plate 4 × M75 × 1.5	–	–	✓ Only for 1XB7712-P01
<b>P04</b>	Cable entry plate 4 × M63 × 1.5	–	✓ Only for 1XB7712-P03	✓ Only for 1XB7712-P01 1XB7712-P03
<b>U60</b>	Holding brake 230 V 1 AC	✓	–	–
<b>U61</b>	Holding brake 230 V 1 AC with microswitch	✓	–	–
<b>U62</b>	Holding brake 230 V 1 AC with manual brake release lever	✓	–	–
<b>U63</b>	Holding brake 230 V 1 AC with microswitch and manual brake release lever	✓	For 1PH818 and 1PH822 only	–
<b>U65</b>	Holding brake 24 V DC	✓	–	–
<b>U66</b>	Holding brake 24 V DC with microswitch	✓	–	–
<b>U67</b>	Holding brake 24 V DC with manual brake release lever	✓	–	–
<b>U68</b>	Holding brake 24 V DC with microswitch and manual brake release lever	✓	–	–

<sup>1)</sup> Not possible for 1PH822 and terminal box 1XB7712-P03.

<sup>2)</sup> Regardless of the degree of protection, at high levels of atmospheric pollution, the fan must be cleaned.

<sup>3)</sup> Not possible in combination with options K18 and V91.



# SIMOTICS main motors

## Asynchronous and synchronous motors SIMOTICS M for SINAMICS S120

### SIMOTICS M-1PH8 asynchronous and synchronous motors Options

## Options (continued)

Order code	Description	For use with motors		
		1PH808 1PH810 1PH813 1PH816	1PH818 1PH822 1PH828 (water cooling)	1PH828 1PH835 for forced ventilation only (11th position of Order No. 1 or 4)
V90	1PH7-compatible shaft extension ( $d \times l$ : 42 mm $\times$ 110 mm (1.65 in $\times$ 4.33 in)) (note reduced radial forces)	✓ For 1PH813 only	-	-
V91	1FT6-compatible shaft extension ( $d \times l$ : 48 mm $\times$ 82 mm (1.90 in $\times$ 3.23 in)) (not possible in combination with holding brake (8th position of Order No. 3 or 4) <sup>1)</sup> )	✓ For 1PH813 only	-	-
V92	1PH7184/1PL6184-compatible shaft extension ( $d \times l$ : 60 mm $\times$ 140 mm (2.36 in $\times$ 5.51 in)) (not possible in combination with holding brake (8th position of Order No. 3 or 4))	-	✓ For 1PH818 only	-
Y84	Customer specifications on rating plate (max. 30 characters)	✓	✓	✓
<b>Paint finish</b>				
-	Paint finish: Anthracite RAL 7016	Standard	Standard	Standard
K24	Primer	✓ Pale green	✓ Red brown	✓ Red brown
K23	Special paint finish, worldwide, primer and paint finish: anthracite RAL 7016	✓	✓	✓
K23+X..	Special paint finish, worldwide, primer and other paint finish can be selected from X01 to X08	✓	✓	✓
X01	Paint finish: jet black, matt RAL 9005	✓	✓	✓
X02	Paint finish: cream white RAL 9001	✓	✓	✓
X03	Paint finish: reseda green RAL 6011	✓	✓	✓
X04	Paint finish: pebble gray RAL 7032	✓	✓	✓
X05	Paint finish: sky blue RAL 5015	✓	✓	✓
X06	Paint finish: light ivory RAL 1015	✓	✓	✓
X08	Paint finish: white aluminum RAL 9006	✓	✓	✓

✓ Option available

- Option not available

When ordering a motor with order codes, **-Z** should be added to the order number.

<sup>1)</sup> Not possible in combination with options U60 to U68.

# SIMOTICS main motors

## Selection guides

### Selection guides for SIMOTICS M-1PH8 motors

#### Terminal boxes/Cable cross-sections

#### Technical specifications

Terminal box type (see selection and ordering data for assignment)	Cable entry		Max. outer cable diameter <sup>3)</sup> mm (in)	Number of main terminals	Max. cross-section per terminal mm <sup>2</sup>	Max. rated current <sup>4)</sup> A
	Power	External signals				
gk803	1 × M25 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	20 (0.79)	Phases: 3 × M5 Grounding: 2 × M5	1 × 10	52
gk813	1 × M32 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	24.2 (0.95)	Phases: 3 × M5 Grounding: 2 × M5	1 × 16	70
gk823	1 × M32 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	24.2 (0.95)	Phases: 3 × M5 Grounding: 2 × M5	1 × 16	70
gk826	1 × M32 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	24.2 (0.95)	Phases: 6 × M5 Grounding: 2 × M5	1 × 10	52
gk833	1 × M40 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	32 (1.26)	Phases: 3 × M6 Grounding: 2 × M6	1 × 35	110
gk843	1 × M50 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	38 (1.50)	Phases: 3 × M6 Grounding: 2 × M6	1 × 50	133
gk863	1 × M50 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	38 (1.50)	Phases: 3 × M6 Grounding: 2 × M6	1 × 50	133
gk873	1 × M63 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	42.6 (1.68)	Phases: 3 × M6 Grounding: 2 × M6	1 × 50	133
gk874	1 × M63 × 1.5	1 × M16 × 1.5 <sup>1)</sup>	42.6 (1.68)	Phases: 3 × M10 Grounding: 2 × M6	2 × 70	240
1XB7322-P05	2 × M50 × 1.5	1 × M16 × 1.5 <sup>2)</sup>	38 (1.50)	Phases: 3 × M12 Grounding: 2 × M6	2 × 50	210
1XB7422-P06	2 × M63 × 1.5	1 × M16 × 1.5 <sup>2)</sup>	53 (2.09)	Phases: 3 × M12 Grounding: 4 × M8	2 × 70	270
1XB7700-P02	3 × M75 × 1.5	1 × M16 × 1.5 <sup>2)</sup>	68 (2.68)	Phases: 3 × 2 × M12 Grounding: 3 × fixing eyelet	3 × 150	700
1XB7712-P03	4 × M75 × 1.5	1 × M16 × 1.5 <sup>2)</sup>	68 (2.68)	Phases: 3 × 4 × M16 Grounding: 4 × M16	4 × 185	1150
<b>With 1PH835 only</b>						
1XB7712-P01	3 × M63 × 1.5	1 × M20 × 1.5 <sup>5)</sup> 1 × M25 × 1.5 <sup>6)</sup>	53 (2.09)	Phases: 3 × 4 × M16 Grounding: 4 × M16	3 × 95	450
1XB7712-P03	4 × M75 × 1.5	1 × M20 × 1.5 <sup>5)</sup> 1 × M25 × 1.5 <sup>6)</sup>	68 (2.68)	Phases: 3 × 4 × M16 Grounding: 4 × M16	4 × 185	1150
1XB7820-P00	Undrilled	1 × M20 × 1.5 <sup>5)</sup> 1 × M25 × 1.5 <sup>6)</sup>	–	Phases: 2 × 3 × 4 × M16 Grounding: 8 × M16	8 × 240	2100

For terminal box type **1XB7712-P01** or **1XB7712-P03**, other cable entries (power) can be ordered via P options, depending on the standard:

<b>P00</b>	Undrilled cable entry plate
<b>P01</b>	Cable entry plate 3 × M63 × 1.5 (not for 1XB7712-P01)
<b>P02</b>	Cable entry plate 3 × M75 × 1.5
<b>P03</b>	Cable entry plate 4 × M75 × 1.5 (not for 1XB7712-P03)
<b>P04</b>	Cable entry plate 4 × M63 × 1.5

For terminal box type **1XB7700-P02**, other cable entries (power) can be ordered via P options, depending on the standard:

<b>P00</b>	Undrilled cable entry plate
<b>P01</b>	Cable entry plate 3 × M63 × 1.5

For terminal box types **1XB7322-P05** and **1XB7422-P06**, another cable entry (power) can be ordered via the P option, depending on the standard:

<b>P00</b>	Undrilled cable entry plate
------------	-----------------------------

For options **K09** or **K10**, instead of terminal box **gk863**, terminal box **gk873** is used mounted on the side.

For options **K09** or **K10**, instead of terminal box **gk833**, terminal box **gk843** is used mounted on the side.

For options **K09** or **K10**, instead of terminal box **gk813**, terminal box **gk823** is used mounted on the side.

- 1) Thread M16 × 1.5 arranged with 90° to signal connection; thread only for options A12, A25 and 9th position of Order No. A (without encoder).
- 2) Arranged opposite of signal connection (sideways from cable entry plate), thread only for option A12 and 9th position of Order No. A (without encoder).
- 3) [Dependent on the design of the metric cable gland \(see 1PH8 Configuration Manual for definition\).](#)
- 4) Current-carrying capacity based on EN 60204-1/IEC 60364-5-52 with installation type C.
- 5) Mounted on left side of terminal box (viewed toward cable entries).
- 6) Mounted on right side of terminal box (viewed toward cable entries).

#### Technical specifications (continued)

Motor type	Fan motor current consumption, max.			Direction of air flow	Volume of air, min.	Sound pressure level $L_{pA}$ (1 m) Motor + external fan operation 50 Hz tolerance + 3 dB
	A	A	A		m <sup>3</sup> /s (ft <sup>3</sup> /s)	dB
<b>Forced ventilation</b>	<b>230 V 1 AC/50 Hz (± 10 %)</b>	<b>230 V 1 AC/60 Hz (± 10 %)</b>	<b>265 V 1 AC/60 Hz (± 10 %)</b>			
1PH808	0.33 0.20	0.25 0.16	0.32 0.19	NDE → DE DE → NDE	0.02 (0.71)	70 <sup>1)</sup>
<b>Forced ventilation</b>	<b>400 V 3 AC/50 Hz (± 10 %)</b>	<b>400 V 3 AC/60 Hz (± 10 %)</b>	<b>480 V 3 AC/60 Hz (± 10 %)</b>			
1PH810	0.12 0.13	0.09 0.09	0.12 0.13	NDE → DE DE → NDE	0.04 (1.41)	70 <sup>1)</sup>
1PH813	0.13 0.21	0.16 0.19	0.17 0.23	NDE → DE DE → NDE	0.09 (3.18)	70 <sup>1)</sup>
1PH816	0.17 0.23	0.22 0.30	0.22 0.30	NDE → DE DE → NDE	0.16 (5.65)	73 <sup>1)</sup>
<b>Forced ventilation (EC fan)</b>	<b>200 V ... 277 V 1 AC/ 50 Hz, 60 Hz (± 10 %)</b>					
1PH818	1.45 ... 1.05	–	–	NDE → DE DE → NDE	0.17 (6.00)	73 <sup>2)</sup>
1PH822	2.3 ... 1.6	–	–	NDE → DE DE → NDE	0.31 (10.9)	73 <sup>2)</sup>
<b>Forced ventilation</b>	<b>400 V 3 AC/50 Hz (± 10 %)</b>	<b>400 V 3 AC/60 Hz (+ 5 %, ± 10 %)</b>	<b>480 V 3 AC/60 Hz (+ 5 %, – 10 %)</b>			
1PH828	2.55	2.5	2.5	NDE → DE DE → NDE	0.31 (10.9)	74 <sup>2)</sup>
1PH835.-1..1 (IP55 degree of protection)	4.7	4.6	4.6	NDE → DE DE → NDE	0.75 (26.5)	77 <sup>3)</sup>
1PH835.-1..4 (IP23 degree of protection)	4.7	4.6	4.6	NDE → DE DE → NDE	1 (35.3)	77 <sup>3)</sup>

1) For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.

2) For rated pulse frequency of 2 kHz and speed ranges:  
 Forced ventilation (IP55 degree of protection):  
 1PH818 up to 5000 rpm  
 1PH822 up to 3500 rpm  
 1PH828 up to 3300 rpm  
 Forced ventilation (IP23 degree of protection):  
 1PH818 up to 3000 rpm  
 1PH822 up to 2000 rpm  
 1PH828 up to 2800 rpm

3) For rated pulse frequency of 2.5 kHz and speed range up to 2800 rpm.

# SIMOTICS main motors

## Selection guides

### Selection guides for SIMOTICS M-1PH8 motors

#### Cooling data/Sound pressure levels/Water specification

#### Technical specifications (continued)

##### Cooling data and sound pressure levels

Motor type	Flow volume, min.	Pressure drop	Water connection at NDE thread	Sound pressure level $L_{pA}$ (1 m) motor tolerance + 3 dB
	l/min (US gal./min)	bar	Inch	dB
<b>Water cooling</b>				
1PH808	6 (1.58)	0.6	G 1/8	68 <sup>1)</sup>
1PH810	8 (2.11)	0.4	G 1/4	68 <sup>1)</sup>
1PH813	12 (3.17)	0.9	G 3/8	68 <sup>1)</sup>
1PH816	15 (3.96)	0.2	G 1/2	69 <sup>1)</sup>
1PH8184	15 (3.96)	0.6	G 3/8	70 <sup>2)</sup>
1PH8186	15 (3.96)	0.7	G 3/8	70 <sup>2)</sup>
1PH822.-1 (asynchronous variant)	20 (5.28)	0.6	G 3/8	70 <sup>2)</sup>
1PH822.-2 (synchronous variant)	25 (6.60)	0.9	G 3/8	70 <sup>3)</sup>
1PH828	35 (9.25)	0.6	G 1/2	72 <sup>3)</sup>

##### Water specification

#### Cooling water quality

The values specified for the cooling water correspond to the requirements for a closed cooling circuit. Not all of the specified concentrations will occur in the cooling water at the same time. For trouble-free operation, a filter can be installed. The filter fineness should be no less than 100 µm.

Cooling water specifications	Quality of the water used as coolant for motors with stainless steel pipes + cast iron or steel jacket 1PH808 ... 1PH816	Quality of the water used as coolant for motors with stainless steel pipes 1PH818 ... 1PH828
pH value	6.0 ... 9.0	
Total hardness	< 170 ppm	
Conductivity	< 500 µS/cm	< 2000 µS/cm
Operating pressure, max.	< 6 bar	
Pressure drop at V(N)	< 1 bar	
Cooling water inlet temperature, max.	< 30 °C (86 °F)	
Cooling water temperature, min.	$T_{\text{cooling water}} > T_{\text{ambient}} - 5 \text{ K}$	
Anti-freeze protection / corrosion protection	20 ... 30 %	
NALCO 00GE056 inhibitor	0.2 ... 0.25 %	
<b>Components</b>		
Dissolved substances	< 340 ppm	
Max. grain size	< 100 µm	
Chloride ions	< 40 ppm	< 250 ppm
Sulfate ions	< 50 ppm	< 240 ppm
Nitrate ions	< 50 ppm	

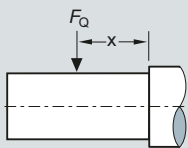
<sup>1)</sup> For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.

<sup>2)</sup> For rated pulse frequencies of 2 kHz or 4 kHz and speed ranges:  
1PH818 up to 5000 rpm  
1PH822 up to 4500 rpm.

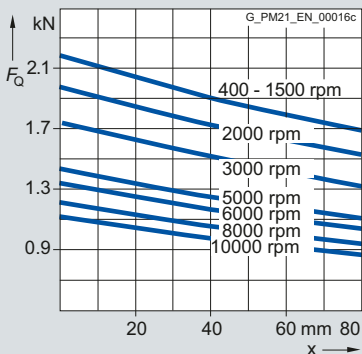
<sup>3)</sup> At rated pulse frequency of 2 kHz and speed ranges:  
1PH822 up to 4500 rpm  
1PH828 up to 3300 rpm.

#### Characteristic curves

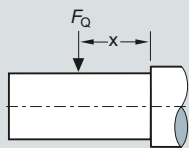
**Permissible radial forces**  
**1PH808 motors**  
**Standard**



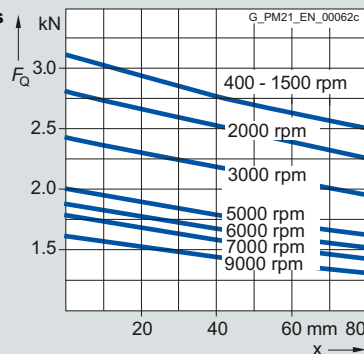
$L_{10h} = 20000 \text{ h}$



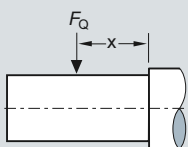
**Permissible radial forces**  
**1PH810 motors**  
**Standard**



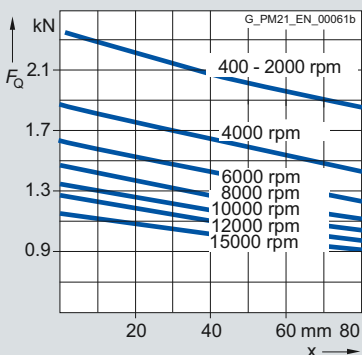
$L_{10h} = 20000 \text{ h}$



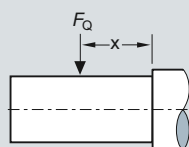
**Permissible radial forces**  
**1PH808 motors**  
**Performance**



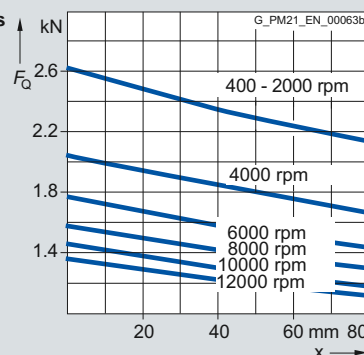
$L_{10h} = 12000 \text{ h}$



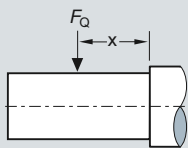
**Permissible radial forces**  
**1PH810 motors**  
**Performance**



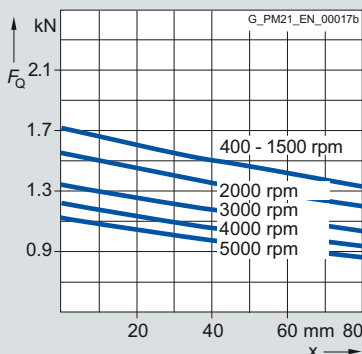
$L_{10h} = 12000 \text{ h}$



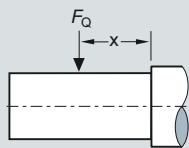
**Permissible radial forces**  
**1PH808 motors**  
**Advanced lifetime**



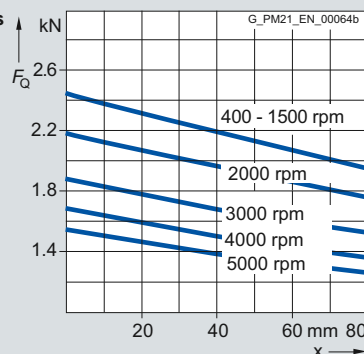
$L_{10h} = 40000 \text{ h}$



**Permissible radial forces**  
**1PH810 motors**  
**Advanced lifetime**



$L_{10h} = 40000 \text{ h}$



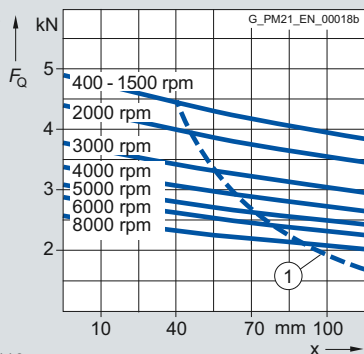
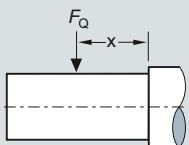
# SIMOTICS main motors

## Selection guides

### Selection guides for SIMOTICS M-1PH8 motors Radial force diagrams

#### Characteristic curves (continued)

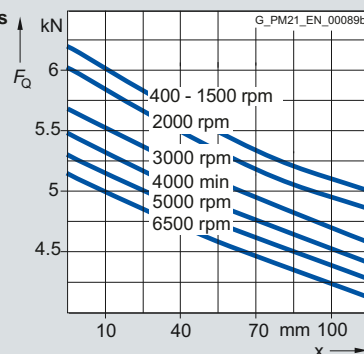
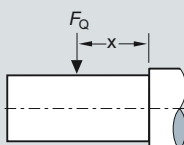
**Permissible radial forces  
1PH813 motors  
Standard**



① Maximum load for 1PH7-compatible shaft extension (42 x 110 mm (1.65 x 4.33 in)) (option V90)

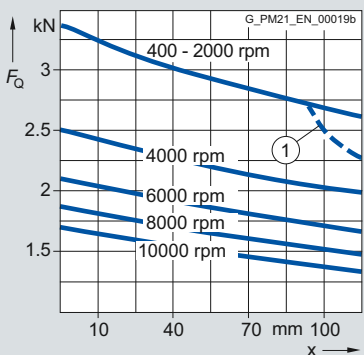
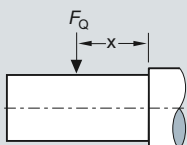
$L_{10h} = 20000$  h

**Permissible radial forces  
1PH816 motors  
Standard**



$L_{10h} = 20000$  h

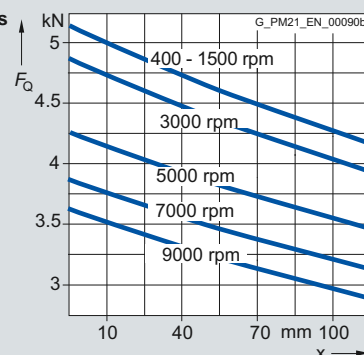
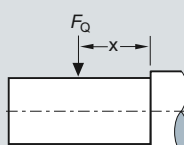
**Permissible radial forces  
1PH813 motors  
Performance**



① Maximum load for 1PH7-compatible shaft extension (42 x 110 mm (1.65 x 4.33 in)) (option V90)

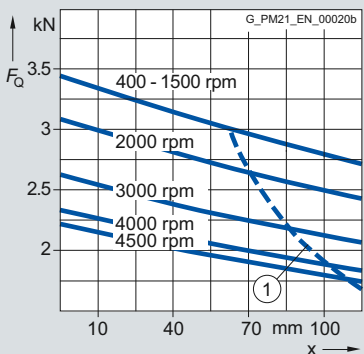
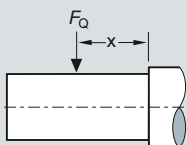
$L_{10h} = 12000$  h

**Permissible radial forces  
1PH816 motors  
Performance**



$L_{10h} = 12000$  h

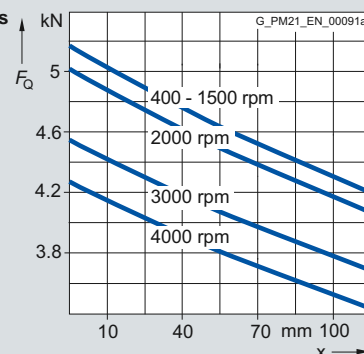
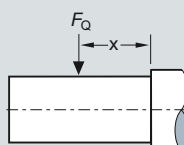
**Permissible radial forces  
1PH813 motors  
Advanced lifetime**



① Maximum load for 1PH7-compatible shaft extension (42 x 110 mm (1.65 x 4.33 in)) (option V90)

$L_{10h} = 40000$  h

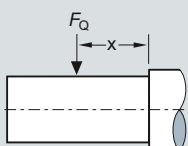
**Permissible radial forces  
1PH816 motors  
Advanced Lifetime**



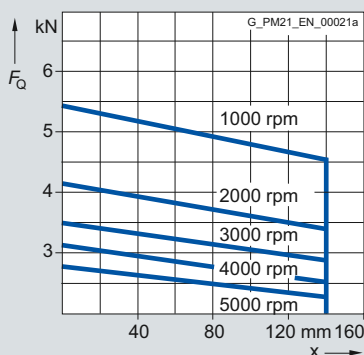
$L_{10h} = 40000$  h

#### Characteristic curves (continued)

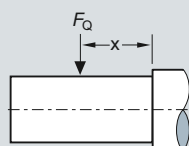
**Permissible radial forces**  
**1PH818 motors**  
**Standard**



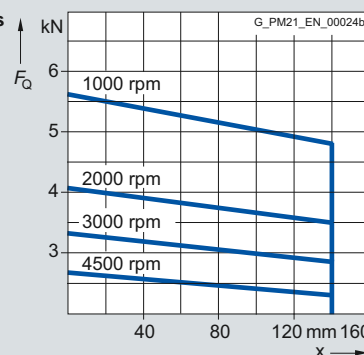
$L_{10h} = 20000$  h



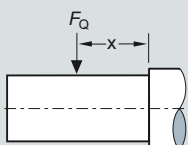
**Permissible radial forces**  
**1PH822 motors**  
**Standard**



$L_{10h} = 20000$  h

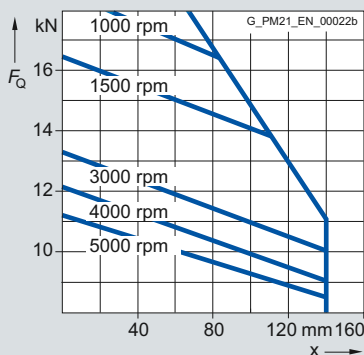


**Permissible radial forces**  
**1PH818 motors**  
**with increased radial force**

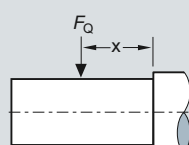


Minimum radial force 4 kN  
(899 lbf)

$L_{10h} = 12000$  h

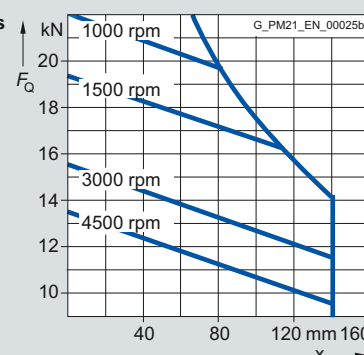


**Permissible radial forces**  
**1PH822 motors**  
**with increased radial force**

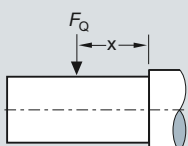


Minimum radial force 5 kN  
(1124 lbf)

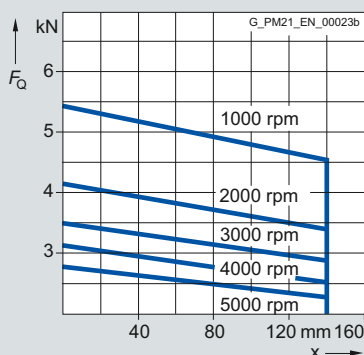
$L_{10h} = 12000$  h



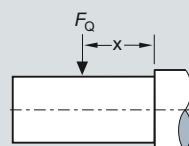
**Permissible radial forces**  
**1PH818 motors**  
**Performance**



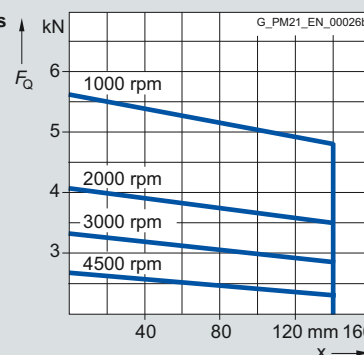
$L_{10h} = 12000$  h



**Permissible radial forces**  
**1PH822 motors**  
**Performance**



$L_{10h} = 12000$  h



The roller bearings used here (bearings with increased radial force) could sustain damage if they are operated under no load. Observe the specified minimum radial forces.

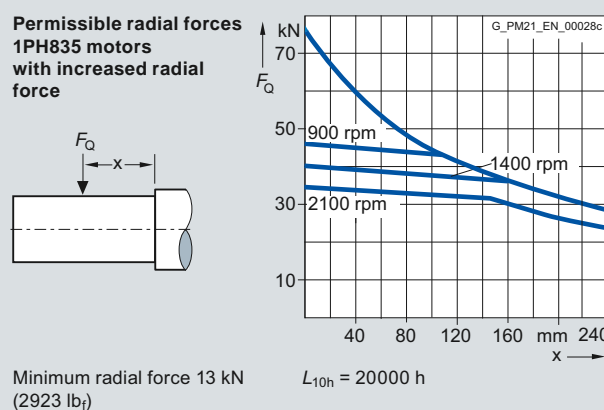
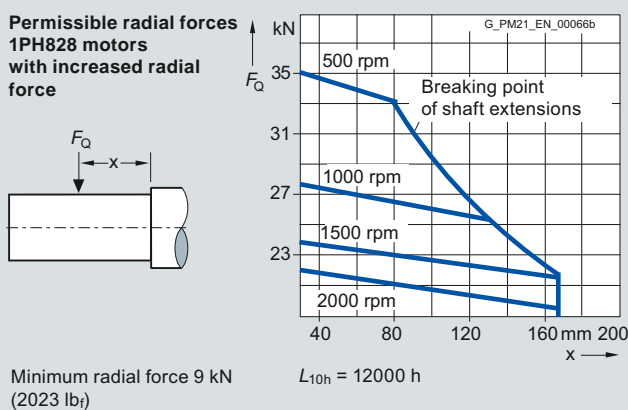
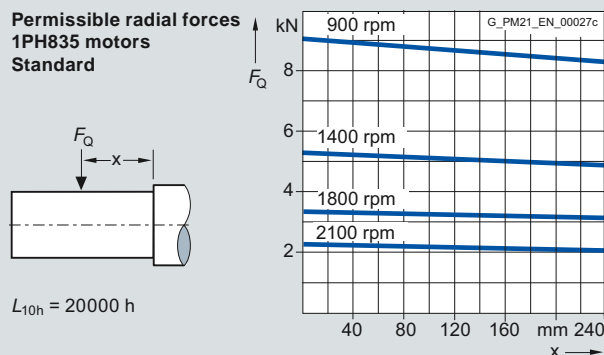
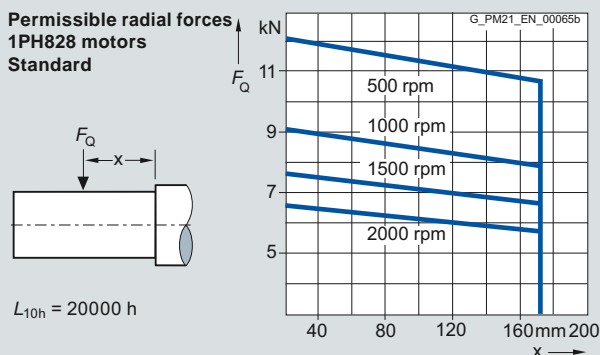
# SIMOTICS main motors

## Selection guides

### Selection guides for SIMOTICS M-1PH8 motors Radial force diagrams

#### Characteristic curves (continued)

5



The roller bearings used here (bearings with increased radial force) could sustain damage if they are operated under no load. Observe the specified minimum radial forces.



#### Overview

##### Mounted holding brake for 1PH8 motors

A brake can be mounted on the DE of 1PH808 to 1PH822 motors.

These brakes are electromagnetic units for dry-running operation. An electromagnetic field is used to release the brake which is applied using spring force. They operate in accordance with the quiescent current principle, i.e. when no current is flowing, the spring-operated brake brakes and holds the drive. When current is flowing, the brake is released and the drive can turn.

When the power fails or an emergency stop is issued, the drive is braked from its current speed down to standstill.

Connection of the brakes (must be provided by the customer)

- Alternating voltage 230 V 1 AC, 50/60 Hz
- Direct voltage 24 V DC up to 1PH816

The brake module is designed for an ambient temperature of -5 °C (41 °F) to +40 °C (104 °F).

The maximum speed of a motor with brake is limited to the maximum speed of the brake (refer to the table).

**The holding brakes are not UL-approved. Motors with brake mounting therefore do not have the cUR marking.**

Motor type	Brake type	Holding torque	Maximum speed	Moment of inertia	Weight	Coil current		Single switching energy, perm. $W_E$	Total moment of inertia (emergency stop) $J_{tot}$	Speed (emergency stop) $n$	Number of emergency stops <sup>1)</sup> $z$	Opening time	Closing time
						230 V AC ±10 %	24 V DC ±10 %						
		Nm (lb <sub>f</sub> -ft)	$n_{max}$ rpm	$J_{Br}$ kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	$m_{Br}$ kg (lb)	A	A	kJ	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	rpm		ms	ms
1PH808	Size 13	29 (21.4)	5000	0.00093 (0.0082)	10 (22.0)	0.8	4.1	2.2	0.0174 (0.154)	4800	2000	150	40
1PH810	Size 19	60 ... 150 (44.3 ... 111)	5000	0.0048 (0.042)	21 (46.3)	1.0	4.7	7	0.063 (0.558)	4500	2000	500	60
1PH813	Size 24	140 ... 310 (103 ... 229)	4500	0.0141 (0.125)	46 (101)	1.3	6.3	15.5	0.218 (1.930)	3600	2000	650	100
1PH816	Size 29	280 ... 500 (207 ... 369)	4000	0.0266 (0.235)	66 (145)	1.4	6.7	24	0.456 (4.036)	3100	2000	750	150
1PH818	NFF-A 63	1000 (738)	3500	0.022 (0.195)	63 (139)	2.2	–	98	1.3 (11.5)	3000	2000	300	80
1PH822	NFF-A 100	1600 (1180)	3100	0.051 (0.451)	88 (194)	2.7	–	210	3.9 (34.5)	2800	1200	300	100

#### Explanation of terms

Holding torque	For 1PH810 to 1PH816 motors, the holding torque can be continuously set in the specified value range using a setting ring. The dynamic braking torque is approximately 70 % of the set holding torque.
Single switching energy, perm. $W_E$	Perm. switching energy for emergency stop $W_E = J_{tot} \times n^2 / 182.4 \times 10^{-3}$ ( $J$ in kgm <sup>2</sup> , $n$ in rpm)
Service life switching energy $W_{max}$	Max. possible switching energy of the brake (for emergency stop) until the brake linings must be replaced, $W_{max} = W_E \times z$ .
Number of emergency stops $z$	The specified number of emergency stops refers to the specified conditions. A conversion can be made for operation under different conditions: Number of emergency stops $z = W_{max} / W_E$
Coil current	Current to release the brake.
Opening time	Separating time until the brake opens (the specified values refer to the maximum braking torque and with rated voltage).
Closing time	Interlocking time until the brake closes (values refer to the maximum braking torque and with rated voltage).

<sup>1)</sup> Max. 3 switching operations per hour

# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 80 – Forced ventilation

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HD	HE
--------------	------	-------	----	---	---	---	----	----	----

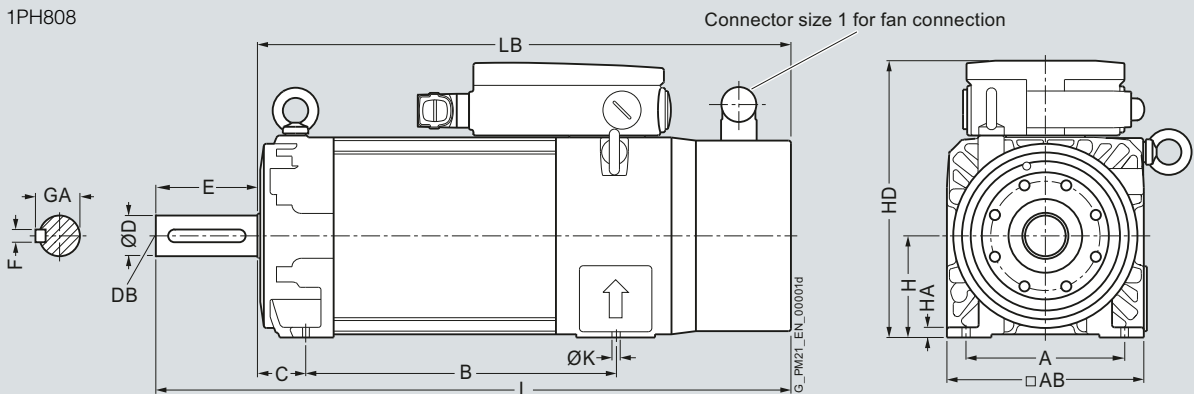
1PH8, type of construction IM B3, forced ventilation

80	1PH8083	125 (4.92)	155 (6.10)	194 (7.64)	38 (1.50)	80 (3.15)	8 (0.31)	216 (8.50)	253.5 (9.98)
	1PH8087			244 (9.61)					

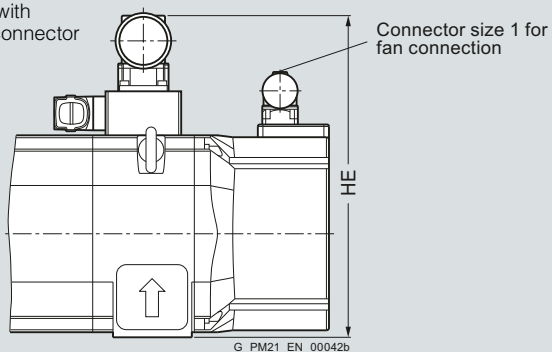
Shaft height	Type	IEC L	LB	K	Shaft extension DE		E	F	GA
					D	DB			

80	1PH8083	455 (17.91)	375 (14.76)	10 (0.39)	<b>32</b> <b>(1.26)</b>	M12	80 (3.15)	10 (0.39)	35 (1.38)
	1PH8087	505 (19.88)	425 (16.73)						

1PH808



Variant with power connector size 1.5



5

# SIMOTICS main motors

## Dimensional drawings

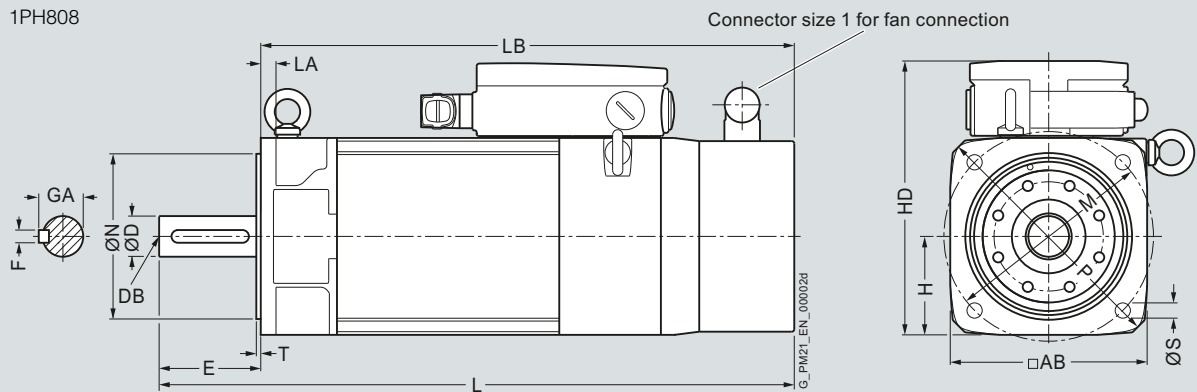
### SIMOTICS M-1PH8 asynchronous motors Shaft height 80 – Forced ventilation

#### Dimensional drawings

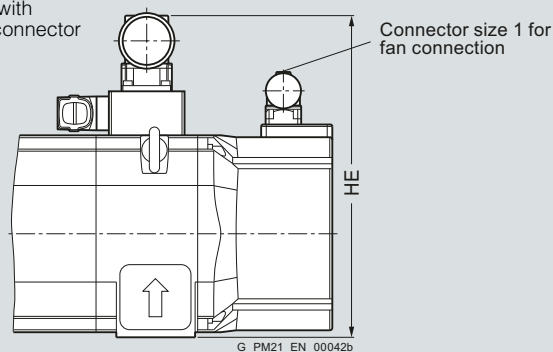
For motor		Dimensions in mm (inches)								
Shaft height	Type	IEC AB	H	HD	HE	L	LA	LB	M	N
<b>1PH8, type of construction IM B5, forced ventilation</b>										
80	1PH8083	155 (6.10)	77.5 (3.05)	213.5 (8.41)	251 (9.88)	455 (17.91)	12 (0.47)	375 (14.76)	165 (6.50)	130 (5.12)
	1PH8087					505 (19.88)		425 (16.73)		

Shaft height	Type	IEC P	S	T	Shaft extension DE				
					D	DB	E	F	GA
80	1PH8083	200 (7.87)	12 (0.47)	3.5 (0.14)	<b>32</b> <b>(1.26)</b>	M12	80 (3.15)	10 (0.39)	35 (1.38)
	1PH8087								

1PH808



Variant with power connector size 1.5



# SIMOTICS main motors

## Dimensional drawings

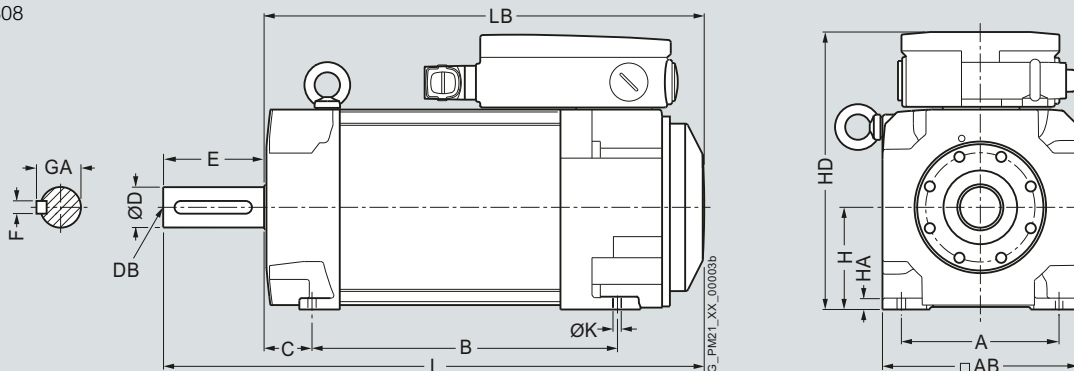
### SIMOTICS M-1PH8 asynchronous motors Shaft height 80 – Water cooling

#### Dimensional drawings

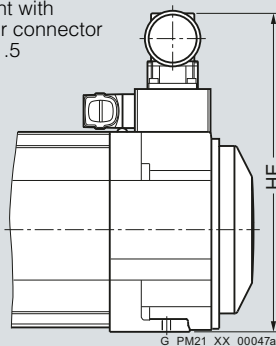
For motor		Dimensions in mm (inches)							
Shaft height	Type	IEC A	AB	B	C	H	HA	HD	HE
<b>1PH8, type of construction IM B3, water cooling</b>									
80	1PH8083	125 (4.92)	155 (6.10)	194 (7.64)	38 (1.50)	80 (3.15)	8 (0.31)	216 (8.50)	253.5 (9.98)
	1PH8087			244 (9.61)					

Shaft height	Type	IEC K	L	LB	Shaft extension DE		E	F	GA
					D	DB			
80	1PH8083	10 (0.39)	381.5 (15.02)	301.5 (11.87)	<b>32</b> <b>(1.26)</b>	M12	80 (3.15)	10 (0.39)	35 (1.38)
	1PH8087		431.5 (16.99)	351.5 (13.84)					

1PH808



Variant with power connector size 1.5



5

# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 80 – Water cooling

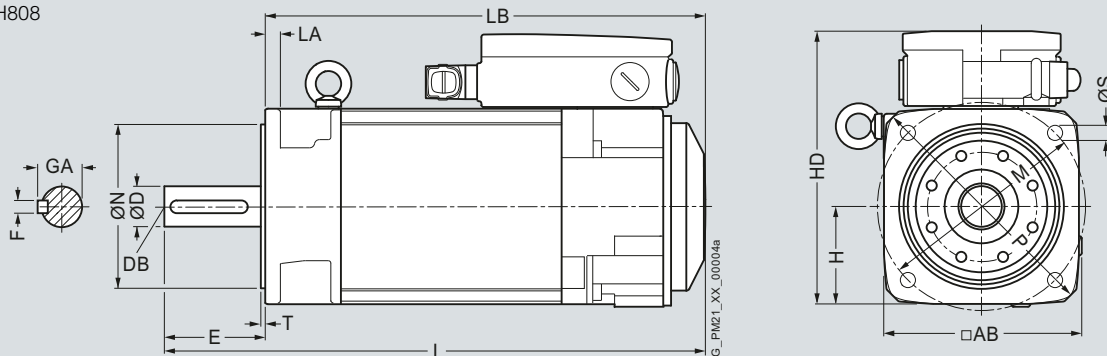
#### Dimensional drawings

For motor Dimensions in mm (inches)

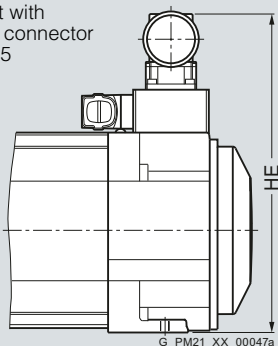
Shaft height	Type	IEC AB	H	HD	HE	L	LA	LB	M	N
<b>1PH8, type of construction IM B5, water cooling</b>										
80	1PH8083	155 (6.10)	77.5 (3.05)	213.5 (8.41)	251 (9.88)	381.5 (15.02)	12 (0.47)	301.5 (11.87)	165 (6.50)	130 (5.12)
	1PH8087					431.5 (16.99)		351.5 (13.84)		

Shaft height	Type	IEC P	S	T	Shaft extension DE				
					D	DB	E	F	GA
80	1PH8083	200 (7.87)	12 (0.47)	3.5 (0.14)	<b>32</b> <b>(1.26)</b>	M12	80 (3.15)	10 (0.39)	35 (1.38)
	1PH8087								

1PH808



Variant with power connector size 1.5



# SIMOTICS main motors

## Dimensional drawings

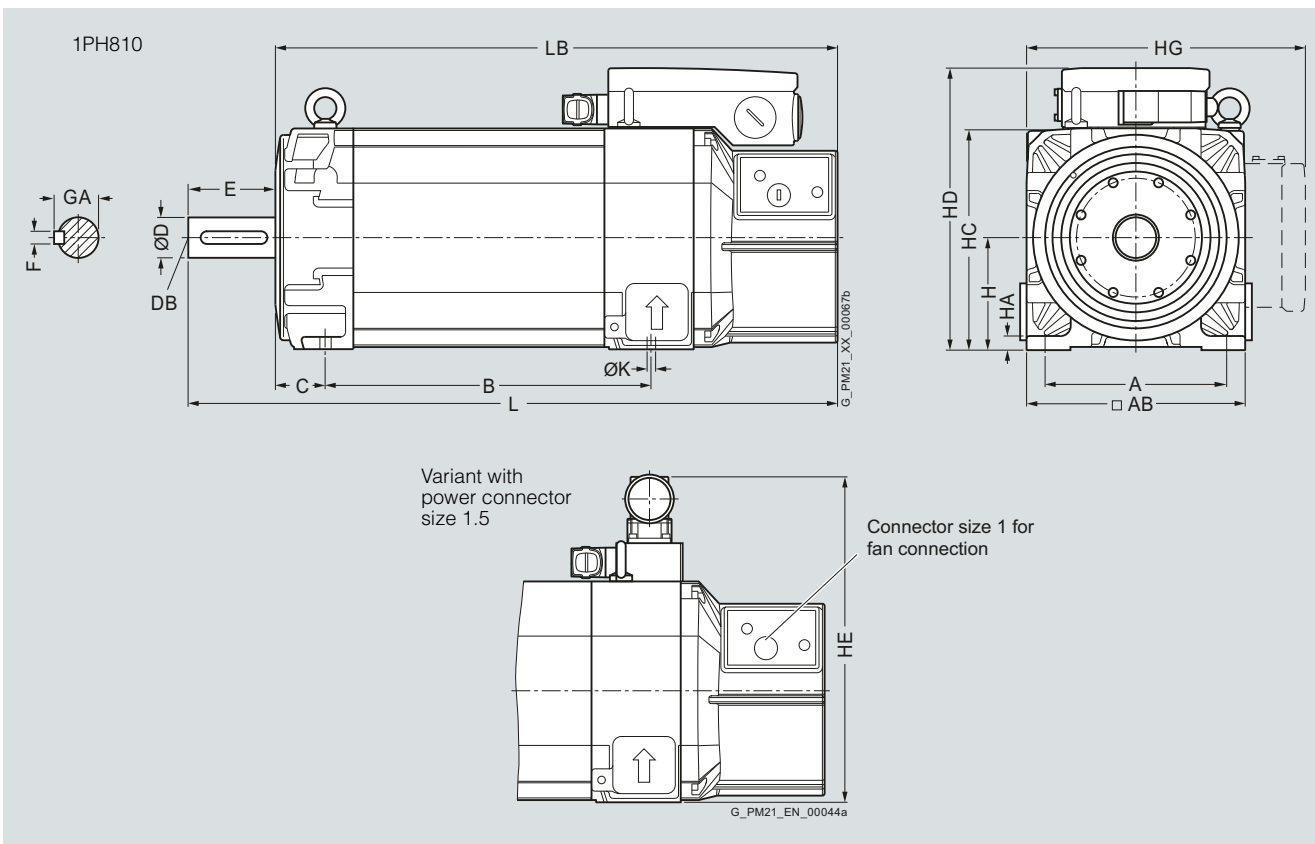
### SIMOTICS M-1PH8 asynchronous motors Shaft height 100 – Forced ventilation

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	C	B	H	HA	HC	HD	HE
<b>1PH8, type of construction IM B3, forced ventilation</b>										
100	1PH8101	160 (6.30)	196 (7.72)	43 (1.69)	167 (6.57)	100 (3.94)	11 (0.43)	198 (7.80)	252 (9.92)	294 (11.57)
	1PH8103				202.5 (7.97)					
	1PH8105				262 (10.31)					
	1PH8107				297.5 (11.71)					

Shaft height	Type	IEC HG	L	K	LB	Shaft extension DE				
						D	DB	E	F	GA
100	1PH8101	276.5 (10.89)	449.5 (17.70)	12 (0.47)	369.5 (14.55)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103		485 (19.09)		405 (15.94)					
	1PH8105		544.5 (21.44)		464.5 (18.29)					
	1PH8107		580 (22.83)		500 (19.69)					



# SIMOTICS main motors

## Dimensional drawings

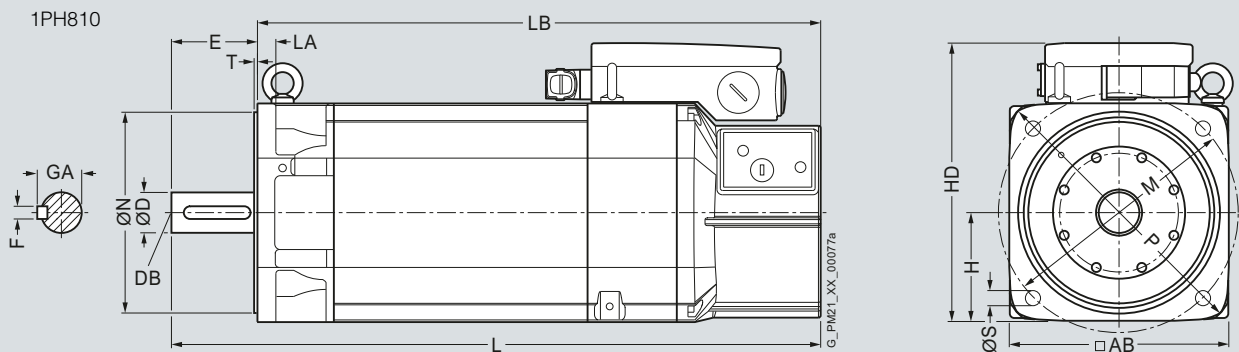
### SIMOTICS M-1PH8 asynchronous motors Shaft height 100 – Forced ventilation

#### Dimensional drawings

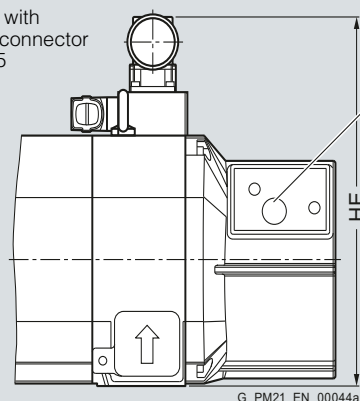
For motor Dimensions in mm (inches)

Shaft height	Type	IEC AB	H	HD	HE	L	LA	LB	M	N
<b>1PH8, type of construction IM B5, forced ventilation</b>										
100	1PH8101	196 (7.72)	98 (3.86)	250 (9.84)	292 (11.50)	449.5 (17.70)	16 (0.63)	369.5 (14.55)	215 (8.46)	180 (7.09)
	1PH8103					485 (19.09)		405 (15.94)		
	1PH8105					544.5 (21.44)		464.5 (18.29)		
	1PH8107					580 (22.83)		500 (19.69)		

Shaft height	Type	IEC P	S	T	Shaft extension DE				
					D	DB	E	F	GA
100	1PH8101	250 (9.84)	14 (0.55)	4 (0.16)	<b>38</b> (1.50)	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103								
	1PH8105								
	1PH8107								



Variant with  
power connector  
size 1.5



Connector size 1 for  
fan connection

# SIMOTICS main motors

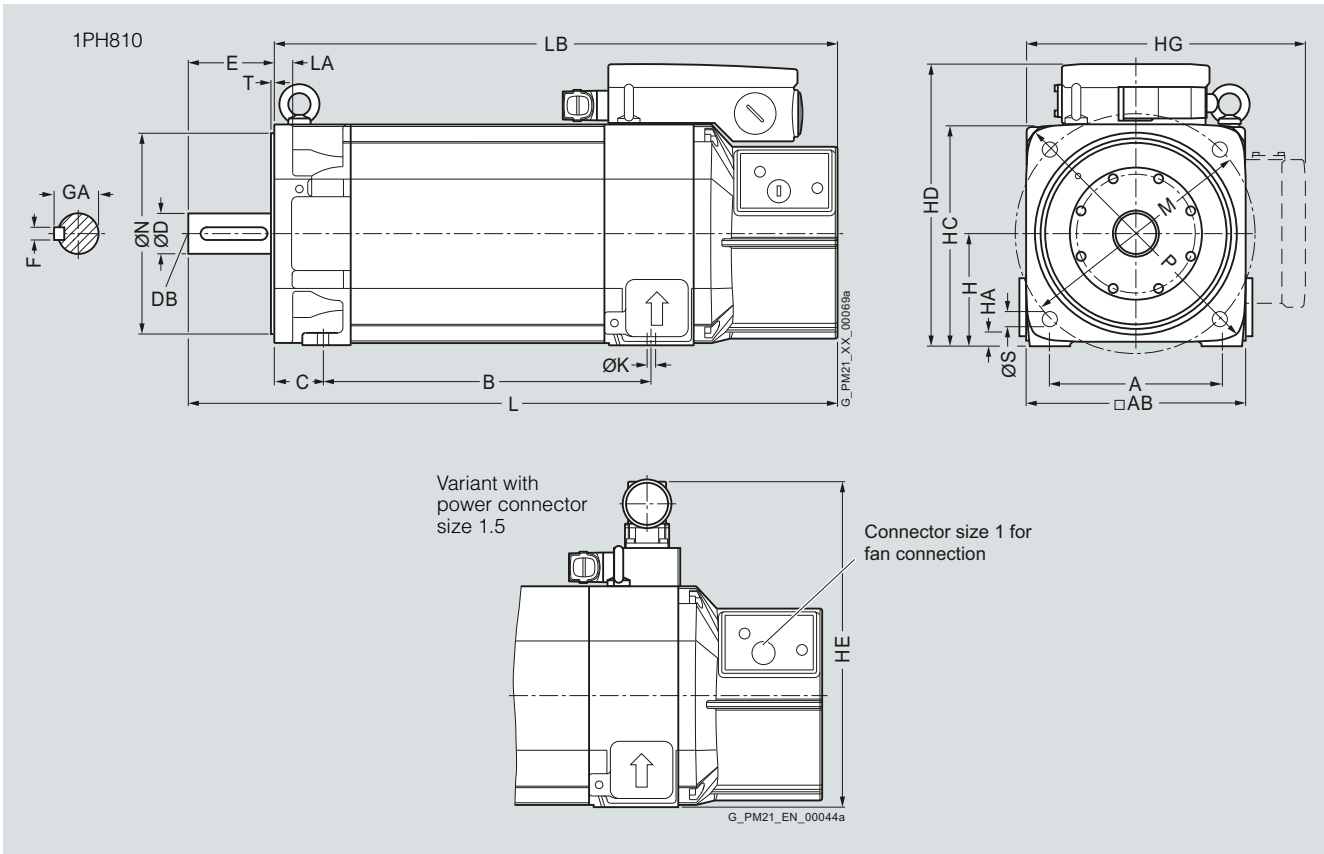
## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 100 – Forced ventilation

#### Dimensional drawings

For motor		Dimensions in mm (inches)											
Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE	HG	K	L
<b>1PH8, type of construction IM B35, forced ventilation</b>													
100	1PH8101	160 (6.30)	196 (7.72)	167 (6.57)	43 (1.69)	100 (3.94)	11 (0.43)	198 (7.80)	252 (9.92)	294 (11.57)	276.5 (10.89)	12 (0.47)	449.5 (17.70)
	1PH8103			202.5 (7.97)									485 (19.09)
	1PH8105			262 (10.31)									544.5 (21.44)
	1PH8107			297.5 (11.71)									580 (22.83)

Shaft height	Type	IEC LA	LB	M	N	P	S	T	Shaft extension DE				
									D	DB	E	F	GA
100	1PH8101	16 (0.63)	369.5 (14.55)	215 (8.46)	180 (7.09)	250 (9.84)	14 (0.55)	4 (0.16)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103		405 (15.94)										
	1PH8105		464.5 (18.29)										
	1PH8107		500 (19.69)										



5



# SIMOTICS main motors

## Dimensional drawings

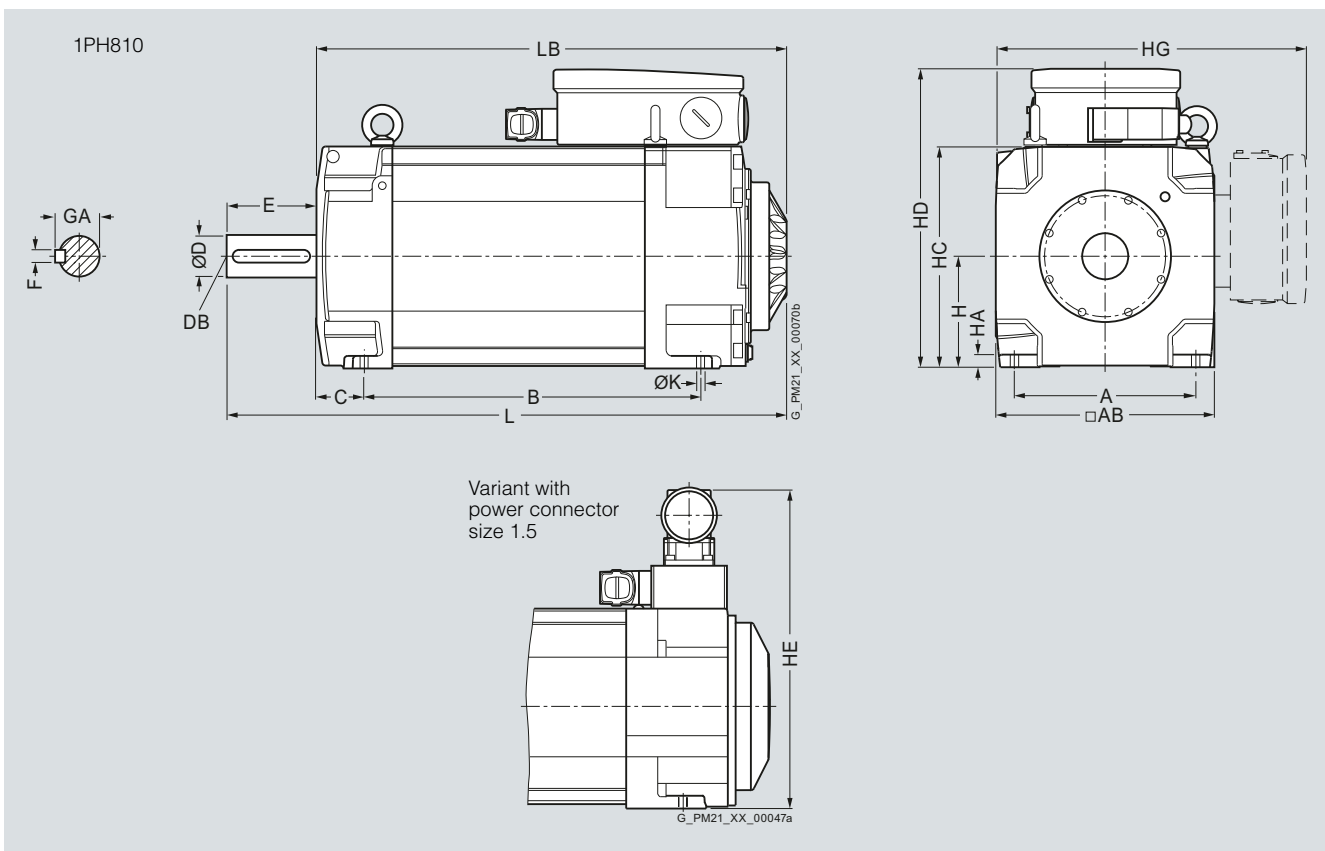
### SIMOTICS M-1PH8 asynchronous motors Shaft height 100 – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE
<b>1PH8, type of construction IM B3, water cooling</b>										
100	1PH8101	160 (6.30)	196 (7.72)	167 (6.57)	43 (1.69)	100 (3.94)	11 (0.43)	198 (7.80)	266.5 (10.49)	294 (11.57)
	1PH8103			202.5 (7.97)						
	1PH8105			262 (10.31)						
	1PH8107			297.5 (11.71)						

Shaft height	Type	IEC HG	K	L	LB	Shaft extension DE				
						D	DB	E	F	GA
100	1PH8101	276.5 (10.89)	12 (0.47)	369.5 (14.55)	289.5 (11.40)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103			405 (15.94)	325 (12.80)					
	1PH8105			464.5 (18.29)	384.5 (15.14)					
	1PH8107			500 (19.69)	420 (16.54)					



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 100 – Water cooling

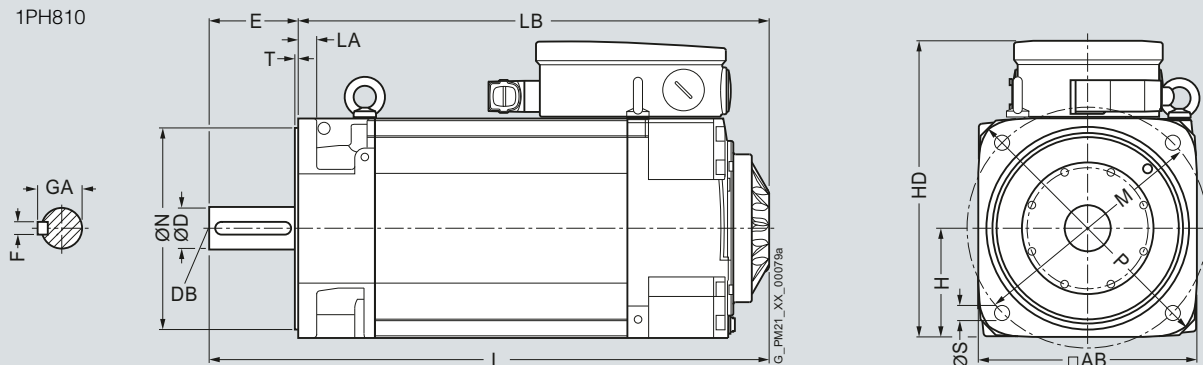
#### Dimensional drawings

For motor Dimensions in mm (inches)

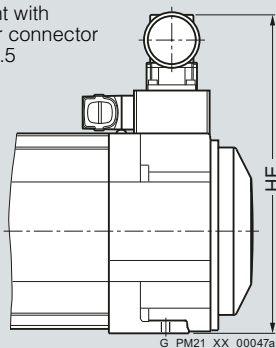
Shaft height	Type	IEC AB	H	HD	HE	L	LA	LB	M	N
<b>1PH8, type of construction IM B5, water cooling</b>										
100	1PH8101	196 (7.72)	98 (3.86)	264.5 (10.41)	292 (11.50)	369.5 (14.55)	16 (0.63)	289.5 (11.40)	215 (8.46)	180 (7.09)
	1PH8103					405 (15.94)		325 (12.80)		
	1PH8105					464.5 (18.29)		384.5 (15.14)		
	1PH8107					500 (19.69)		420 (16.54)		

Shaft height	Type	IEC P	S	T	Shaft extension DE				
					D	DB	E	F	GA
100	1PH8101	250 (9.84)	14 (0.55)	4 (0.16)	<b>38</b> (1.50)	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103								
	1PH8105								
	1PH8107								

1PH810



Variant with  
power connector  
size 1.5



# SIMOTICS main motors

## Dimensional drawings

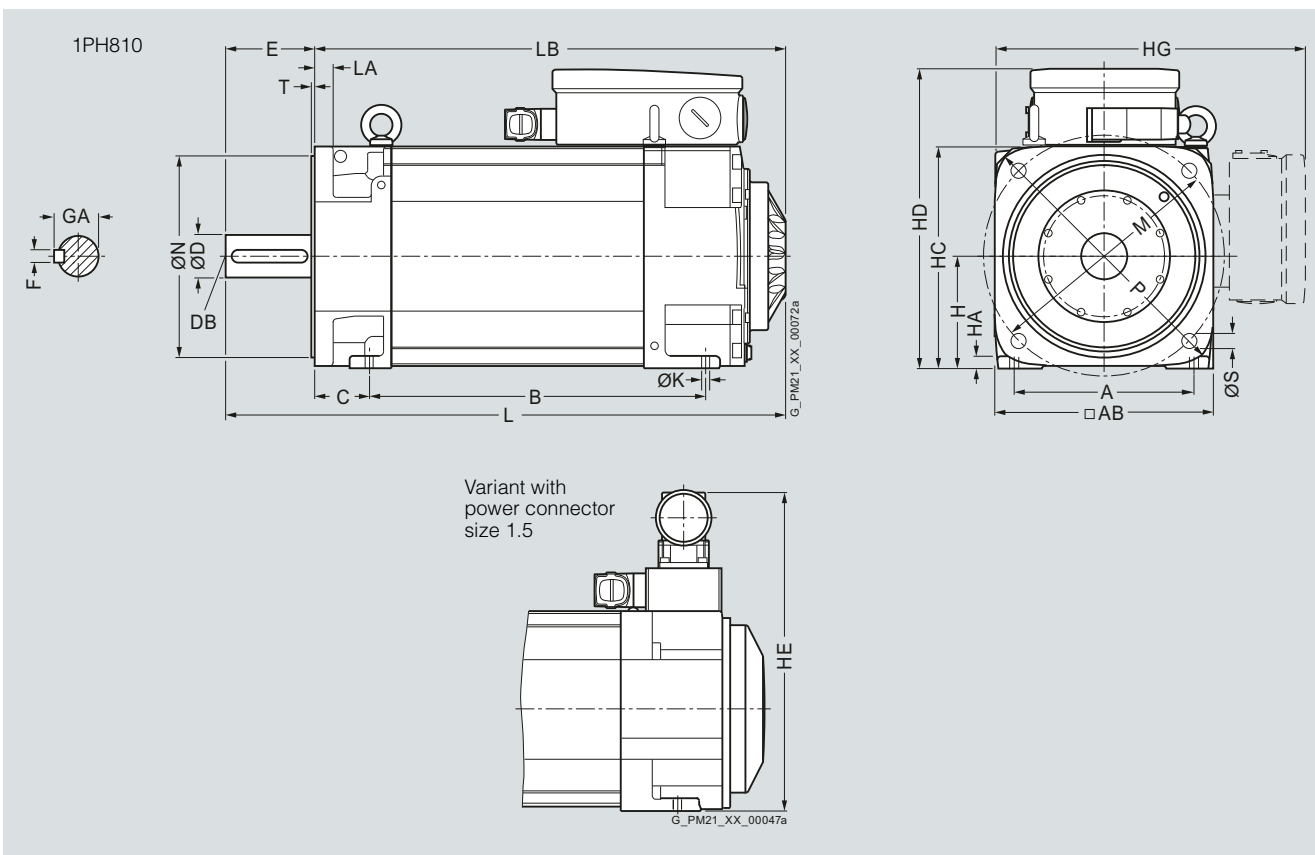
### SIMOTICS M-1PH8 asynchronous motors Shaft height 100 – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE	HG	K	L
<b>1PH8, type of construction IM B35, water cooling</b>													
100	1PH8101	160 (6.30)	196 (7.72)	167 (6.57)	43 (1.69)	100 (3.94)	11 (0.43)	198 (7.80)	266.5 (10.49)	294 (11.57)	276.5 (10.89)	12 (0.47)	369.5 (14.55)
	1PH8103			202.5 (7.97)									405 (15.94)
	1PH8105			262 (10.31)									464.5 (18.29)
	1PH8107			297.5 (11.71)									500 (19.69)

Shaft height	Type	IEC LA	LB	M	N	P	S	T	Shaft extension DE				
									D	DB	E	F	GA
100	1PH8101	16 (0.63)	289.5 (11.40)	215 (8.46)	180 (7.09)	250 (9.84)	14 (0.55)	4 (0.16)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	10 (0.39)	41 (1.61)
	1PH8103		325 (12.80)										
	1PH8105		384.5 (15.14)										
	1PH8107		420 (16.54)										



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 132 – Forced ventilation

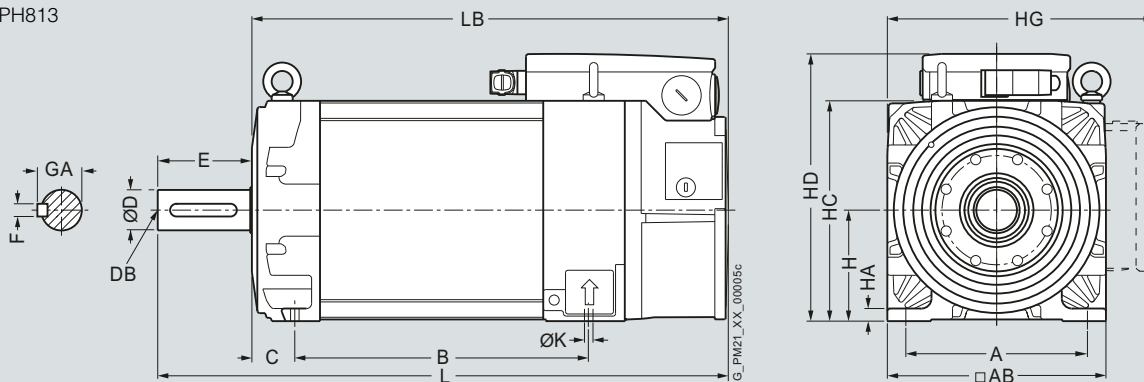
#### Dimensional drawings

For motor Dimensions in mm (inches)

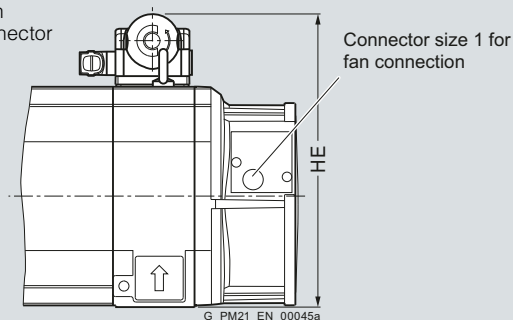
Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE
<b>1PH8, type of construction IM B3, forced ventilation</b>										
132	1PH8131	216 (8.50)	260 (10.24)	220.5 (8.68)	53 (2.09)	132 (5.20)	15 (0.59)	262 (10.31)	317.5 (12.50)	347 (13.66)
	1PH8133			265.5 (10.45)						
	1PH8135			310.5 (12.22)						
	1PH8137			350.5 (13.80)						

Shaft height	Type	IEC HG	K	L	LB	Shaft extension DE				
						D	DB	E	F	GA
132	1PH8131	357.5 (14.07)	12 (0.47)	549 (21.61)	439 (17.28)	<b>48</b> <b>(1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133			594 (23.39)	484 (19.06)					
	1PH8135			639 (25.16)	529 (20.83)					
	1PH8137			679 (26.73)	569 (22.40)					

1PH813



Variant with  
power connector  
size 3



G\_PM21\_EN\_00045a

# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 132 – Forced ventilation

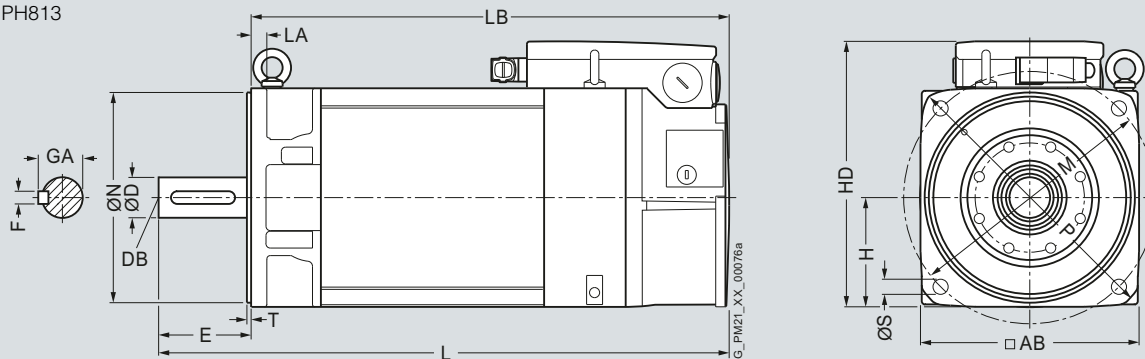
#### Dimensional drawings

For motor Dimensions in mm (inches)

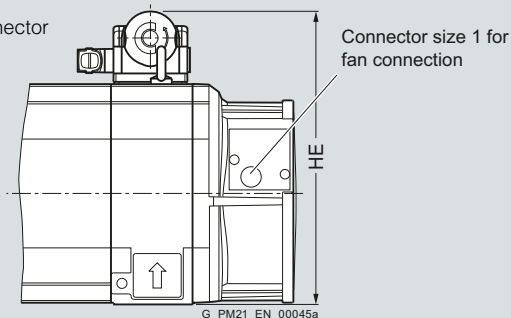
Shaft height	Type	IEC AB	H	HD	HE	L	LA	LB	M	N
<b>1PH8, type of construction IM B5, forced ventilation</b>										
132	1PH8131	260 (10.24)	130 (5.12)	315.5 (12.42)	345 (13.58)	549 (21.61)	18 (0.71)	439 (17.28)	300 (11.81)	250 (9.84)
	1PH8133					594 (23.39)		484 (19.06)		
	1PH8135					639 (25.16)		529 (20.83)		
	1PH8137					679 (26.73)		569 (22.40)		

Shaft height	Type	IEC P	S	T	Shaft extension DE				
					D	DB	E	F	GA
132	1PH8131	340 (13.39)	18 (0.71)	5 (0.20)	<b>48</b> <b>(1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133								
	1PH8135								
	1PH8137								

1PH813



Variant with power connector size 3



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 132 – Forced ventilation

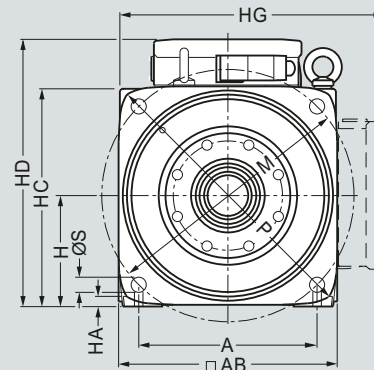
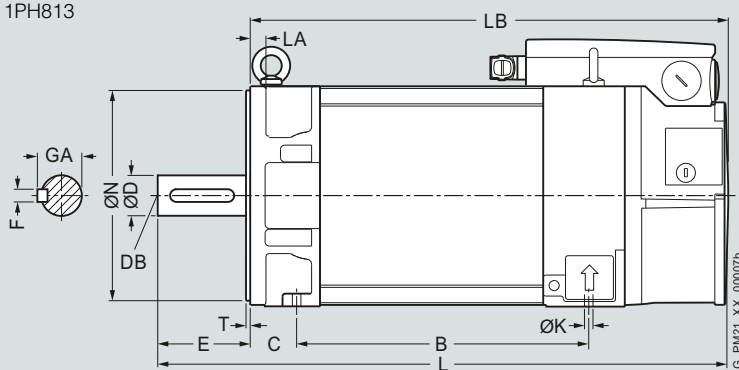
#### Dimensional drawings

For motor Dimensions in mm (inches)

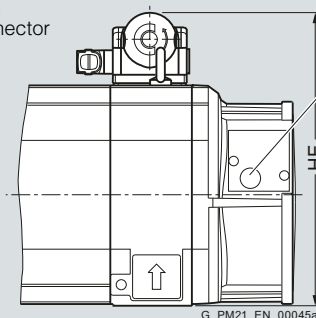
Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE	HG	K	L
<b>1PH8, type of construction IM B35, forced ventilation</b>													
132	1PH8131	216 (8.50)	260 (10.24)	220.5 (8.68)	53 (2.09)	132 (5.20)	15 (0.59)	262 (10.31)	317.5 (12.50)	347 (13.66)	357.5 (14.07)	12 (0.47)	549 (21.61)
	1PH8133			265.5 (10.45)									594 (23.39)
	1PH8135			310.5 (12.22)									639 (25.16)
	1PH8137			350.5 (13.80)									679 (26.73)

Shaft height	Type	IEC LA	LB	M	N	P	S	T	Shaft extension DE				
									D	DB	E	F	GA
132	1PH8131	18 (0.71)	439 (17.28)	300 (11.81)	250 (9.84)	340 (13.39)	18 (0.71)	5 (0.20)	<b>48</b> <b>(1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133		484 (19.06)										
	1PH8135		529 (20.83)										
	1PH8137		569 (22.40)										

1PH813



Variant with power connector size 3



Connector size 1 for fan connection

# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 132 – Water cooling

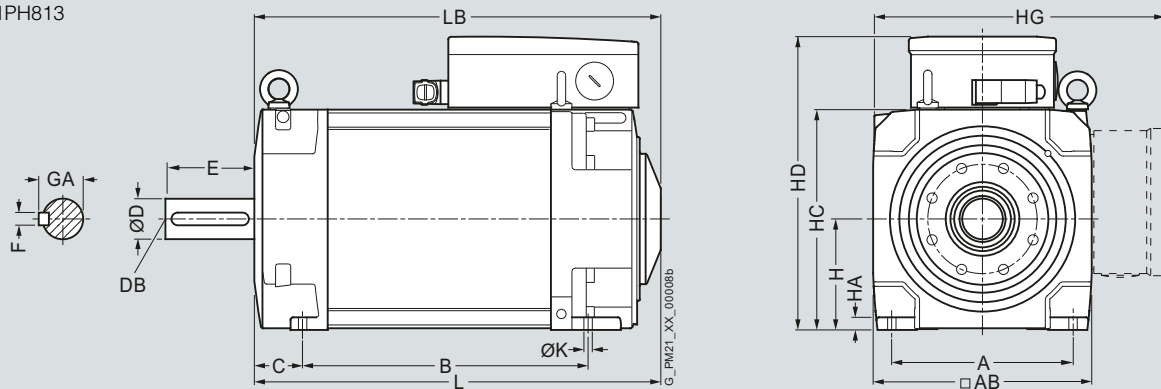
#### Dimensional drawings

For motor Dimensions in mm (inches)

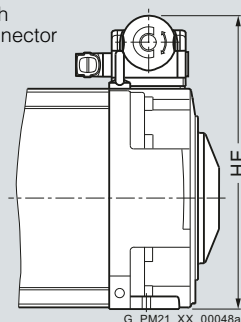
Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE
<b>1PH8, type of construction IM B3, water cooling</b>										
132	1PH8131	216 (8.50)	260 (10.24)	220.5 (8.68)	53 (2.09)	132 (5.20)	15 (0.59)	262 (10.31)	347.5 (13.68)	347 (13.66)
	1PH8133			265.5 (10.45)						
	1PH8135			310.5 (12.22)						
	1PH8137/ 1PH8138			350.5 (13.80)						

Shaft height	Type	IEC HG	K	L	LB	Shaft extension DE				
						D	DB	E	F	GA
132	1PH8131	357.5 (14.07)	12 (0.47)	457.5 (18.01)	347.5 (13.68)	<b>48</b> <b>(1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133			502.5 (19.78)	392.5 (15.45)					
	1PH8135			547.5 (21.56)	437.5 (17.22)					
	1PH8137/ 1PH8138			587.5 (23.13)	477.5 (18.80)					

1PH813



Variant with  
power connector  
size 3



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 132 – Water cooling

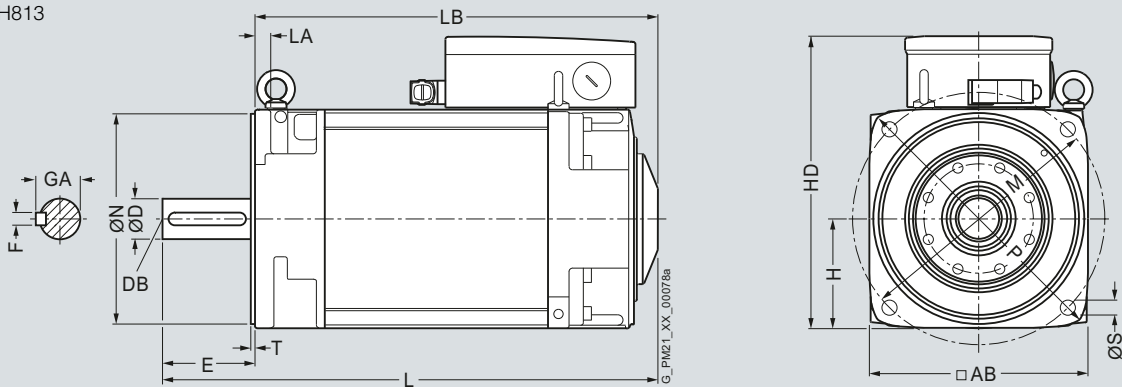
#### Dimensional drawings

For motor                      Dimensions in mm (inches)

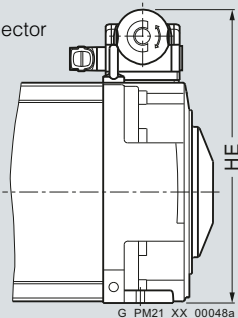
Shaft height	Type	IEC AB	H	HD	HE	L	LA	LB	M	N
<b>1PH8, type of construction IM B5, water cooling</b>										
132	1PH8131	260 (10.24)	132 (5.20)	345.5 (13.60)	345 (13.58)	457.5 (18.01)	18 (0.71)	347.5 (13.68)	300 (11.81)	250 (9.84)
	1PH8133					502.5 (19.78)		392.5 (15.45)		
	1PH8135					547.5 (21.56)		437.5 (17.22)		
	1PH8137/ 1PH8138					587.5 (23.13)		477.5 (18.80)		

Shaft height	Type	IEC P	S	T	Shaft extension DE				
					D	DB	E	F	GA
132	1PH8131	340 (13.39)	18 (0.71)	5 (0.20)	<b>48</b> <b>(1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133								
	1PH8135								
	1PH8137/ 1PH8138								

1PH813



Variant with power connector size 3





# SIMOTICS main motors

## Dimensional drawings

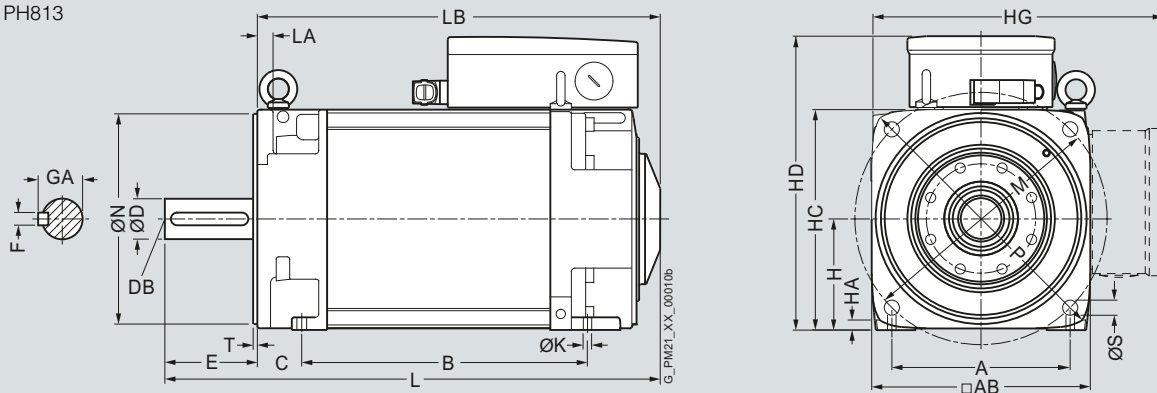
**SIMOTICS M-1PH8 asynchronous and synchronous motors**  
**Shaft height 132 – Water cooling**

### Dimensional drawings

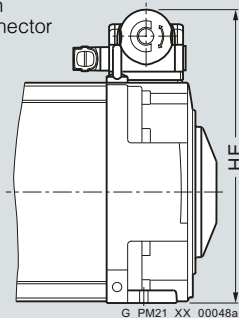
For motor		Dimensions in mm (inches)											
Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HE	HG	K	L
<b>1PH8, type of construction IM B35, water cooling</b>													
132	1PH8131	216 (8.50)	260 (10.24)	220.5 (8.68)	53 (2.09)	132 (5.20)	15 (0.59)	262 (10.31)	347.5 (13.68)	347 (13.66)	357.5 (14.07)	12 (0.47)	457.5 (18.01)
	1PH8133			265.5 (10.45)									502.5 (19.78)
	1PH8135			310.5 (12.22)									547.5 (21.56)
	1PH8137/ 1PH8138			350.5 (13.80)									587.5 (23.13)

Shaft height	Type	IEC LA	LB	M	N	P	S	T	Shaft extension DE				
									D	DB	E	F	GA
132	1PH8131	18 (0.71)	347.5 (13.68)	300 (11.81)	250 (9.84)	340 (13.39)	18 (0.71)	5 (0.20)	<b>48 (1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)
	1PH8133		392.5 (15.45)										
	1PH8135		437.5 (17.22)										
	1PH8137/ 1PH8138		477.5 (18.80)										

1PH813



Variant with power connector size 3



# SIMOTICS main motors

## Dimensional drawings

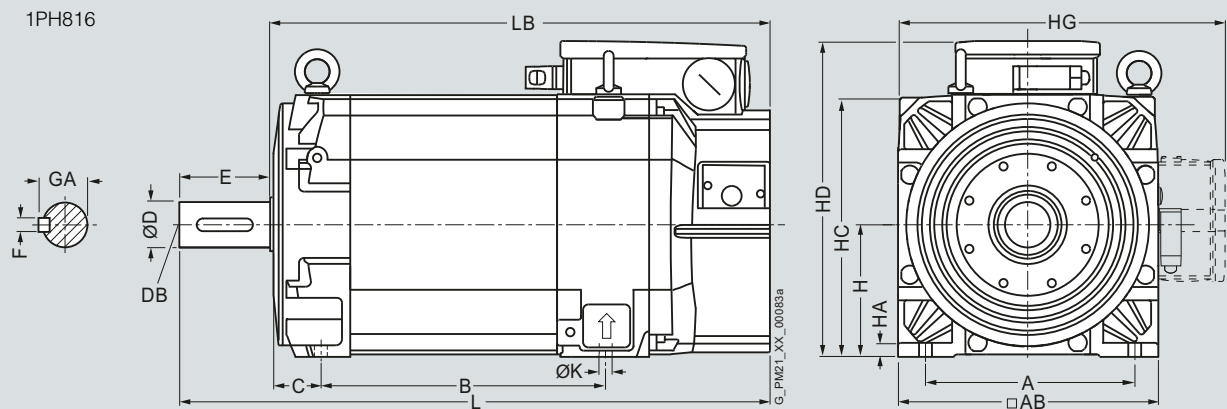
### SIMOTICS M-1PH8 asynchronous motors Shaft height 160 – Forced ventilation

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HG
<b>1PH8, type of construction IM B3, forced ventilation</b>										
160	1PH8163	254 (10.00)	314 (12.36)	346.5 (13.64)	61 (2.40)	160 (6.30)	17 (0.67)	317 (12.48)	382.5 (15.06)	412.5 (16.24)
	1PH8165			406.5 (16.00)						

Shaft height	Type	IEC K	L	LB	Shaft extension DE				
					D	DB	E	F	GA
160	1PH8163	14 (0.55)	720.5 (28.37)	610.5 (24.04)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)
	1PH8165		780.5 (30.73)	670.5 (26.40)					



# SIMOTICS main motors

## Dimensional drawings

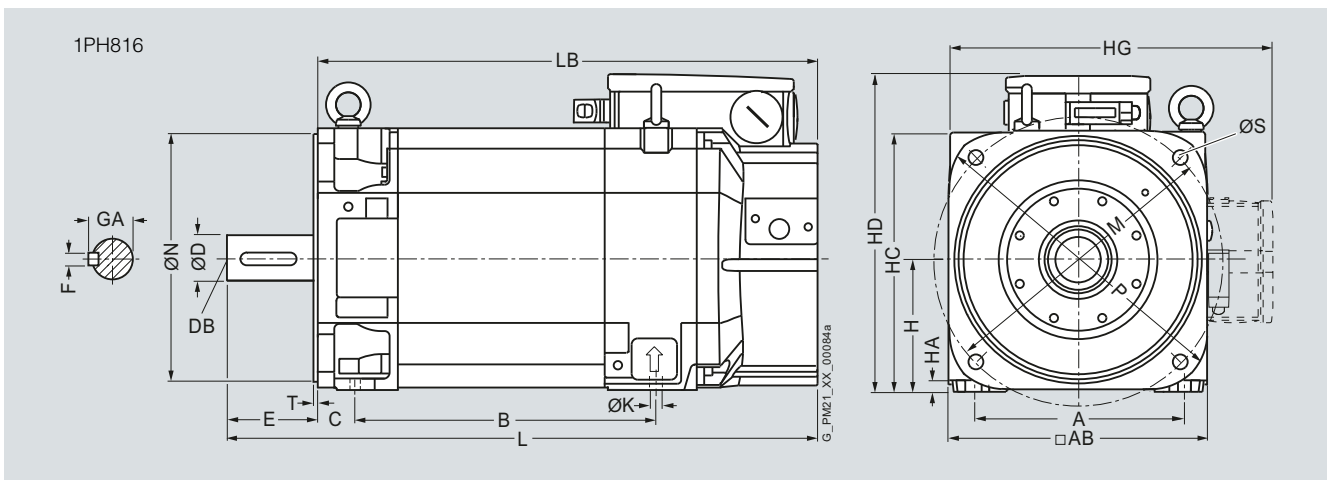
### SIMOTICS M-1PH8 asynchronous motors Shaft height 160 – Forced ventilation

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HG	K	L
<b>1PH8, type of construction IM B5/IM B35, forced ventilation</b>												
160	1PH8163	254 (10.00)	314 (12.36)	346.5 (13.64)	61 (2.40)	160 (6.30)	17 (0.67)	317 (12.48)	382.5 (15.06)	412.5 (16.24)	14 (0.55)	720.5 (28.37)
	1PH8165			406.5 (16.00)								780.5 (30.73)

Shaft height	Type	IEC LB	M	N	P	S	T	Shaft extension DE				
								D	DB	E	F	GA
160	1PH8163	610.5 (24.04)	350 (13.78)	300 (11.81)	393 (15.47)	18 (0.71)	5 (0.20)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)
	1PH8165	670.5 (26.40)										



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 synchronous motors Shaft height 160 – Forced ventilation

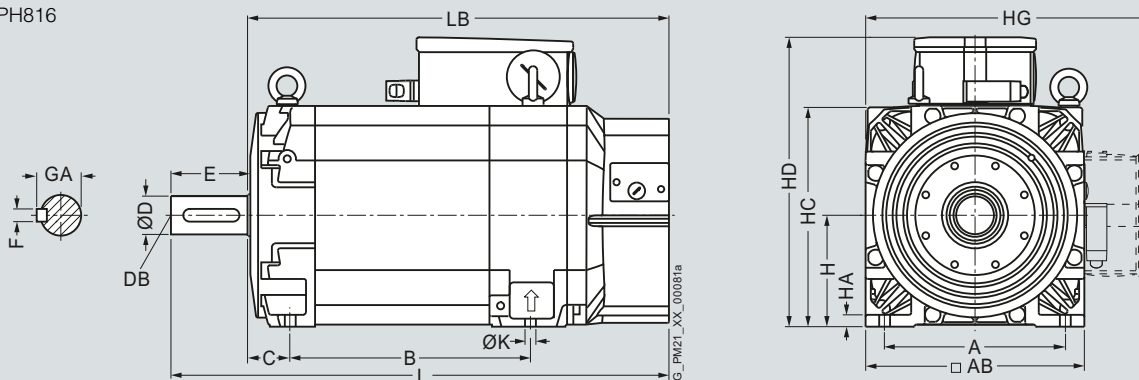
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HG
<b>1PH8, type of construction IM B3, forced ventilation</b>										
160	1PH8165	254 (10.00)	314 (12.36)	406.5 (16.00)	61 (2.40)	160 (6.30)	17 (0.67)	317 (12.48)	415.5 (16.36)	412.5 (16.24)
	1PH8167			446.5 (17.58)						

Shaft height	Type	IEC K	L	LB	Shaft extension DE		E	F	GA
					D	DB			
160	1PH8165	14 (0.55)	780.5 (30.73)	670.5 (26.40)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)
	1PH8167		820.5 (32.30)	710.5 (27.97)					

1PH816



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 synchronous motors Shaft height 160 – Forced ventilation

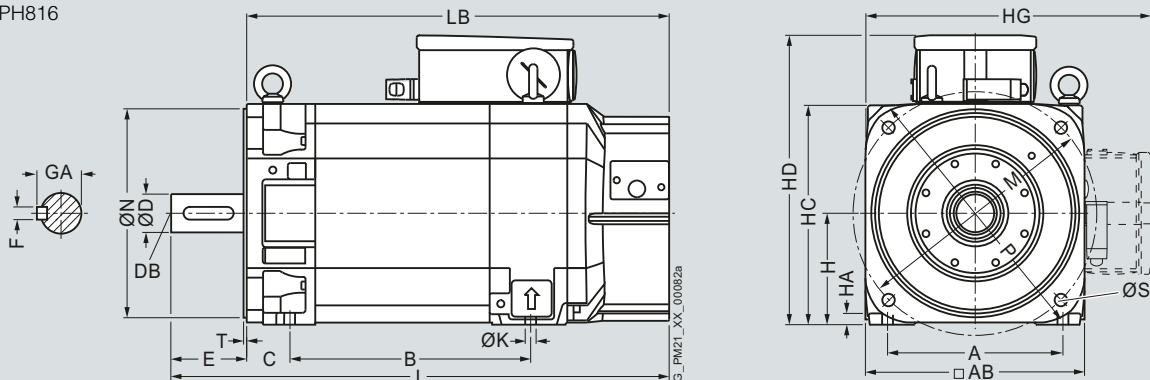
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HG	K	L
<b>1PH8, type of construction IM B5/IM B35, forced ventilation</b>												
160	1PH8165	254 (10.00)	314 (12.36)	406.5 (16.00)	61 (2.40)	160 (6.30)	17 (0.67)	317 (12.48)	415.5 (16.36)	412.5 (16.24)	14 (0.55)	780.5 (30.73)
	1PH8167			446.5 (17.58)								820.5 (32.30)

Shaft height	Type	IEC LB	M	N	P	S	T	Shaft extension DE				
								D	DB	E	F	GA
160	1PH8165	670.5 (26.40)	350 (13.78)	300 (11.81)	393 (15.47)	18 (0.71)	5 (0.20)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)
	1PH8167	710.5 (27.97)										

1PH816



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 160 – Water cooling

#### Dimensional drawings

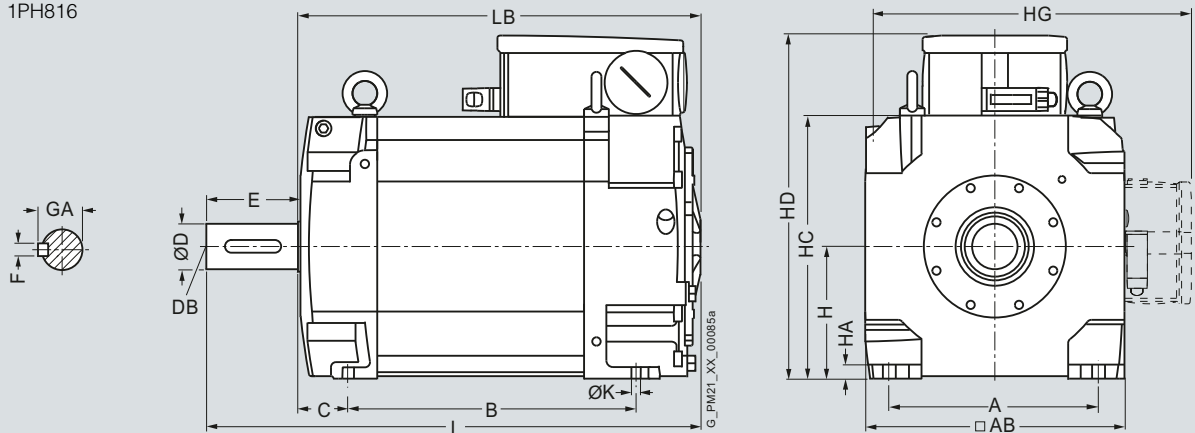
For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HG
<b>1PH8, type of construction IM B3, water cooling</b>										
160	1PH8163/ 1PH8164	254 (10.00)	314 (12.36)	346.5 (13.64)	61 (2.40)	160 (6.30)	17 (0.67)	317 (12.48)	415.5 (16.36)	412.5 (16.24)
	1PH8165/ 1PH8166			406.5 (16.00)						
	1PH8168			446.5 (17.58)						

5

Shaft height	Type	IEC K	L	LB	Shaft extension DE				
					D	DB	E	F	GA
160	1PH8163/ 1PH8164	14 (0.55)	598.5 (23.56)	488.5 (19.23)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)
	1PH8165/ 1PH8166		658.5 (25.93)	548.5 (21.59)					
	1PH8168		698.5 (27.50)	588.5 (23.17)					

1PH816



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 160 – Water cooling

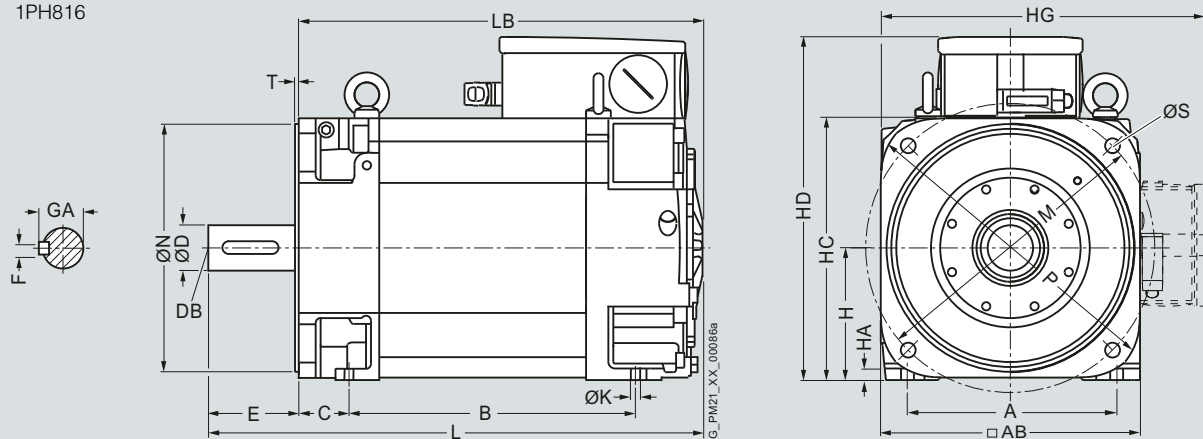
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	B	C	H	HA	HC	HD	HG	K	L
<b>1PH8, type of construction IM B5/IM B35, water cooling</b>												
160	1PH8163/ 1PH8164	254 (10.00)	314 (12.36)	346.5 (13.64)	61 (2.40)	160 (6.30)	17 (0.67)	317 (12.48)	415.5 (16.36)	412.5 (16.24)	14 (0.55)	598.5 (23.56)
	1PH8165/ 1PH8166			406.5 (16.00)								658.5 (25.93)
	1PH8168			446.5 (17.58)								698.5 (27.50)

Shaft height	Type	IEC LB	M	N	P	S	T	Shaft extension DE				
								D	DB	E	F	GA
160	1PH8163/ 1PH8164	488.5 (19.23)	350 (13.78)	300 (11.81)	393 (15.47)	18 (0.71)	5 (0.20)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)
	1PH8165/ 1PH8166	548.5 (21.59)										
	1PH8168	588.5 (23.17)										

1PH816



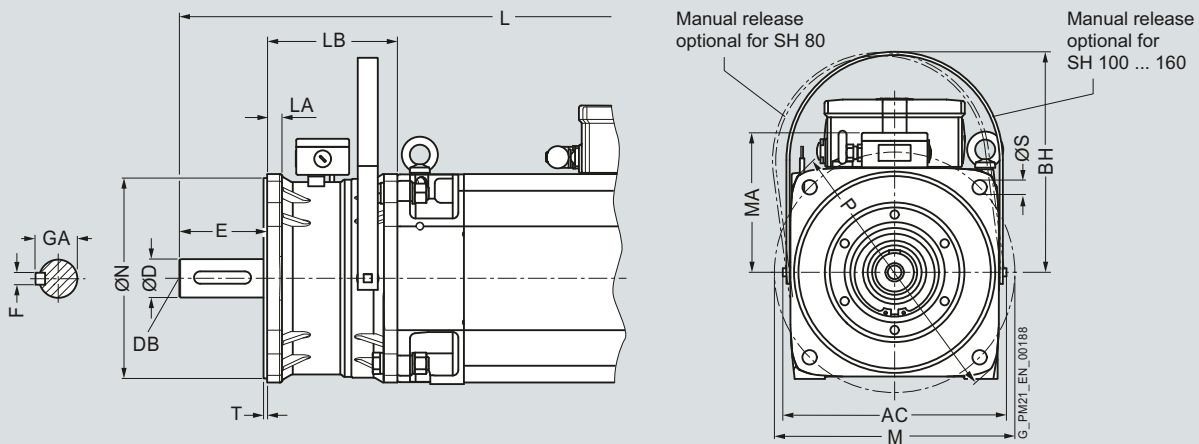
# SIMOTICS main motors

## Dimensional drawings

**SIMOTICS M-1PH8 asynchronous motors with holding brake, shaft heights 80 to 160**  
**SIMOTICS M-1PH8 synchronous motors with holding brake, shaft heights 132 and 160**

### Dimensional drawings

For motor		Dimensions in mm (inches)														Shaft extension DE				
Shaft height	Type	IEC	AC	BH	L	LA	LB	M	MA	N	P	S	T	D	DB	E	F	GA		
																			Forced ventilation	Water cooling
<b>1PH8 shaft heights 80 to 132, types of construction IM B5 and IM B35, forced ventilation and water cooling – Brake mounting</b>																				
80	1PH8083	164 (6.46)	162 (6.38)	586 (23.07)	506.5 (19.94)	12 (0.47)	125 (4.92)	165 (6.50)	162 (6.38)	130 (5.12)	200 (7.87)	12 (0.47)	3.5 (0.14)	<b>32</b> <b>(1.26)</b>	M12	80 (3.15)	10 (0.39)	35 (1.38)		
	1PH8087			636 (25.04)	556.5 (21.91)															
100	1PH8101	220.5 (8.68)	224 (8.82)	579.5 (22.81)	499.5 (19.67)	16 (0.63)	130 (5.12)	215 (8.46)	224 (8.82)	180 (7.09)	250 (9.84)	14 (0.55)	4 (0.16)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	10 (0.39)	41 (1.61)		
	1PH8103			615 (24.21)	535 (21.06)															
	1PH8105			674.5 (26.56)	594.5 (23.41)															
	1PH8107			710 (27.95)	630 (24.80)															
132	1PH8131	278.5 (10.96)	269 (10.59)	711 (27.99)	619.5 (24.39)	18 (0.71)	162 (6.38)	300 (11.81)	269 (10.59)	250 (9.84)	340 (13.39)	18 (0.71)	5 (0.20)	<b>48</b> <b>(1.89)</b>	M16	110 (4.33)	14 (0.55)	51.5 (2.03)		
	1PH8133			756 (29.76)	664.5 (26.16)															
	1PH8135			801 (31.54)	709.5 (27.93)															
	1PH8137/ 1PH8138			841 (33.11)	749.5 (29.51)															
<b>1PH8 shaft height 160, type of construction IM B35, forced ventilation and water cooling – Brake mounting</b>																				
160	1PH8163/ 1PH8164	319 (12.56)	328 (12.91)	888.5 (34.98)	766.5 (30.18)	23 (0.91)	168 (6.61)	350 (13.78)	328 (12.91)	300 (11.81)	393 (15.47)	18 (0.71)	5 (0.20)	<b>55</b> <b>(2.17)</b>	M20	110 (4.33)	16 (0.63)	59 (2.32)		
	1PH8165/ 1PH8166			948.5 (37.34)	826.5 (32.54)															
	1PH8167/ 1PH8168			988.5 (38.92)	866.5 (34.11)															





# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft heights 80 to 160 – Forced ventilation with pipe connection

#### Dimensional drawings

For motor Dimensions in mm (inches)

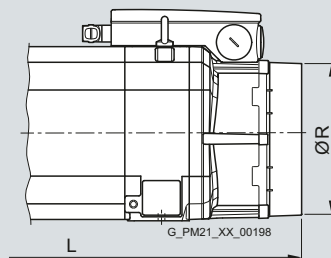
Shaft height	Type	IEC L	R
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#### 1PH8 asynchronous motors shaft heights 80 and 100, forced ventilation – Pipe connection (option K80)

80	1PH8083	503 (19.80)	143 (5.63)
	1PH8087	553 (21.77)	
100	1PH8101	496.5 (19.55)	158 (6.22)
	1PH8103	532 (20.94)	
	1PH8105	591.5 (23.29)	
	1PH8107	627 (24.68)	

#### 1PH8 asynchronous and synchronous motors shaft heights 132 and 160, forced ventilation – Pipe connection (option K80)

132	1PH8131	595.5 (23.44)	222 (8.74)
	1PH8133	640.5 (25.22)	
	1PH8135	685.5 (26.99)	
	1PH8137	725.5 (28.56)	
160	1PH8163	792 (31.18)	276 (10.87)
	1PH8165	852 (33.54)	
	1PH8167	892 (35.12)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Forced ventilation

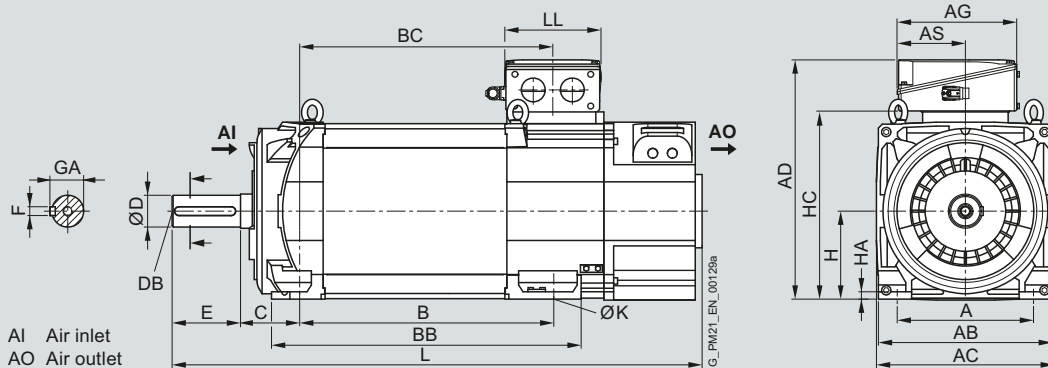
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	Dimensions in mm (inches)												Shaft extension DE				
		IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	D	DB	E	F	GA	
<b>1PH8, type of construction IM B3, forced ventilation – direction of air flow DE → NDE</b>																		
180	1PH8184	279 (10.98)	356 (14.02)	364 (14.33)	430 (16.93)	545 (21.46)	121 (4.76)	180 (7.09)	15 (0.59)	383 (15.08)	14.5 (0.57)	995 (39.17)	<b>65</b> <b>(2.56)</b>	M20	140 (5.51)	18 (0.71)	69 (2.72)	
	1PH8186				520 (20.47)	635 (25.00)							1085 (42.72)					

Terminal box Dimensions in mm (inches)

Shaft height	Type	Dimensions in mm (inches)				
		IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
180	1PH8184	490 (19.29)	245 (9.65)	140 (5.51)	429 (16.89)	196 (7.72)
	1PH8186				519 (20.43)	
<b>Terminal box type 1XB7422</b>						
180	1PH8184	533 (20.98)	281 (11.06)	176 (6.93)	429 (16.89)	233 (9.17)
	1PH8186				519 (20.43)	
<b>Terminal box type 1XB7700</b>						
180	1PH8184	586 (23.07)	297 (11.69)	156 (6.14)	429 (16.89)	310 (12.20)
	1PH8186				519 (20.43)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Forced ventilation

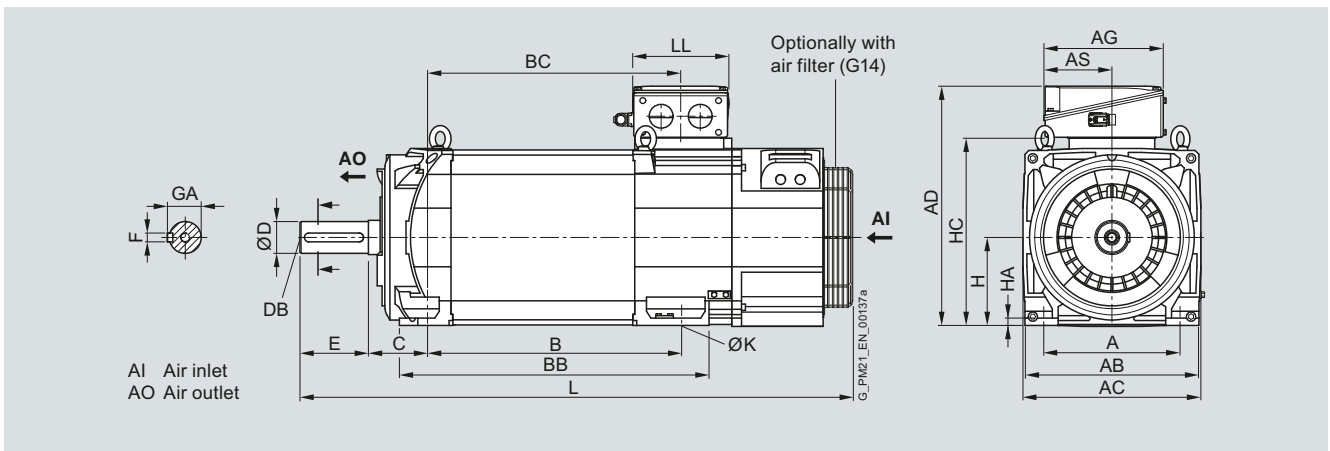
#### Dimensional drawings

For motor		Dimensions in mm (inches)												Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	D	DB	E	F	GA	
<b>1PH8, type of construction IM B3, forced ventilation – direction of air flow NDE → DE</b>																		
180	1PH8184	279 (10.98)	356 (14.02)	364 (14.33)	430 (16.93)	545 (21.46)	121 (4.76)	180 (7.09)	15 (0.59)	383 (15.08)	14.5 (0.57)	1047 (41.22)	<b>65</b> <b>(2.56)</b>	M20	140 (5.51)	18 (0.71)	69 (2.72)	
	1PH8186				520 (20.47)	635 (25.00)							1137 (44.76)					

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
180	1PH8184	490 (19.29)	245 (9.65)	140 (5.51)	429 (16.89)	196 (7.72)
	1PH8186				519 (20.43)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	533 (20.98)	281 (11.06)	176 (6.93)	429 (16.89)	233 (9.17)
	1PH8186				519 (20.43)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	586 (23.07)	297 (11.69)	156 (6.14)	429 (16.89)	310 (12.20)
	1PH8186				519 (20.43)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Forced ventilation

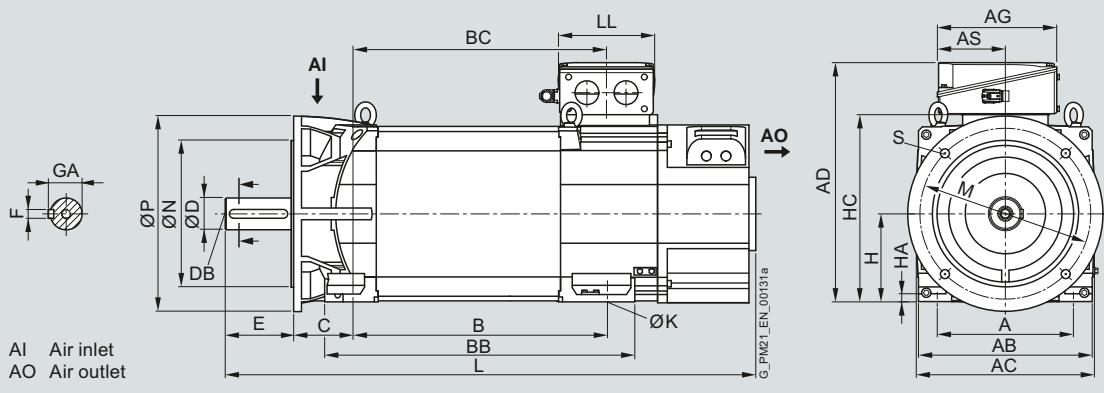
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type																Shaft extension DE				
		IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	M	N	P	S	D	DB	E	F	GA
<b>1PH8, type of construction IM B35, forced ventilation – direction of air flow DE → NDE, flange A400 (option K90)</b>																					
180	1PH8184	279 (10.98)	356 (14.02)	364 (14.33)	430 (16.93)	545 (21.46)	121 (4.76)	180 (7.09)	15 (0.59)	383 (15.08)	14.5 (0.57)	995 (39.17)	350 (13.78)	300 (11.81)	400 (15.75)	18.5 (0.73)	<b>65</b> <b>(2.56)</b>	M20	140 (5.51)	18 (0.71)	69 (2.72)
	1PH8186				520 (20.47)	635 (25.00)						1085 (42.72)									

Terminal box Dimensions in mm (inches)

Shaft height	Type					
		IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
180	1PH8184	490 (19.29)	245 (9.65)	140 (5.51)	429 (16.89)	196 (7.72)
	1PH8186				519 (20.43)	
<b>Terminal box type 1XB7422</b>						
180	1PH8184	533 (20.98)	281 (11.06)	176 (6.93)	429 (16.89)	233 (9.17)
	1PH8186				519 (20.43)	
<b>Terminal box type 1XB7700</b>						
180	1PH8184	586 (23.07)	297 (11.69)	156 (6.14)	429 (16.89)	310 (12.20)
	1PH8186				519 (20.43)	



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# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Forced ventilation

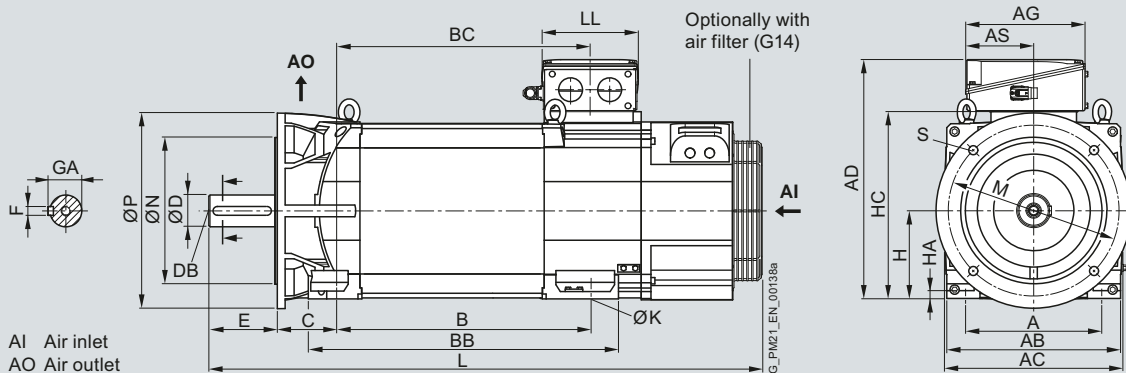
#### Dimensional drawings

For motor		Dimensions in mm (inches)															Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	M	N	P	S	D	DB	E	F	GA
<b>1PH8, type of construction IM B35, forced ventilation – direction of air flow NDE → DE, flange A400 (option K90)</b>																					
180	1PH8184	279 (10.98)	356 (14.02)	364 (14.33)	430 (16.93)	545 (21.46)	121 (4.76)	180 (7.09)	15 (0.59)	383 (15.08)	14.5 (0.57)	1047 (41.22)	350 (13.78)	300 (11.81)	400 (15.75)	18.5 (0.73)	<b>65</b> <b>(2.56)</b>	M20	140 (5.51)	18 (0.71)	69 (2.72)
	1PH8186				520 (20.47)	635 (25.00)						1137 (44.76)									

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
180	1PH8184	490 (19.29)	245 (9.65)	140 (5.51)	429 (16.89)	196 (7.72)
	1PH8186				519 (20.43)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	533 (20.98)	281 (11.06)	176 (6.93)	429 (16.89)	233 (9.17)
	1PH8186				519 (20.43)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	586 (23.07)	297 (11.69)	156 (6.14)	429 (16.89)	310 (12.20)
	1PH8186				519 (20.43)	



5

# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Forced ventilation

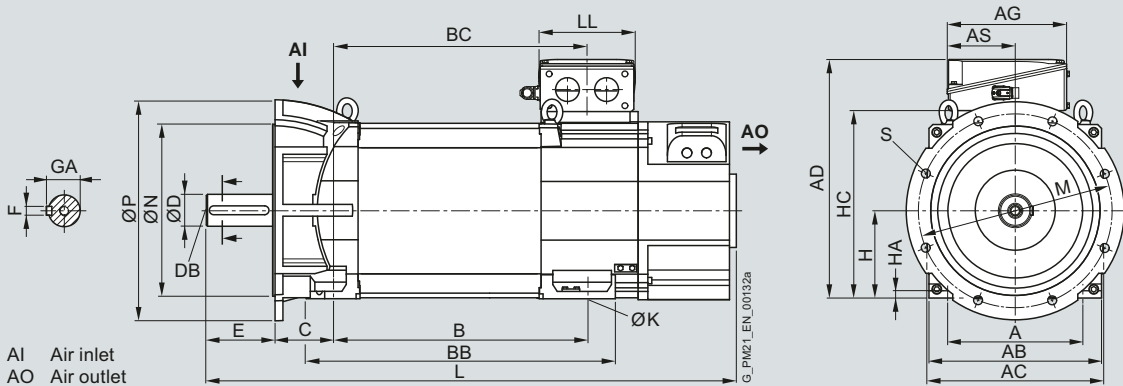
#### Dimensional drawings

For motor		Dimensions in mm (inches)																Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	M	N	P	S	D	DB	E	F	GA	
<b>1PH8, type of construction IM B35, forced ventilation – direction of air flow DE → NDE, flange A450</b>																						
180	1PH8184	279 (10.98)	356 (14.02)	364 (14.33)	430 (16.93)	545 (21.46)	121 (4.76)	180 (7.09)	15 (0.59)	383 (15.08)	14.5 (0.57)	995 (39.17)	400 (15.75)	350 (13.78)	450 (17.72)	18.5 (0.73)	<b>65</b> <b>(2.56)</b>	M20	140 (5.51)	18 (0.71)	69 (2.72)	
	1PH8186				520 (20.47)	635 (25.00)						1085 (42.72)										

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
180	1PH8184	490 (19.29)	245 (9.65)	140 (5.51)	429 (16.89)	196 (7.72)
	1PH8186				519 (20.43)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	533 (20.98)	281 (11.06)	176 (6.93)	429 (16.89)	233 (9.17)
	1PH8186				519 (20.43)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	586 (23.07)	297 (11.69)	156 (6.14)	429 (16.89)	310 (12.20)
	1PH8186				519 (20.43)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Forced ventilation

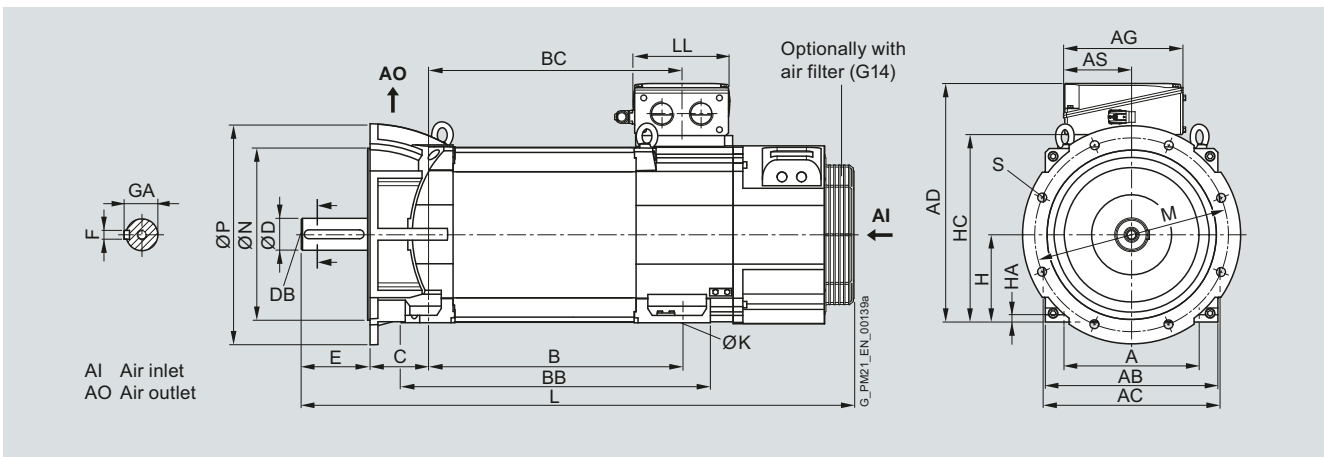
#### Dimensional drawings

For motor		Dimensions in mm (inches)																Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	M	N	P	S	D	DB	E	F	GA	
<b>1PH8, type of construction IM B35, forced ventilation – direction of air flow NDE→ DE, flange A450</b>																						
180	1PH8184	279 (10.98)	356 (14.02)	364 (14.33)	430 (16.93)	545 (21.46)	121 (4.76)	180 (7.09)	15 (0.59)	383 (15.08)	14.5 (0.57)	1047 (41.22)	400 (15.75)	350 (13.78)	450 (17.72)	18.5 (0.73)	<b>65</b> <b>(2.56)</b>	M20	140 (5.51)	18 (0.71)	69 (2.72)	
	1PH8186				520 (20.47)	635 (25.00)						1137 (44.76)										

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
180	1PH8184	490 (19.29)	245 (9.65)	140 (5.51)	429 (16.89)	196 (7.72)
	1PH8186				519 (20.43)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	533 (20.98)	281 (11.06)	176 (6.93)	429 (16.89)	233 (9.17)
	1PH8186				519 (20.43)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
180	1PH8184	586 (23.07)	297 (11.69)	156 (6.14)	429 (16.89)	310 (12.20)
	1PH8186				519 (20.43)	



# SIMOTICS main motors

## Dimensional drawings

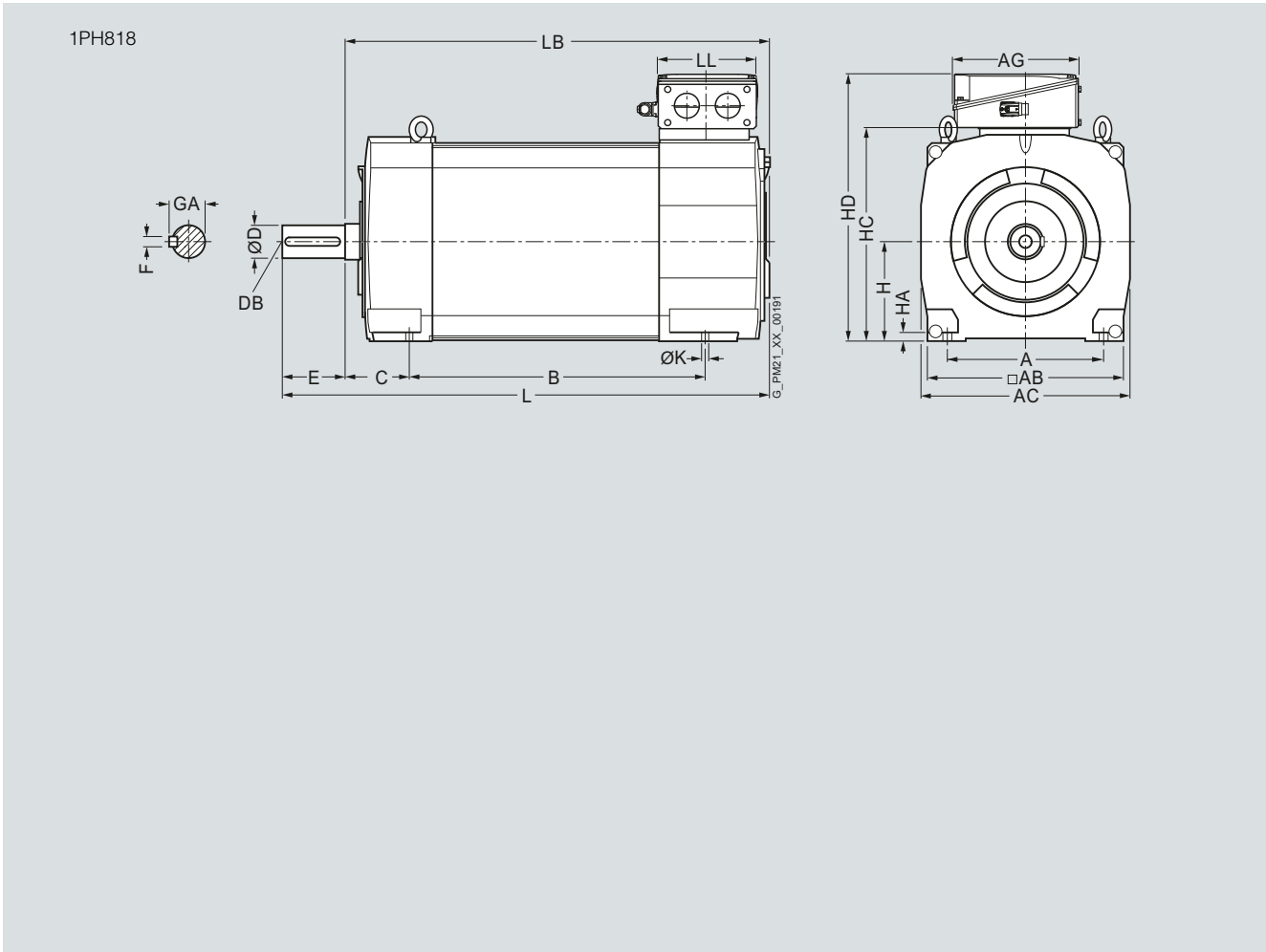
### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Water cooling

#### Dimensional drawings

For motor		Dimensions in mm (inches)										
Shaft height	Type	IEC A	AB	AC	B	C	H	HA	HC	K	L	LB
<b>1PH8, types of construction IM B3/IM V5, water cooling</b>												
180	1PH8184	279 (10.98)	356 (14.02)	384 (15.12)	430 (16.93)	121 (4.76)	180 (7.09)	15 (0.59)	372 (14.65)	14.5 (0.57)	810 (31.89)	670 (26.38)
	1PH8186				520 (20.47)						900 (35.43)	760 (29.92)

5

Shaft height	Type	Shaft extension DE					Terminal box type								
		IEC D	DB	E	F	GA	1XB7322			1XB7422			1XB7700		
							AG	HD	LL	AG	HD	LL	AG	HD	LL
180	1PH8184	<b>65</b> (2.56)	M20	140 (5.51)	18 (0.71)	69 (2.72)	245 (9.65)	490 (19.29)	196 (7.72)	281 (11.06)	533 (20.98)	233 (9.17)	297 (11.69)	586 (23.07)	310 (12.20)
	1PH8186														





# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 180 – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	AC	B	C	H	HA	HC	K	L	LA	LB	A400	A450	A400	A450
														M	N		
<b>1PH8, types of construction IM B5/IM B35/IM V15, water cooling</b>																	
180	1PH8184	279 (10.98)	356 (14.02)	384 (15.12)	430 (16.93)	121 (4.76)	180 (7.09)	15 (0.59)	372 (14.65)	14.5 (0.57)	810 (31.89)	16 (0.63)	670 (26.38)	350 (13.78)	400 (15.75)	300 (11.81)	350 (13.78)
	1PH8186				520 (20.47)						900 (35.43)		760 (29.92)				

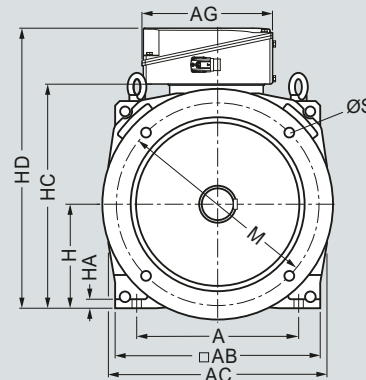
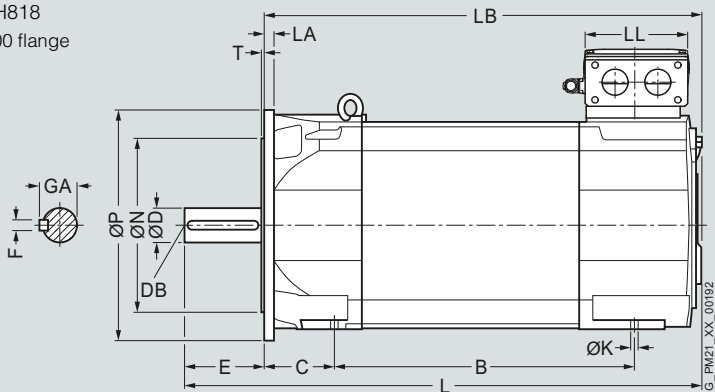
Shaft extension DE

Terminal box type 1XB7322, 1XB7422, 1XB7700

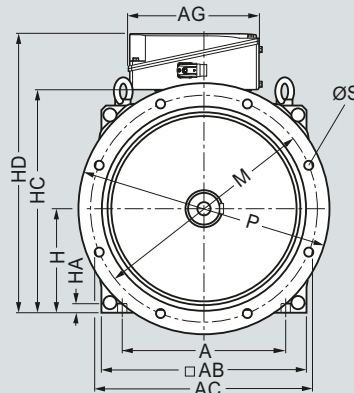
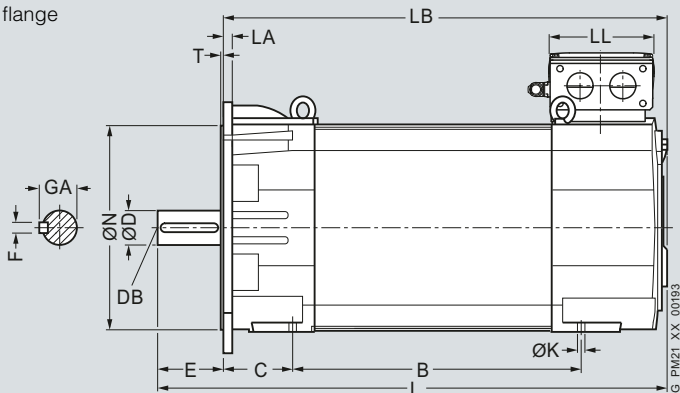
Dimensions as for types of construction IM B3/IM V5

Shaft height	Type	IEC P	A400		A450		S	T	D	DB	E	F	GA
			P	S									
180	1PH8184	400 (15.75)	450 (17.72)	18.5 (0.73)	5 (0.20)	<b>65</b> (2.56)	M20	140 (5.51)	18 (0.71)	69 (2.72)			
	1PH8186												

1PH818  
A400 flange



A450 flange



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 225 – Forced ventilation

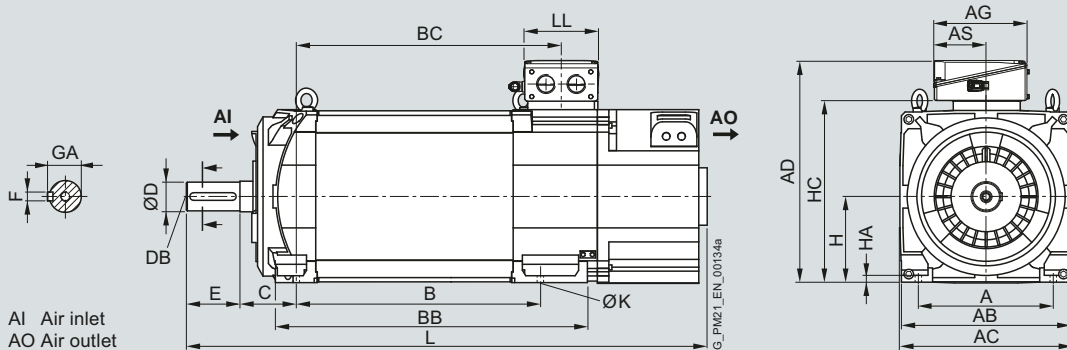
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	Dimensions in mm (inches)											Shaft extension DE				
		IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	D	DB	E	F	GA
<b>1PH8, type of construction IM B3, forced ventilation – direction of air flow DE → NDE</b>																	
225	1PH8224	356 (14.02)	446 (17.56)	454 (17.87)	445 (17.52)	625 (24.61)	149 (5.87)	225 (8.86)	18 (0.71)	475 (18.70)	18.5 (0.73)	1171 (46.10)	<b>75</b> <b>(2.95)</b>	M20	140 (5.51)	20 (0.79)	79.5 (3.13)
	1PH8226				545 (21.46)	725 (28.54)						1271 (40.04)					
	1PH8228				635 (25.00)	815 (32.09)						1361 (53.58)					

Terminal box Dimensions in mm (inches)

Shaft height	Type	Dimensions in mm (inches)				
		IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
225	1PH8224	582 (22.91)	245 (9.65)	140 (5.51)	481 (18.94)	196 (7.72)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	
<b>Terminal box type 1XB7422</b>						
225	1PH8224	625 (24.61)	281 (11.06)	176 (6.93)	481 (18.94)	233 (9.17)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	
<b>Terminal box type 1XB7700</b>						
225	1PH8224	678 (26.69)	297 (11.69)	156 (6.14)	481 (18.94)	310 (12.20)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 225 – Forced ventilation

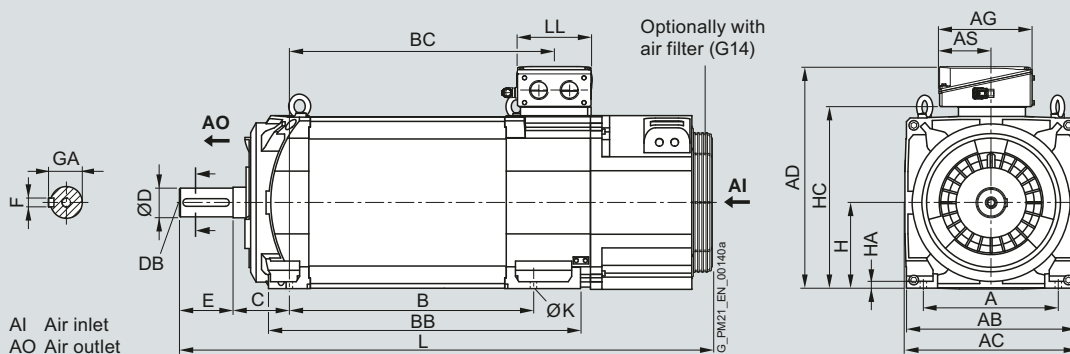
#### Dimensional drawings

For motor		Dimensions in mm (inches)											Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	D	DB	E	F	GA
<b>1PH8, type of construction IM B3, forced ventilation – direction of air flow NDE → DE</b>																	
225	1PH8224	356 (14.02)	446 (17.56)	454 (17.87)	445 (17.52)	625 (24.61)	149 (5.87)	225 (8.86)	18 (0.71)	475 (18.70)	18.5 (0.73)	1206 (47.48)	<b>75</b> <b>(2.95)</b>	M20	140 (5.51)	20 (0.79)	79.5 (3.13)
	1PH8226				545 (21.46)	725 (28.54)						1306 (51.42)					
	1PH8228				635 (25.00)	815 (32.09)						1396 (54.96)					

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
225	1PH8224	582 (22.91)	245 (9.65)	140 (5.51)	481 (18.94)	196 (7.72)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
225	1PH8224	625 (24.61)	281 (11.06)	176 (6.93)	481 (18.94)	233 (9.17)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
225	1PH8224	678 (26.69)	297 (11.69)	156 (6.14)	481 (18.94)	310 (12.20)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 225 – Forced ventilation

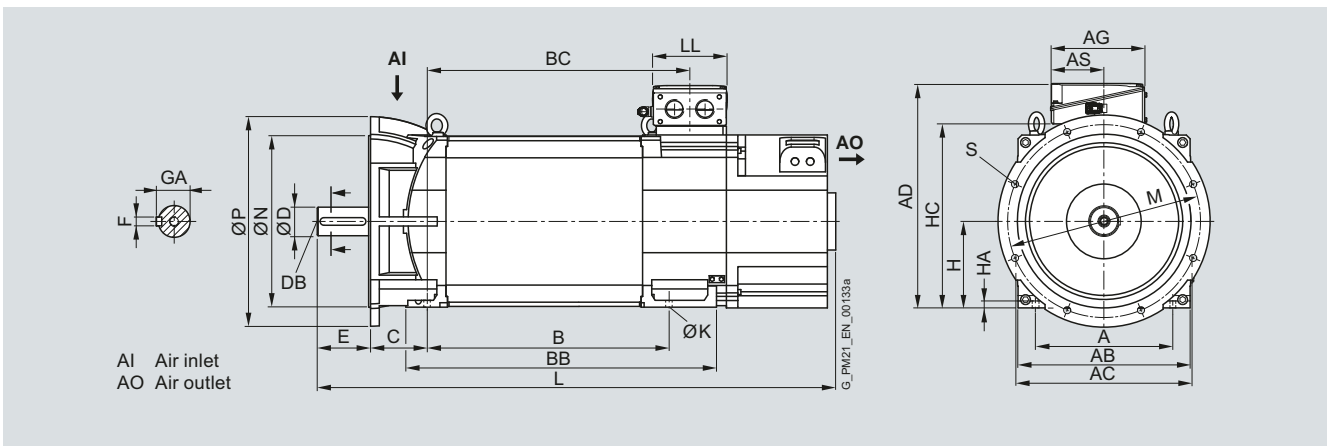
#### Dimensional drawings

For motor		Dimensions in mm (inches)															Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	M	N	P	S	D	DB	E	F	GA
1PH8, type of construction IM B35, forced ventilation – direction of air flow DE → NDE, flange A550																					
225	1PH8224	356 (14.02)	446 (17.56)	454 (17.87)	445 (17.52)	625 (24.61)	149 (5.87)	225 (8.86)	18 (0.71)	475 (18.70)	18.5 (0.73)	1171 (46.10)	500 (19.69)	450 (17.72)	550 (21.65)	18.5 (0.73)	<b>75</b> <b>(2.95)</b>	M20	140 (5.51)	20 (0.79)	79.5 (3.13)
	1PH8226				545 (21.46)	725 (28.54)						1271 (50.04)									
	1PH8228				635 (25.00)	815 (32.09)						1361 (53.58)									

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
Terminal box type 1XB7322						
225	1PH8224	582 (22.91)	245 (9.65)	140 (5.51)	481 (18.94)	196 (7.72)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
225	1PH8224	625 (24.61)	281 (11.06)	176 (6.93)	481 (18.94)	233 (9.17)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
225	1PH8224	678 (26.69)	297 (11.69)	156 (6.14)	481 (18.94)	310 (12.20)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 225 – Forced ventilation

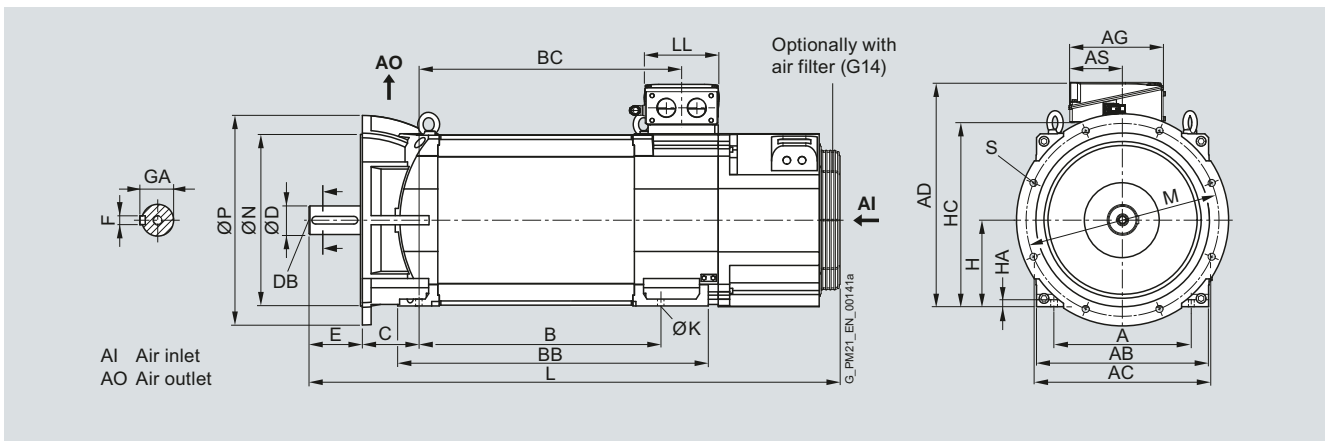
#### Dimensional drawings

For motor		Dimensions in mm (inches)															Shaft extension DE				
Shaft height	Type	IEC A	AB	AC	B	BB	C	H	HA	HC	K	L	M	N	P	S	D	DB	E	F	GA
<b>1PH8, type of construction IM B35, forced ventilation – direction of air flow NDE → DE, flange A550</b>																					
225	1PH8224	356 (14.02)	446 (17.56)	454 (17.87)	445 (17.52)	625 (24.61)	149 (5.87)	225 (8.86)	18 (0.71)	475 (18.70)	18.5 (0.73)	1206 (47.48)	500 (19.69)	450 (17.72)	550 (21.65)	18.5 (0.73)	<b>75</b> <b>(2.95)</b>	M20	140 (5.51)	20 (0.79)	79.5 (3.13)
	1PH8226				545 (21.46)	725 (28.54)						1306 (51.42)									
	1PH8228				635 (25.00)	815 (32.09)						1396 (54.96)									

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7322</b>						
225	1PH8224	582 (22.91)	245 (9.65)	140 (5.51)	481 (18.94)	196 (7.72)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	

Terminal box type 1XB7422		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
225	1PH8224	625 (24.61)	281 (11.06)	176 (6.93)	481 (18.94)	233 (9.17)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	

Terminal box type 1XB7700		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
225	1PH8224	678 (26.69)	297 (11.69)	156 (6.14)	481 (18.94)	310 (12.20)
	1PH8226				581 (22.87)	
	1PH8228				671 (26.42)	



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 225 – Water cooling

#### Dimensional drawings

For motor      Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	AC	B	C	H	HA	HC	K	L	LB
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#### 1PH8, types of construction IM B3/IM V5, water cooling

225	1PH8224	356 (14.02)	446 (17.56)	474 (18.66)	445 (17.52)	149 (5.87)	225 (8.86)	18 (0.71)	462 (18.19)	18.5 (0.73)	915 (36.02)	775 (30.51)
	1PH8226				545 (21.46)						1015 (39.96)	875 (34.45)
	1PH8228				635 (25.0)						1105 (43.50)	965 (37.99)

5

Shaft extension DE

Terminal box type

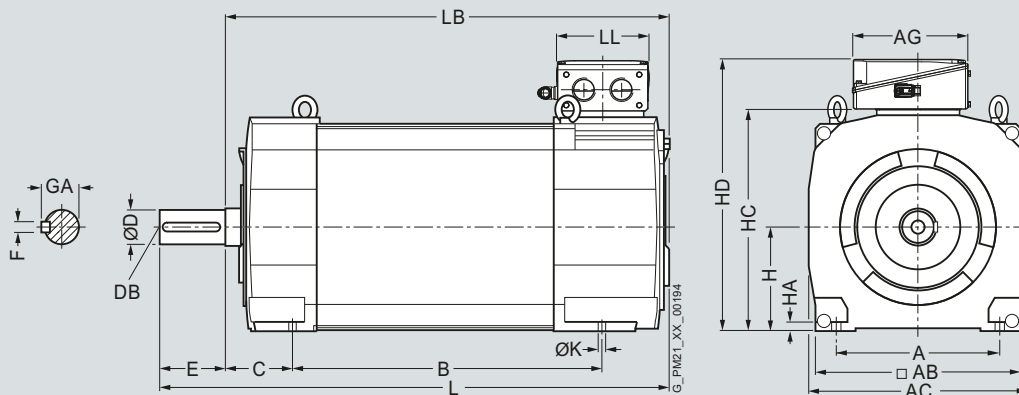
1XB7322

1XB7422

1XB7700

Shaft height	Type	IEC D	Shaft extension DE				Terminal box type 1XB7322			Terminal box type 1XB7422			Terminal box type 1XB7700		
			DB	E	F	GA	AG	HD	LL	AG	HD	LL	AG	HD	LL
225	1PH8224	<b>75</b> (2.95)	M20	140 (5.51)	20 (0.79)	79.5 (3.13)	245 (9.65)	585 (23.03)	196 (7.72)	281 (11.06)	628 (24.72)	233 (9.17)	297 (11.69)	677 (26.65)	310 (12.20)
	1PH8226														
	1PH8228														

1PH822



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft height 225 – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	AC	B	C	H	HA	HC	K	L	LA	LB	M	N	P	S	T
<b>1PH8, types of construction IM B5/IM B35/IM V15, water cooling, A550 flange</b>																		
225	1PH8224	356 (14.02)	446 (17.56)	474 (18.66)	445 (17.52)	149 (5.87)	225 (8.86)	18 (0.71)	462 (18.19)	18.5 (0.73)	910 (35.83)	20 (0.79)	770 (30.31)	500 (19.69)	450 (17.72)	550 (21.65)	18.5 (0.73)	5 (0.20)
	1PH8226				545 (21.46)						1012 (39.84)		872 (34.33)					
	1PH8228				635 (25.00)						1102 (43.39)		962 (37.87)					

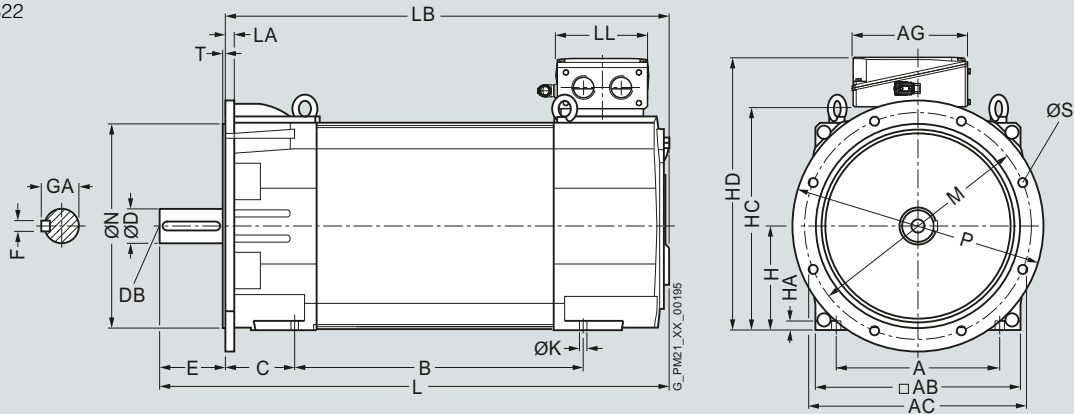
Shaft extension DE

Terminal box type 1XB7322, 1XB7422, 1XB7700

Dimensions as for types of construction IM B3/IM V5

Shaft height	Type	IEC D	DB	E	F	GA
225	1PH8224	<b>75</b> (2.95)	M20	140 (5.51)	20 (0.79)	79.5 (3.13)
	1PH8226					
	1PH8228					

1PH822



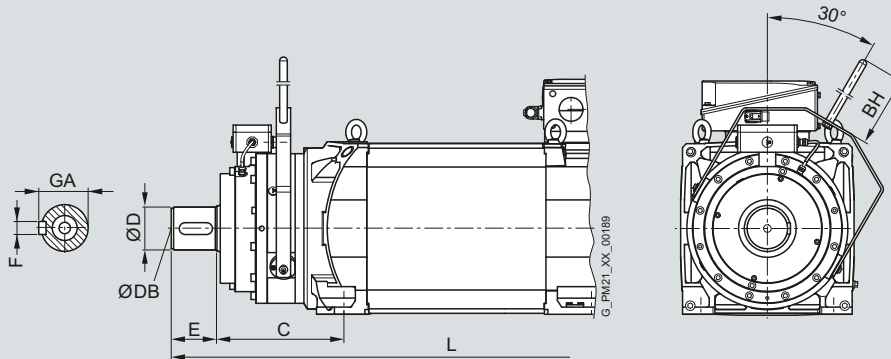
# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous and synchronous motors with holding brake Shaft heights 180 and 225

#### Dimensional drawings

For motor		Dimensions in mm (inches)									
Shaft height	Type	IEC BH	C	Forced ventilation		Water cooling	Shaft extension DE				
				L DE → NDE	L NDE → DE	L	D	DB	E	F	GA
1PH8, type of construction IM B3, forced ventilation – directions of air flow DE → NDE and NDE → DE, water cooling; brake mounting (option U63)											
180	1PH8184	252 (9.92)	268 (10.55)	1096 (43.15)	1148 (45.20)	911 (35.87)	<b>90</b> <b>(3.54)</b>	M20	95 (3.74)	25 (0.98)	95 (3.74)
	1PH8186			1186 (46.69)	1238 (48.74)	1001 (39.41)					
225	1PH8224	493 (19.41)		1295 (50.98)	1330 (52.36)	1040 (40.94)	95 (3.74)	M20	105 (4.13)	25 (0.98)	100 (3.94)
	1PH8226			1395 (54.92)	1430 (56.30)	1140 (44.88)					
	1PH8228			1495 (58.86)	1520 (59.84)	1230 (48.43)					





### SIMOTICS M-1PH8 asynchronous and synchronous motors Shaft heights 180 and 225 – Forced ventilation with pipe connection

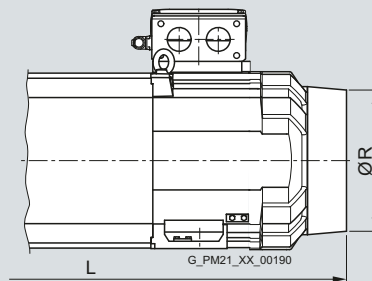
#### Dimensional drawings

For motor            Dimensions in mm (inches)

Shaft height	Type	IEC L	R
--------------	------	-------	---

#### 1PH8 forced ventilation – pipe connection (option K80)

180	1PH8184	993 (39.09)	300 (11.81)
	1PH8186	1083 (42.64)	
225	1PH8224	1084 (42.68)	350 (13.78)
	1PH8226	1184 (46.61)	
	1PH8228	1274 (50.16)	



# SIMOTICS main motors

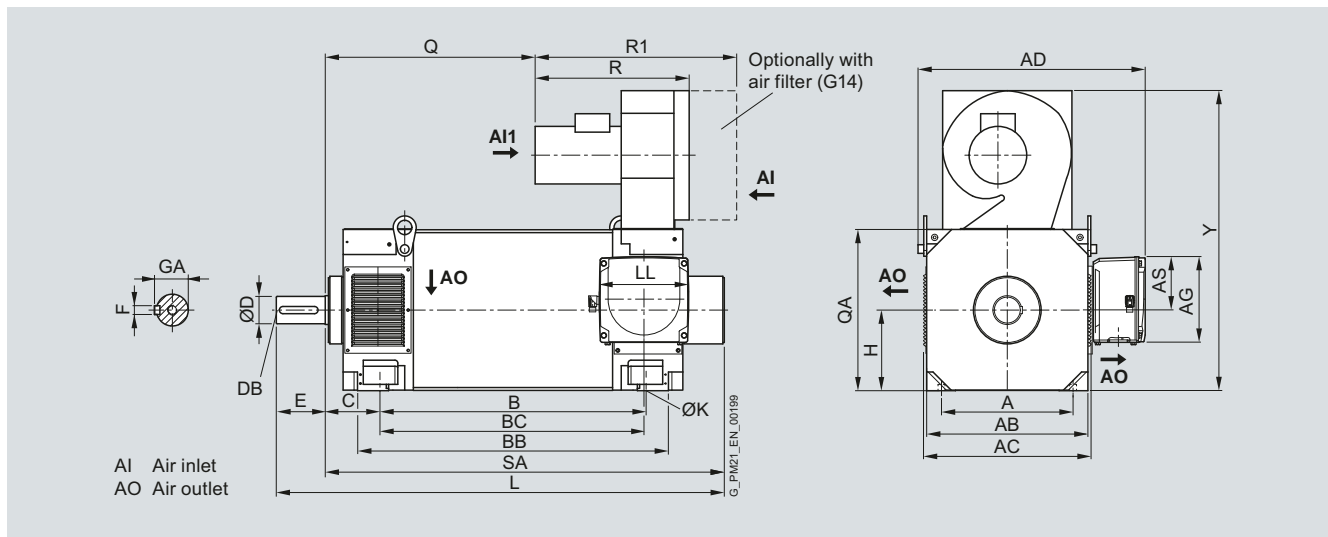
## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 280 – Forced ventilation

#### Dimensional drawings

For motor		Dimensions in mm (inches)									
Shaft height	Type	IEC A	AB	AC	B	BB	C	D	DB	E	F
<b>1PH8, type of construction IM B3, forced ventilation – direction of air flow NDE → DE</b>											
280	1PH8284	457 (17.99)	560 (22.05)	582 (22.91)	684 (26.93)	840 (33.07)	190 (7.48)	95 (3.74)	M24	170 (6.69)	25 (0.98)
	1PH8286				794 (31.26)	950 (37.40)					
	1PH8288				924 (36.38)	1080 (42.52)					
		GA	H	K	L	Q	QA	R	R1	SA	Y
	1PH8284	100 (3.94)	280 (11.02)	24 (0.94)	1316 (51.81)	489 (19.25)	560 (22.05)	546 (21.50)	700 (27.56)	1146 (45.12)	1042 (41.02)
	1PH8286				1426 (56.14)	599 (23.58)				1256 (49.45)	
	1PH8288				1556 (61.26)	729 (28.70)				1386 (54.57)	

Terminal box		Dimensions in mm (inches)				
Shaft height	Type	IEC AD	AG	AS	BC	LL
<b>Terminal box type 1XB7700</b>						
280	1PH8284	789 (31.06)	297 (11.69)	186 (7.32)	677 (26.65)	310 (12.20)
	1PH8286				787 (30.98)	
	1PH8288				917 (36.10)	
<b>Terminal box type 1XB7712</b>						
280	1PH8284	836 (32.91)	371 (14.61)	201 (7.91)	691 (27.20)	370 (14.57)
	1PH8286				801 (31.54)	
	1PH8288				931 (36.65)	



# SIMOTICS main motors

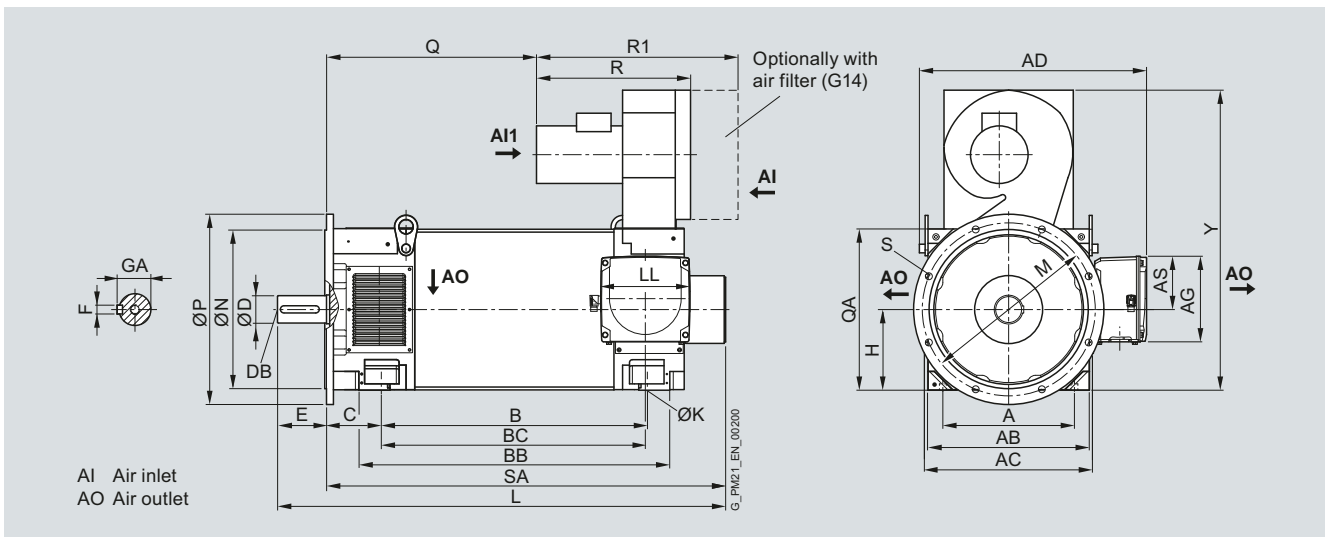
## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 280 – Forced ventilation

#### Dimensional drawings

For motor		Dimensions in mm (inches)											
Shaft height	Type	IEC A	AB	AC	B	BB	C	D	DB	E	F	GA	H
<b>1PH8, type of construction IM B35, forced ventilation – direction of air flow NDE → DE, flange A660</b>													
280	1PH8284	457 (17.99)	560 (22.05)	582 (22.91)	684 (26.93)	840 (33.07)	190 (7.48)	95 (3.74)	M24	170 (6.69)	25 (0.98)	100 (3.94)	280 (11.02)
	1PH8286				794 (31.26)	950 (37.40)							
	1PH8288				924 (36.38)	1080 (42.52)							
		K	L	M	N	P	Q	QA	R	R1	S	SA	Y
	1PH8284	24 (0.94)	1316 (51.81)	600 (23.62)	550 (21.65)	660 (25.98)	489 (19.25)	560 (22.05)	546 (21.50)	700 (27.56)	24 (0.94)	1146 (45.12)	1042 (41.02)
	1PH8286		1426 (56.14)				599 (23.58)					1256 (49.45)	
	1PH8288		1556 (61.26)				729 (28.70)					1386 (54.57)	

Terminal box		Dimensions in mm (inches)					
Shaft height	Type	IEC AD	AG	AS	BC	LL	
<b>Terminal box type 1XB7700</b>							
280	1PH8284	789 (31.06)	297 (11.69)	186 (7.32)	677 (26.65)	310 (12.20)	
	1PH8286				787 (30.98)		
	1PH8288				917 (36.10)		
<b>Terminal box type 1XB7712</b>							
280	1PH8284	836 (32.91)	371 (14.61)	201 (7.91)	691 (27.20)	370 (14.57)	
	1PH8286				801 (31.54)		
	1PH8288				931 (36.65)		



# SIMOTICS main motors

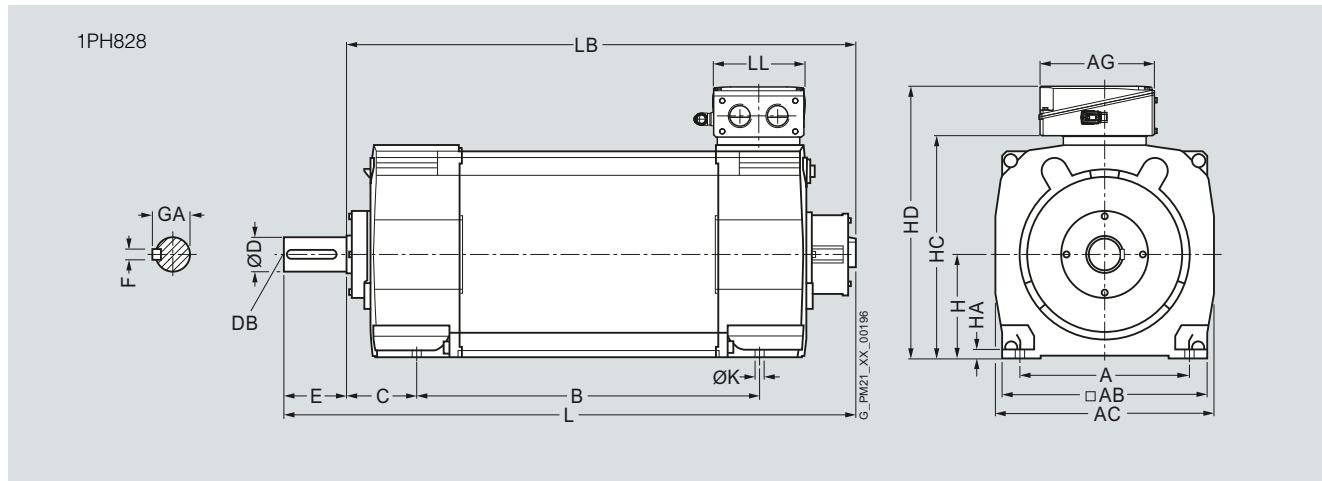
## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 280 – Water cooling

#### Dimensional drawings

For motor		Dimensions in mm (inches)											Shaft extension DE					
Shaft height	Type	IEC A	AB	AC	B	C	H	HA	HC	K	LB	D	DB	E	F	GA	L	
<b>1PH8, types of construction IM B3/IM V5, water cooling</b>																		
280	1PH8284	457 (17.99)	556 (21.89)	588 (23.15)	684 (26.93)	190 (7.48)	280 (11.02)	21 (0.83)	574 (22.60)	24 (0.94)	1134 (44.65)	<b>95</b> <b>(3.74)</b>	M24	170 (6.69)	25 (0.98)	100 (3.94)	1304 (51.34)	
	1PH8286				794 (31.26)						1244 (48.98)						1414 (55.67)	
	1PH8288				924 (36.38)						1374 (54.09)						1544 (60.79)	

Shaft height	Type	IEC	Terminal box type			1XB7422			1XB7700			1XB7712		
			AG	HD	LL	AG	HD	LL	AG	HD	LL	AG	HD	LL
280	1PH8284	245 (9.65)	674 (26.54)	196 (7.72)	281 (11.06)	717 (28.23)	233 (9.17)	297 (11.69)	751 (29.57)	310 (12.20)	371 (14.61)	813 (32.01)	370 (14.57)	
	1PH8286													
	1PH8288													



# SIMOTICS main motors

## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 280 – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	IEC A	AB	AC	B	C	H	HA	HC	K	L	LA	LB	M	N	P
<b>1PH8, types of construction IM B5/IM B35/IM V15 D660, water cooling</b>																
280	1PH8284	457 (17.99)	556 (21.89)	588 (23.15)	684 (26.93)	190 (7.48)	280 (11.02)	21 (0.83)	574 (22.60)	24 (0.94)	1304 (51.34)	24 (0.94)	1134 (44.65)	600 (23.62)	550 (21.65)	660 (25.98)
	1PH8286				794 (31.26)						1414 (55.67)		1244 (48.98)			
	1PH8288				924 (36.38)						1544 (60.79)		1374 (54.09)			

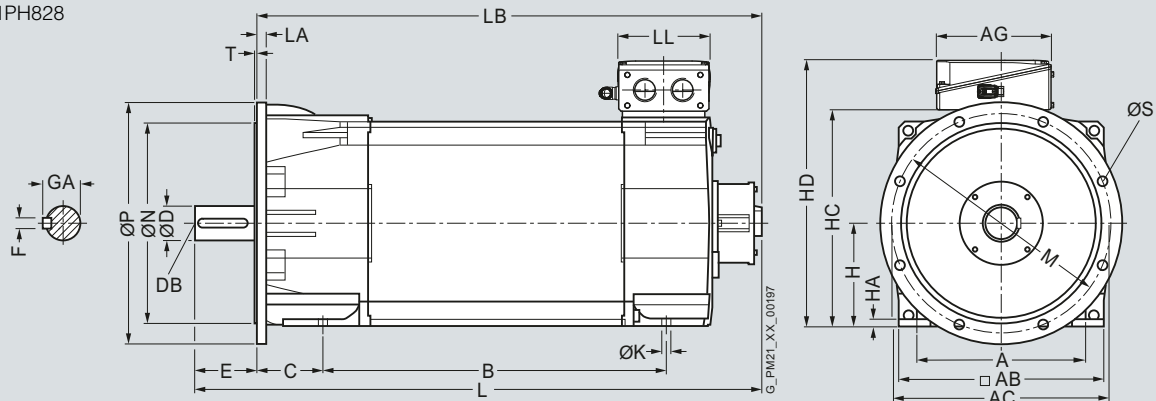
Shaft extension DE

Terminal box type 1XB77322, 1XB7422, 1XB7700, 1XB7712

Dimensions as for types of construction  
IM B3/IM V5

Shaft height	Type	IEC S	T	D	DB	E	F	GA
280	1PH8284	24 (0.94)	6 (0.24)	<b>95</b> <b>(3.74)</b>	M24	170 (6.69)	25 (0.98)	100 (3.94)
	1PH8286							
	1PH8288							

1PH828



# SIMOTICS main motors

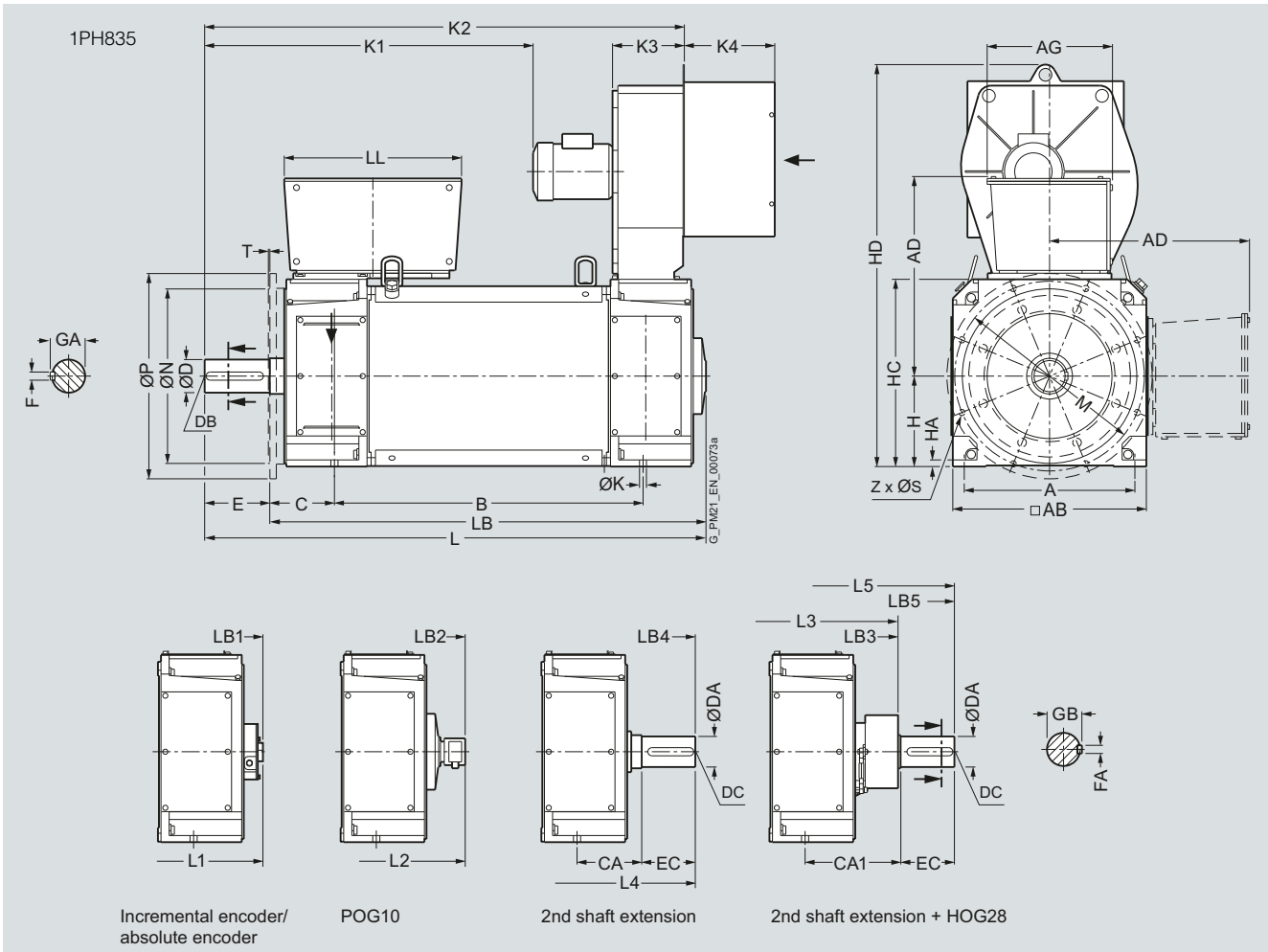
## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors Shaft height 355 – Forced ventilation

#### Dimensional drawings

For motor		Dimensions in mm (inches)															
Shaft height	Type	IEC A	AB	B	C/CA	CA1	H	HA	HC	HD	K	K1	K2	K3	K4	L	L1
<b>1PH8, type of construction IM B35, forced ventilation</b>																	
355	1PH8350/ 1PH8351	670 (26.38)	760 (29.92)	772 (30.39)	254 (10.00)	375 (14.76)	355 (13.98)	26 (1.02)	735 (28.94)	1269 (49.96)	28 (1.10)	855 (33.66)	1412 (55.59)	200 (7.87)	355 (13.98)	1523 (59.96)	1549 (60.98)
	1PH8352			862 (33.94)								945 (37.20)	1502 (59.13)			1613 (63.50)	1639 (64.53)
	1PH8354			972 (38.27)								1055 (41.54)	1612 (63.46)			1723 (67.83)	1749 (68.86)
	1PH8356			1092 (42.99)								1175 (46.26)	1732 (68.19)			1843 (72.56)	1869 (73.58)
	1PH8358			1212 (47.72)								1295 (50.98)	1852 (72.91)			1963 (77.28)	1989 (78.31)

Shaft height	Type	IEC L2	L3	L4	L5	LB	LB1	LB2	LB3	LB4	LB5	M	N	P	S	T	Z
355	1PH8350/ 1PH8351	1625 (63.98)	1644 (64.72)	1740 (68.50)	1861 (73.72)	1273 (50.12)	1299 (51.14)	1375 (54.13)	1394 (54.88)	1490 (58.66)	1611 (63.43)	740 (29.13)	680 (26.77)	800 (31.50)	24 (0.94)	6 (0.24)	8 (0.31)
	1PH8352	1715 (67.52)	1734 (68.27)	1830 (72.05)	1951 (76.81)	1363 (53.66)	1389 (54.68)	1465 (57.68)	1484 (58.43)	1580 (62.20)	1701 (66.97)						
	1PH8354	1825 (71.85)	1844 (72.60)	1940 (76.38)	2061 (81.14)	1473 (57.99)	1499 (59.02)	1575 (62.01)	1594 (62.76)	1670 (66.54)	1746 (71.30)						
	1PH8356	1945 (76.57)	1964 (77.32)	2060 (81.10)	2181 (85.87)	1593 (62.72)	1619 (63.74)	1695 (66.73)	1714 (67.48)	1790 (71.26)	1866 (76.02)						
	1PH8358	2065 (81.30)	2084 (82.05)	2180 (85.83)	2301 (90.59)	1713 (67.44)	1739 (68.46)	1815 (71.46)	1834 (72.20)	1910 (75.98)	1986 (80.75)						



For dimensions of shaft extension and terminal box, see page 5/139.

# SIMOTICS main motors

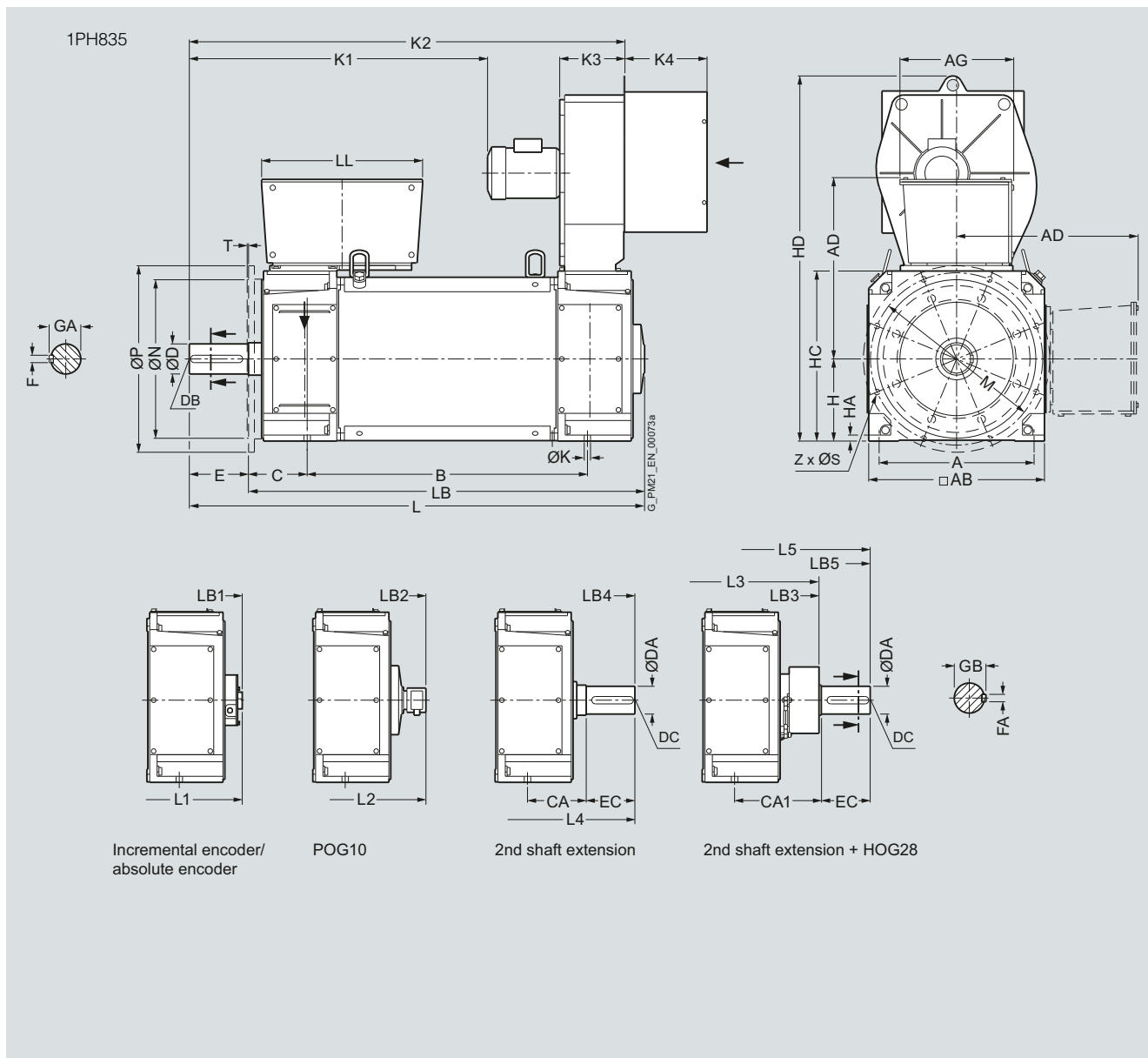
## Dimensional drawings

### SIMOTICS M-1PH8 asynchronous motors

#### Shaft height 355 – Forced ventilation

#### Dimensional drawings

Shaft height	Type	Shaft extension DE									Terminal box type					
		IEC D	DA	DB/DC E	EC	F	FA	GA	GB	1XB7712 AD	1XB7712 AG	1XB7712 LL	1XB7820 AD	1XB7820 AG	1XB7820 LL	
355	1PH8350/ 1PH8351	130 (5.12)	120 (4.72)	M24	250 (9.84)	180 (7.09)	32 (1.26)	32 (1.26)	119 (4.69)	114 (4.49)	640 (25.20)	377 (14.84)	370 (14.57)	784 (30.87)	492 (19.37)	696 (27.40)
	1PH8352															
	1PH8354															
	1PH8356															
	1PH8358															







# SIMOTICS

## linear and torque motors



<b>6/2</b>	<b>Overview</b>
<b>6/4</b>	<b>SIMOTICS L linear motors for SINAMICS S120</b>
6/4	<u>SIMOTICS L-1FN3 linear motors</u>
6/6	Version for peak load – Water cooling
6/10	Version for continuous load – Water cooling
6/12	Optional components
6/14	Hall-effect sensor box
6/15	<u>SIMOTICS L-1FN3/-1FN6 linear motors</u>
	Linear measuring systems – Liquid cooling
6/16	<u>SIMOTICS L-1FN6 linear motors</u>
6/18	Natural cooling
6/22	Water cooling
<b>6/24</b>	<b>SIMOTICS T torque motors for SINAMICS S120</b>
6/24	<u>SIMOTICS T-1FW6 built-in torque motors</u>
6/26	Water cooling
6/38	<u>SIMOTICS T-1FW3 complete torque motors</u>
6/40	Water cooling
<b>6/84</b>	<b>Dimensional drawings</b>
6/84	SIMOTICS L-1FN3 linear motors
6/86	SIMOTICS L-1FN6 linear motors
6/88	SIMOTICS T-1FW6 built-in torque motors
6/91	SIMOTICS T-1FW3 complete torque motors
Part 4	<b>Technical definitions for AC motors</b>
Part 14	<b>CAD CREATOR</b> Dimension drawing and 2D/3D CAD generator <a href="http://www.siemens.com/cadcreator">www.siemens.com/cadcreator</a>

# SIMOTICS linear and torque motors

## Overview

6

Motor type	Features	Degree of protection	Type of cooling
<b>SIMOTICS L-1FN3 linear motors</b> 	Synchronous linear motor Permanent magnet Secondary section equipped with permanent magnets	IP65	Water cooling
<b>SIMOTICS L-1FN6 linear motors</b> 	Synchronous linear motor Permanent magnet Nonmagnetic secondary section	Primary section: IP65 <sup>1)</sup>	Natural cooling  Water cooling
Motor type	Features	Degree of protection	Type of cooling
<b>SIMOTICS T-1FW6 built-in torque motors</b> 	Synchronous motor Permanent magnet Hollow shaft Individual components	IP23 <sup>2)</sup>	Water cooling
Motor type	Features	Degree of protection	Type of cooling
<b>SIMOTICS T-1FW3 complete torque motors</b> 	Synchronous motor Permanent magnet Hollow shaft Plug-on shaft Solid shaft	IP54 IP55 IP55	Water cooling

The selection and ordering data for the SINAMICS S120 Motor Modules are based on the booksize format by way of example. Other formats are also possible. The engineering tool SIZER for Siemens Drives is available for detailed configuration.

**For technical definitions for AC motors, see SIMOTICS servomotors.**

<sup>1)</sup> Degree of protection of the motor is determined by the construction of the motor's installation in the machine. Minimum requirement: IP23.

<sup>2)</sup> The final degree of protection (minimum degree of protection is IP54) for the installed motor is determined by the machine manufacturer.

Primary section width mm	Feedrate force $F_{rated}$ N (lb <sub>f</sub> )	Velocity $v_{max}$ at $F_{rated}$	Page
without precision cooling 67/96/126/ 141/188/ 248/342	with precision cooling 76/105/135/ 150/197/ 257/351	<b>Peak load</b>	<b>6/6</b>
		200 (45)                      8100 (1821)	
		<b>Continuous load</b>	<b>6/10</b>
		150 (33.7)                      10375 (2332)	
80/115/130/209/289	66.3 (14.9)                      3000 (674)	93.9 ... 1280 m/min (308 ... 4200 ft/min)	<b>6/18</b>
80/115	119 (26.8)                      1430 (321)	57.5 ... 852 m/min (189 ... 2795 ft/min)	<b>6/22</b>
Diameter mm	Rated torque $M_{rated}$ Nm (lb <sub>f</sub> -in)	Max. speed $n_{max}$ at $M_{rated}$	Page
External diameter 159/184/230/310/385/440/ 502/576/730	22 (16.2)                      5760 (50982)	38 ... 940 rpm	<b>6/26</b>
Shaft height mm	Rated power $P_{rated}$ for S1 duty kW (HP)	Rated torque $M_{rated}$	Page
SH 150/SH 200/SH 280	2.8 (3.75)                      435 (583)	95 ... 7000 Nm (70.1 ... 5163 lb <sub>f</sub> -ft)	<b>6/40</b>

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors

#### Overview



SIMOTICS L-1FN3 linear motor, primary section

In combination with the SINAMICS S120 drive system, SIMOTICS L-1FN3 linear motors provide an optimally tuned linear direct drive system for the requirements of modern mechanical engineering.

The motors comprise a primary section and a secondary section with magnets made of rare-earth material. The primary section has fixed dimensions, while the secondary section is made up of individual elements (segments) to suit the required traversing range. Through parallel operation of the motors, feedrate force and length can be scaled beyond the available spectrum.

#### Benefits

- Outstanding dynamic response and very high traversing velocity
- Excellent precision
- Easy installation
- Drive components are free of wear thanks to contactless drive force transmission

The main advantage of linear direct drive technology is the extensive avoidance of the effects of elasticity, play, and friction, as well as natural oscillation in the drive train. This results in a higher dynamic response and increased precision. If suitable measuring systems are used and the temperature conditions are appropriate, the motors can be positioned in the nanometer range.

#### Application

##### Version for peak load

Used in machine axes that are temporarily accelerated, e.g. S3 duty or when large forces are required for a short time.

Typical applications:

- High-dynamic, flexible machine tool and production machine construction
- Laser machining
- Handling

##### Version for continuous load

Used in machine axes with constant acceleration changes, e.g. S1 duty, with high process/weight forces or for operation without water cooling.

Typical applications:

- Grinding
- Non-circular machining (e.g. oscillating applications)
- Z-axes without weight compensation, quills
- Handling, Cartesian robots

#### Design

The simple mechanical construction without transmission elements, such as ballscrew, coupling or belt, enhances the reliability of the drive components.

Heat loss occurs almost exclusively in the primary section and is dissipated via an integrated liquid cooling system. The optional Thermo-Sandwich dual-circuit cooling system permits both a thermal decoupling of the motor from the machine, and also a low-priced cooling design.

The stainless metal encapsulation of the primary section ensures the high mechanical ruggedness and resistance to soiling required for use in machine tools and production machines, as well as high resistance to corrosive liquids. In addition, the motor places minimal demands on the preparation of mounting surfaces thanks to the large air gap. The mounting tolerances for the air gap are  $\pm 0.3$  mm (0.012 in).

##### Design variants

SIMOTICS L-1FN3 linear motors are available as single-sided or double-sided motors.

- Single-sided motors  
The single-sided version consists of a primary section that is mounted parallel to the associated secondary section.
- Double-sided motors  
The special secondary section of the double-sided version lies between two primary sections (one primary section with standard winding and one with complementary winding). The design as a double-sided motor is particularly suitable for applications with movable secondary section and small traversing paths with fast acceleration, e.g. non-circular machining.

#### More information

Some motor types can be delivered under plant standstill conditions as spare motors with the fast delivery service and offer the benefits of faster spare parts supply. Please address any questions regarding SIMOTICS L-1FN3 linear motors to the email address below:

[info.drives@siemens.com](mailto:info.drives@siemens.com)

# SIMOTICS linear and torque motors

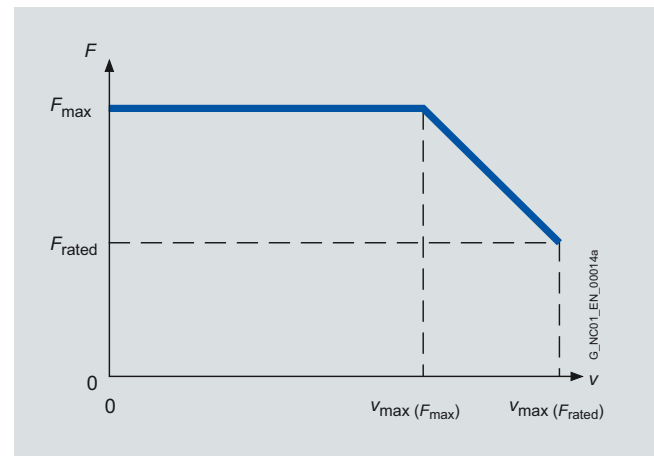
## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors

#### Technical specifications

<b>Product name</b>	SIMOTICS L-1FN3 linear motor
<b>Motor type</b>	Permanent magnet linear motor
<b>Magnet material</b>	Rare-earth permanent magnets
<ul style="list-style-type: none"> <li>• Primary section</li> <li>• Secondary section</li> </ul>	Rare-earth permanent magnets
<b>Overload ratio (<math>F_{max}:F_{rated}</math>) up to max.</b>	
<ul style="list-style-type: none"> <li>• Version for peak load</li> <li>• Version for continuous load</li> </ul>	2.75 1.7
<b>Cooling</b>	Water cooling <sup>1)</sup>
<b>Water cooler connections</b>	G 1/8" internal thread on all primary and secondary section coolers
<b>Temperature influence on surrounding construction with precision cooling, max.</b>	+4 K
<b>Coolant inlet temperature, permissible</b>	35 °C (95 °F) (avoid condensation) > 35 °C (95 °F) on reduction of rated motor power
<b>Temperature monitoring integrated in the primary section winding<sup>2)</sup></b>	2 monitoring circuits: Temp-S with PTC thermistor and Temp-F with KTY84 temperature sensor
<b>Insulation in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature of 120 °C (248 °F)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65
<b>Available configurations</b>	Different graduations due to modular construction
<b>Secondary section cover</b>	Exchangeable through all segments or segment by segment
<b>2nd rating plate</b>	Enclosed separately
<b>Encoder system<sup>3)</sup></b> (not included in scope of supply)	Select according to basic conditions specific to the application and the drive
<b>Connection</b>	
<ul style="list-style-type: none"> <li>• 1FN3050</li> </ul>	Permanently connected signal and power cable assembled with plugs or with open core ends
<ul style="list-style-type: none"> <li>• 1FN3100 ... 1FN3900</li> </ul>	Connection cover prepared for separate power and signal cables
<b>Approvals, according to</b>	cURus UR for 1FN3900-4WC00-...

#### Characteristic curves



Velocity/force characteristic curve

The SIMOTICS L-1FN3 linear motors have an overload range available for acceleration processes. The maximum force  $F_{max}$  can only be utilized up to a maximum velocity  $v_{max}(F_{max})$ ; up to velocity  $v_{max}(F_{rated})$  only the feedrate force  $F_{rated}$  is available.

<sup>1)</sup> See liquid cooling on page 6/15.

<sup>2)</sup> Evaluation via SME120/SME125 Sensor Module External or TM120 Terminal Module, see SINAMICS S120 drive system.

<sup>3)</sup> See recommended linear measuring systems on page 6/15.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors

#### Version for peak load – Water cooling

#### Selection and ordering data

Feedrate force				Maximum velocity <sup>3)</sup>		SIMOTICS L-1FN3 linear motors Version for peak load		Weight, approx.	
						Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
$F_{rated}^{1)2)}$	$F_{max}$	$v_{max} at F_{max}$	$v_{max} at F_{rated}$						
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)		
<b>Water cooling</b>									
<b>200 (45)</b>	550 (124)	146 (479)	373 (1224)	<b>1FN3050-2WC00-0EA1</b>	<b>1FN3050-4SA00-0AA0</b>	2.4/2.9 (5.3/6.4)	0.4/0.5 (0.9/1.1)		
		146 (479)	373 (1224)	<b>1FN3050-2WC00-0FA1</b>					
<b>200 (45)</b>	490 (110)	138 (453)	322 (1056)	<b>1FN3100-1WC00-0BA1</b>	<b>1FN3100-4SA00-0AA0</b>	2.2/– (4.9/–) <sup>4)</sup>	0.7/0.8 (1.5/1.8)		
<b>450 (101)</b>	1100 (247)	131 (430)	297 (974)	<b>1FN3100-2WC00-0BA1</b>		3.8/4.4 (8.4/9.7)			
		237 (778)	497 (1631)	<b>1FN3100-2WE00-0BA1</b>					
<b>675 (152)</b>	1650 (371)	120 (394)	277 (909)	<b>1FN3100-3WC00-0BA1</b>		5.4/6.2 (11.9/13.7)			
		237 (778)	497 (1631)	<b>1FN3100-3WE00-0BA1</b>					
<b>900 (202)</b>	2200 (495)	131 (430)	297 (974)	<b>1FN3100-4WC00-0BA1</b>		7.4/8.5 (16.3/18.7)			
		237 (778)	497 (1631)	<b>1FN3100-4WE00-0BA1</b>					
<b>1125 (253)</b>	2750 (618)	109 (358)	255 (837)	<b>1FN3100-5WC00-0BA1</b>		9.1/10.4 (20.1/22.9)			
<b>340 (76)</b>	820 (184)	126 (413)	282 (925)	<b>1FN3150-1WC00-0BA1</b>	<b>1FN3150-4SA00-0AA0</b>	3.0/– (6.6/–) <sup>4)</sup>	1.2/1.3 (2.7/2.9)		
<b>675 (152)</b>	1650 (371)	126 (413)	282 (925)	<b>1FN3150-2WC00-0BA1</b>		5.3/6 (11.7/13.2)			
<b>1010 (227)</b>	2470 (555)	126 (413)	282 (925)	<b>1FN3150-3WC00-0BA1</b>		7.8/8.7 (17.2/19.2)			
<b>1350 (304)</b>	3300 (742)	126 (413)	282 (925)	<b>1FN3150-4WC00-0BA1</b>		10.2/11.4 (22.5/25.1)			
<b>1690 (380)</b>	4120 (926)	126 (413)	282 (925)	<b>1FN3150-5WC00-0BA1</b>		12.8/14.2 (28.2/31.3)			
<b>610 (137)</b>	1720 (387)	128 (420)	309 (1014)	<b>1FN3300-1WC00-0BA1</b>	<b>1FN3300-4SA00-0AA0</b>	6.2/– (13.7/–) <sup>4)</sup>	2.4/2.6 (5.3/5.7)		
<b>1225 (275)</b>	3450 (776)	63 (207)	176 (577)	<b>1FN3300-2WB00-0BA1</b>		11.4/12.4 (25.1/27.3)			
		125 (410)	297 (974)	<b>1FN3300-2WC00-0BA1</b>					
		369 (1211)	805 (2641)	<b>1FN3300-2WG00-0BA1</b>					
<b>1840 (414)</b>	5170 (1162)	125 (410)	297 (974)	<b>1FN3300-3WC00-0BA1</b>		17.0/18.4 (37.5/40.6)			
		383 (1257)	836 (2743)	<b>1FN3300-3WG00-0BA1</b>					
<b>2450 (551)</b>	6900 (1551)	63 (207)	176 (577)	<b>1FN3300-4WB00-0BA1</b>		22.2/24 (48.9/52.9)			
		125 (410)	297 (974)	<b>1FN3300-4WC00-0BA1</b>					

#### Type of connection:

1FN3100 to 1FN3900 motors

Connection cover prepared for separate power and signal cables

**B**

1FN3050 motor

Permanently connected power and signal cables with exposed core ends  
Length: 2 m (6.56 ft)

**E**

1FN3050 motor

Permanently connected power and signal cables pre-assembled, with connectors  
Length: 0.5 m (1.64 ft)

**F**

Description

Order No.

**Signal cable, pre-assembled with M17 connector<sup>8)</sup>**

For SIMOTICS L linear motors

- 1FN3100/1FN3150
- 1FN3300 ... 1FN3900

**6FX7002-2SL01-....**

**6FX7002-2SL02-....**

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

**SIMOTICS L-1FN3 linear motors**  
Version for peak load – Water cooling

Motor type Primary section (repeated)	Rated current	Maxi- mum current	Calcula- ted power	SINAMICS S120 Motor Module Booksize format		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current	For additional versions and components see SINAMICS S120 drive system	Pre-assembled adapter cable for motor	Power con- nector	Cable cross- section <sup>5)</sup>	Pre-assembled basic cable to the drive system
	$I_{rated}^1)$	$I_{max}$	$P_{el, max.}$	$I_{rated}/I_{max}$	Order No.	Order No.	Size	mm <sup>2</sup>	Order No.
	A	A	kW (HP)	A					
1FN3050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10	<b>6SL312-1-TE15-0AA3</b>	6)	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3050-2WC00-...	2.7	8.2	4.1 (5.5)	5/10	<b>6SL312-1-TE15-0AA3</b>	7)	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-1WC00-...	2.4	6.5	3.1 (4.2)	5/10	<b>6SL312-1-TE15-0AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-2WC00-...	5.1	13.5	6.3 (8.5)	9/18	<b>6SL312-1-TE21-0AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-2WE00-...	8.1	21.5	8.3 (11.1)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-3WC00-...	7.2	19.1	9.2 (12.3)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-3WE00-...	12.1	32.2	12.4 (16.6)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-4WC00-...	10.1	27.0	12.6 (16.9)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-4WE00-...	16.1	43.0	16.6 (22.3)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3100-5WC00-...	11.0	29.5	14.4 (19.3)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3150-1WC00-...	3.6	9.5	4.3 (5.8)	5/10	<b>6SL312-1-TE15-0AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3150-2WC00-...	7.2	19.1	8.7 (11.7)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3150-3WC00-...	10.7	28.6	13.0 (17.4)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3150-4WC00-...	14.3	38.2	17.4 (23.3)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3150-5WC00-...	17.9	47.7	21.7 (29.1)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM42-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3300-1WC00-...	6.5	20.0	8.7 (11.7)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3300-2WB00-...	8.0	24.7	13.2 (17.7)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3300-2WC00-...	12.6	39.2	16.7 (22.4)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3300-2WG00-...	32.2	99.7	30.1 (40.4)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM82-....</b>	1.5	4 × 6	<b>6FX8002-5CS54-....</b>
1FN3300-3WC00-...	19.0	58.7	25.1 (33.7)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3300-3WG00-...	50.0	154.9	46.2 (61.9)	132/210	<b>6SL312-1-TE31-3AA3</b>	<b>6FX7002-5LM02-....</b>	1.5	4 × 16	<b>6FX8002-5CS24-....</b>
1FN3300-4WB00-...	16.0	49.4	26.3 (35.3)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3300-4WC00-...	25.3	78.3	33.5 (44.9)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

.... Length code ....

For information on the cables refer to  
[MOTION-CONNECT](#)  
connection systems

1) For water cooling with inlet temperature 35 °C (95 °F).

2) A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

3) Velocity values refer to a DC link voltage of the drive system of 600 V DC.

4) No precision cooler available.

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

6) Permanently connected power and signal cables, length 2 m (6.56 ft), with exposed core ends.

7) Permanently connected power and signal cables, length 0.5 m (1.64 ft), with power connector size 1 and M17 signal connector.

8) For length code, see [MOTION-CONNECT](#) connection systems.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors Version for peak load – Water cooling

#### Selection and ordering data

Feedrate force				Maximum velocity <sup>3)</sup>		SIMOTICS L-1FN3 linear motors Version for peak load		Weight, approx.	
				Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles		
$F_{rated}$ <sup>1)2)</sup>	$F_{max}$	$v_{max}$ at $F_{max}$	$v_{max}$ at $F_{rated}$	Order No.	Order No.	kg (lb)	kg (lb)		
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)						
<b>Water cooling</b>									
<b>1930 (434)</b>	5180 (1165)	30 (98)	112 (368)	<b>1FN3450-2WA50-0BA1</b>	<b>1FN3450-4SA00-0AA0</b>	15.9/17.1 (35.1/37.7)	3.8/4 (8.4/8.8)		
		120 (394)	275 (902)	<b>1FN3450-2WC00-0BA1</b>					
		240 (787)	519 (1703)	<b>1FN3450-2WE00-0BA1</b>					
<b>2895 (651)</b>	7760 (1745)	62 (203)	164 (538)	<b>1FN3450-3WB00-0BA1</b>		22.6/24.3 (49.8/53.6)			
		90 (295)	217 (712)	<b>1FN3450-3WB50-0BA1</b>					
		120 (394)	275 (902)	<b>1FN3450-3WC00-0BA1</b>					
		240 (787)	519 (1703)	<b>1FN3450-3WE00-0BA1</b>					
<b>3860 (868)</b>	10350 (2327)	62 (203)	164 (538)	<b>1FN3450-4WB00-0BA1</b>		30.9/33.1 (68.1/73)			
		90 (295)	217 (712)	<b>1FN3450-4WB50-0BA1</b>					
		120 (394)	275 (902)	<b>1FN3450-4WC00-0BA1</b>					
		240 (787)	519 (1703)	<b>1FN3450-4WE00-0BA1</b>					
<b>2610 (587)</b>	6900 (1551)	36 (118)	120 (394)	<b>1FN3600-2WA50-0BA1</b>	<b>1FN3600-4SA00-0AA0</b>	22.2/24.7 (49/54.5)	4.6/5 (10.1/11)		
		127 (417)	279 (915)	<b>1FN3600-3WC00-0BA1</b>					
<b>3915 (880)</b>	10350 (2327)	58 (190)	155 (509)	<b>1FN3600-3WB00-0BA1</b>		31.5/33.4 (69.5/73.7)			
		127 (417)	279 (915)	<b>1FN3600-3WC00-0BA1</b>					
		26 (85)	105 (345)	<b>1FN3600-4WA30-0BA1</b>					
<b>5220 (1174)</b>	13800 (3102)	58 (190)	155 (509)	<b>1FN3600-4WB00-0BA1</b>		40.8/43.3 (90/95.5)			
		91 (299)	215 (705)	<b>1FN3600-4WB50-0BA1</b>					
		112 (367)	254 (833)	<b>1FN3600-4WC00-0BA1</b>					
		65 (213)	160 (525)	<b>1FN3900-2WB00-0BA1</b>			<b>1FN3900-4SA00-0AA0</b>	28.2/29.7 (62.2/65.4)	7.5/7.9 (16.5/17.4)
115 (377)	253 (830)	<b>1FN3900-2WC00-0BA1</b>							
<b>6075 (1366)</b>	15530 (3491)	75 (246)	181 (594)	<b>1FN3900-3WB00-0BA1</b>		42.2/44.3 (93.1/97.6)			
		65 (213)	160 (525)	<b>1FN3900-4WB00-0BA1</b>					
		88 (290)	203 (666)	<b>1FN3900-4WB50-0BA1</b>					
<b>8100 (1821)</b>	20700 (4653)	115 (377)	253 (830)	<b>1FN3900-4WC00-0BA1</b>		56.2/58.9 (124/130)			
		65 (213)	160 (525)	<b>1FN3900-4WB00-0BA1</b>					
		88 (290)	203 (666)	<b>1FN3900-4WB50-0BA1</b>					

#### Type of connection:

1FN3100 to 1FN3900 motors

Connection cover prepared for separate power and signal cables

**B**

Description	Order No.
<b>Signal cable, pre-assembled with M17 connector<sup>7)</sup></b>	
For SIMOTICS L linear motors	
• 1FN3100/1FN3150	<b>6FX7002-2SL01-....</b>
• 1FN3300 ... 1FN3900	<b>6FX7002-2SL02-....</b>



# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

**SIMOTICS L-1FN3 linear motors**  
Version for peak load – Water cooling

Motor type Primary section (repeated)	Rated current	Maxi- mum cur- rent	Calculated power	SINAMICS S120 Motor Module Booksize format		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration			
				Required rated current	For additional versions and components see SINAMICS S120 drive system	Pre-assembled adapter cable for motor	Power con- nector	Cable cross- section <sup>4)</sup>	Pre-assembled basic cable to the drive system
	$I_{rated}^{1)}$	$I_{max}$	$P_{el, max.}$	$I_{rated}/I_{max}$	Order No.	Order No.	Size	mm <sup>2</sup>	Order No.
	A	A	kW (HP)	A					
1FN3450-2WA50-...	8.6	25.3	15.9 (21.3)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3450-2WC00-...	18.8	55.3	23.1 (31)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3450-2WE00-...	33.8	99.7	32.6 (43.7)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM82-....</b>	1.5	4 × 6	<b>6FX8002-5CS54-....</b>
1FN3450-3WB00-...	17.9	52.7	27.5 (36.9)	30/56	<b>6SL312-1-TE23-0AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3450-3WB50-...	22.8	67.3	31.1 (41.7)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>
1FN3450-3WC00-...	28.1	83.0	34.6 (46.4)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>
1FN3450-3WE00-...	50.7	149.6	49.0 (65.7)	132/210	<b>6SL312-1-TE31-3AA3</b>	<b>6FX7002-5LM02-....</b>	1.5	4 × 16	<b>6FX8002-5CS24-....</b>
1FN3450-4WB00-...	23.8	70.3	36.7 (49.2)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>
1FN3450-4WB50-...	30.4	89.8	41.4 (55.5)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM82-....</b>	1.5	4 × 6	<b>6FX8002-5CS54-....</b>
1FN3450-4WC00-...	37.5	110.6	46.2 (61.9)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM32-....</b>	1.5	4 × 10	<b>6FX8002-5CS64-....</b>
1FN3450-4WE00-...	67.6	199.5	65.3 (87.5)	132/210	<b>6SL312-1-TE31-3AA3</b>	<b>6FX7008-1BB61-....<sup>5)</sup></b>	–	4 × 25	<b>6FX7008-1BB25-....<sup>6)</sup></b>
1FN3600-2WA50-...	12.4	36.0	21.9 (29.4)	18/36	<b>6SL312-1-TE21-8AA3</b>	<b>6FX7002-5LM62-....</b>	1	4 × 2.5	<b>6FX8002-5CS11-....</b>
1FN3600-3WB00-...	23.2	67.3	35.4 (47.5)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>
1FN3600-3WC00-...	35.7	105.9	44.6 (59.8)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM82-....</b>	1.5	4 × 6	<b>6FX8002-5CS54-....</b>
1FN3600-4WA30-...	22.3	64.9	41.9 (56.2)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>
1FN3600-4WB00-...	30.9	89.8	47.2 (63.3)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM82-....</b>	1.5	4 × 6	<b>6FX8002-5CS54-....</b>
1FN3600-4WB50-...	40.8	118.5	53.2 (71.3)	85/141	<b>6SL312-1-TE28-5AA3</b>	<b>6FX7002-5LM32-....</b>	1.5	4 × 10	<b>6FX8002-5CS64-....</b>
1FN3600-4WC00-...	46.9	136.5	55.5 (74.4)	85/141	<b>6SL312-1-TE28-5AA3</b>	<b>6FX7002-5LM32-....</b>	1.5	4 × 10	<b>6FX8002-5CS64-....</b>
1FN3900-2WB00-...	24.7	69.5	34.5 (46.3)	45/85	<b>6SL312-1-TE24-5AA3</b>	<b>6FX7002-5LM72-....</b>	1.5	4 × 4	<b>6FX8002-5CS54-....</b>
1FN3900-2WC00-...	36.7	103.3	40.9 (54.8)	60/113	<b>6SL312-1-TE26-0AA3</b>	<b>6FX7002-5LM32-....</b>	1.5	4 × 10	<b>6FX8002-5CS64-....</b>
1FN3900-3WB00-...	40.6	114.0	54.5 (73.1)	85/141	<b>6SL312-1-TE28-5AA3</b>	<b>6FX7002-5LM32-....</b>	1.5	4 × 10	<b>6FX8002-5CS64-....</b>
1FN3900-4WB00-...	49.4	138.9	68.9 (92.4)	132/210	<b>6SL312-1-TE31-3AA3</b>	<b>6FX7002-5LM32-....</b>	1.5	4 × 10	<b>6FX8002-5CS64-....</b>
1FN3900-4WB50-...	60.6	170.3	76.3 (102.3)	132/210	<b>6SL312-1-TE31-3AA3</b>	<b>6FX7002-5LM02-....</b>	1.5	4 × 16	<b>6FX8002-5CS24-....</b>
1FN3900-4WC00-...	73.5	206.5	81.9 (109.8)	132/210	<b>6SL312-1-TE31-3AA3</b>	<b>6FX7008-1BB61-....<sup>5)</sup></b>	–	4 × 25	<b>6FX7008-1BB25-....<sup>6)</sup></b>

<b>Cooling:</b> Internal air cooling	<b>0</b>
External air cooling	<b>1</b>
<b>Motor Module:</b> Single Motor Module	<b>1</b>
Double Motor Module	<b>2</b>

....	Length code	....
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For information on the cables refer to [MOTION-CONNECT connection systems](#)

<sup>1)</sup> For water cooling with inlet temperature 35 °C (95 °F).

<sup>2)</sup> A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

<sup>3)</sup> Velocity values refer to a DC link voltage of the drive system of 600 V DC.

<sup>4)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

<sup>5)</sup> Sold by the meter only (4 × 16 mm<sup>2</sup>). Connected to primary section with 16 mm<sup>2</sup> (< 1.5 m (4.92 ft)) then routed onwards through terminal box with 25 mm<sup>2</sup>.

<sup>6)</sup> Sold by the meter only (4 × 25 mm<sup>2</sup>).

<sup>7)</sup> For length code, see [MOTION-CONNECT connection systems](#).

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors

#### Version for continuous load – Water cooling

#### Selection and ordering data

Feedrate force				Maximum velocity <sup>3)</sup>		SIMOTICS L-1FN3 linear motors Version for continuous load		Weight, approx.	
						Primary section	Secondary section	Primary section without/with precision cooling	Secondary section without/with heatsink profiles
$F_{rated}^{1)2)}$	$F_{max}$	$v_{max}$ at $F_{max}$	$v_{max}$ at $F_{rated}$						
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)		
<b>Water cooling</b>									
<b>150 (34)</b>	260 (58)	242 (794)	435 (1427)	<b>1FN3050-1ND00-0EA1</b>	<b>1FN3050-4SA00-0AA0</b>	1.9/2.4 (4.2/5.3)	0.4/0.5 (0.9/1.1)		
		242 (794)	435 (1427)	<b>1FN3050-1ND00-0FA1</b>					
<b>300 (67)</b>	510 (115)	106 (348)	202 (663)	<b>1FN3050-2NB80-0EA1</b>	<b>1FN3050-4SA00-0AA0</b>	3.2/4.0 (7.1/8.8)			
		106 (348)	202 (663)	<b>1FN3050-2NB80-0FA1</b>					
<b>300 (67)</b>	510 (115)	117 (384)	214 (702)	<b>1FN3100-1NC00-0BA1</b>	<b>1FN3100-4SA00-0AA0</b>	3/3.5 (6.6/7.7)	0.7/0.8 (1.5/1.8)		
<b>605 (136)</b>	1020 (229)	170 (558)	307 (1007)	<b>1FN3100-2NC80-0BA1</b>					
<b>905 (203)</b>	1530 (344)	115 (337)	211 (692)	<b>1FN3100-3NC00-0BA1</b>	<b>1FN3100-4SA00-0AA0</b>	7.3/8.3 (16.1/18.03)			
<b>1205 (271)</b>	2040 (459)	169 (555)	305 (1001)	<b>1FN3100-4NC80-0BA1</b>					
<b>455 (102)</b>	770 (173)	129 (423)	234 (768)	<b>1FN3150-1NC20-0BA1</b>	<b>1FN3150-4SA00-0AA0</b>	4.1/4.6 (9.0/10.1)	1.2/1.3 (2.7/2.9)		
<b>905 (203)</b>	1530 (344)	110 (361)	201 (660)	<b>1FN3150-2NB80-0BA1</b>					
<b>1360 (306)</b>	2300 (517)	163 (535)	292 (958)	<b>1FN3150-3NC70-0BA1</b>	<b>1FN3150-4SA00-0AA0</b>	7.2/8.1 (15.9/17.9)			
<b>1810 (407)</b>	3060 (688)	109 (358)	200 (656)	<b>1FN3150-4NB80-0BA1</b>					
<b>865 (195)</b>	1470 (331)	129 (423)	230 (755)	<b>1FN3300-1NC10-0BA1</b>	<b>1FN3300-4SA00-0AA0</b>	8.8/9.5 (19.4/20.9)	2.4/2.6 (5.3/5.7)		
<b>1730 (389)</b>	2940 (661)	127 (417)	228 (748)	<b>1FN3300-2NC10-0BA1</b>					
<b>2595 (583)</b>	4400 (989)	144 (473)	257 (843)	<b>1FN3300-3NC40-0BA1</b>	<b>1FN3300-4SA00-0AA0</b>	22.8/24.3 (50.3/53.6)			
<b>3460 (778)</b>	5870 (1320)	109 (358)	196 (643)	<b>1FN3300-4NB80-0BA1</b>					
<b>2595 (583)</b>	4400 (989)	153 (502)	271 (889)	<b>1FN3450-2NC50-0BA1</b>	<b>1FN3450-4SA00-0AA0</b>	22/23.2 (48.5/51.2)	3.8/4 (8.4/8.8)		
<b>3890 (875)</b>	6600 (1484)	152 (499)	270 (886)	<b>1FN3450-3NC50-0BA1</b>					
<b>5185 (1166)</b>	8810 (1981)	106 (348)	190 (623)	<b>1FN3450-4NB80-0BA1</b>	<b>1FN3450-4SA00-0AA0</b>	32/33.6 (70.6/74.1)			
<b>3460 (778)</b>	5870 (1320)	112 (368)	200 (656)	<b>1FN3600-2NB80-0BA1</b>					
<b>5185 (1166)</b>	8810 (1981)	111 (364)	199 (653)	<b>1FN3600-3NB80-0BA1</b>	<b>1FN3600-4SA00-0AA0</b>	42.3/44.3 (93.3/97.9)	4.6/5 (10.1/11)		
<b>6915 (1555)</b>	11740 (2639)	111 (364)	199 (653)	<b>1FN3600-4NB80-0BA1</b>					
<b>5185 (1166)</b>	8810 (1981)	71 (233)	130 (427)	<b>1FN3900-2NB20-0BA1</b>	<b>1FN3900-4SA00-0AA0</b>	56.6/59.2 (124.8/130.54)	7.5/7.9 (16.5/17.4)		
<b>7780 (1749)</b>	13210 (2970)	71 (233)	129 (423)	<b>1FN3900-3NB20-0BA1</b>					
<b>10375 (2332)</b>	17610 (3959)	70 (230)	129 (423)	<b>1FN3900-4NB20-0BA1</b>	<b>1FN3900-4SA00-0AA0</b>	62/64.5 (136.7/142.2)			
						82.2/85.3 (181.3/188.1)			

#### Type of connection:

1FN3100 to 1FN3900 motors

Connection cover prepared for separate power and signal cables

**B**

1FN3050 motor

Permanently connected power and signal cables with exposed core ends  
Length: 2 m (6.56 ft)

**E**

1FN3050 motor

Permanently connected power and signal cables pre-assembled,  
with connectors  
Length: 0.5 m (1.64 ft)

**F**

Description	Order No.
<b>Signal cable, pre-assembled with M17 connector<sup>7)</sup></b>	
For SIMOTICS L linear motors	
• 1FN3100/1FN3150	<b>6FX7002-2SL01-....</b>
• 1FN3300 ... 1FN3900	<b>6FX7002-2SL02-....</b>

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

**SIMOTICS L-1FN3 linear motors**  
Version for continuous load – Water cooling

Motor type Primary section (repeated)	Rated current	Maxi- mum current	Calculated power	SINAMICS S120 Motor Module Booksize format		Power cable with complete shield Motor connection via adapter cable with power connector for increased velocity/acceleration				
				Required rated current	For additional versions and components see SINAMICS S120 drive system	Pre-assembled adapter cable for motor	Power con- nector	Cable cross- section <sup>5)</sup>	Pre-assembled basic cable to the drive system	
				$I_{rated}/I_{max}$	Order No.					Order No.
$I_{rated}$ <sup>1)</sup>	$I_{max}$	$P_{el, max.}$	$I_{rated}/I_{max}$							
A	A	kW (HP)	A							
1FN3050-1ND...	2.8	5.9	1.7 (2.28)	3/6	6SL312-1-TE13-0AA3	6)	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3050-1ND...	2.8	5.9	1.7 (2.28)	3/6	6SL312-1-TE13-0AA3	6)	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3050-2NB...	2.8	5.9	2.3 (3.08)	3/6	6SL312-1-TE13-0AA3	6)	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3050-2NB...	2.8	5.9	2.3 (3.08)	3/6	6SL312-1-TE13-0AA3	6)	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3100-1NC...	2.8	5.9	2.1 (2.8)	3/6	6SL312-1-TE13-0AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3100-2NC...	8	16.5	5.1 (6.84)	9/18	6SL312-1-TE21-0AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3100-3NC...	8.5	17.6	6.3 (8.5)	9/18	6SL312-1-TE21-0AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3100-4NC...	15.9	33.1	10.2 (13.9)	18/36	6SL312-1-TE21-8AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3150-1NC...	4.5	9.4	3.2 (4.3)	5/10	6SL312-1-TE15-0AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3150-2NB...	8	16.5	5.8 (7.78)	9/18	6SL312-1-TE21-0AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3150-3NC...	16.9	35.2	10.8 (14.5)	18/36	6SL312-1-TE21-8AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3150-4NB...	15.9	33.1	11.6 (15.6)	18/36	6SL312-1-TE21-8AA3	6FX7002-5LM42- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3300-1NC...	8.1	17.1	5.4 (7.2)	9/18	6SL312-1-TE21-0AA3	6FX7002-5LM62- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3300-2NC...	16.2	34.1	10.7 (14.3)	18/36	6SL312-1-TE21-8AA3	6FX7002-5LM62- ....	1	4 × 2.5	6FX8002-5CS11- ....	
1FN3300-3NC...	27.3	57.4	17.3 (23.2)	30/56 <sup>4)</sup>	6SL312-1-TE23-0AA3	6FX7002-5LM72- ....	1.5	4 × 4	6FX8002-5CS41- ....	
1FN3300-4NB...	28.4	59.6	19.6 (26.3)	30/56 <sup>4)</sup>	6SL312-1-TE23-0AA3	6FX7002-5LM72- ....	1.5	4 × 4	6FX8002-5CS41- ....	
1FN3450-2NC...	28.4	59.6	17.4 (23.3)	30/56 <sup>4)</sup>	6SL312-1-TE23-0AA3	6FX7002-5LM72- ....	1.5	4 × 4	6FX8002-5CS41- ....	
1FN3450-3NC...	42.5	89.5	26.1 (35.0)	45/85 <sup>4)</sup>	6SL312-1-TE24-5AA3	6FX7002-5LM32- ....	1.5	4 × 10	6FX8002-5CS64- ....	
1FN3450-4NB...	40.8	85.8	27.9 (37.4)	45/85 <sup>4)</sup>	6SL312-1-TE24-5AA3	6FX7002-5LM32- ....	1.5	4 × 10	6FX8002-5CS64- ....	
1FN3600-2NB...	28.4	59.6	19.3 (25.9)	30/56 <sup>4)</sup>	6SL312-1-TE23-0AA3	6FX7002-5LM72- ....	1.5	4 × 4	6FX8002-5CS41- ....	
1FN3600-3NB...	42.5	89.5	28.9 (38.8)	45/85 <sup>4)</sup>	6SL312-1-TE24-5AA3	6FX7002-5LM32- ....	1.5	4 × 10	6FX8002-5CS64- ....	
1FN3600-4NB...	56.7	119.3	38.5 (51.6)	60/113 <sup>4)</sup>	6SL312-1-TE26-0AA3	6FX7002-5LM02- ....	1.5	4 × 16	6FX8002-5CS24- ....	
1FN3900-2NB...	28.4	59.6	22.3 (29.9)	30/56 <sup>4)</sup>	6SL312-1-TE23-0AA3	6FX7002-5LM72- ....	1.5	4 × 4	6FX8002-5CS41- ....	
1FN3900-3NB...	42.5	89.5	33.4 (44.8)	45/85 <sup>4)</sup>	6SL312-1-TE24-5AA3	6FX7002-5LM32- ....	1.5	4 × 10	6FX8002-5CS64- ....	
1FN3900-4NB...	56.7	119.3	44.5 (59.7)	60/113 <sup>4)</sup>	6SL312-1-TE26-0AA3	6FX7002-5LM02- ....	1.5	4 × 16	6FX8002-5CS24- ....	

<b>Cooling:</b> Internal air cooling	0	.... Length code	....
External air cooling	1		
<b>Motor Module:</b> Single Motor Module	1	For information on the cables refer to MOTION-CONNECT connection systems	
Double Motor Module	2		

<sup>1)</sup> For water cooling with inlet temperature 35 °C (95 °F).

<sup>2)</sup> A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

<sup>3)</sup> Velocity values refer to a DC link voltage of the drive system of 600 V DC.

<sup>4)</sup> Power modules are designed for fee rate force  $F_{rated}$ . If feedrate force  $F_{max}$  is utilized, the next largest power module must be used. If a power module with a higher rating is used, you must check whether the specified power cable can be connected to it.

<sup>5)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

<sup>6)</sup> Permanently connected power and signal cables.

<sup>7)</sup> For length code, see MOTION-CONNECT connection systems.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors

#### Optional components

#### Selection and ordering data

SIMOTICS L-1FN3 linear motors Type	Optional components Secondary section cover		Cover end pieces for secondary section cover <sup>2)</sup> Retaining of the integrated cover without heatsink profiles Order No.
	Continuous <sup>1)</sup>	Segmented	
	Order No.	Order No.	
1FN3050-...	<b>1FN3050-0TB00-1</b> ■ ■ 0	<b>1FN3050-4TP00-1A</b> ■ ■	<b>1FN3050-0TC00-0AA0</b>
1FN3100-...	<b>1FN3100-0TB00-1</b> ■ ■ 0	<b>1FN3100-4TP00-1A</b> ■ ■	<b>1FN3100-0TC00-0AA0</b>
1FN3150-...	<b>1FN3150-0TB00-1</b> ■ ■ 0	<b>1FN3150-4TP00-1A</b> ■ ■	<b>1FN3150-0TC00-0AA0</b>
1FN3300-...	<b>1FN3300-0TB00-1</b> ■ ■ 0	<b>1FN3300-4TP00-1A</b> ■ ■	<b>1FN3300-0TC00-0AA0</b>
1FN3450-...	<b>1FN3450-0TB00-1</b> ■ ■ 0	<b>1FN3450-4TP00-1A</b> ■ ■	<b>1FN3450-0TC00-0AA0</b>
1FN3600-...	<b>1FN3600-0TB00-1</b> ■ ■ 0	<b>1FN3600-4TP00-1A</b> ■ ■	–
1FN3900-...	<b>1FN3900-0TB00-1</b> ■ ■ 0	<b>1FN3900-4TP00-1A</b> ■ ■	–

#### Number of secondary sections

0	A
10	B
20	C
30	D
40	E
50	F
0	A
1	B
2	C
3	D
4	E
5	F
6	G
7	H
8	J
9	K

Number of secondary sections for all motors	2.5	C	5
	3	D	0
	3.5	D	5
	4	E	0
	5	F	0
Number of secondary sections for 1FN3600/1FN3900 motors	5.5	F	5
	6.5	G	5

SIMOTICS L-1FN3 linear motors Version for peak load	Optional components Precision cooler
Type	Order No.
1FN3050-2W...	<b>1FN3050-2PK00-0AA0</b>
1FN3100-2W...	<b>1FN3100-2PK00-0AA0</b>
1FN3100-3W...	<b>1FN3100-3PK00-0AA0</b>
1FN3100-4W...	<b>1FN3100-4PK00-0AA0</b>
1FN3100-5W...	<b>1FN3100-5PK00-0AA0</b>
1FN3150-2W...	<b>1FN3150-2PK00-0AA0</b>
1FN3150-3W...	<b>1FN3150-3PK00-0AA0</b>
1FN3150-4W...	<b>1FN3150-4PK00-0AA0</b>
1FN3150-5W...	<b>1FN3150-5PK00-0AA0</b>
1FN3300-2W...	<b>1FN3300-2PK00-0AA0</b>
1FN3300-3W...	<b>1FN3300-3PK00-0AA0</b>
1FN3300-4W...	<b>1FN3300-4PK00-0AA0</b>
1FN3450-2W...	<b>1FN3450-2PK00-0AA0</b>
1FN3450-3W...	<b>1FN3450-3PK00-0AA0</b>
1FN3450-4W...	<b>1FN3450-4PK00-0AA0</b>
1FN3600-2W...	<b>1FN3600-2PK00-0AA0</b>
1FN3600-3W...	<b>1FN3600-3PK00-0AA0</b>
1FN3600-4W...	<b>1FN3600-4PK00-0AA0</b>
1FN3900-2W...	<b>1FN3900-2PK00-0AA0</b>
1FN3900-3W...	<b>1FN3900-3PK00-0AA0</b>
1FN3900-4W...	<b>1FN3900-4PK00-0AA0</b>

SIMOTICS L-1FN3 linear motors Version for continuous load	Optional components Precision cooler
Type	Order No.
1FN3050-1N...	<b>1FN3050-1PK10-0AA0</b>
1FN3050-2N...	<b>1FN3050-2PK10-0AA0</b>
1FN3100-1N...	<b>1FN3100-1PK10-0AA0</b>
1FN3100-2N...	<b>1FN3100-2PK10-0AA0</b>
1FN3100-3N...	<b>1FN3100-3PK10-0AA0</b>
1FN3100-4N...	<b>1FN3100-4PK10-0AA0</b>
1FN3150-1N...	<b>1FN3150-1PK10-0AA0</b>
1FN3150-2N...	<b>1FN3150-2PK10-0AA0</b>
1FN3150-3N...	<b>1FN3150-3PK10-0AA0</b>
1FN3150-4N...	<b>1FN3150-4PK10-0AA0</b>
1FN3300-1N...	<b>1FN3300-1PK10-0AA0</b>
1FN3300-2N...	<b>1FN3300-2PK10-0AA0</b>
1FN3300-3N...	<b>1FN3300-3PK10-0AA0</b>
1FN3300-4N...	<b>1FN3300-4PK10-0AA0</b>
1FN3450-2N...	<b>1FN3450-2PK10-0AA0</b>
1FN3450-3N...	<b>1FN3450-3PK10-0AA0</b>
1FN3450-4N...	<b>1FN3450-4PK10-0AA0</b>
1FN3600-2N...	<b>1FN3600-2PK10-0AA0</b>
1FN3600-3N...	<b>1FN3600-3PK10-0AA0</b>
1FN3600-4N...	<b>1FN3600-4PK10-0AA0</b>
1FN3900-2N...	<b>1FN3900-2PK10-0AA0</b>
1FN3900-3N...	<b>1FN3900-3PK10-0AA0</b>
1FN3900-4N...	<b>1FN3900-4PK10-0AA0</b>

<sup>1)</sup> Integrated cover for several secondary sections. The maximum length of the secondary section cover is 6 m (19.7 ft). For the following motors, this corresponds to: 1FN3050 to 1FN3150, a maximum number of 50 secondary sections (AB to FA). 1FN3300 to 1FN3900, a maximum number of 32 secondary sections (AB to DC).

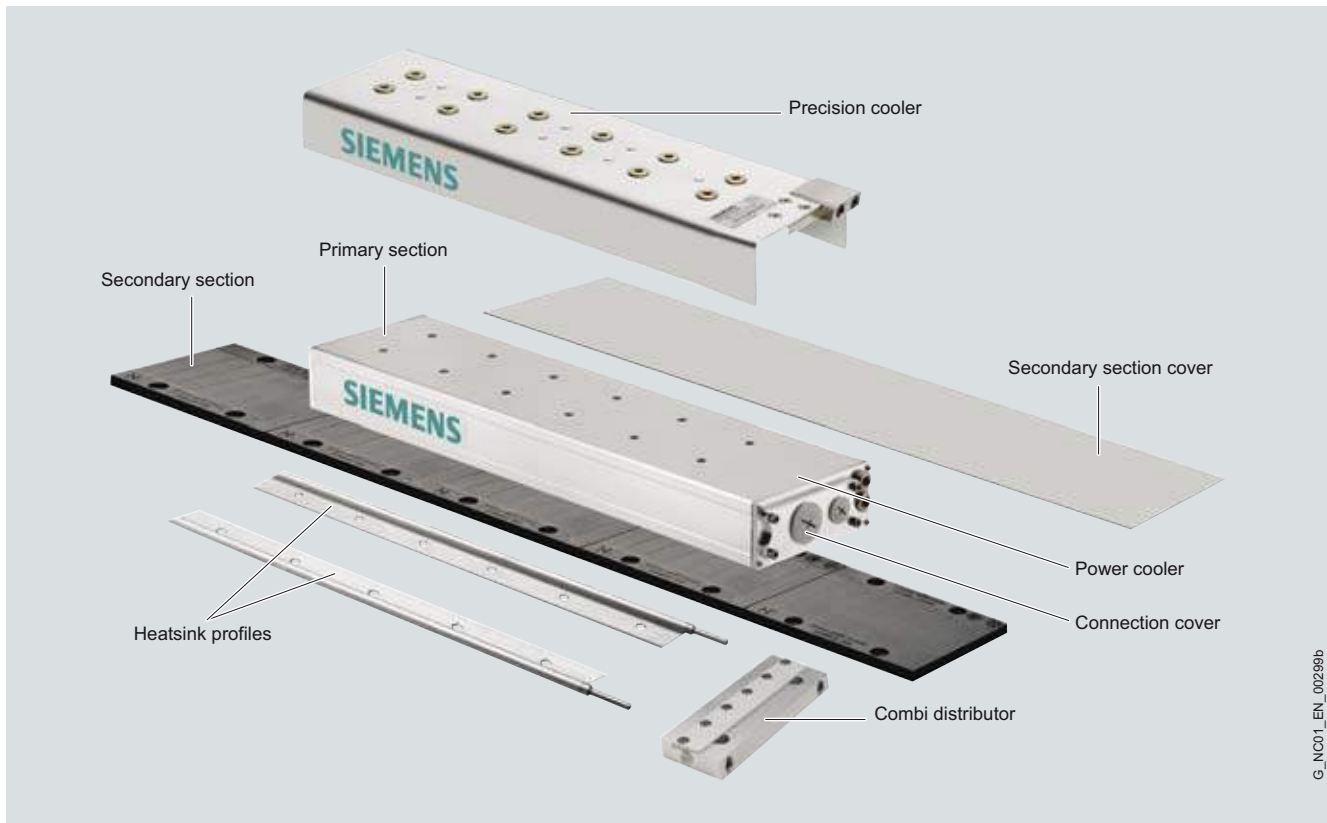
<sup>2)</sup> The secondary section end pieces are designed to allow clamping of the integrated secondary section cover.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors Optional components

#### Selection and ordering data (continued)



G\_NC01\_EN\_00299b

SIMOTICS L-1FN3 linear motors Type	Optional components			
	Heatsink profile <sup>3)</sup>	Secondary section end pieces <sup>2)</sup>		
		Combi distributor Parallel water connection for all heatsink profiles	Combi adapter Combi adapter and end piece can only be implemented together. Single-sided water connection	Combi end piece Water diversion
Order No.	Order No.	Order No.	Order No.	
1FN3050-...	1FN3002-0TK0 ■ -1 ■ ■ 0	1FN3050-0TJ01-0AA0	1FN3050-0TG01-0AA0	1FN3050-0TF01-0AA0
1FN3100-...	1FN3002-0TK0 ■ -1 ■ ■ 0	1FN3100-0TJ01-0AA0	1FN3100-0TG01-0AA0	1FN3100-0TF01-0AA0
1FN3150-...	1FN3002-0TK0 ■ -1 ■ ■ 0	1FN3150-0TJ01-0AA0	1FN3150-0TG01-0AA0	1FN3150-0TF01-0AA0
1FN3300-...	1FN3003-0TK0 ■ -1 ■ ■ 0	1FN3300-0TJ01-0AA0	1FN3300-0TG01-0AA0	1FN3300-0TF01-0AA0
1FN3450-...	1FN3003-0TK0 ■ -1 ■ ■ 0	1FN3450-0TJ01-0AA0	1FN3450-0TG01-0AA0	1FN3450-0TF01-0AA0
1FN3600-...	1FN3004-0TK0 ■ -1 ■ ■ 0	1FN3600-0TJ01-0AA0	-	-
1FN3900-...	1FN3005-0TK0 ■ -1 ■ ■ 0	1FN3900-0TJ01-0AA0	-	-

With plug-in coupling prepared for connection to combi distributor with plug-in coupling, combi adapter with plug-in coupling, combi end piece with plug-in coupling or as intermediate unit for heat-sink profile with cable grommet nipple 1FN3050 to 1FN3450 motors <sup>4)</sup> : <b>Grommet nipple only on right end</b> of secondary section track 1FN3600/1FN3900 motors: <b>Grommet nipple on both ends</b> of secondary section track 1FN3050 to 1FN3450 motors <sup>4)</sup> : <b>Grommet nipple only on left end</b> of secondary section track	Number of secondary sections
4	A 0 B 10 C 20
6	A 0 B 1 C 2 D 3 E 4 F 5 G 6 H 7 J 8 K 9
6	A 0 B 1 C 2 D 3 E 4 F 5 G 6 H 7 J 8 K 9
7	A 0 B 1 C 2 D 3 E 4 F 5 G 6 H 7 J 8 K 9

<sup>3)</sup> 1FN3050 to 1FN3450 motors:  
2 units required per secondary section track.  
1FN3600 to 1FN3900:  
3 units per secondary section track.  
The maximal available length of a single-part heatsink profile is 3 m (9.84 ft).  
For the following motors, this corresponds to:  
1FN3050 to 1FN3150, a maximum of 24 secondary sections (AB to CE)  
1FN3300 to 1FN3900, a maximum of 16 secondary sections (AB to BG).

<sup>4)</sup> Available only in length AC (equals 2 secondary sections). The difference in the secondary section track length must be compensated through assembly with the heatsink profile 1FN300.-0TK04-1..0.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3 linear motors Hall-effect sensor box

#### Overview



The hall-effect sensor box may be required with incremental length measuring systems when the software method for pole position identification cannot be applied.

#### Selection and ordering data

SIMOTICS L-1FN3 linear motors	Hall-effect sensor box	
	Straight cable outlet	Cable outlet at side
Type	Order No.	Order No.
<b>Mounted opposite primary section terminal end</b>		
1FN3050-2... 1FN3100-2... 1FN3100-4... 1FN3150-2... 1FN3150-4...	<b>1FN3002-0PH00-0AA0</b>	<b>1FN3002-0PH01-0AA0</b>
1FN3100-1... 1FN3100-3... 1FN3100-5... 1FN3150-1... 1FN3150-3... 1FN3150-5...	<b>1FN3005-0PH00-0AA0</b>	<b>1FN3005-0PH01-0AA0</b>
1FN3300-2... 1FN3300-4... 1FN3450-2... 1FN3450-4... 1FN3600-2... 1FN3600-4... 1FN3900-2... 1FN3900-4...	<b>1FN3003-0PH00-0AA0</b>	<b>1FN3003-0PH01-0AA0</b>
1FN3300-1... 1FN3300-3... 1FN3450-3... 1FN3600-3... 1FN3900-3...	<b>1FN3006-0PH00-0AA0</b>	<b>1FN3006-0PH01-0AA0</b>
<b>Mounted on primary section terminal end</b>		
1FN3050-... 1FN3100-... 1FN3150-...	<b>1FN3002-0PH00-0AA0</b>	<b>1FN3002-0PH01-0AA0</b>
1FN3300-... 1FN3450-... 1FN3600-... 1FN3900-...	<b>1FN3003-0PH00-0AA0</b>	<b>1FN3003-0PH01-0AA0</b>

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN3/-1FN6 linear motors Linear measuring systems – Liquid cooling

#### Overview

##### Recommended linear measuring systems for SIMOTICS L-1FN3/-1FN6 linear motors

<b>Product name</b>	Absolute encoder EnDat enclosed	
<b>Type</b>	LC 183	LC 483
<b>Signal cycle</b>	20 $\mu\text{m}$	20 $\mu\text{m}$
<b>Acceleration in measuring direction, max.</b>	100 $\text{m/s}^2$ (328 $\text{ft/s}^2$ )	100 $\text{m/s}^2$ (328 $\text{ft/s}^2$ )
<b>Traversing velocity, max.</b>	180 $\text{m/min}$ (591 $\text{ft/min}$ )	180 $\text{m/min}$ (591 $\text{ft/min}$ )
<b>Measuring length, max.</b>	3040 $\text{mm}$ (120 $\text{in}$ )	2040 $\text{mm}$ (80.3 $\text{in}$ )
<b>Output signal</b>	1 $V_{\text{pp}}$	1 $V_{\text{pp}}$
<b>Product name</b>	Incremental encoder sin/cos 1 $V_{\text{pp}}$ enclosed	
<b>Type</b>	LS 187	LS 487
<b>Signal cycle</b>	20 $\mu\text{m}$	20 $\mu\text{m}$
<b>Acceleration in measuring direction, max.</b>	100 $\text{m/s}^2$ (328 $\text{ft/s}^2$ )	100 $\text{m/s}^2$ (328 $\text{ft/s}^2$ )
<b>Traversing velocity, max.</b>	120 $\text{m/min}$ (394 $\text{ft/min}$ )	120 $\text{m/min}$ (394 $\text{ft/min}$ )
<b>Measuring length, max.</b>	3040 $\text{mm}$ (120 $\text{in}$ )	2040 $\text{mm}$ (80.3 $\text{in}$ )
<b>Output signal</b>	1 $V_{\text{pp}}$	1 $V_{\text{pp}}$
<b>Product name</b>	Incremental encoder sin/cos 1 $V_{\text{pp}}$ open	
<b>Type</b>	LIDA 485	Renishaw RG2
<b>Signal cycle</b>	20 $\mu\text{m}$	20 $\mu\text{m}$
<b>Acceleration in measuring direction, max.<sup>1)</sup></b>	200 $\text{m/s}^2$ (656 $\text{ft/s}^2$ )	300 $\text{m/s}^2$ (984 $\text{ft/s}^2$ )
<b>Traversing velocity, max.</b>	480 $\text{m/min}$ (1575 $\text{ft/min}$ )	300 $\text{m/min}$ (984 $\text{ft/min}$ )
<b>Measuring length, max.</b>	30040 $\text{mm}$ (1183 $\text{in}$ )	50000 $\text{mm}$ (1968 $\text{in}$ )
<b>Output signal</b>	1 $V_{\text{pp}}$	1 $V_{\text{pp}}$

<sup>1)</sup> Refers to the measuring head.

#### Overview

##### Liquid cooling

These are non-Siemens products whose fundamental suitability is familiar to us. It goes without saying that equivalent products from other manufacturers may be used. Our recommendations are to be seen as helpful information, not as requirements or dictates. We do not accept liability for the composition, nature, state or quality of non-Siemens products.

Please get in touch with the cooler manufacturers listed below for technical information.

##### BKW Kälte-Wärme-Versorgungstechnik GmbH

[www.bkw-kuema.de](http://www.bkw-kuema.de)

##### Helmut Schimpke and Team Industriekühlanlagen GmbH + Co. KG

[www.schimpke.com](http://www.schimpke.com)

##### Hydac System GmbH

[www.hydac.com](http://www.hydac.com)

##### Pfannenberg GmbH

[www.pfannenberg.com](http://www.pfannenberg.com)

##### Rittal GmbH & Co. KG

[www.rittal.com](http://www.rittal.com)

For design of the coolers, see Configuration Manual (see documentation).

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN6 linear motors

#### Overview



SIMOTICS L-1FN6 linear motors, left: with 2 integrated sockets, separately for power and signal cables, right: with permanently connected power and signal cables

In combination with the SINAMICS S120 drive system, the SIMOTICS L-1FN6 linear motors provide an optimally tuned linear direct drive system for the requirements of modern mechanical engineering.

The motors comprise a primary section and a secondary section equipped with magnets which are not made of rare-earth material – in contrast to the current linear motor technology. The primary section has fixed dimensions, while the secondary section is made up of individual elements (segments) to suit the required traversing range. Through parallel operation of the motors, feedrate force and length can be scaled beyond the available spectrum.

#### Benefits

- High dynamic response and very high traversing velocity
- Excellent precision
- Very easy installation due to magnet-free secondary section track
- Drive components are free of wear thanks to contactless drive force transmission

The main advantages of linear direct drive technology are the extensive avoidance of

- Effects of elasticity, play and friction
- Natural oscillation in the drive train

This results in a higher dynamic response and increased precision. If suitable measuring systems are used and the temperature conditions are appropriate, the motors can be positioned in the nanometer range.

#### Application

Typical applications:

- Linear axes with traverse paths of approximately 4 m (13.1 ft) or more
- Handling and concatenated axes in the area of machine tools and production machines
- High-dynamic and high-precision feed axes in water jet and laser cutting machines
- Environmental conditions that require a non-magnetic secondary section track

#### Design

The simple mechanical construction without transmission elements, such as ballscrew, coupling or belt, enhances the reliability of the drive components.

Heat loss occurs almost exclusively in the primary section and is dissipated via the optimized housing type.

In addition, the 1FN6003/1FN6007 motors are available with water cooling.

The stainless metal encapsulation of the primary section ensures the high mechanical ruggedness and resistance to soiling required for use in machine tools and production machines, as well as high resistance to corrosive liquids.

The motor places minimal demands on the preparation of mounting surfaces thanks to the large air gap. The mounting tolerances for the air gap are  $\pm 0.3$  mm (0.012 in).

#### Design variant

SIMOTICS L-1FN6 linear motors are constructed as single-sided motors. The primary section is mounted parallel to the associated secondary section. Several primary sections can traverse one secondary section track.

#### More information

Any questions regarding SIMOTICS L-1FN6 linear motors can be emailed to:

[info.drives@siemens.com](mailto:info.drives@siemens.com)



# SIMOTICS linear and torque motors

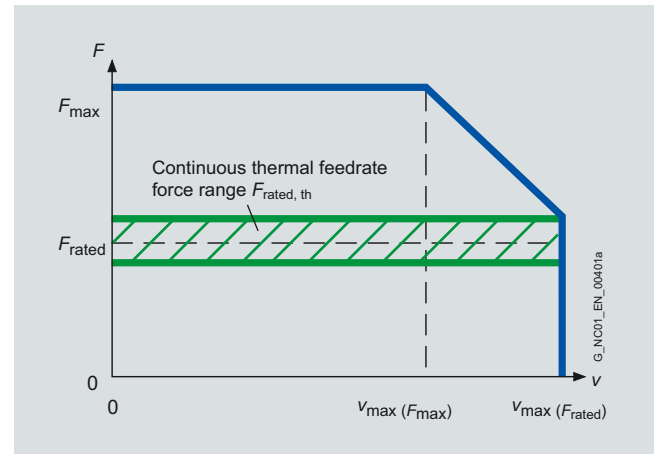
## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN6 linear motors

#### Technical specifications

<b>Product name</b>	SIMOTICS L-1FN6 linear motor
<b>Motor type</b>	Permanent magnet linear motor
<b>Magnet material</b>	Rare-earth permanent magnets
<ul style="list-style-type: none"> <li>Primary section</li> <li>Secondary section</li> </ul>	No magnet
<b>Cooling</b>	
<ul style="list-style-type: none"> <li>1FN6003 ... 1FN6024</li> <li>1FN6003 ... 1FN6007</li> </ul>	Natural cooling Water cooling <sup>1)</sup>
<b>Temperature monitoring in primary section<sup>2)</sup></b>	
<ul style="list-style-type: none"> <li>In accordance with DIN 44081/DIN 44082</li> <li>In accordance with EN 60034-11 (IEC 60034-11)</li> </ul>	PTC thermistor in triple connection Temperature sensor KTY84
<b>Insulation in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F)
<b>Type of construction</b>	Individual components
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	Primary section: IP65 Degree of protection of the motor is determined by the construction of the motor's installation in the machine. Minimum requirement: IP23
<b>Encoder system<sup>3)</sup></b> (not included in scope of supply)	Select according to basic conditions specific to the application and the drive
<b>Connection</b>	
<ul style="list-style-type: none"> <li>1FN6003</li> <li>1FN6007 ... 1FN6024</li> </ul>	Permanently connected signal and power cables with connectors Length 0.5 m (1.64 ft) Power and signal cables are connected via two separate integrated sockets on the front
<b>Approvals, according to</b>	cURus

#### Characteristic curves



Velocity/force characteristic curve

The 1FN6 linear motors have an overload range available for acceleration processes. The maximum force  $F_{max}$  can only be utilized up to a maximum velocity  $v_{max}(F_{max})$ ; up to velocity  $v_{max}(F_{rated})$  only the feedrate force  $F_{rated}$  is available.

<sup>1)</sup> See liquid cooling on page 6/15.

<sup>2)</sup> Evaluation via SME120/SME125 Sensor Module External or TM120 Terminal Module, see SINAMICS S120 drive system.

<sup>3)</sup> See recommended linear measuring systems on page 6/15.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN6 linear motors

#### Natural cooling

#### Selection and ordering data

Continuous thermal feedrate force range <sup>1)3)</sup>	Rated feedrate force, typ. <sup>2)3)</sup>	Feedrate-force, max.	Maximum velocity <sup>4)</sup>		SIMOTICS L-1FN6 linear motors		Weight, approx.	
			$F_{rated}$ , th	$F_{rated}$	$F_{max}$	$v_{max}$ at $F_{max}$	$v_{max}$ at $F_{rated}$	Primary section
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
<b>49 ... 119</b> <b>(11 ... 27)</b>	66.3 (14.9)	157(35.3)	345 (1132)	748 (2454)	<b>1FN6003-1LC57-0FA1</b>	<b>1FN6003-1S00-0AA0</b>	3.19 (7.03)	0.76/1.89 (1.68/4.17)
			503 (1650)	1080 (3543)	<b>1FN6003-1LC84-0FA1</b>			
<b>98 ... 239</b> <b>(22 ... 54)</b>	133 (29.9)	315(70.8)	226 (742)	515 (1690)	<b>1FN6003-1LE38-0FA1</b>		4.99 (11.0)	
			572 (1877)	1280 (4200)	<b>1FN6003-1LE88-0FA1</b>			
<b>147 ... 358</b> <b>(33 ... 80)</b>	199 (44.7)	472 (106)	141 (463)	333 (1093)	<b>1FN6003-1LG24-0FA1</b>		6.79 (15.0)	
			366 (1201)	836 (2743)	<b>1FN6003-1LG61-0FA1</b>			
<b>196 ... 477</b> <b>(44 ... 107)</b>	265 (59.6)	630 (142)	99.6 (327)	243 (797)	<b>1FN6003-1LJ17-0FA1</b>		8.59 (18.9)	
			267 (876)	618 (2028)	<b>1FN6003-1LJ44-0FA1</b>			
<b>245 ... 597</b> <b>(55 ... 134)</b>	332 (74.6)	787 (177)	74.7 (245)	190 (623)	<b>1FN6003-1LL12-0FA1</b>		10.4 (22.9)	
			208 (682)	488 (1601)	<b>1FN6003-1LL35-0FA1</b>			
<b>294 ... 716</b> <b>(66 ... 161)</b>	398 (89.5)	945 (212)	57.9 (190)	155 (509)	<b>1FN6003-1LN10-0FA1</b>		12.2 (26.9)	
			169 (554)	402 (1319)	<b>1FN6003-1LN28-0FA1</b>			
<b>98 ... 239</b> <b>(22 ... 54)</b>	133 (29.9)	315(70.8)	187 (614)	386 (1266)	<b>1FN6007-1LC31-0KA1</b>	<b>1FN6007-1S00-0AA0</b>	5.08 (11.2)	1.61/4.03 (3.55/8.89)
			276 (906)	562 (1844)	<b>1FN6007-1LC46-0KA1</b>			
<b>196 ... 477</b> <b>(44 ... 107)</b>	265 (59.6)	630 (142)	120 (394)	265 (869)	<b>1FN6007-1LE20-0KA1</b>		8.39 (18.5)	
			315 (1034)	668 (2192)	<b>1FN6007-1LE53-0KA1</b>			
<b>294 ... 716</b> <b>(66 ... 161)</b>	398 (89.5)	945 (212)	71.7 (235)	169 (554)	<b>1FN6007-1LG12-0KA1</b>		11.7 (25.8)	
			200 (656)	435 (1427)	<b>1FN6007-1LG33-0KA1</b>			
<b>392 ... 955</b> <b>(88 ... 215)</b>	531 (119)	1260 (283)	47.4 (156)	122 (400)	<b>1FN6007-1LJ08-0KA1</b>		15 (33.1)	
			143 (469)	320 (1050)	<b>1FN6007-1LJ24-0KA1</b>			
<b>490 ... 1190</b> <b>(110 ... 268)</b>	663 (149)	1570 (353)	32.4 (106)	93.9 (308)	<b>1FN6007-1LL05-0KA1</b>		18.3 (40.4)	
			110 (361)	251 (824)	<b>1FN6007-1LL18-0KA1</b>			
<b>588 ... 1430</b> <b>(132 ... 321)</b>	796 (179)	1890 (425)	87.9 (288)	206 (676)	<b>1FN6007-1LN15-0KA1</b>		21.6 (47.6)	
			194 (637)	429 (1408)	<b>1FN6007-1LN32-0KA1</b>			

#### Type of connection:

1FN6003 motors

Permanently connected power and signal cables pre-assembled with connectors  
Length: 0.5 m (1.64 ft)

F

1FN6007 motors

Two separate integrated sockets, for power and signal cable

K

#### Secondary section:

Length: 200 mm (7.87 in)  
Length: 500 mm (19.69 in)

C  
F

Description	Order No.
<b>Signal cable, pre-assembled<sup>7)</sup></b> For SIMOTICS L-1FN6 linear motors	<b>6FX7002-2SL10-....</b>

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

**SIMOTICS L-1FN6 linear motors**  
Natural cooling

Motor type Primary section (repeated)	Continuous thermal current range <sup>1)3)</sup>	Rated cur- rent, typ. <sup>2)3)</sup>		Maxi- mum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield		
		$I_{rated, th}$	$I_{rated}$			$I_{max}$	$P_{el, max}$	Required rated current <sup>5)</sup>	Booksized format For additional versions and components see SINAMICS S120 drive system	Pre-assembled cable to the drive system
		A	A	A	kW (HP)	$I_{rated}/I_{max}$	Order No.	Power connector	Cable cross- section <sup>6)</sup>	Order No.
						A		Size	mm <sup>2</sup>	
1FN6003-1LC57-....	1.17 ... 3.2	1.61	5.18	1.29 (1.73)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LC84-....	1.69 ... 4.6	2.31	7.45	1.71 (2.29)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LE38-....	1.69 ... 4.6	2.31	7.45	1.97 (2.64)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LE88-....	4.11 ... 11.2	5.63	18.2	3.86 (5.18)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LG24-....	1.69 ... 4.6	2.31	7.45	2.28 (3.06)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LG61-....	4.11 ... 11.2	5.63	18.2	4.16 (5.58)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LJ17-....	1.69 ... 4.6	2.31	7.45	2.61 (3.50)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LJ44-....	4.11 ... 11.2	5.63	18.2	4.49 (6.02)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LL12-....	1.69 ... 4.6	2.31	7.45	2.93 (3.93)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LL35-....	4.11 ... 11.2	5.63	18.2	4.84 (6.49)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LN10-....	1.69 ... 4.6	2.31	7.45	3.25 (4.36)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6003-1LN28-....	4.11 ... 11.2	5.63	18.2	5.2 (6.97)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LC31-....	1.17 ... 3.2	1.61	5.18	1.59 (2.13)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LC46-....	1.69 ... 4.6	2.31	7.45	2.07 (2.78)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LE20-....	1.69 ... 4.6	2.31	7.45	2.5 (3.35)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LE53-....	4.11 ... 11.2	5.63	18.2	4.65 (6.24)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LG12-....	1.69 ... 4.6	2.31	7.45	2.98 (4.00)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LG33-....	4.11 ... 11.2	5.63	18.2	5.14 (6.89)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LJ08-....	1.69 ... 4.6	2.31	7.45	3.46 (4.64)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LJ24-....	4.11 ... 11.2	5.63	18.2	5.67 (7.60)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LL05-....	1.69 ... 4.6	2.31	7.45	3.93 (5.27)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LL18-....	4.11 ... 11.2	5.63	18.2	6.21 (8.33)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LN15-....	4.11 ... 11.2	5.63	18.2	6.74 (9.04)	9/18	6SL312-1-TE21-0AA3	1	4 × 1.5	6FX8002-5CN01-....	
1FN6007-1LN32-....	8.22 ... 21	11.3	36.3	10.1 (13.5)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CN11-....	

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

Length code	....
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For information on the cables refer to MOTION-CONNECT connection systems

- The continuous thermal feedrate force  $F_{rated, th}$ , that the linear motor can achieve, depends on the installation position and ambient conditions and the cooling efficiency that is achieved. Large cooling surfaces and/or high air flow speeds ensure that the linear motors achieve a higher continuous thermal current  $I_{rated, th}$  and therefore a higher feedrate force. The winding is protected against overloading by means of temperature monitoring circuits. Selection of the Motor Modules and power cables is based on increased continuous current. If a lower continuous current is required in the application, where necessary, a Motor Module with a lower rating and the appropriate power cable can be used.
- The rated feedrate force  $F_{rated}$  and the corresponding rated current  $I_{rated}$  specify values that are typically achieved. The values refer to a black aluminum plate to which the motor is bolted. The radiation surface of the plate is three times the size of the area to which the primary section is bolted.
- A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.
- Velocity values refer to a DC link voltage of the drive system of 600 V DC.
- The Motor Module is selected on the basis of the maximum current  $I_{max}$ . In some cases, to fully utilize the feedrate force  $F_{max}$ , the next largest Motor Module must be used. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.
- The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).
- For length code, see MOTION-CONNECT connection systems.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN6 linear motors

#### Natural cooling

#### Selection and ordering data

Continuous thermal feedrate force range <sup>1)3)</sup>	Rated feedrate force, typ. <sup>2)3)</sup>	Feedrate-force, max.	Maximum velocity <sup>4)</sup>		SIMOTICS L-1FN6 linear motors		Weight, approx.		
			$F_{\text{rated}}$ , th	$F_{\text{rated}}$	$F_{\text{max}}$	$v_{\text{max}}$ at $F_{\text{max}}$	$v_{\text{max}}$ at $F_{\text{rated}}$	Primary section	Secondary section
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)	
<b>Natural cooling</b>									
<b>309 ... 572 (69 ... 129)</b>	374 (84.1)	898 (202)	98.5 (323) 224 (735)	218 (715) 473 (1552)	<b>1FN6008-1LC17-0KA1</b> <b>1FN6008-1LC37-0KA1</b>	<b>1FN6008-1SC00-0AA0</b>	16.3 (35.9)	2.81 (6.20)	
<b>617 ... 1140 (139 ... 256)</b>	749 (168)	1800 (405)	96.8 (318) 207 (679)	221 (725) 456 (1496)	<b>1FN6008-1LE16-0KA1</b> <b>1FN6008-1LE34-0KA1</b>		27.9 (61.5)		
<b>926 ... 1720 (208 ... 387)</b>	1120 (252)	2690 (605)	96.7 (317) 200 (656)	224 (735) 449 (1473)	<b>1FN6008-1LG16-0KA1</b> <b>1FN6008-1LG33-0KA1</b>		39.6 (87.3)		
<b>543 ... 1140 (122 ... 256)</b>	692 (156)	1800 (405)	110 (361) 176 (577)	241 (791) 377 (1237)	<b>1FN6016-1LC18-0KA1</b> <b>1FN6016-1LC30-0KA1</b>	<b>1FN6016-1SC00-0AA0</b>	27.6 (60.9)	5.42 (11.9)	
<b>1090 ... 2290 (245 ... 515)</b>	1380 (310)	3590 (807)	101 (331) 162 (532)	233 (764) 365 (1198)	<b>1FN6016-1LE17-0KA1</b> <b>1FN6016-1LE27-0KA1</b>		48.2 (106)		
<b>1630 ... 3430 (366 ... 771)</b>	2070 (465)	5390 (1212)	98.2 (322) 156 (512)	230 (755) 360 (1181)	<b>1FN6016-1LG16-0KA1</b> <b>1FN6016-1LG26-0KA1</b>		68.5 (151)		
<b>758 ... 1720 (170 ... 387)</b>	1000 (225)	2690 (605)	70.1 (230) 115 (377)	160 (525) 252 (827)	<b>1FN6024-1LC12-0KA1</b> <b>1FN6024-1LC20-0KA1</b>	<b>1FN6024-1SC00-0AA0</b>	39.9 (88.0)	7.96 (17.6)	
<b>1520 ... 3430 (342 ... 771)</b>	2000 (450)	5390 (1212)	64.8 (213) 106 (348)	155 (509) 244 (801)	<b>1FN6024-1LE11-0KA1</b> <b>1FN6024-1LE18-0KA1</b>		69.5 (153)		
<b>2270 ... 5140 (510 ... 1156)</b>	3000 (674)	8080 (1816)	62.8 (206) 102 (335)	153 (502) 241 (791)	<b>1FN6024-1LG10-0KA1</b> <b>1FN6024-1LG17-0KA1</b>		99.2 (219)		

#### Type of connection:

1FN6008 to 1FN6024 motors

Two separate integrated sockets, for power and signal cable

**K**

Description	Order No.
<b>Signal cable, pre-assembled<sup>7)</sup></b> For SIMOTICS L-1FN6 linear motors	<b>6FX7002-2SL10-....</b>

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

**SIMOTICS L-1FN6 linear motors**  
Natural cooling

Motor type Primary section (repeated)	Continuous thermal current range <sup>1)3)</sup>	Rated cur- rent, typ. <sup>2)3)</sup>	Maxi- mum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield		
					Required rated current <sup>5)</sup>	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Pre-assembled cable to the drive system	Power connec- tor	Cable cross- section <sup>6)</sup>
	$I_{rated, th}$	$I_{rated}$	$I_{max}$	$P_{el, max}$	$I_{rated}/I_{max}$		Size	mm <sup>2</sup>	
		A	A	kW (HP)	A				
1FN6008-1LC17-...	2.22 ... 4.32	2.71	8.64	3.09 (4.14)	5/10	<b>6SL312-1-TE15-0AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6008-1LC37-...	4.62 ... 9	5.65	18	4.88 (6.54)	9/18	<b>6SL312-1-TE21-0AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6008-1LE16-...	4.62 ... 9	5.65	18	5.93 (7.95)	9/18	<b>6SL312-1-TE21-0AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6008-1LE34-...	9.24 ... 18	11.3	36	9.28 (12.4)	18/36	<b>6SL312-1-TE21-8AA3</b>	1	4 × 2.5	<b>6FX8002-5CN11-....</b>
1FN6008-1LG16-...	7.11 ... 13.8	8.69	27.7	8.87 (11.9)	18/36	<b>6SL312-1-TE21-8AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6008-1LG33-...	13.9 ... 27	17	54	13.7 (18.4)	30/56	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX8002-5CN41-....</b>
1FN6016-1LC18-...	4.05 ... 9	5.2	18	5.77 (7.74)	9/18	<b>6SL312-1-TE21-0AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6016-1LC30-...	6.23 ... 13.8	8	27.7	7.75 (10.4)	18/36	<b>6SL312-1-TE21-8AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6016-1LE17-...	8.11 ... 18	10.4	36	11.1 (14.9)	18/36	<b>6SL312-1-TE21-8AA3</b>	1	4 × 2.5	<b>6FX8002-5CN11-....</b>
1FN6016-1LE27-...	12.5 ... 27.7	16	55.4	14.8 (19.8)	30/56	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX8002-5CN41-....</b>
1FN6016-1LG16-...	12.2 ... 27	15.6	54.1	16.4 (22.0)	30/56	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX8002-5CN41-....</b>
1FN6016-1LG26-...	18.7 ... 41.5	24	83.1	21.9 (29.4)	45/85	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 10	<b>6FX8002-5CN64-....</b>
1FN6024-1LC12-...	3.76 ... 9	5	18	6.59 (8.84)	9/18	<b>6SL312-1-TE21-0AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6024-1LC20-...	5.79 ... 13.8	7.69	27.7	8.6 (11.5)	18/36	<b>6SL312-1-TE21-8AA3</b>	1	4 × 1.5	<b>6FX8002-5CN01-....</b>
1FN6024-1LE11-...	7.53 ... 18	10	36	12.8 (17.2)	18/36	<b>6SL312-1-TE21-8AA3</b>	1	4 × 2.5	<b>6FX8002-5CN11-....</b>
1FN6024-1LE18-...	11.6 ... 27.7	15.4	55.4	16.5 (22.1)	30/56	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX8002-5CN41-....</b>
1FN6024-1LG10-...	11.3 ... 27	15	54.1	18.9 (25.3)	30/56	<b>6SL312-1-TE23-0AA3</b>	1.5	4 × 4	<b>6FX8002-5CN41-....</b>
1FN6024-1LG17-...	17.4 ... 41.5	23.1	83.1	24.5 (32.9)	45/85	<b>6SL312-1-TE24-5AA3</b>	1.5	4 × 10	<b>6FX8002-5CN64-....</b>

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

Length code	....
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For information on the cables refer to MOTION-CONNECT connection systems

1) The continuous thermal feedrate force  $F_{rated, th}$ , that the linear motor can achieve, depends on the installation position and ambient conditions and the cooling efficiency that is achieved. Large cooling surfaces and/or high air flow speeds ensure that the linear motors achieve a higher continuous thermal current  $I_{rated, th}$  and therefore a higher feedrate force. The winding is protected against overloading by means of temperature monitoring circuits. Selection of the Motor Modules and power cables is based on increased continuous current. If a lower continuous current is required in the application, where necessary, a Motor Module with a lower rating and the appropriate power cable can be used.

2) The rated feedrate force  $F_{rated}$  and the corresponding rated current  $I_{rated}$  specify values that are typically achieved. The values refer to a black aluminum plate to which the motor is bolted. The radiation surface of the plate is three times the size of the area to which the primary section is bolted.

3) A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

4) Velocity values refer to a DC link voltage of the drive system of 600 V DC.

5) The Motor Module is selected on the basis of the maximum current  $I_{max}$ . In some cases, to fully utilize the feedrate force  $F_{max}$ , the next largest Motor Module must be used. If a Motor Module with a higher rating is used, you must check whether the specified power cable can be connected to it.

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

7) For length code, see MOTION-CONNECT connection systems.

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN6 linear motors

#### Water cooling

#### Selection and ordering data

Feedrateforce <sup>1)2)</sup>		Maximum velocity <sup>3)</sup>		SIMOTICS L-1FN6 linear motors		Weight, approx.	
$F_{rated}$	$F_{max}$	$v_{max}$ at $F_{max}$	$v_{max}$ at $F_{rated}$	Primary section	Secondary section	Primary section	Secondary section 200 mm (7.87 in)/ 500 mm (19.69 in)
N (lb <sub>f</sub> )	N (lb <sub>f</sub> )	m/min (ft/min)	m/min (ft/min)	Order No.	Order No.	kg (lb)	kg (lb)
<b>Water cooling</b>							
<b>119 (27)</b>	157 (35.3)	345 (1132)	509 (1670)	<b>1FN6003-1WC57-0FA1</b>	<b>1FN6003-1S00-0AA0</b>	3.19 (7.03)	0.76/1.89 (1.68/4.17)
		503 (1650)	740 (2428)	<b>1FN6003-1WC84-0FA1</b>			
<b>239 (54)</b>	315 (70.8)	226 (742)	339 (1112)	<b>1FN6003-1WE38-0FA1</b>		4.99 (11.0)	
		572 (1877)	852 (2795)	<b>1FN6003-1WE88-0FA1</b>			
<b>358 (80)</b>	472 (106)	141 (463)	215 (705)	<b>1FN6003-1WG24-0FA1</b>		6.79 (15.0)	
		366 (1201)	549 (1801)	<b>1FN6003-1WG61-0FA1</b>			
<b>477 (107)</b>	630 (142)	99.6 (327)	155 (509)	<b>1FN6003-1WJ17-0FA1</b>		8.59 (18.9)	
		267 (876)	402 (1319)	<b>1FN6003-1WJ44-0FA1</b>			
<b>597 (134)</b>	787 (177)	74.7 (245)	119 (390)	<b>1FN6003-1WL12-0FA1</b>		10.4 (22.9)	
		208 (682)	316 (1037)	<b>1FN6003-1WL35-0FA1</b>			
<b>716 (161)</b>	945 (212)	57.9 (190)	95.1 (312)	<b>1FN6003-1WN10-0FA1</b>		12.2 (26.9)	
		169 (554)	258 (846)	<b>1FN6003-1WN28-0FA1</b>			
<b>239 (54)</b>	315 (70.8)	187 (614)	272 (892)	<b>1FN6007-1WC31-0KA1</b>	<b>1FN6007-1S00-0AA0</b>	5.08 (11.2)	1.61/4.03 (3.55/8.89)
		276 (906)	399 (1309)	<b>1FN6007-1WC46-0KA1</b>			
<b>477 (107)</b>	630 (142)	120 (394)	180 (591)	<b>1FN6007-1WE20-0KA1</b>		8.39 (18.5)	
		315 (1034)	462 (1516)	<b>1FN6007-1WE53-0KA1</b>			
<b>716 (161)</b>	945 (212)	71.7 (235)	111 (364)	<b>1FN6007-1WG12-0KA1</b>		11.7 (25.8)	
		200 (656)	296 (971)	<b>1FN6007-1WG33-0KA1</b>			
<b>955 (215)</b>	1260 (283)	47.4 (156)	77.6 (255)	<b>1FN6007-1WJ08-0KA1</b>		15 (33.1)	
		143 (469)	215 (705)	<b>1FN6007-1WJ24-0KA1</b>			
<b>1190 (268)</b>	1570 (353)	32.4 (106)	57.5 (189)	<b>1FN6007-1WL05-0KA1</b>		18.3 (40.4)	
		110 (361)	167 (548)	<b>1FN6007-1WL18-0KA1</b>			
<b>1430 (321)</b>	1890 (425)	87.9 (288)	135 (443)	<b>1FN6007-1WN15-0KA1</b>		21.6 (47.6)	
		194 (637)	288 (879)	<b>1FN6007-1WN32-0KA1</b>			

#### Type of connection:

##### 1FN6003 motors

Permanently connected power and signal cables pre-assembled with connectors

Length: 0.5 m (1.64 ft)

**F**

##### 1FN6007 motors

Two separate integrated sockets, for power and signal cable

**K**

#### Secondary section:

Length: 200 mm (7.87 in)

Length: 500 mm (19.69 in)

**C**

**F**

Description	Order No.
<b>Signal cable, pre-assembled<sup>5)</sup></b> For SIMOTICS L-1FN6 linear motors	<b>6FX7002-2SL10-....</b>

# SIMOTICS linear and torque motors

## SIMOTICS L linear motors for SINAMICS S120

### SIMOTICS L-1FN6 linear motors Water cooling

Motor type Primary section (repeated)	Rated current, typ. <sup>1)</sup>	Maximum current	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield		
	$I_{rated}$	$I_{max}$	$P_{el, max}$	Required rated current	Booksized format For additional versions and components see SINAMICS S120 drive system	Pre-assembled cable to the drive system		
	A	A	kW (HP)	$I_{rated}/I_{max}$	Order No.	Power connector	Cable cross- section <sup>4)</sup>	Order No.
				A		Size	mm <sup>2</sup>	
1FN6003-1WC57-...	3.2	5.18	1.29 (1.73)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WC84-...	4.6	7.45	1.71 (2.29)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WE38-...	4.6	7.45	1.97 (2.64)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WE88-...	11.2	18.2	3.86 (5.18)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WG24-...	4.6	7.45	2.28 (3.06)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WG61-...	11.2	18.2	4.16 (5.58)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WJ17-...	4.6	7.45	2.61 (3.5)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WJ44-...	11.2	18.2	4.49 (6.02)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WL12-...	4.6	7.45	2.93 (3.93)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WL35-...	11.2	18.2	4.84 (6.49)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WN10-...	4.6	7.45	3.25 (4.36)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6003-1WN28-...	11.2	18.2	5.2 (6.97)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WC31-...	3.2	5.18	1.59 (2.13)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WC46-...	4.6	7.45	2.07 (2.78)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WE20-...	4.6	7.45	2.5 (3.35)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WE53-...	11.2	18.2	4.65 (6.24)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WG12-...	4.6	7.45	2.98 (4.0)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WG33-...	11.2	18.2	5.14 (6.89)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WJ08-...	4.6	7.45	3.46 (4.64)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WJ24-...	11.2	18.2	5.67 (7.6)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WL05-...	4.6	7.45	3.93 (5.27)	5/10	6SL312-1-TE15-0AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WL18-...	11.2	18.2	6.21 (8.33)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WN15-...	11.2	18.2	6.74 (9.04)	18/36	6SL312-1-TE21-8AA3	1	4 × 1.5	6FX8002-5CN01-...
1FN6007-1WN32-...	21	36.3	10.1 (13.54)	30/56	6SL312-1-TE23-0AA3	1	4 × 2.5	6FX8002-5CN11-...

<b>Cooling:</b>		
Internal air cooling	0	
External air cooling	1	
<b>Motor Module:</b>		
Single Motor Module	1	
Double Motor Module	2	

Length code	...
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For information on the cables refer to MOTION-CONNECT connection systems

<sup>1)</sup> For water cooling with inlet temperature 35 °C (95 °F).

<sup>2)</sup> A reduction of up to 30 % must be expected in case of motor standstill, at very low velocities, or with very short traverse paths.

<sup>3)</sup> Velocity values refer to a DC link voltage of the drive system of 600 V DC.

<sup>4)</sup> The current carrying capacity of the power cables complies with IEC 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

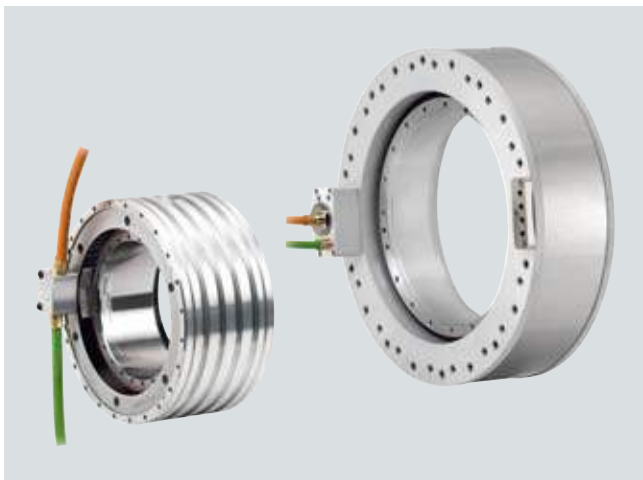
<sup>5)</sup> For length code, see MOTION-CONNECT connection systems.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Overview



SIMOTICS T-1FW6 built-in torque motors with jacket cooling (left) and with integrated cooling (right)

SIMOTICS T-1FW6 built-in torque motors are liquid-cooled, multi-pole permanent magnet AC synchronous motors with hollow-shaft rotor. The motors are supplied as built-in components that are held together in the delivered state by transport locks. For a complete drive unit, an additional bearing and shaft encoder are required.

Each frame size is available in different axis lengths. Most stators and rotors are equipped with flanges at each end with centering surfaces and threaded holes for installation in the machine.

Please note that when SIMOTICS T-1FW6 direct motors (torque motors) are used in fork heads for machine tools or robots, a license for US patent US5584621 and the associated international patent protection may be required. Please observe the national and international licensing conditions when using direct motors so that no infringements of industrial property rights occur.

#### Benefits

- No elasticity in the drive train
- High availability, since there are no gear components subject to wear in the drive train
- High torque, compact design and low construction volume
- Low moment of inertia
- Direct coupling to the machine using flanges

#### Application

In conjunction with the SINAMICS S120 drive system, the SIMOTICS T built-in torque motors can be used as direct drive for the following machine applications:

- Rotary indexing machines, rotary tables, swivel axes
- Rotary axes (A, B, C axis in 5-axis machine tools)
- Turret indexing and cylinder indexing for single-spindle and multi-spindle machines
- Dynamic tool magazines
- Workpiece spindles in turning machines
- Roller and cylinder drives
- Infeed and handling axes

#### Design

The SIMOTICS T-1FW6 built-in torque motor comprises the following components:

##### Stator

Iron core with a 3-phase AC winding. To improve dissipation of the heat loss, the motor can be force-cooled by means of a liquid cooler (main cooler).

##### Rotor

Cylindrical hollow shaft made of steel with permanent magnets fixed to the circumference.

If the main cooler and precision cooler are used together in a cooling unit, a cooling connection adapter (accessory) can be ordered separately for simpler connection.

##### Cooler types

The design of the cooling system is dependent on the size (external diameter) of the motor.

SIMOTICS T-1FW6 built-in torque motor Type	Type of cooling
1FW6050 and 1FW6060	Integrated single-circuit cooling (1 cooling circuit)
1FW6090 ... 1FW6150	Jacket cooling
1FW6160 ... 1FW6290	Integrated two-circuit cooling (2 cooling circuits)

##### Motors with integrated single-circuit cooling

These motors have a ready-to-connect, integrated single-circuit cooling system; they are compact and therefore suitable for easy integration in a machine.



Motor components of sizes 1FW6050 and 1FW6060 with integrated cooling (rotor, stator)



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Design (continued)

##### Motors with jacket cooling

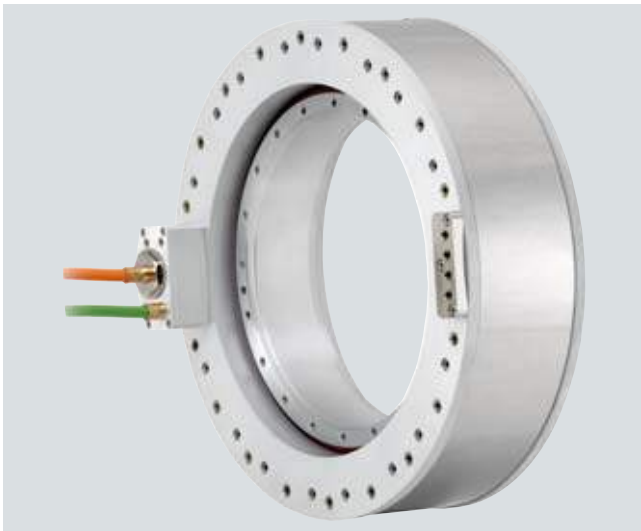
The coolant inlet/return flow circuit must be provided by the machine manufacturer in the surrounding construction.



Motor components of sizes 1FW6090 to 1FW6150 with jacket cooling (rotor, stator)

##### Motors with integrated dual-circuit cooling

These motors feature a ready-to-connect, integrated dual-circuit cooling system and are therefore thermally insulated against the mechanical axis construction to a considerable extent.



Motor components of sizes 1FW6160 to 1FW6290 with integrated cooling (rotor, stator)

#### More information

Any questions regarding SIMOTICS T-1FW6 built-in torque motors can be emailed to:

[info.drives@siemens.com](mailto:info.drives@siemens.com)

#### Integration

The SIMOTICS T-1FW6 built-in torque motors which must be fed from the SINAMICS S120 drive system are designed for operation on a 600 V DC link voltage level and require a sinusoidal current.

The cable connection is brought out of the front face of the stator and the free cable end must be connected to a terminal box provided by the machine manufacturer. The length of the power and signal cables from the motor to the drive system must not exceed 50 m (164 ft).

#### Technical specifications

<b>Product name</b>	SIMOTICS T-1FW6 built-in torque motor
<b>Motor type</b>	Synchronous motor with permanent magnet rotor multi-pole (number of rotor poles from 22 ... 98)
<b>Torque ripple</b>	≤ 1.5 % $M_0$
<b>Coolant inlet temperature, max.</b>	35 °C (95 °F)
<b>Pressure in cooling circuit, max.</b>	10 bar (static)
<b>Temperature monitoring<sup>1)</sup></b>	<ul style="list-style-type: none"> <li>In accordance with DIN EN 60034-11: 1 × KTY84 temperature sensor in the stator with all motors</li> <li>In accordance with DIN 44081/DIN 44082:               <ul style="list-style-type: none"> <li>- 1FW6050 and 1FW6060: 1 × PTC thermistor in triple connection with 130 °C (266 °F) response threshold</li> <li>- 1FW6090 ... 1FW6290: 2 × PTC thermistor in triple connection with 130 °C/150 °C (266 °F/302 °F) response threshold</li> </ul> </li> </ul>
<b>Insulation of stator winding according to DIN EN 60034-1</b>	Temperature class 155 (F)
<b>Type of construction</b>	Individual components: Stator, rotor
<b>Degree of protection to DIN EN 60034-5</b>	IP23 The final degree of protection (minimum degree of protection is IP54) for the installed motor is determined by the machine manufacturer. Protection against touch, foreign bodies and water for electrical equipment is specified in accordance with IEC 60034-5.
<b>Encoder system</b> (not included in scope of supply)	Select according to basic conditions specific to the application and the drive
<b>Connection, electrical</b>	Permanently connected power and signal cables
<b>Paint finish</b>	Unpainted
<b>Rating plate</b>	1 unit enclosed separately
<b>Approvals, according to</b>	cURus

<sup>1)</sup> Evaluation via SME120/SME125 Sensor Module External or TM120 Terminal Module, see SINAMICS S120 drive system.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Speed at maximum torque, max. <sup>2)</sup>	Speed at rated torque, max. <sup>2)</sup>	<b>SIMOTICS T-1FW6 built-in torque motors</b>	Moment of inertia of rotor	Weight, approx. stator + rotor
$M_{max}$	$M_0$	$M_{rated}$	$n_{max}$ at $M_{max}$	$n_{max}$ at $M_{rated}$	Order No.	$J$	$m$
Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	rpm	rpm		10 <sup>-2</sup> kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)
<b>Water cooling</b>							
<b>34.4 (25.4)</b>	24.2 (17.8)	22.3 (16.4)	670	940	<b>1FW6050-0 B03-0F 1</b>	0.139 (0.012)	3.1 (6.84)
<b>57.5 (54.4)</b>	40.4 (29.8)	38.6 (28.5)	360	520	<b>1FW6050-0 B05-0F 1</b>	0.267 (0.024)	5.9 (13.01)
<b>80.6 (59.5)</b>	56.6 (41.7)	54.9 (40.5)	220	340	<b>1FW6050-0 B07-0F 1</b>	0.39 (0.035)	7.9 (17.42)
<b>81.2 (59.9)</b>	53 (39.1)	48.8 (36)	660	880	<b>1FW6050-0 B07-0K 1</b>		
<b>116 (85.6)</b>	75.8 (55.9)	71.8 (53)	420	570	<b>1FW6050-0 B10-0K 1</b>	0.488 (0.043)	11.4 (25.14)
<b>174 (128.3)</b>	114 (84.1)	110 (81.1)	220	340	<b>1FW6050-0 B15-0K 1</b>	0.691 (0.061)	19.2 (42.34)
		105 (77.4)	640	840	<b>1FW6050-0 B15-1J 1</b>		
<b>64.5 (47.6)</b>	33.3 (24.6)	30.7 (22.6)	340	660	<b>1FW6060-0 B03-0F 1</b>	0.347 (0.031)	7.1 (15.66)
<b>123 (90.7)</b>	63.1 (46.5)	60.7 (44.8)	130	320	<b>1FW6060-0 B05-0F 1</b>	0.665 (0.059)	9.9 (21.83)
		57.9 (42.7)	410	690	<b>1FW6060-0 B05-0K 1</b>		
<b>166 (122.4)</b>	85.4 (63)	83.2 (61.4)	46	210	<b>1FW6060-0 B07-0F 1</b>	0.904 (0.080)	12.5 (27.56)
		80.5 (59.4)	260	480	<b>1FW6060-0 B07-0K 1</b>		
<b>231 (170.4)</b>	119 (87.8)	114 (84.1)	140	310	<b>1FW6060-0 B10-0K 1</b>	1.21 (0.107)	16.2 (35.72)
<b>226 (166.7)</b>	116 (85.6)	106 (78.2)	500	740	<b>1FW6060-0 B10-1J 1</b>		
<b>339 (250)</b>	174 (128.3)	171 (126.1)	31	180	<b>1FW6060-0 B15-0K 1</b>	1.72 (0.152)	22.4 (49.39)
<b>332 (244.9)</b>	171 (126.1)	161 (118.8)	270	460	<b>1FW6060-0 B15-1J 1</b>		

**Cable outlet only** for 1FW6050 and 1FW6060:

Axial  
Tangential

W  
T

#### Type of connection:

Permanently connected power and signal cables with exposed core ends<sup>5)</sup>

Length: 2 m (6.56 ft)

Permanently connected power and signal cables pre-assembled with connectors

Length: 0.5 m (1.64 ft)

C  
D

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW6 built-in torque motors**  
Water cooling

Motor type (repeated)	Stall current 1)3)	Rated current 2)3)	Maxi- mum current <sup>2)</sup>	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via power connector <sup>5)</sup>		
	$I_0$ A	$I_{rated}$ A	$I_{max}$ A	$P_{el, max}$ kW (HP)	Required rated current	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Power con- nector	Cable cross- section <sup>6)</sup>	Pre-assembled basic cable to the drive system Order No.
					$I_{rated}/I_{max}$ A		Size	mm <sup>2</sup>	
1FW6050-0.B03-0F..	5	4.6	7.6	4.18 (5.61)	5/10	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6050-0.B05-0F..	5	4.8	7.6	4.54 (6.09)	5/10	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6050-0.B07-0F..	5.1	4.9	7.6	4.82 (6.46)	5/10	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6050-0.B07-0K..	9.3	8.6	14	8.68 (11.64)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6050-0.B10-0K..	9.3	8.8	14	9.06 (12.15)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6050-0.B15-0K..	9.3	9	14	9.58 (12.85)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6050-0.B15-1J..	18	17	29	17.2 (22.8)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B03-0F..	4.5	4.1	9.8	5.85 (7.84)	5/10	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B05-0F..	4.5	4.3	9.8	6.62 (8.88)	5/10	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B05-0K..	8.1	7.4	17	10.2 (13.68)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B07-0F..	4.5	4.3	9.8	7.06 (9.47)	5/10	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B07-0K..	8.1	7.6	17	10.8 (14.48)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B10-0K..	8.1	7.8	17	11.7 (15.69)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B10-1J..	15	13	31	19.4 (26.02)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B15-0K..	8.1	7.9	17	12.9 (17.3)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6060-0.B15-1J..	15	14	31	20.6 (27.62)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

Length code	....
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For information on the cables refer to MOTION-CONNECT connection systems

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ± 10 % (drive system DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) Selection optimized to size of the Motor Module. The next higher Motor Module offers 100 % torque utilization.

5) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor and must be ordered separately (see Accessories on page 6/37).

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Speed at maximum torque, max. <sup>2)</sup>	Speed at rated torque, max. <sup>2)</sup>	<b>SIMOTICS T-1FW6 built-in torque motors</b>	Moment of inertia of rotor	Weight, approx. stator + rotor
$M_{max}$	$M_0$	$M_{rated}$	$n_{max}$ at $M_{max}$	$n_{max}$ at $M_{rated}$	Order No.	$J$	$m$
Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	rpm	rpm		10 <sup>-2</sup> kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)
<b>Water cooling</b>							
<b>179 (132)</b>	119 (87.8)	113 (83.3)	46	140	<b>1FW6090-0B05-0F 2</b>	1.52 (0.13)	9.2 (20.3)
		109 (80.4)	140	250	<b>1FW6090-0B05-0K 2</b>		
<b>251 (185)</b>	166 (122)	154 (114)	120	220	<b>1FW6090-0B07-0K 2</b>	2.2 (0.19)	12.2 (27)
		142 (105)	270	430	<b>1FW6090-0B07-1J 2</b>		
<b>358 (264)</b>	238 (176)	231 (170)	8.7	82	<b>1FW6090-0B10-0K 2</b>	3.09 (0.27)	17.2 (37.9)
		216 (159)	170	270	<b>1FW6090-0B10-1J 2</b>		
<b>537 (396)</b>	357 (263)	338 (249)	78	150	<b>1FW6090-0B15-1J 2</b>	4.65 (0.41)	27.2 (60)
		319 (235)	200	310	<b>1FW6090-0B15-2J 2</b>		
<b>439 (324)</b>	258 (190)	241 (178)	47	130	<b>1FW6130-0B05-0K 2</b>	6.37 (0.56)	13.2 (29.1)
		217 (160)	180	310	<b>1FW6130-0B05-1J 2</b>		
<b>614 (453)</b>	361 (266)	344 (254)	21	96	<b>1FW6130-0B07-0K 2</b>	8.92 (0.79)	18.2 (40.1)
		324 (239)	110	200	<b>1FW6130-0B07-1J 2</b>		
<b>878 (648)</b>	516 (381)	484 (357)	50	120	<b>1FW6130-0B10-1J 2</b>	12.7 (1.12)	25.2 (55.6)
		450 (332)	150	250	<b>1FW6130-0B10-2J 2</b>		
<b>1320 (974)</b>	775 (572)	744 (549)	14	78	<b>1FW6130-0B15-1J 2</b>	19.1 (1.69)	38.2 (84.2)
		714 (527)	77	150	<b>1FW6130-0B15-2J 2</b>		
<b>710 (524)</b>	360 (266)	338 (249)	110	230	<b>1FW6150-0B05-1J 2</b>	10.1 (0.8939)	21.7 (47.8)
		298 (220)	330	650	<b>1FW6150-0B05-4F 2</b>		
<b>994 (733)</b>	504 (372)	470 (347)	130	260	<b>1FW6150-0B07-2J 2</b>	14.2 (1.2568)	33.5 (73.9)
		445 (327)	230	450	<b>1FW6150-0B07-4F 2</b>		
<b>1420 (1047)</b>	720 (531)	688 (507)	76	170	<b>1FW6150-0B10-2J 2</b>	20.9 (1.8498)	47.5 (104.7)
		664 (489)	150	300	<b>1FW6150-0B10-4F 2</b>		
<b>2130 (1571)</b>	1080 (797)	1050 (774)	32	100	<b>1FW6150-0B15-2J 2</b>	31.3 (2.7703)	70.8 (156)
		1030 (760)	89	190	<b>1FW6150-0B15-4F 2</b>		

**Cable outlet only** for 1FW6090/1FW6130/1FW6150:

Axial  
Radially outwards  
Tangential

P  
Q  
N

#### Type of connection:

Permanently connected power and signal cables with exposed core ends<sup>5)</sup>  
Length: 2 m (6.56 ft)  
Permanently connected power and signal cables pre-assembled with connectors  
Length: 0.5 m (1.64 ft)

C  
D

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW6 built-in torque motors**  
Water cooling

Motor type (repeated)	Stall current 1)3)	Rated current 2)3)	Maxi- mum current <sup>2)</sup>	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via power connector <sup>5)</sup>		
	$I_0$ A	$I_{rated}$ A	$I_{max}$ A	$P_{el, max}$ kW (HP)	Required rated current  $I_{rated}/I_{max}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system  Order No.	Power con- nector  Size	Cable cross- section <sup>6)</sup>  mm <sup>2</sup>	Pre-assembled basic cable to the drive system  Order No.
1FW6090-0.B05-0F..	5.9	5.6	9.5	6.55 (8.78)	5/10 <sup>4)</sup>	6SL312-1-TE15-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B05-0K..	8.2	7.4	13	8.12 (10.88)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B07-0K..	10	9.5	16	10.3 (13.8)	9/18 <sup>4)</sup>	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B07-1J..	16	13	26	14.1 (18.9)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B10-0K..	8.2	7.9	13	9.43 (12.6)	9/18	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B10-1J..	16	14	26	15.3 (20.5)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B15-1J..	16	15	26	17.1 (22.9)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6090-0.B15-2J..	26	23	43	24.1 (32.3)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6130-0.B05-0K..	9.7	9	18	12.2 (16.4)	9/18 <sup>4)</sup>	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B05-1J..	17	14	32	18.3 (24.5)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B07-0K..	10	10	20	14.2 (19)	9/18 <sup>4)</sup>	6SL312-1-TE21-0AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B07-1J..	17	15	32	19.7 (26.4)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B10-1J..	17	16	32	21.4 (28.7)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B10-2J..	28	24	53	30.6 (41)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6130-0.B15-1J..	19	18	36	25.4 (34.1)	18/36 <sup>4)</sup>	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6130-0.B15-2J..	28	26	54	34.1 (45.7)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B05-1J..	18	17	44	22.8 (30.6)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....
1FW6150-0.B05-4F..	44	36	100	39.4 (52.8)	45/85	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....
1FW6150-0.B07-2J..	27	25	66	32.0 (42.9)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B07-4F..	44	38	100	42.7 (57.3)	45/85	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....
1FW6150-0.B10-2J..	27	26	66	36.2 (48.5)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B10-4F..	44	40	100	47.3 (63.4)	45/85	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....
1FW6150-0.B15-2J..	27	26	66	42.4 (56.9)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....
1FW6150-0.B15-4F..	44	41	100	54.5 (73.1)	45/85	6SL312-1-TE24-5AA3	1.5	4 × 10	6FX8002-5CS64-....

<b>Cooling:</b> Internal air cooling	0	Length code	....
External air cooling	1		
<b>Motor Module:</b> Single Motor Module	1	For information on the cables refer to MOTION-CONNECT connection systems	
Double Motor Module	2		

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ± 10 % (drive system DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) Selection optimized to size of the Motor Module. The next higher Motor Module offers 100 % torque utilization.

5) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor and must be ordered separately (see Accessories on page 6/37).

6) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Speed at maximum torque, max. <sup>2)</sup>	Speed at rated torque, max. <sup>2)</sup>	<b>SIMOTICS T-1FW6 built-in torque motors</b>	Moment of inertia of rotor	Weight, approx. stator + rotor	
$M_{\max}$	$M_0$	$M_{\text{rated}}$	$n_{\max}$ at $M_{\max}$	$n_{\max}$ at $M_{\text{rated}}$	Order No.	$J$	$m$	
Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	rpm	rpm		10 <sup>-2</sup> kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	
<b>Water cooling</b>								
<b>716 (528)</b>	467 (344)	431 (318)	84	140	<b>1FW6160-0 B05-1J B2</b>	19.0 (1.68)	36.3 (80.0)	
		404 (298)	150	250	<b>1FW6160-0 B05-2J B2</b>			
		314 (232)	320	590	<b>1FW6160-0 B05-5G B2</b>			
<b>1000 (738)</b>	653 (482)	620 (457)	53	96	<b>1FW6160-0 B07-1J B2</b>	25.8 (2.28)	48.3 (107)	
		594 (438)	100	170	<b>1FW6160-0 B07-2J B2</b>			
		514 (379)	230	390	<b>1FW6160-0 B07-5G B2</b>			
		432 (319)	330	610	<b>1FW6160-0 B07-8F B2</b>			
<b>1430 (1055)</b>	933 (688)	903 (666)	29	60	<b>1FW6160-0 B10-1J B2</b>	36.0 (3.19)	66.3 (146)	
		878 (648)	65	110	<b>1FW6160-0 B10-2J B2</b>			
		804 (593)	160	260	<b>1FW6160-0 B10-5G B2</b>			
		732 (540)	230	390	<b>1FW6160-0 B10-8F B2</b>			
		622 (459)	330	600	<b>1FW6160-0 B10-2PB2</b>			67.4 (149)
<b>2150 (1586)</b>	1400 (1033)	1350 (996)	34	66	<b>1FW6160-0 B15-2J B2</b>	53.1 (4.70)	95.3 (210)	
		1280 (944)	97	160	<b>1FW6160-0 B15-5G B2</b>			
		1220 (900)	150	240	<b>1FW6160-0 B15-8F B2</b>			
		1120 (826)	220	360	<b>1FW6160-0 B15-2PB2</b>			96.4 (213)
		961 (709)	320	560	<b>1FW6160-0 B15-0WB2</b>			
<b>2860 (2110)</b>	1870 (1379)	1750 (1291)	68	110	<b>1FW6160-0 B20-5G B2</b>	70.1 (6.20)	124.3 (274)	
		1690 (1247)	110	170	<b>1FW6160-0 B20-8F B2</b>			
		1600 (1180)	160	260	<b>1FW6160-0 B20-2PB2</b>			125.4 (277)
		1460 (1077)	240	400	<b>1FW6160-0 B20-0WB2</b>			

**Cable outlet only** for 1FW6160 to 1FW6290:

Axial  
Radially outwards  
Tangential (only for types of connection C and D)

W  
V  
T

#### Type of connection:

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>

Length: 2 m (6.56 ft)

Permanently connected power and signal cables pre-assembled with connectors

Length: 0.5 m (1.64 ft)

C

D

#### Type of connection only for specific motors (Not selectable):

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>

Length: 1 m (3.28 ft)

B

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW6 built-in torque motors**  
Water cooling

Motor type (repeated)	Stall current 1)3)	Rated current 2)3)	Maxi- mum current <sup>2)</sup>	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via power connector <sup>4)</sup>			
					Required rated current	Booksize format For additional versions and components see SINAMICS S120 drive system	Power con- nector	Cable cross- section <sup>5)</sup>	Pre-assembled basic cable to the drive system	
										$I_{rated}/I_{max}$
$I_0$	$I_{rated}$	$I_{max}$	$P_{el, max}$	A	A	A	kW (HP)	A	A	A
1FW6160-0.B05-1J..	17	16	31	15.1 (20.2)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....	
1FW6160-0.B05-2J..	28	24	49	20 (26.8)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6160-0.B05-5G..	56	36	98	33.1 (44.4)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6160-0.B07-1J..	17	16	31	16.7 (22.4)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....	
1FW6160-0.B07-2J..	28	25	49	21.8 (29.2)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6160-0.B07-5G..	56	43	98	35.2 (47.2)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6160-0.B07-8FB.	80	51	140	46.7 (62.6)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6160-0.B10-1J..	17	17	31	19 (25.5)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....	
1FW6160-0.B10-2J..	28	26	49	24.4 (32.7)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6160-0.B10-5G..	56	47	98	38.1 (51.1)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6160-0.B10-8FB.	80	61	140	49.8 (66.8)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6160-0.B10-2PB.	110	73	190	64.6 (86.6)	132/210	6SL312-1-TE31-3AA3	–	–	–	
1FW6160-0.B15-2J..	28	26	49	28.2 (37.8)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6160-0.B15-5G..	56	50	98	42.6 (57.1)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6160-0.B15-8FB.	80	68	140	54.6 (73.2)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6160-0.B15-2PB.	110	88	190	69.5 (93.2)	132/210	6SL312-1-TE31-3AA3	–	–	–	
1FW6160-0.B15-0WB.	160	100	280	92.8 (124)	200/282	6SL312-1-TE32-0AA3	–	–	–	
1FW6160-0.B20-5G..	56	52	98	46.9 (62.9)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6160-0.B20-8FB.	80	72	140	59.2 (79.4)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6160-0.B20-2PB.	110	95	190	74.2 (99.5)	132/210	6SL312-1-TE31-3AA3	–	–	–	
1FW6160-0.B20-0WB.	160	120	280	97.7 (131)	200/282	6SL312-1-TE32-0AA3	–	–	–	

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

Length code	....
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For information on the cables refer to MOTION-CONNECT connection systems

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ±10 % (drive system DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor and must be ordered separately (see Accessories on page 6/37).

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Speed at maximum torque, max. <sup>2)</sup>	Speed at rated torque, max. <sup>2)</sup>	<b>SIMOTICS T-1FW6 built-in torque motors</b>	Moment of inertia of rotor	Weight, approx. stator + rotor	
$M_{\max}$	$M_0$	$M_{\text{rated}}$	$n_{\max}$ at $M_{\max}$	$n_{\max}$ at $M_{\text{rated}}$	Order No.	$J$	$m$	
Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	rpm	rpm		10 <sup>-2</sup> kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	
<b>Water cooling</b>								
<b>990 (730)</b>	672 (496)	633 (467)	54	97	<b>1FW6190-0B05-1J B2</b>	35.8 (3.17)	42.8 (94.4)	
		605 (446)	96	160	<b>1FW6190-0B05-2J B2</b>			
		509 (375)	210	380	<b>1FW6190-0B05-5G B2</b>			
<b>1390 (1025)</b>	941 (694)	905 (668)	33	63	<b>1FW6190-0B07-1J B2</b>	48.6 (4.30)	55.8 (123)	
		879 (648)	64	110	<b>1FW6190-0B07-2J B2</b>			
		791 (583)	150	250	<b>1FW6190-0B07-5G B2</b>			
		704 (519)	220	390	<b>1FW6190-0B07-8F B2</b>			
<b>1980 (1460)</b>	1340 (988)	1310 (966)	14	38	<b>1FW6190-0B10-1J B2</b>	67.8 (6.0)	75.8 (167)	
		1290 (952)	39	70	<b>1FW6190-0B10-2J B2</b>			
		1210 (892)	100	170	<b>1FW6190-0B10-5G B2</b>			
		1130 (833)	150	260	<b>1FW6190-0B10-8F B2</b>			
		955 (704)	250	450	<b>1FW6190-0B10-2PB2</b>			77.1 (170)
<b>2970 (2191)</b>	2020 (1490)	1970 (1453)	17	40	<b>1FW6190-0B15-2J B2</b>	99.8 (8.83)	107.8 (238)	
		1890 (1394)	62	100	<b>1FW6190-0B15-5G B2</b>			
		1820 (1342)	97	160	<b>1FW6190-0B15-8F B2</b>			
		1670 (1232)	160	270	<b>1FW6190-0B15-2PB2</b>			109.1 (241)
		1540 (1136)	210	370	<b>1FW6190-0B15-0WB2</b>			
<b>3960 (2921)</b>	2690 (1984)	2570 (1896)	42	73	<b>1FW6190-0B20-5G B2</b>	132.0 (11.68)	136.2 (300)	
		2500 (1844)	68	110	<b>1FW6190-0B20-8F B2</b>			
		2360 (1741)	120	200	<b>1FW6190-0B20-2PB2</b>			137.5 (303)
		2250 (1660)	160	260	<b>1FW6190-0B20-0WB2</b>			

**Cable outlet only** for 1FW6160 to 1FW6290:

Axial  
Radially outwards  
Tangential (only for types of connection C and D)

W  
V  
T

#### Type of connection:

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>  
Length: 2 m (6.56 ft) **C**  
Permanently connected power and signal cables pre-assembled with connectors  
Length: 0.5 m (1.64 ft) **D**

#### Type of connection only for specific motors (Not selectable):

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>  
Length: 1 m (3.28 ft) **B**



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW6 built-in torque motors**  
Water cooling

Motor type (repeated)	Stall current 1)3)		Rated current 2)3)		Maximum current <sup>2)</sup>	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via power connector <sup>4)</sup>			
	$I_0$ A	$I_{rated}$ A	$I_{max}$ A	$P_{el, max}$ kW (HP)			Required rated current	Booksized format For additional versions and components see SINAMICS S120 drive system	Power con- nector	Cable cross- section <sup>5)</sup>	Pre-assembled basic cable to the drive system	Order No.
1FW6190-0.B05-1J..	18	17	31	16.3 (21.9)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....			
1FW6190-0.B05-2J..	27	24	47	20.6 (27.6)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....			
1FW6190-0.B05-5G..	54	40	95	32.9 (44.1)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....			
1FW6190-0.B07-1J..	18	17	31	18.2 (24.4)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....			
1FW6190-0.B07-2J..	27	25	47	22.7 (30.4)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....			
1FW6190-0.B07-5G..	54	44	95	35.4 (47.5)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....			
1FW6190-0.B07-8FB.	78	56	130	46.3 (62.1)	85/141	6SL312-1-TE28-5AA3	-	-	-			
1FW6190-0.B10-1J..	18	17	31	20.7 (27.8)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....			
1FW6190-0.B10-2J..	27	26	47	25.7 (34.5)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....			
1FW6190-0.B10-5G..	54	48	95	38.7 (51.9)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....			
1FW6190-0.B10-8FB.	78	64	130	49.9 (66.9)	85/141	6SL312-1-TE28-5AA3	-	-	-			
1FW6190-0.B10-2PB.	120	84	210	69.9 (93.7)	132/210	6SL312-1-TE31-3AA3	-	-	-			
1FW6190-0.B15-2J..	27	26	47	30.1 (40.4)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....			
1FW6190-0.B15-5G..	54	50	95	44.1 (59.1)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....			
1FW6190-0.B15-8FB.	78	69	130	55.6 (74.6)	85/141	6SL312-1-TE28-5AA3	-	-	-			
1FW6190-0.B15-2PB.	120	99	210	75.8 (102)	132/210	6SL312-1-TE31-3AA3	-	-	-			
1FW6190-0.B15-0WB.	150	110	270	91.5 (123)	200/282	6SL312-1-TE32-0AA3	-	-	-			
1FW6190-0.B20-5G..	54	51	95	49 (54.7)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....			
1FW6190-0.B20-8FB.	78	71	130	61.1 (81.9)	85/141	6SL312-1-TE28-5AA3	-	-	-			
1FW6190-0.B20-2PB.	120	100	210	81.5 (109)	132/210	6SL312-1-TE31-3AA3	-	-	-			
1FW6190-0.B20-0WB.	150	120	270	97.4 (131)	200/282	6SL312-1-TE32-0AA3	-	-	-			

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

Length code	....
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For information on the cables refer to MOTION-CONNECT connection systems

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ±10 % (drive system DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor and must be ordered separately (see Accessories on page 6/37).

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2)3)</sup>	Speed at maximum torque, max. <sup>2)</sup>	Speed at rated torque, max. <sup>2)</sup>	<b>SIMOTICS T-1FW6 built-in torque motors</b>	Moment of inertia of rotor	Weight, approx. stator + rotor
$M_{\max}$	$M_0$	$M_{\text{rated}}$	$n_{\max}$ at $M_{\max}$	$n_{\max}$ at $M_{\text{rated}}$	Order No.	$J$	$m$
Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	rpm	rpm		$10^{-2}\text{kgm}^2$ (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)
<b>Water cooling</b>							
<b>1320 (974)</b>	841 (620)	799 (589)	34	69	<b>1FW6230-0B05-1J B 2</b>	62.2 (5.51)	44.8 (98.8)
		774 (571)	59	110	<b>1FW6230-0B05-2J B 2</b>		
		660 (487)	160	290	<b>1FW6230-0B05-5G B 2</b>		
<b>1840 (1357)</b>	1180 (870)	1140 (841)	19	45	<b>1FW6230-0B07-1J B 2</b>	84.3 (7.46)	58.8 (130)
		1120 (826)	38	73	<b>1FW6230-0B07-2J B 2</b>		
		1010 (745)	110	190	<b>1FW6230-0B07-5G B 2</b>		
		923 (681)	160	290	<b>1FW6230-0B07-8FB 2</b>		
<b>2630 (1940)</b>	1680 (1239)	1630 (1202)	21	46	<b>1FW6230-0B10-2J B 2</b>	118.0 (10.4)	81.8 (180)
		1520 (1121)	74	130	<b>1FW6230-0B10-5G B 2</b>		
		1450 (1070)	110	190	<b>1FW6230-0B10-8FB 2</b>		
		1320 (974)	160	290	<b>1FW6230-0B10-2PB 2</b>		
<b>3950 (2914)</b>	2520 (1859)	2440 (1800)	19	43	<b>1FW6230-0B15-4C B 2</b>	173.0 (15.3)	117.8 (260)
		2380 (1755)	44	80	<b>1FW6230-0B15-5G B 2</b>		
		2310 (1704)	67	120	<b>1FW6230-0B15-8FB 2</b>		
		2190 (1615)	100	180	<b>1FW6230-0B15-2PB 2</b>		
		2020 (1490)	150	270	<b>1FW6230-0B15-0WB 2</b>		
<b>5260 (3880)</b>	3360 (2478)	3230 (2382)	29	56	<b>1FW6230-0B20-5G B 2</b>	228.0 (20.2)	153.8 (339)
		3160 (2331)	47	84	<b>1FW6230-0B20-8FB 2</b>		
		3050 (2250)	74	130	<b>1FW6230-0B20-2PB 2</b>		
		2890 (2132)	110	190	<b>1FW6230-0B20-0WB 2</b>		

**Cable outlet** only for 1FW6160 to 1FW6290:

Axial  
 Radially outwards  
 Tangential (only for types of connection C and D)

W  
V  
T

**Type of connection:**

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>

Length: 2 m (6.56 ft)

Permanently connected power and signal cables pre-assembled with connectors

Length: 0.5 m (1.64 ft)

C

D

**Type of connection only for specific motors** (Not selectable):

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>

Length: 1 m (3.28 ft)

B

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW6 built-in torque motors**  
Water cooling

Motor type (repeated)	Stall current 1)3)	Rated current 2)3)	Maxi- mum current <sup>2)</sup>	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via power connector <sup>4)</sup>			
					Required rated current	Booksize format For additional versions and components see SINAMICS S120 drive system	Power con- nector	Cable cross- section <sup>5)</sup>	Pre-assembled basic cable to the drive system	
										$I_{rated}/I_{max}$
$I_0$	$I_{rated}$	$I_{max}$	$P_{el, max}$	A	A	A	kW (HP)	A	A	A
1FW6230-0.B05-1J..	16	15	31	17.3 (23.2)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....	
1FW6230-0.B05-2J..	24	22	45	21 (28.2)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6230-0.B05-5G..	53	40	100	34.1 (45.7)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6230-0.B07-1J..	16	16	31	19.4 (26.0)	18/36	6SL312-1-TE21-8AA3	1	4 × 2.5	6FX8002-5CS11-....	
1FW6230-0.B07-2J..	24	22	45	23.6 (31.6)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6230-0.B07-5G..	53	44	100	36.9 (49.5)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6230-0.B07-8FB.	74	56	130	46.3 (62.1)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6230-0.B10-2J..	24	23	45	27.1 (36.3)	30/56	6SL312-1-TE23-0AA3	1.5	4 × 4	6FX8002-5CS41-....	
1FW6230-0.B10-5G..	54	48	100	42 (56.3)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6230-0.B10-8FB.	74	62	130	50.6 (67.9)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6230-0.B10-2PB.	100	80	190	65.4 (87.7)	132/210	6SL312-1-TE31-3AA3	–	–	–	
1FW6230-0.B15-4C..	33	32	63	38 (50.9)	45/85	6SL312-1-TE24-5AA3	1.5	4 × 6	6FX8002-5CS54-....	
1FW6230-0.B15-5G..	53	49	100	47.4 (63.5)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6230-0.B15-8FB.	74	66	130	57.3 (76.8)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6230-0.B15-2PB.	100	90	190	72.5 (97.2)	132/210	6SL312-1-TE31-3AA3	–	–	–	
1FW6230-0.B15-0WB.	140	110	270	91.2 (122)	200/282	6SL312-1-TE32-0AA3	–	–	–	
1FW6230-0.B20-5G..	53	51	100	53.5 (71.7)	60/113	6SL312-1-TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....	
1FW6230-0.B20-8FB.	74	69	130	63.7 (85.4)	85/141	6SL312-1-TE28-5AA3	–	–	–	
1FW6230-0.B20-2PB.	100	94	190	79.4 (106)	132/210	6SL312-1-TE31-3AA3	–	–	–	
1FW6230-0.B20-0WB.	140	120	270	98.1 (132)	200/282	6SL312-1-TE32-0AA3	–	–	–	

<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1
Double Motor Module	2

Length code	....
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For information on the cables refer to MOTION-CONNECT connection systems

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ± 10 % (drive system DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor and must be ordered separately (see Accessories on page 6/37).

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW6 built-in torque motors

#### Water cooling

#### Selection and ordering data

Maximum torque	Static torque <sup>1)3)</sup>	Rated torque <sup>2) 3)</sup>	Speed at maximum torque, max. <sup>2)</sup>	Speed at rated torque, max. <sup>2)</sup>	<b>SIMOTICS T-1FW6 built-in torque motors</b>	Moment of inertia of rotor	Weight, approx. stator + rotor
$M_{\max}$ Nm (lb <sub>r</sub> -ft)	$M_0$ Nm (lb <sub>r</sub> -ft)	$M_{\text{rated}}$ Nm (lb <sub>r</sub> -ft)	$n_{\max}$ at $M_{\max}$ rpm	$n_{\max}$ at $M_{\text{rated}}$ rpm	Order No.	$J$ $10^{-2}\text{kgm}^2$ (lb <sub>r</sub> -in-s <sup>2</sup> )	$m$ kg (lb)
<b>Water cooling</b>							
<b>4000 (2950)</b>	2220 (1637)	2060 (1519)	59	110	<b>1FW6290-0 B07-5G B 2</b>	228 (20.2)	103.6 (228)
		1910 (1409)	110	210	<b>1FW6290-0 B07-0L B 2</b>		108.8 (240)
		1810 (1335)	150	270	<b>1FW6290-0 B07-2PB 2</b>		108.8 (240)
<b>6280 (4632)</b>	3490 (2574)	3320 (2449)	40	73	<b>1FW6290-0 B11-7A B 2</b>	334 (29.6)	159 (351)
		3200 (2360)	71	130	<b>1FW6290-0 B11-0L B 2</b>		164.2 (362)
		3100 (2287)	93	170	<b>1FW6290-0 B11-2PB 2</b>		164.2 (362)
<b>8570 (6321)</b>	4760 (3511)	4590 (3386)	28	53	<b>1FW6290-0 B15-7A B 2</b>	440 (38.9)	214.6 (473)
		4480 (3304)	50	89	<b>1FW6290-0 B15-0L B 2</b>		219.8 (485)
		4390 (3238)	67	120	<b>1FW6290-0 B15-2PB 2</b>		219.8 (485)
<b>10900 (8040)</b>	6030 (4448)	5760 (4249)	38	68	<b>1FW6290-0 B20-0L B 2</b>	546 (48.3)	260.6 (575)
		5670 (4182)	51	91	<b>1FW6290-0 B20-2PB 2</b>		265.8 (586)

**Cable outlet** only for 1FW6160 to 1FW6290:

Axial

Radially outwards

Tangential (only for types of connection C and D)

W  
V  
T

#### Type of connection:

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>

Length: 2 m (6.56 ft)

Permanently connected power and signal cables pre-assembled with connectors

Length: 0.5 m (1.64 ft)

C  
D

#### Type of connection only for specific motors (Not selectable):

Permanently connected power and signal cables with exposed core ends<sup>4)</sup>

Length: 1 m (3.28 ft)

B

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW6 built-in torque motors**  
Water cooling

Motor type (repeated)	Stall current 1)3)		Rated current 2)3)		Maximum current <sup>2)</sup>	Calculated power	SINAMICS S120 Motor Module		Power cable with complete shield Motor connection via power connector <sup>4)</sup>		
	$I_0$ A	$I_{rated}$ A	$I_{max}$ A	$P_{el, max}$ kW (HP)			Required rated current $I_{rated}/I_{max}$ A	Booksized format For additional versions and components see SINAMICS S120 drive system Order No.	Power connector Size	Cable cross-section <sup>5)</sup> mm <sup>2</sup>	Pre-assembled basic cable to the drive system Order No.
1FW6290-0.B07-5G..	56	52	110	47.7 (64.0)	60/113	6SL312-1TE26-0AA3	1.5	4 × 16	6FX8002-5CS24-....		
1FW6290-0.B07-0LB.	100	86	210	70.6 (94.7)	132/210	6SL312-1TE31-3AA3	–	–	–		
1FW6290-0.B07-2PB.	120	100	270	85.4 (115)	200/282	6SL312-1TE32-0AA3	–	–	–		
1FW6290-0.B11-7A..	62	59	130	58 (77.8)	85/141	6SL312-1TE28-5AA3	1.5	4 × 16	6FX8002-5CS24-....		
1FW6290-0.B11-0LB.	100	91	210	78.2 (105)	132/210	6SL312-1TE31-3AA3	–	–	–		
1FW6290-0.B11-2PB.	120	110	270	93.2 (125)	200/282	6SL312-1TE32-0AA3	–	–	–		
1FW6290-0.B15-7A..	64	61	130	65.2 (87.4)	85/141	6SL312-1TE28-5AA3	1.5	4 × 16	6FX8002-5CS24-....		
1FW6290-0.B15-0LB.	100	94	210	85.2 (114)	132/210	6SL312-1TE31-3AA3	–	–	–		
1FW6290-0.B15-2PB.	120	110	270	101 (135)	200/282	6SL312-1TE32-0AA3	–	–	–		
1FW6290-0.B20-0LB.	100	95	210	91.9 (123)	132/210	6SL312-1TE31-3AA3	–	–	–		
1FW6290-0.B20-2PB.	120	120	270	107 (144)	200/282	6SL312-1TE32-0AA3	–	–	–		

<b>Cooling:</b> Internal air cooling	0	Length code	....
External air cooling	1		
<b>Motor Module:</b> Single Motor Module	1	For information on the cables refer to MOTION-CONNECT connection systems	

### Accessories

Description	Order No.	Description	Order No.
<b>Cooling connection adapter</b> For SIMOTICS T built-in torque motors • 1FW6160 ... 1FW6230 • 1FW6290	<b>1FW6160-1BA00-0AA0</b> <b>1FW6290-1BA00-0AA0</b>	<b>Power connector<sup>4)</sup></b> For SIMOTICS T-1FW6 built-in torque motors • Size 1 for 4 × 2.5 mm <sup>2</sup> • Size 1.5 for 4 × 4/4 × 10/4 × 16 mm <sup>2</sup>	<b>6FX2003-0LA00</b> <b>6FX2003-0LA10</b>
		<b>Signal connector<sup>4)</sup></b> For SIMOTICS T-1FW6 built-in torque motors • M17 (socket) for 6 × 0.5 + 1 × 1.0 mm <sup>2</sup>	<b>6FX2003-0SU07</b>
		<b>Signal cable, pre-assembled<sup>6)</sup></b> For SIMOTICS T-1FW6 built-in torque motors	<b>6FX7002-2SL10-....</b>

1) Torque and current at low speeds.

2) The values refer to a supply voltage of 400 V 3 AC ± 10 % (drive system DC link voltage 600 V DC).

3) In case of water cooling with inlet temperature of 35 °C (95 °F) and maximum rotor flange temperature of 60 °C (140 °F).

4) For type of connection with exposed core ends, power and signal connectors are not included in the scope of supply of the motor and must be ordered separately.

5) The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F).

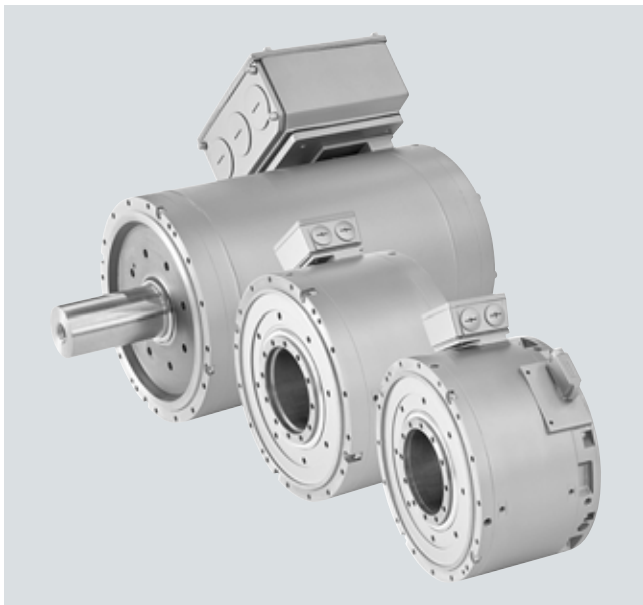
6) For length code, see MOTION-CONNECT connection systems.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Overview



SIMOTICS T-1FW3 complete torque motors

The SIMOTICS T-1FW3 complete torque motors are water-cooled, high-pole (slow running) permanent magnet synchronous motors. The operating characteristics can be essentially compared to those of regular synchronous motors.

The 1FW3 motor spectrum comprises 3 external diameters in various shaft lengths as well as 3 different shaft versions.

- Hollow shaft (continuous)
  - For infeed of cooling and heating media, measurement cables, etc.
  - Motors with various lengths can be connected to the machine shaft
- Plug-on shaft with integrated shaft centering
  - Simple and quick installation as a result of the integrated shaft adapter with centering
  - Optimized clamping element
  - Easy encoder replacement (safety-capability)
  - Longer bearing lifetime
- Solid shaft
  - Simple replacement of a geared motor without having to change the connection to the machine
  - Easy encoder replacement (safety-capability)

The SIMOTICS T-1FW3 compact complete torque motors are high-pole, permanent magnet AC synchronous motors that must be flanged onto the machine using the specially-developed stator torque arms. The rotor is coupled to the machine shaft using the clamping element that will be supplied if required. This results in a perfectly rigid drive train that can be optimally controlled.

The SIMOTICS T-1FW3 complete torque motors can be combined with the SINAMICS S120 drive system to create a powerful, high-performance system. The integrated encoder systems for speed and position control can be selected depending on the application.

#### Benefits

- High torque, compact design and low construction volume
- Optimized mechatronic solution
  - High degree of rigidity
  - High speeds possible
  - Innovative machine concepts are possible
  - Increased productivity and quality
- The right design for any application
  - Wide performance range
  - Hollow shaft, plug-on shaft or solid shaft
  - Different encoder types for speed control and high-precision positioning
- Excellent performance
  - Maximum speeds up to 1800 rpm
  - Excellent rotational accuracy
  - High dynamic response, i.e. short ramp-up times
- The ideal motor for energy-saving solutions
- Simple encoder replacement without requiring any readjustment for plug-on and solid shafts

#### Application

The SIMOTICS T-1FW3 complete torque motors were developed as direct drives. These direct drives form a compact drive unit where the mechanical motor power is transferred directly to the driven machine without any mechanical transmission elements.

- Extruder main drives
- Screw drives for injection molding machines
- Roll drive
- Winders
- Cross lapper
- Pull-roll drives for foil-stretching machines
- Stretch, calender and chill rolls
- Dynamic positioning tasks, e.g. rotary tables, cyclic conveyor belts
- Substitute for hydraulic motors
- Roller drives in paper machines
- Cross-cutter drives for continuous material webs, e.g. paper, textiles, metal sheet
- Wire-drawing machines

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Technical specifications

<b>Product name</b>	SIMOTICS T-1FW3 complete torque motor
<b>Motor type</b>	Permanent magnet synchronous motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding overtemperature of $\Delta T = 100$ K at a coolant (water) inlet temperature of 30 °C (86 °F)
<b>Cooling according to EN 60034-6 (IEC 60034-6)</b>	Water cooling
<b>Thermal motor protection according to EN 60034-11 (IEC 60034-11)</b>	KTY84 temperature sensor in the stator winding
<b>Type of construction according to EN 60034-7 (IEC 60034-7)</b>	
• 1FW315/1FW320	IM B14, IM V18, IM V19
• 1FW328	IM B35, IM B5
<b>Degree of protection according to EN 60034-5 (IEC 60034-5)</b>	
• Hollow shaft	IP54
• Plug-on shaft for 1FW315/1FW320	IP55
• Solid shaft	IP55
<b>Shaft extension according to DIN 748-3 (IEC 60072-1)</b>	Hollow shaft, plug-on shaft, solid shaft
<b>Shaft and flange accuracy in accordance with 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance N (at normal running temperature)
<b>Vibration severity in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade A (maintained up to rated speed)
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with DIN EN ISO 1680</b> Tolerance + 3 dB	
• At rated pulse frequency	
- 4 kHz	70 dB
- 2 kHz	73 dB
<b>Shock load</b>	Maximum permissible radial acceleration 50 m/s <sup>2</sup> (not in operational state)
<b>Bearings</b>	Roller bearing with permanent grease lubrication (bearing replacement interval with regreasing system $L_{h10} = 60000$ h)
<b>Connection</b>	Terminal box for power cable Connector for encoder signals and temperature sensor
<b>Paint finish</b>	Anthracite RAL 7016
<b>2nd rating plate</b>	Enclosed separately
<b>Approvals, according to</b>	cURus

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling		
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$			
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm			
<b>Line voltage 400 V 3 AC Smart Line Module/Basic Line Module</b>											
<b>140</b>	200	4.4 (5.90)	300 (221)	13	351	32.7	380	1000	1FW3201-1 ■ E ■ 2- ■ AA0 1FW3201-1 ■ E ■ 2- ■ AS0 1FW3201-1 ■ E ■ 2- ■ AM0		
		7.3 (9.79)	500 (369)	21	329	32.7	380	1000	1FW3202-1 ■ E ■ 2- ■ AA0 1FW3202-1 ■ E ■ 2- ■ AS0 1FW3202-1 ■ E ■ 2- ■ AM0		
		11.0 (14.8)	750 (553)	31	335	32.7	370	1000	1FW3203-1 ■ E ■ 2- ■ AA0 1FW3203-1 ■ E ■ 2- ■ AS0 1FW3203-1 ■ E ■ 2- ■ AM0		
		14.7 (19.7)	1000 (738)	40	330	32.7	360	1000	1FW3204-1 ■ E ■ 2- ■ AA0 1FW3204-1 ■ E ■ 2- ■ AS0 1FW3204-1 ■ E ■ 2- ■ AM0		
		22.0 (29.5)	1500 (1106)	65	311	32.7	390	1000	1FW3206-1 ■ E ■ 2- ■ AA0 1FW3206-1 ■ E ■ 2- ■ AS0 1FW3206-1 ■ E ■ 2- ■ AM0		
		29.3 (1475)	2000 (1475)	84	316	32.7	380	1000	1FW3208-1 ■ E ■ 2- ■ AA0 1FW3208-1 ■ E ■ 2- ■ AS0 1FW3208-1 ■ E ■ 2- ■ AM0		
	280	36.7 (49.2)	2500 (1844)	82	367	23.3	290	1000	1FW3281-2 ■ E ■ 3- ■ AA0		
		51.3 (68.8)	3500 (2582)	115	365	23.3	290	1000	1FW3283-2 ■ E ■ 3- ■ AA0		
		73.3 (98.3)	5000 (3688)	160	368	23.3	290	1000	1FW3285-2 ■ E ■ 3- ■ AA0		
		102.6 (138)	7000 (5163)	230	359	23.3	290	1000	1FW3287-2 ■ E ■ 3- ■ AA0		
		<b>220</b>	280	56.0 (75.1)	2450 (1807)	126	352	36.7	460	1000	1FW3281-2 ■ G ■ 3- ■ AA0
				79.5 (107)	3450 (2545)	176	352	36.7	460	1000	1FW3283-2 ■ G ■ 3- ■ AA0
114.0 (153)	4950 (3651)			244	362	36.7	440	1000	1FW3285-2 ■ G ■ 3- ■ AA0		
160.1 (215)	6950 (5126)			355	350	36.7	460	1000	1FW3287-2 ■ G ■ 3- ■ AA0		

#### Shaft design:

Hollow shaft	A
Plug-on shaft	S
Solid shaft	M

For versions, see  
Order No. supplements on  
pages 6/80 to 6/82

Further rated speeds on request.



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	223 (492) 275 (606) 285 (628)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	279 (615) 330 (728) 345 (761)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	348 (767) 400 (882) 415 (915)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3281-2.E.3-....	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	<b>6SL312-1TE28-5AA3</b>
1FW3283-2.E.3-....	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3285-2.E.3-....	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3287-2.E.3-....	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3281-2.G.3-....	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3283-2.G.3-....	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3285-2.G.3-....	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3287-2.G.3-....	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
- 2) Maximum speed that must not be exceeded. Certain constraints may apply, see Order number supplements.
- 3) Optimum efficiency in continuous duty.
- 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$	
rpm		kW (HP)	Nm (lb-ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 400 V 3 AC Smart Line Module/Basic Line Module</b>									
<b>270</b>	150	2.8 (3.75)	100 (73.8)	8	369	31.5	630	1700	1FW3150-1 H 2- AA0 1FW3150-1 H 2- AS0 1FW3150-1 H 2- AM0
		5.7 (7.64)	200 (148)	14	368	31.5	630	1700	1FW3152-1 H 2- AA0 1FW3152-1 H 2- AS0 1FW3152-1 H 2- AM0
		8.5 (11.4)	300 (221)	20.5	368	31.5	610	1700	1FW3154-1 H 2- AA0 1FW3154-1 H 2- AS0 1FW3154-1 H 2- AM0
	11.3 (15.2)	400 (295)	28	358	31.5	630	1700	1FW3155-1 H 2- AA0 1FW3155-1 H 2- AS0 1FW3155-1 H 2- AM0	
	14.1 (18.9)	500 (369)	34	366	31.5	610	1700	1FW3156-1 H 2- AA0 1FW3156-1 H 2- AS0 1FW3156-1 H 2- AM0	
	200	8.5 (11.4)	300 (221)	23	341	63.0	680	1000	1FW3201-1 H 2- AA0 1FW3201-1 H 2- AS0 1FW3201-1 H 2- AM0
		14.1 (18.9)	500 (369)	37	330	63.0	670	1000	1FW3202-1 H 2- AA0 1FW3202-1 H 2- AS0 1FW3202-1 H 2- AM0
		21.2 (28.4)	750 (553)	59	311	63.0	710	1000	1FW3203-1 H 2- AA0 1FW3203-1 H 2- AS0 1FW3203-1 H 2- AM0
		28.3 (38.0)	1000 (738)	74	321	63.0	670	1000	1FW3204-1 H 2- AA0 1FW3204-1 H 2- AS0 1FW3204-1 H 2- AM0
		42.4 (56.9)	1500 (1106)	118	317	63.0	700	1000	1FW3206-1 H 2- AA0 1FW3206-1 H 2- AS0 1FW3206-1 H 2- AM0
56.5 (75.8)		2000 (1475)	153	313	63.0	690	1000	1FW3208-1 H 2- AA0 1FW3208-1 H 2- AS0 1FW3208-1 H 2- AM0	
<b>350</b>		280	88.0 (118)	2400 (1770)	192	345	58.3	720	1000
	122.8 (165)		3350 (2471)	279	330	58.3	750	1000	1FW3283-3 J 3- AA0
	174.1 (233)		4750 (3504)	380	341	58.3	720	1000	1FW3285-3 J 3- AA0
	243.7 (327)		6650 (4905)	508	357	58.3	690	1000	1FW3287-3 J 3- AA0

#### Shaft design:

Hollow shaft **A**  
 Plug-on shaft **S**  
 Solid shaft **M**

For versions, see  
 Order No. supplements  
 on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.H.2-....	105 (77.4)	7.3	0.89	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	9	<b>6SL312-1TE21-0AA3</b>
1FW3152-1.H.2-....	210 (155)	15	0.92	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3154-1.H.2-....	315 (232)	21.5	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3155-1.H.2-....	420 (310)	29	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3156-1.H.2-....	525 (387)	35	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3201-1.H.2-....	315 (232)	24	0.92	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3202-1.H.2-....	525 (387)	39	0.94	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3203-1.H.2-....	790 (583)	62	0.95	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3204-1.H.2-....	1050 (774)	77	0.95	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	223 (492) 275 (606) 285 (628)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3206-1.H.2-....	1575 (1162)	121	0.95	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	279 (615) 330 (728) 345 (761)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3208-1.H.2-....	2100 (1549)	160	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	348 (767) 400 (882) 415 (915)	gk630	200	<b>6SL312-1TE32-0AA3</b>
1FW3281-3.J.3-....	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3283-3.J.3-....	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3285-3.J.3-....	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3287-3.J.3-....	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	618 <sup>5)</sup>	<b>6SL3320-1TE37-5AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling	
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm		
<b>Line voltage 400 V 3 AC Smart Line Module/Basic Line Module</b>										
<b>450</b>	150	4.7 (6.30)	100 (73.8)	12	370	52.5	960	1700	1FW3150-1 ■ L ■ 2- ■ AA0 1FW3150-1 ■ L ■ 2- ■ AS0 1FW3150-1 ■ L ■ 2- ■ AM0	
		9.4 (12.6)	200 (148)	22	370	52.5	960	1700	1FW3152-1 ■ L ■ 2- ■ AA0 1FW3152-1 ■ L ■ 2- ■ AS0 1FW3152-1 ■ L ■ 2- ■ AM0	
		14.1 (18.9)	300 (221)	32	370	52.5	950	1700	1FW3154-1 ■ L ■ 2- ■ AA0 1FW3154-1 ■ L ■ 2- ■ AS0 1FW3154-1 ■ L ■ 2- ■ AM0	
		18.8 (25.2)	400 (295)	43	370	52.5	960	1700	1FW3155-1 ■ L ■ 2- ■ AA0 1FW3155-1 ■ L ■ 2- ■ AS0 1FW3155-1 ■ L ■ 2- ■ AM0	
			23.6 (31.6)	500 (369)	53	370	52.5	950	1700	1FW3156-1 ■ L ■ 2- ■ AA0 1FW3156-1 ■ L ■ 2- ■ AS0 1FW3156-1 ■ L ■ 2- ■ AM0
			200	14.1 (18.9)	300 (221)	37	349	105	1110	1000
	23.6 (31.6)	500 (369)		59	340	105	1070	1000	1FW3202-1 ■ L ■ 2- ■ AA0 1FW3202-1 ■ L ■ 2- ■ AS0 1FW3202-1 ■ L ■ 2- ■ AM0	
	35.3 (47.3)	750 (553)		92	330	105	1110	1000	1FW3203-1 ■ L ■ 2- ■ AA0 1FW3203-1 ■ L ■ 2- ■ AS0 1FW3203-1 ■ L ■ 2- ■ AM0	
	47.1 (63.2)	1000 (738)		118	335	105	1060	1000	1FW3204-1 ■ L ■ 2- ■ AA0 1FW3204-1 ■ L ■ 2- ■ AS0 1FW3204-1 ■ L ■ 2- ■ AM0	
	66.0 (88.5)	1400 (1033)		169	318	105	1090	1000	1FW3206-1 ■ L ■ 2- ■ AA0 1FW3206-1 ■ L ■ 2- ■ AS0 1FW3206-1 ■ L ■ 2- ■ AM0	
	87.2 (117)	1850 (1365)		226	332	105	1100	1000	1FW3208-1 ■ L ■ 2- ■ AA0 1FW3208-1 ■ L ■ 2- ■ AS0 1FW3208-1 ■ L ■ 2- ■ AM0	
	<b>520</b>	280	122.5 (164)	2250 (1660)	262	339	86.7	1050	1000	1FW3281-3 ■ M ■ 3- ■ AA0
			171.5 (230)	3150 (2323)	362	345	86.7	1030	1000	1FW3283-3 ■ M ■ 3- ■ AA0
			247.8 (332)	4550 (3356)	484	369	86.7	960	1000	1FW3285-3 ■ M ■ 3- ■ AA0
337.6 (453)			6200 (4573)	713	341	86.7	1030	1000	1FW3287-3 ■ M ■ 3- ■ AA0	

**Shaft design:**

Hollow shaft	<b>A</b>
Plug-on shaft	<b>S</b>
Solid shaft	<b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.L.2-....	105 (77.4)	11.5	0.90	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3152-1.L.2-....	210 (155)	22.5	0.92	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3154-1.L.2-....	315 (232)	33	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3155-1.L.2-....	420 (310)	45	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3156-1.L.2-....	525 (387)	55	0.94	0.28 (2.48) 0.34 (3.01) 0.28 (2.48)	171 (377) 184 (406) 187 (412)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3201-1.L.2-....	315 (232)	38	0.92	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3202-1.L.2-....	525 (387)	62	0.94	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk420	30	<b>6SL312-1TE23-0AA3</b>
1FW3203-1.L.2-....	790 (583)	100	0.95	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.L.2-....	1050 (774)	129	0.95	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk630	45	<b>6SL312-1TE24-5AA3</b>
1FW3206-1.L.2-....	1575 (1162)	189	0.95	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk630	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.L.2-....	2100 (1549)	255	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk630	85	<b>6SL312-1TE28-5AA3</b>
1FW3281-3.M.3-....	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3283-3.M.3-....	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3285-3.M.3-....	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	<b>6SL3320-1TE35-0AA3</b>
1FW3287-3.M.3-....	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	734 <sup>5)</sup>	<b>6SL3320-1TE38-4AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 400 V 3 AC Smart Line Module/Basic Line Module</b>									
<b>670</b>	150	7.0 (9.39)	100 (73.8)	18	369	78.2	1470	1700	1FW3150-1 P 2- AA0 1FW3150-1 P 2- AS0 1FW3150-1 P 2- AM0
		14.0 (18.8)	200 (148)	32.5	370	78.2	1450	1700	1FW3152-1 P 2- AA0 1FW3152-1 P 2- AS0 1FW3152-1 P 2- AM0
		21.0 (28.2)	300 (221)	47.5	370	78.2	1420	1700	1FW3154-1 P 2- AA0 1FW3154-1 P 2- AS0 1FW3154-1 P 2- AM0
		28.1 (37.7)	400 (295)	64	360	78.2	1450	1700	1FW3155-1 P 2- AA0 1FW3155-1 P 2- AS0 1FW3155-1 P 2- AM0
		35.1 (47.1)	500 (369)	76	370	78.2	1380	1700	1FW3156-1 P 2- AA0 1FW3156-1 P 2- AS0 1FW3156-1 P 2- AM0
<b>Shaft design:</b> Hollow shaft Plug-on shaft Solid shaft									<b>A</b> <b>S</b> <b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.P.2-....	105 (77.4)	17.5	0.90	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3152-1.P.2-....	210 (155)	33.5	0.93	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3154-1.P.2-....	315 (232)	49	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	60	<b>6SL312-1TE26-0AA3</b>
1FW3155-1.P.2-....	420 (310)	67	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3156-1.P.2-....	525 (387)	80	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk420	85	<b>6SL312-1TE28-5AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

6

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 400 V 3 AC Smart Line Module/Basic Line Module</b>									
<b>710</b>	200	18.2 (24.4)	245 (181)	37	311	106.7	1320	1800	1FW3201-3 P 2- AS0 1FW3201-3 P 2- AM0
		35.5 (47.6)	475 (350)	69	318	106.7	1290	1800	1FW3202-3 P 2- AS0 1FW3202-3 P 2- AM0
		51 (68.4)	690 (509)	97	327	106.7	1250	1800	1FW3203-3 P 2- AS0 1FW3203-3 P 2- AM0
		70 (93.9)	940 (693)	138	313	106.7	1310	1800	1FW3204-3 P 2- AS0 1FW3204-3 P 2- AM0
		103 (138)	1380 (1018)	194	327	106.7	1260	1800	1FW3206-3 P 2- AS0 1FW3206-3 P 2- AM0
		143 (192)	1930 (1424)	275	324	106.7	1270	1800	1FW3208-3 P 2- AS0 1FW3208-3 P 2- AM0
		<b>1050</b>	200	26 (34.9)	235 (173)	51	321	160	1890
50 (67.1)	455 (336)			95	329	160	1850	1800	1FW3202-3 S 2- AS0 1FW3202-3 S 2- AM0
71 (95.2)	650 (479)			135	330	160	1840	1800	1FW3203-3 S 2- AS0 1FW3203-3 S 2- AM0
98 (131)	890 (656)			197	309	160	1970	1800	1FW3204-3 S 2- AS0 1FW3204-3 S 2- AM0
140 (188)	1270 (937)			280	307	160	1980	1800	1FW3206-3 S 2- AS0 1FW3206-3 S 2- AM0
196 (263)	1780 (1313)			405	299	160	2050	1800	1FW3208-3 S 2- AS0 1FW3208-3 S 2- AM0
<b>Shaft design:</b> Plug-on shaft <b>S</b> Solid shaft <b>M</b>									

For versions, see  
Order No. supplements  
on pages 6/81 and 6/82



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque  $M_0$ at $\Delta T=100\text{ K}$  Nm (lb-ft)	Stall current  $I_0$ at $\Delta T=100\text{ K}$  A	Effi- ciency <sup>3)</sup>  $\eta$	Moment of inertia  $J$  kgm <sup>2</sup> (lb-in-s <sup>2</sup> )	Weight, approx.  $m$  kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup>  $I_{\text{rated}}$  A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-3.P.. 1FW3201-3.P..	260 (192)	38	88.7	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3202-3.P.. 1FW3202-3.P..	500 (369)	72	91	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3203-3.P.. 1FW3203-3.P..	730 (538)	102	92.2	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.P.. 1FW3204-3.P..	1000 (738)	145	92.8	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.P.. 1FW3206-3.P..	1500 (1106)	210	93.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	200	<b>6SL312-1TE32-0AA4</b>
1FW3208-3.P.. 1FW3208-3.P..	2100 (1549)	295	93.7	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3201-3.S.. 1FW3201-3.S..	260 (192)	54	90.1	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3202-3.S.. 1FW3202-3.S..	500 (369)	102	92.2	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3203-3.S.. 1FW3203-3.S..	730 (538)	149	93.5	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.S.. 1FW3204-3.S..	1000 (738)	220	94	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.S.. 1FW3206-3.S..	1500 (1106)	330	94.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3208-3.S.. 1FW3208-3.S..	2100 (1549)	470	94.6	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	490	<b>6SL3320-1TE35-0AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

6

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling		
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$			
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm			
<b>Line voltage 400 V 3 AC Active Line Module</b>											
<b>150</b>	200	4.7 (6.30)	300 (221)	13	373	35	380	1000	1FW3201-1 ■ E ■ 2- ■ AA0 1FW3201-1 ■ E ■ 2- ■ AS0 1FW3201-1 ■ E ■ 2- ■ AM0		
		7.9 (10.6)	500 (369)	21	350	35	380	1000	1FW3202-1 ■ E ■ 2- ■ AA0 1FW3202-1 ■ E ■ 2- ■ AS0 1FW3202-1 ■ E ■ 2- ■ AM0		
		11.8 (15.8)	750 (553)	31	357	35	370	1000	1FW3203-1 ■ E ■ 2- ■ AA0 1FW3203-1 ■ E ■ 2- ■ AS0 1FW3203-1 ■ E ■ 2- ■ AM0		
		15.7 (21.1)	1000 (738)	40	351	35	360	1000	1FW3204-1 ■ E ■ 2- ■ AA0 1FW3204-1 ■ E ■ 2- ■ AS0 1FW3204-1 ■ E ■ 2- ■ AM0		
		23.6 (31.7)	1500 (1106)	65	331	35	390	1000	1FW3206-1 ■ E ■ 2- ■ AA0 1FW3206-1 ■ E ■ 2- ■ AS0 1FW3206-1 ■ E ■ 2- ■ AM0		
		31.4 (42.1)	2000 (1475)	84	337	35	380	1000	1FW3208-1 ■ E ■ 2- ■ AA0 1FW3208-1 ■ E ■ 2- ■ AS0 1FW3208-1 ■ E ■ 2- ■ AM0		
	280	39.3 (52.7)	2500 (1844)	82	390	25	290	1000	1FW3281-2 ■ E ■ 3- ■ AA0		
		55.0 (73.8)	3500 (2582)	115	388	25	290	1000	1FW3283-2 ■ E ■ 3- ■ AA0		
		78.5 (105)	5000 (3688)	160	391	25	290	1000	1FW3285-2 ■ E ■ 3- ■ AA0		
		110.0 (148)	7000 (5163)	230	382	25	290	1000	1FW3287-2 ■ E ■ 3- ■ AA0		
		<b>250</b>	280	64.1 (86.0)	2450 (1807)	126	396	41.7	460	1000	1FW3281-2 ■ G ■ 3- ■ AA0
				90.3 (121)	3450 (2545)	176	397	41.7	460	1000	1FW3283-2 ■ G ■ 3- ■ AA0
129.6 (174)	4950 (3651)			244	408	41.7	440	1000	1FW3285-2 ■ G ■ 3- ■ AA0		
180.6 (242)	6900 (5089)			352	393	41.7	460	1000	1FW3287-2 ■ G ■ 3- ■ AA0		

#### Shaft design:

Hollow shaft	A
Plug-on shaft	S
Solid shaft	M

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3281-2.E.3-....	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	<b>6SL312-1TE28-5AA3</b>
1FW3283-2.E.3-....	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3285-2.E.3-....	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3287-2.E.3-....	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3281-2.G.3-....	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3283-2.G.3-....	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3285-2.G.3-....	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3287-2.G.3-....	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>

<b>Format:</b>	
Booksized	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
- 2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.
- 3) Optimum efficiency in continuous duty.
- 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm		
<b>Line voltage 400 V 3 AC Active Line Module</b>										
<b>300</b>	150	3.1 (4.16)	100 (73.8)	8	403	35	630	1700	1FW3150-1 H 2- AA0 1FW3150-1 H 2- AS0 1FW3150-1 H 2- AM0	
		6.3 (8.45)	200 (148)	14	404	35	630	1700	1FW3152-1 H 2- AA0 1FW3152-1 H 2- AS0 1FW3152-1 H 2- AM0	
		9.4 (12.6)	300 (221)	20.5	405	35	610	1700	1FW3154-1 H 2- AA0 1FW3154-1 H 2- AS0 1FW3154-1 H 2- AM0	
	200	150	12.6 (16.9)	400 (295)	28	395	35	630	1700	1FW3155-1 H 2- AA0 1FW3155-1 H 2- AS0 1FW3155-1 H 2- AM0
			15.7 (21.1)	500 (369)	34	403	35	610	1700	1FW3156-1 H 2- AA0 1FW3156-1 H 2- AS0 1FW3156-1 H 2- AM0
		200	9.4 (12.6)	300 (221)	23	377	70	680	1000	1FW3201-1 H 2- AA0 1FW3201-1 H 2- AS0 1FW3201-1 H 2- AM0
			15.7 (21.1)	500 (369)	37	365	70	670	1000	1FW3202-1 H 2- AA0 1FW3202-1 H 2- AS0 1FW3202-1 H 2- AM0
	23.6 (31.6)		750 (553)	59	343	70	710	1000	1FW3203-1 H 2- AA0 1FW3203-1 H 2- AS0 1FW3203-1 H 2- AM0	
	<b>400</b>	280	31.4 (42.1)	1000 (738)	74	355	70	670	1000	1FW3204-1 H 2- AA0 1FW3204-1 H 2- AS0 1FW3204-1 H 2- AM0
			47.1 (63.2)	1500 (1106)	118	351	70	700	1000	1FW3206-1 H 2- AA0 1FW3206-1 H 2- AS0 1FW3206-1 H 2- AM0
62.8 (84.2)			2000 (1475)	153	346	70	690	1000	1FW3208-1 H 2- AA0 1FW3208-1 H 2- AS0 1FW3208-1 H 2- AM0	
138.2 (185)			3300 (2434)	275	373	66.7	750	1000	1FW3283-3 J 3- AA0	
	196.9 (264)	4700 (3467)	376	386	66.7	720	1000	1FW3285-3 J 3- AA0		
	276.5 (371)	6600 (4868)	504	405	66.7	690	1000	1FW3287-3 J 3- AA0		

#### Shaft design:

Hollow shaft **A**  
 Plug-on shaft **S**  
 Solid shaft **M**

For versions, see  
 Order No. supplements  
 on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.H.2-....	105 (77.4)	7.3	0.89	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	9	<b>6SL312-1TE21-0AA3</b>
1FW3152-1.H.2-....	210 (155)	15	0.92	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3154-1.H.2-....	315 (232)	21.5	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3155-1.H.2-....	420 (310)	29	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3156-1.H.2-....	525 (387)	35	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3201-1.H.2-....	315 (232)	24	0.92	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3202-1.H.2-....	525 (387)	39	0.94	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3203-1.H.2-....	790 (583)	62	0.95	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3204-1.H.2-....	1050 (774)	77	0.95	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3206-1.H.2-....	1575 (1162)	121	0.95	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3208-1.H.2-....	2100 (1549)	160	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk630	200	<b>6SL312-1TE32-0AA3</b>
1FW3281-3.J.3-....	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3283-3.J.3-....	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3285-3.J.3-....	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3287-3.J.3-....	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	618 <sup>5)</sup>	<b>6SL3320-1TE37-5AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling	
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm		
<b>Line voltage 400 V 3 AC Active Line Module</b>										
<b>500</b>	150	5.2 (6.97)	100 (73.8)	12	413	58.3	960	1700	1FW3150-1 ■ L ■ 2- ■ AA 0 1FW3150-1 ■ L ■ 2- ■ AS 0 1FW3150-1 ■ L ■ 2- ■ AM 0	
		10.5 (14.1)	200 (148)	22	415	58.3	960	1700	1FW3152-1 ■ L ■ 2- ■ AA 0 1FW3152-1 ■ L ■ 2- ■ AS 0 1FW3152-1 ■ L ■ 2- ■ AM 0	
		15.7 (21.1)	300 (221)	32	415	58.3	950	1700	1FW3154-1 ■ L ■ 2- ■ AA 0 1FW3154-1 ■ L ■ 2- ■ AS 0 1FW3154-1 ■ L ■ 2- ■ AM 0	
		200	20.9 (28.0)	400 (295)	43	412	58.3	960	1700	1FW3155-1 ■ L ■ 2- ■ AA 0 1FW3155-1 ■ L ■ 2- ■ AS 0 1FW3155-1 ■ L ■ 2- ■ AM 0
			26.2 (35.1)	500 (369)	53	415	58.3	950	1700	1FW3156-1 ■ L ■ 2- ■ AA 0 1FW3156-1 ■ L ■ 2- ■ AS 0 1FW3156-1 ■ L ■ 2- ■ AM 0
			15.7 (21.1)	300 (221)	37	386	116.7	1110	1000	1FW3201-1 ■ L ■ 2- ■ AA 0 1FW3201-1 ■ L ■ 2- ■ AS 0 1FW3201-1 ■ L ■ 2- ■ AM 0
		280	26.2 (35.1)	500 (369)	59	376	116.7	1070	1000	1FW3202-1 ■ L ■ 2- ■ AA 0 1FW3202-1 ■ L ■ 2- ■ AS 0 1FW3202-1 ■ L ■ 2- ■ AM 0
			39.3 (52.7)	750 (553)	92	366	116.7	1110	1000	1FW3203-1 ■ L ■ 2- ■ AA 0 1FW3203-1 ■ L ■ 2- ■ AS 0 1FW3203-1 ■ L ■ 2- ■ AM 0
			52.4 (70.3)	1000 (738)	118	371	116.7	1060	1000	1FW3204-1 ■ L ■ 2- ■ AA 0 1FW3204-1 ■ L ■ 2- ■ AS 0 1FW3204-1 ■ L ■ 2- ■ AM 0
			73.3 (98.3)	1400 (1033)	169	353	116.7	1090	1000	1FW3206-1 ■ L ■ 2- ■ AA 0 1FW3206-1 ■ L ■ 2- ■ AS 0 1FW3206-1 ■ L ■ 2- ■ AM 0
			96.9 (130)	1850 (1365)	226	368	116.7	1100	1000	1FW3208-1 ■ L ■ 2- ■ AA 0 1FW3208-1 ■ L ■ 2- ■ AS 0 1FW3208-1 ■ L ■ 2- ■ AM 0
	<b>600</b>	280	138.2 (185)	2200 (1623)	256	387	100.0	1050	1000	1FW3281-3 ■ M ■ 3- ■ AA 0
194.5 (261)			3100 (2287)	357	394	100.0	1030	1000	1FW3283-3 ■ M ■ 3- ■ AA 0	
276.5 (371)			4400 (3245)	469	415	100.0	960	1000	1FW3285-3 ■ M ■ 3- ■ AA 0	
380.1 (510)			6050 (4462)	696	389	100.0	1030	1000	1FW3287-3 ■ M ■ 3- ■ AA 0	

**Shaft design:**

Hollow shaft	<b>A</b>
Plug-on shaft	<b>S</b>
Solid shaft	<b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.L.2-....	105 (77.4)	11.5	0.90	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3152-1.L.2-....	210 (155)	22.5	0.92	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3154-1.L.2-....	315 (232)	33	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3155-1.L.2-....	420 (310)	45	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3156-1.L.2-....	525 (387)	55	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3201-1.L.2-....	315 (232)	38	0.92	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3202-1.L.2-....	525 (387)	62	0.94	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk420	30	<b>6SL312-1TE23-0AA3</b>
1FW3203-1.L.2-....	790 (583)	100	0.95	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.L.2-....	1050 (774)	129	0.95	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk630	45	<b>6SL312-1TE24-5AA3</b>
1FW3206-1.L.2-....	1575 (1162)	189	0.95	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk630	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.L.2-....	2100 (1549)	255	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk630	85	<b>6SL312-1TE28-5AA3</b>
1FW3281-3.M.3-....	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3283-3.M.3-....	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3285-3.M.3-....	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	<b>6SL3320-1TE35-0AA3</b>
1FW3287-3.M.3-....	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	734 <sup>5)</sup>	<b>6SL3320-1TE38-4AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 400 V 3 AC Active Line Module</b>									
<b>750</b>	150	7.9 (10.6)	100 (73.8)	18	410	87.5	1470	1700	1FW3150-1 P 2-AA0 1FW3150-1 P 2-AS0 1FW3150-1 P 2-AM0
		15.7 (31.1)	200 (148)	32.5	415	87.5	1450	1700	1FW3152-1 P 2-AA0 1FW3152-1 P 2-AS0 1FW3152-1 P 2-AM0
		23.6 (31.6)	300 (221)	47.5	412	87.5	1420	1700	1FW3154-1 P 2-AA0 1FW3154-1 P 2-AS0 1FW3154-1 P 2-AM0
		31.4 (42.1)	400 (295)	64	401	87.5	1450	1700	1FW3155-1 P 2-AA0 1FW3155-1 P 2-AS0 1FW3155-1 P 2-AM0
		39.3 (52.7)	500 (369)	76	415	87.5	1380	1700	1FW3156-1 P 2-AA0 1FW3156-1 P 2-AS0 1FW3156-1 P 2-AM0

#### Shaft design:

Hollow shaft	A
Plug-on shaft	S
Solid shaft	M

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.P.2-....	105 (77.4)	17.5	0.90	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3152-1.P.2-....	210 (155)	33.5	0.93	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3154-1.P.2-....	315 (232)	49	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	60	<b>6SL312-1TE26-0AA3</b>
1FW3155-1.P.2-....	420 (310)	67	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3156-1.P.2-....	525 (387)	80	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk420	85	<b>6SL312-1TE28-5AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

6

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 400 V 3 AC Active Line Module</b>									
<b>800</b>	200	20.5 (27.5)	245 (181)	37	350	106.7	1320	1800	1FW3201-3 P 3- AS0 1FW3201-3 P 3- AM0
		39.5 (53.0)	470 (347)	69	358	106.7	1290	1800	1FW3202-3 P 3- AS0 1FW3202-3 P 3- AM0
		57 (76.4)	680 (502)	96	368	106.7	1250	1800	1FW3203-3 P 3- AS0 1FW3203-3 P 3- AM0
		78 (105)	930 (686)	137	353	106.7	1310	1800	1FW3204-3 P 3- AS0 1FW3204-3 P 3- AM0
		114 (153)	1360 (1003)	192	368	106.7	1260	1800	1FW3206-3 P 3- AS0 1FW3206-3 P 3- AM0
		159 (213)	1900 (1401)	270	365	106.7	1270	1800	1FW3208-3 P 3- AS0 1FW3208-3 P 3- AM0
<b>1200</b>	200	29 (38.9)	230 (170)	50	367	160	1890	1800	1FW3201-3 S 3- AS0 1FW3201-3 S 3- AM0
		55 (73.8)	440 (325)	92	376	160	1850	1800	1FW3202-3 S 3- AS0 1FW3202-3 S 3- AM0
		79 (106)	630 (465)	131	377	160	1840	1800	1FW3203-3 S 3- AS0 1FW3203-3 S 3- AM0
		108 (145)	860 (634)	191	353	160	1970	1800	1FW3204-3 S 3- AS0 1FW3204-3 S 3- AM0
		152 (204)	1210 (892)	270	351	160	1980	1800	1FW3206-3 S 3- AS0 1FW3206-3 S 3- AM0
		215 (288)	1700 (1254)	385	342	160	2050	1800	1FW3208-3 S 3- AS0 1FW3208-3 S 3- AM0

**Shaft design:**  
 Plug-on shaft **S**  
 Solid shaft **M**

For versions, see  
 Order No. supplements  
 on pages 6/81 and 6/82

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-3.P.. 1FW3201-3.P..	260 (192)	38	88.7	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3202-3.P.. 1FW3202-3.P..	500 (369)	72	91	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3203-3.P.. 1FW3203-3.P..	730 (538)	102	92.2	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.P.. 1FW3204-3.P..	1000 (738)	145	92.8	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.P.. 1FW3206-3.P..	1500 (1106)	210	93.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	200	<b>6SL312-1TE32-0AA4</b>
1FW3208-3.P.. 1FW3208-3.P..	2100 (1549)	295	93.7	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3201-3.S.. 1FW3201-3.S..	260 (192)	54	90.1	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3202-3.S.. 1FW3202-3.S..	500 (369)	102	92.2	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3203-3.S.. 1FW3203-3.S..	730 (538)	149	93.5	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.S.. 1FW3204-3.S..	1000 (738)	220	94	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.S.. 1FW3206-3.S..	1500 (1106)	330	94.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3208-3.S.. 1FW3208-3.S..	2100 (1549)	470	94.6	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	490	<b>6SL3320-1TE35-0AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

6

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm		
<b>Line voltage 480 V 3 AC Smart Line Module/Basic Line Module</b>										
<b>160</b>	200	5.0 (6.71)	300 (221)	13	395	37.3	380	1000	1FW3201-1 ■ E ■ 2- ■ AA0 1FW3201-1 ■ E ■ 2- ■ AS0 1FW3201-1 ■ E ■ 2- ■ AM0	
		8.4 (11.3)	500 (369)	21	371	37.3	380	1000	1FW3202-1 ■ E ■ 2- ■ AA0 1FW3202-1 ■ E ■ 2- ■ AS0 1FW3202-1 ■ E ■ 2- ■ AM0	
		12.6 (16.9)	750 (553)	31	378	37.3	370	1000	1FW3203-1 ■ E ■ 2- ■ AA0 1FW3203-1 ■ E ■ 2- ■ AS0 1FW3203-1 ■ E ■ 2- ■ AM0	
		280	16.8 (22.5)	1000 (738)	40	372	37.3	360	1000	1FW3204-1 ■ E ■ 2- ■ AA0 1FW3204-1 ■ E ■ 2- ■ AS0 1FW3204-1 ■ E ■ 2- ■ AM0
			25.1 (33.7)	1500 (1106)	65	351	37.3	390	1000	1FW3206-1 ■ E ■ 2- ■ AA0 1FW3206-1 ■ E ■ 2- ■ AS0 1FW3206-1 ■ E ■ 2- ■ AM0
			33.5 (44.9)	2000 (1475)	84	357	37.3	380	1000	1FW3208-1 ■ E ■ 2- ■ AA0 1FW3208-1 ■ E ■ 2- ■ AS0 1FW3208-1 ■ E ■ 2- ■ AM0
	<b>270</b>	280	41.9 (56.2)	2500 (1844)	82	413	26.7	290	1000	1FW3281-2 ■ E ■ 3- ■ AA0
			58.6 (78.6)	3500 (2582)	115	411	26.7	290	1000	1FW3283-2 ■ E ■ 3- ■ AA0
			83.8 (112)	5000 (3688)	160	415	26.7	290	1000	1FW3285-2 ■ E ■ 3- ■ AA0
			117.3 (157)	7000 (5163)	230	405	26.7	290	1000	1FW3287-2 ■ E ■ 3- ■ AA0
			69.3 (92.9)	2450 (1807)	126	426	45.0	460	1000	1FW3281-2 ■ G ■ 3- ■ AA0
		96.1 (129)	3400 (2508)	173	424	45.0	460	1000	1FW3283-2 ■ G ■ 3- ■ AA0	
	138.5 (186)	4900 (3614)	241	437	45.0	440	1000	1FW3285-2 ■ G ■ 3- ■ AA0		
	195.1 (262)	6900 (5089)	352	423	45.0	460	1000	1FW3287-2 ■ G ■ 3- ■ AA0		

#### Shaft design:

Hollow shaft	A
Plug-on shaft	S
Solid shaft	M

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-1.E.2-....	315 (232)	13	0.91	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3202-1.E.2-....	525 (387)	22	0.93	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3203-1.E.2-....	790 (583)	32	0.94	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.E.2-....	1050 (774)	42	0.94	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3206-1.E.2-....	1575 (1162)	68	0.94	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.E.2-....	2100 (1549)	88	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3281-2.E.3-....	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	<b>6SL312-1TE28-5AA3</b>
1FW3283-2.E.3-....	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3285-2.E.3-....	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3287-2.E.3-....	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3281-2.G.3-....	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3283-2.G.3-....	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3285-2.G.3-....	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3287-2.G.3-....	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
- 2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.
- 3) Optimum efficiency in continuous duty.
- 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC Smart Line Module/Basic Line Module</b>									
<b>330</b>	150	3.5 (4.69)	100 (73.8)	8	437	38.5	630	1700	1FW3150-1 ■■■ 2- ■ AA0 1FW3150-1 ■■■ 2- ■ AS0 1FW3150-1 ■■■ 2- ■ AM0
		6.9 (9.25)	200 (148)	14	441	38.5	630	1700	1FW3152-1 ■■■ 2- ■ AA0 1FW3152-1 ■■■ 2- ■ AS0 1FW3152-1 ■■■ 2- ■ AM0
		10.4 (13.9)	300 (221)	20.5	442	38.5	610	1700	1FW3154-1 ■■■ 2- ■ AA0 1FW3154-1 ■■■ 2- ■ AS0 1FW3154-1 ■■■ 2- ■ AM0
	200	13.8 (18.5)	400 (295)	28	431	38.5	630	1700	1FW3155-1 ■■■ 2- ■ AA0 1FW3155-1 ■■■ 2- ■ AS0 1FW3155-1 ■■■ 2- ■ AM0
		17.3 (23.2)	500 (369)	34	440	38.5	610	1700	1FW3156-1 ■■■ 2- ■ AA0 1FW3156-1 ■■■ 2- ■ AS0 1FW3156-1 ■■■ 2- ■ AM0
		10.4 (13.9)	300 (221)	23	412	77.0	680	1000	1FW3201-1 ■■■ 2- ■ AA0 1FW3201-1 ■■■ 2- ■ AS0 1FW3201-1 ■■■ 2- ■ AM0
	17.3 (23.2)	500 (369)	37	399	77.0	670	1000	1FW3202-1 ■■■ 2- ■ AA0 1FW3202-1 ■■■ 2- ■ AS0 1FW3202-1 ■■■ 2- ■ AM0	
		25.9 (34.7)	750 (553)	59	376	77.0	710	1000	1FW3203-1 ■■■ 2- ■ AA0 1FW3203-1 ■■■ 2- ■ AS0 1FW3203-1 ■■■ 2- ■ AM0
		34.6 (46.4)	1000 (738)	74	388	77.0	670	1000	1FW3204-1 ■■■ 2- ■ AA0 1FW3204-1 ■■■ 2- ■ AS0 1FW3204-1 ■■■ 2- ■ AM0
	51.8 (69.5)	1500 (1106)	118	384	77.0	700	1000	1FW3206-1 ■■■ 2- ■ AA0 1FW3206-1 ■■■ 2- ■ AS0 1FW3206-1 ■■■ 2- ■ AM0	
		69.1 (92.7)	2000 (1475)	153	379	77.0	690	1000	1FW3208-1 ■■■ 2- ■ AA0 1FW3208-1 ■■■ 2- ■ AS0 1FW3208-1 ■■■ 2- ■ AM0

**Shaft design:**  
 Hollow shaft     A  
 Plug-on shaft    S  
 Solid shaft        M

For versions, see  
 Order No. supplements  
 on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$  Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$  A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$  kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$  kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$  A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.H.2-....	105 (77.4)	7.3	0.89	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	9	<b>6SL312-1TE21-0AA3</b>
1FW3152-1.H.2-....	210 (155)	15	0.92	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3154-1.H.2-....	315 (232)	21.5	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3155-1.H.2-....	420 (310)	29	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3156-1.H.2-....	525 (387)	35	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3201-1.H.2-....	315 (232)	24	0.92	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3202-1.H.2-....	525 (387)	39	0.94	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3203-1.H.2-....	790 (583)	62	0.95	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3204-1.H.2-....	1050 (774)	77	0.95	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW32061.H.2-....	1575 (1162)	121	0.95	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3208-1.H.2-....	2100 (1549)	160	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk630	200	<b>6SL312-1TE32-0AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm		
<b>Line voltage 480 V 3 AC Smart Line Module/Basic Line Module</b>										
<b>430</b>	280	105.8 (142)	2350 (1733)	188	417	71.7	720	1000	<b>1FW3281-3 J 3-AA0</b>	
		146.3 (196)	3250 (2397)	271	398	71.7	750	1000	<b>1FW3283-3 J 3-AA0</b>	
		209.4 (281)	4650 (3430)	372	412	71.7	720	1000	<b>1FW3285-3 J 3-AA0</b>	
		294.9 (395)	6550 (4831)	500	433	71.7	690	1000	<b>1FW3287-3 J 3-AA0</b>	
<b>550</b>	150	5.8 (7.78)	100 (73.8)	12	448	64.2	960	1700	<b>1FW3150-1 L 2-AA0</b> <b>1FW3150-1 L 2-AS0</b> <b>1FW3150-1 L 2-AM0</b>	
		11.5 (15.4)	200 (148)	22	448	64.2	960	1700	<b>1FW3152-1 L 2-AA0</b> <b>1FW3152-1 L 2-AS0</b> <b>1FW3152-1 L 2-AM0</b>	
		17.3 (23.2)	300 (221)	32	448	64.2	950	1700	<b>1FW3154-1 L 2-AA0</b> <b>1FW3154-1 L 2-AS0</b> <b>1FW3154-1 L 2-AM0</b>	
		23.0 (30.8)	400 (295)	43	448	64.2	960	1700	<b>1FW3155-1 L 2-AA0</b> <b>1FW3155-1 L 2-AS0</b> <b>1FW3155-1 L 2-AM0</b>	
		28.8 (38.6)	500 (369)	53	448	64.2	950	1700	<b>1FW3156-1 L 2-AA0</b> <b>1FW3156-1 L 2-AS0</b> <b>1FW3156-1 L 2-AM0</b>	
		200	17.3 (23.2)	300 (221)	37	424	128.3	1110	1000	<b>1FW3201-1 L 2-AA0</b> <b>1FW3201-1 L 2-AS0</b> <b>1FW3201-1 L 2-AM0</b>
		200	28.8 (38.6)	500 (369)	59	412	128.3	1070	1000	<b>1FW3202-1 L 2-AA0</b> <b>1FW3202-1 L 2-AS0</b> <b>1FW3202-1 L 2-AM0</b>
			43.2 (57.9)	750 (553)	92	401	128.3	1110	1000	<b>1FW3203-1 L 2-AA0</b> <b>1FW3203-1 L 2-AS0</b> <b>1FW3203-1 L 2-AM0</b>
			57.6 (77.2)	1000 (738)	118	407	128.3	1060	1000	<b>1FW3204-1 L 2-AA0</b> <b>1FW3204-1 L 2-AS0</b> <b>1FW3204-1 L 2-AM0</b>
			74.9 (100)	1300 (959)	157	374	128.3	1090	1000	<b>1FW3206-1 L 2-AA0</b> <b>1FW3206-1 L 2-AS0</b> <b>1FW3206-1 L 2-AM0</b>
			100.8 (135)	1750 (1291)	213	392	128.3	1100	1000	<b>1FW3208-1 L 2-AA0</b> <b>1FW3208-1 L 2-AS0</b> <b>1FW3208-1 L 2-AM0</b>

**Shaft design:**

Hollow shaft	<b>A</b>
Plug-on shaft	<b>S</b>
Solid shaft	<b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb-ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb-in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3281-3.J.3-....	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	<b>6SL312-1TE32-0AA3</b>
1FW3283-3.J.3-....	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3285-3.J.3-....	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3287-3.J.3-....	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	502 <sup>5)</sup>	<b>6SL3320-1TE36-1AA3</b>
1FW3150-1.L.2-....	105 (77.4)	11.5	0.90	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3152-1.L.2-....	210 (155)	22.5	0.92	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3154-1.L.2-....	315 (232)	33	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3155-1.L.2-....	420 (310)	45	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3156-1.L.2-....	525 (387)	55	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3201-1.L.2-....	315 (232)	38	0.92	0.22 (1.95) 0.27 (2.39) 0.23 (2.04)	127 (280) 171 (377) 179 (395)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3202-1.L.2-....	525 (387)	62	0.94	0.36 (3.19) 0.39 (3.45) 0.35 (3.10)	156 (344) 200 (441) 215 (474)	gk420	30	<b>6SL312-1TE23-0AA3</b>
1FW3203-1.L.2-....	790 (583)	100	0.95	0.49 (4.34) 0.52 (4.60) 0.46 (4.07)	182 (401) 225 (496) 240 (529)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.L.2-....	1050 (774)	129	0.95	0.70 (6.20) 0.70 (6.20) 0.61 (5.40)	225 (496) 275 (606) 285 (628)	gk630	45	<b>6SL312-1TE24-5AA3</b>
1FW3206-1.L.2-....	1575 (1162)	189	0.95	0.97 (8.59) 0.94 (8.32) 0.84 (7.43)	280 (617) 330 (728) 345 (761)	gk630	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.L.2-....	2100 (1549)	255	0.94	1.31 (11.6) 1.24 (11.0) 1.11 (9.82)	350 (772) 400 (882) 415 (915)	gk630	85	<b>6SL312-1TE28-5AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC Smart Line Module/Basic Line Module</b>									
<b>650</b>	280	146.3 (196)	2150 (1586)	250	415	108.3	1050	1000	<b>1FW3281-3 ■ M ■ 3- ■ AA0</b>
		204.2 (274)	3000 (2213)	345	421	108.3	1030	1000	<b>1FW3283-3 ■ M ■ 3- ■ AA0</b>
		292.7 (393)	4300 (3172)	457	448	108.3	960	1000	<b>1FW3285-3 ■ M ■ 3- ■ AA0</b>
		401.6 (539)	5900 (4352)	678	418	108.3	1030	1000	<b>1FW3287-3 ■ M ■ 3- ■ AA0</b>
<b>810</b>	150	8.5 (11.4)	100 (73.8)	18	441	94.5	1470	1700	<b>1FW3150-1 ■ P ■ 2- ■ AA0</b> <b>1FW3150-1 ■ P ■ 2- ■ AS0</b> <b>1FW3150-1 ■ P ■ 2- ■ AM0</b>
		17 (22.8)	200 (148)	32.5	448	94.5	1450	1700	<b>1FW3152-1 ■ P ■ 2- ■ AA0</b> <b>1FW3152-1 ■ P ■ 2- ■ AS0</b> <b>1FW3152-1 ■ P ■ 2- ■ AM0</b>
		25.4 (34.1)	300 (221)	47.5	444	94.5	1420	1700	<b>1FW3154-1 ■ P ■ 2- ■ AA0</b> <b>1FW3154-1 ■ P ■ 2- ■ AS0</b> <b>1FW3154-1 ■ P ■ 2- ■ AM0</b>
		33.9 (45.5)	400 (295)	64	432	94.5	1450	1700	<b>1FW3155-1 ■ P ■ 2- ■ AA0</b> <b>1FW3155-1 ■ P ■ 2- ■ AS0</b> <b>1FW3155-1 ■ P ■ 2- ■ AM0</b>
		42.4 (56.9)	500 (369)	76	448	94.5	1380	1700	<b>1FW3156-1 ■ P ■ 2- ■ AA0</b> <b>1FW3156-1 ■ P ■ 2- ■ AS0</b> <b>1FW3156-1 ■ P ■ 2- ■ AM0</b>

**Shaft design:**

Hollow shaft	<b>A</b>
Plug-on shaft	<b>S</b>
Solid shaft	<b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

Further rated speeds on request.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3281-3.M.3-....	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3283-3.M.3-....	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3285-3.M.3-....	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	<b>6SL3320-1TE35-0AA3</b>
1FW3287-3.M.3-....	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	734 <sup>5)</sup>	<b>6SL3320-1TE38-4AA3</b>
1FW3150-1.P.2-....	105 (77.4)	17.5	0.90	0.12 (1.06) 0.14 (1.24) 0.06 (0.53)	87 (192) 102 (225) 102 (225)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3152-1.P.2-....	210 (155)	33.5	0.93	0.16 (1.42) 0.20 (1.77) 0.09 (0.80)	108 (238) 124 (273) 121 (267)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3154-1.P.2-....	315 (232)	49	0.93	0.20 (1.77) 0.25 (2.21) 0.13 (1.15)	129 (284) 143 (315) 143 (315)	gk230	60	<b>6SL312-1TE26-0AA3</b>
1FW3155-1.P.2-....	420 (310)	67	0.94	0.24 (2.12) 0.29 (2.57) 0.17 (1.50)	150 (331) 163 (359) 164 (362)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3156-1.P.2-....	525 (387)	80	0.94	0.28 (2.48) 0.34 (3.01) 0.20 (1.77)	171 (377) 184 (406) 187 (412)	gk420	85	<b>6SL312-1TE28-5AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded. Certain constraints may apply, see order number supplements.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

5) The rated output current of the Motor Module is lower than the rated motor current at 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC Smart Line Module/Basic Line Module</b>									
<b>860</b>	200	22 (29.5)	245 (181)	37	376	106.7	1320	1800	1FW3201-3 ■ P ■ 3- ■ AS0 1FW3201-3 ■ P ■ 3- ■ AM0
		42 (56.3)	465 (343)	68	385	106.7	1290	1800	1FW3202-3 ■ P ■ 3- ■ AS0 1FW3202-3 ■ P ■ 3- ■ AM0
		60 (80.5)	670 (494)	95	396	106.7	1250	1800	1FW3203-3 ■ P ■ 3- ■ AS0 1FW3203-3 ■ P ■ 3- ■ AM0
		83 (111)	920 (679)	135	380	106.7	1310	1800	1FW3204-3 ■ P ■ 3- ■ AS0 1FW3204-3 ■ P ■ 3- ■ AM0
		121 (162)	1340 (988)	189	396	106.7	1260	1800	1FW3206-3 ■ P ■ 3- ■ AS0 1FW3206-3 ■ P ■ 3- ■ AM0
		168 (225)	1870 (1379)	265	392	106.7	1270	1800	1FW3208-3 ■ P ■ 3- ■ AS0 1FW3208-3 ■ P ■ 3- ■ AM0
<b>1300</b>	200	30.5 (40.9)	225 (166)	49	398	160	1890	1800	1FW3201-3 ■ S ■ 3- ■ AS0 1FW3201-3 ■ S ■ 3- ■ AM0
		59 (79.1)	435 (321)	91	407	160	1850	1800	1FW3202-3 ■ S ■ 3- ■ AS0 1FW3202-3 ■ S ■ 3- ■ AM0
		83 (111)	610 (450)	127	408	160	1840	1800	1FW3203-3 ■ S ■ 3- ■ AS0 1FW3203-3 ■ S ■ 3- ■ AM0
		113 (152)	830 (612)	184	382	160	1970	1800	1FW3204-3 ■ S ■ 3- ■ AS0 1FW3204-3 ■ S ■ 3- ■ AM0
		159 (213)	1170 (863)	260	380	160	1980	1800	1FW3206-3 ■ S ■ 3- ■ AS0 1FW3206-3 ■ S ■ 3- ■ AM0
		225 (302)	1640 (1210)	375	371	160	2050	1800	1FW3208-3 ■ S ■ 3- ■ AS0 1FW3208-3 ■ S ■ 3- ■ AM0

Shaft design:  
Plug-on shaft **S**  
Solid shaft **M**

For versions, see  
Order No. supplements  
on pages 6/81 and 6/82

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-3.P. 1FW3201-3.P..	260 (192)	38	88.7	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3202-3.P. 1FW3202-3.P..	500 (369)	72	91	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3203-3.P. 1FW3203-3.P..	730 (538)	102	92.2	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.P. 1FW3204-3.P..	1000 (738)	145	92.8	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.P. 1FW3206-3.P..	1500 (1106)	210	93.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	200	<b>6SL312-1TE32-0AA4</b>
1FW3208-3.P. 1FW3208-3.P..	2100 (1549)	295	93.7	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3201-3.S.. 1FW3201-3.S..	260 (192)	54	90.1	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3202-3.S.. 1FW3202-3.S..	500 (369)	102	92.2	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3203-3.S.. 1FW3203-3.S..	730 (538)	149	93.5	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.S.. 1FW3204-3.S..	1000 (738)	220	94	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.S.. 1FW3206-3.S..	1500 (1106)	330	94.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3208-3.S.. 1FW3208-3.S..	2100 (1549)	470	94.6	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	490	<b>6SL3320-1TE35-0AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

6

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	$V_{\text{rated}}$	$f_{\text{rated}}$	$n_{\text{max, Inv}}$	$n_{\text{max}}$		
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm		
<b>Line voltage 480 V 3 AC Active Line Module</b>										
<b>170</b>	200	5.3 (7.11)	300 (221)	13	416	39.7	380	1000	1FW3201-1 ■ E ■ 2- ■ AA0 1FW3201-1 ■ E ■ 2- ■ AS0 1FW3201-1 ■ E ■ 2- ■ AM0	
		8.9 (11.9)	500 (369)	21	392	39.7	380	1000	1FW3202-1 ■ E ■ 2- ■ AA0 1FW3202-1 ■ E ■ 2- ■ AS0 1FW3202-1 ■ E ■ 2- ■ AM0	
		13.4 (18.0)	750 (553)	31	399	39.7	370	1000	1FW3203-1 ■ E ■ 2- ■ AA0 1FW3203-1 ■ E ■ 2- ■ AS0 1FW3203-1 ■ E ■ 2- ■ AM0	
		280	17.8 (23.9)	1000 (738)	40	393	39.7	360	1000	1FW3204-1 ■ E ■ 2- ■ AA0 1FW3204-1 ■ E ■ 2- ■ AS0 1FW3204-1 ■ E ■ 2- ■ AM0
	26.7 (35.8)		1500 (1106)	65	371	39.7	390	1000	1FW3206-1 ■ E ■ 2- ■ AA0 1FW3206-1 ■ E ■ 2- ■ AS0 1FW3206-1 ■ E ■ 2- ■ AM0	
	35.6 (47.7)		2000 (1475)	84	377	39.7	380	1000	1FW3208-1 ■ E ■ 2- ■ AA0 1FW3208-1 ■ E ■ 2- ■ AS0 1FW3208-1 ■ E ■ 2- ■ AM0	
		280	44.5 (59.7)	2500 (1844)	83	438	28.3	290	1000	1FW3281-2 ■ E ■ 3- ■ AA0
	61 (81.8)		3450 (2545)	114	433	28.3	290	1000	1FW3283-2 ■ E ■ 3- ■ AA0	
	89 (119)		5000 (3688)	161	440	28.3	290	1000	1FW3285-2 ■ E ■ 3- ■ AA0	
	125 (168)		7000 (5163)	230	429	28.3	290	1000	1FW3287-2 ■ E ■ 3- ■ AA0	
	<b>300</b>	280	77 (103)	2450 (1807)	127	472	50	460	1000	1FW3281-2 ■ G ■ 3- ■ AA0
			107 (143)	3400 (2508)	175	471	50	460	1000	1FW3283-2 ■ G ■ 3- ■ AA0
154 (207)			4900 (3614)	245	486	50	440	1000	1FW3285-2 ■ G ■ 3- ■ AA0	
215 (288)			6900 (5089)	355	470	50	460	1000	1FW3287-2 ■ G ■ 3- ■ AA0	

#### Shaft design:

Hollow shaft	A
Plug-on shaft	S
Solid shaft	M

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque  $M_0$ at $\Delta T=100\text{ K}$  Nm (lb <sub>r</sub> -ft)	Stall current  $I_0$ at $\Delta T=100\text{ K}$  A	Effi- ciency <sup>3)</sup>  $\eta$	Moment of inertia  $J$  kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx.  $m$  kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup>  $I_{\text{rated}}$  A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-1.E..	315 (232)	13	0.91	0.22 (1.95)	127 (280)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3201-1.E..				0.27 (2.39)	171 (377)			
1FW3201-1.E..				0.23 (2.04)	179 (395)			
1FW3202-1.E..	525 (387)	22	0.93	0.36 (3.19)	156 (344)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3202-1.E..				0.39 (3.45)	200 (441)			
1FW3202-1.E..				0.35 (3.10)	215 (474)			
1FW3203-1.E..	790 (583)	32	0.94	0.49 (4.34)	182 (401)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3203-1.E..				0.52 (4.60)	225 (496)			
1FW3203-1.E..				0.46 (4.07)	240 (529)			
1FW3204-1.E..	1050 (774)	42	0.94	0.70 (6.20)	225 (496)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3204-1.E..				0.70 (6.20)	275 (606)			
1FW3204-1.E..				0.61 (5.40)	285 (628)			
1FW3206-1.E..	1575 (1162)	68	0.94	0.97 (8.59)	280 (617)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3206-1.E..				0.94 (8.32)	330 (728)			
1FW3206-1.E..				0.84 (7.43)	345 (761)			
1FW3208-1.E..	2100 (1549)	88	0.94	1.31 (11.6)	350 (772)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3208-1.E..				1.24 (11.0)	400 (882)			
1FW3208-1.E..				1.11 (9.82)	415 (915)			
1FW3281-2.E..	2550 (1881)	84	0.94	3.78 (33.5)	600 (1323)	1XB7700	85	<b>6SL312-1TE28-5AA3</b>
1FW3283-2.E..	3550 (2618)	116	0.95	4.64 (41.1)	690 (1521)	1XB7700	132	
1FW3285-2.E..	5100 (3782)	163	0.95	5.98 (52.9)	860 (1896)	1XB7700	200	
1FW3287-2.E..	7150 (5274)	234	0.96	7.81 (69.1)	1030 (2271)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3281-2.G..	2550 (1881)	131	0.95	3.78 (33.5)	600 (1323)	1XB7700	132	<b>6SL312-1TE31-3AA3</b>
1FW3283-2.G..	3550 (2618)	181	0.96	4.64 (41.1)	690 (1521)	1XB7700	200	
1FW3285-2.G..	5100 (3782)	251	0.96	5.98 (52.9)	860 (1896)	1XB7700	260	
1FW3287-2.G..	7150 (5274)	365	0.96	7.81 (69.1)	1030 (2271)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
- 2) Maximum speed that must not be exceeded.
- 3) Optimum efficiency in continuous duty.
- 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC Active Line Module</b>									
<b>360</b>	150	3.8 (5.10)	100 (73.8)	8	472	42	630	1700	1FW3150-1 H H 2- AA0 1FW3150-1 H H 2- AS0 1FW3150-1 H H 2- AM0
		7.5 (10.1)	200 (148)	14	478	42	630	1700	1FW3152-1 H H 2- AA0 1FW3152-1 H H 2- AS0 1FW3152-1 H H 2- AM0
		11.3 (15.2)	300 (221)	20.5	479	42	610	1700	1FW3154-1 H H 2- AA0 1FW3154-1 H H 2- AS0 1FW3154-1 H H 2- AM0
		15.1 (20.2)	400 (295)	28	467	42	630	1700	1FW3155-1 H H 2- AA0 1FW3155-1 H H 2- AS0 1FW3155-1 H H 2- AM0
		18.8 (25.2)	500 (369)	34	477	42	610	1700	1FW3156-1 H H 2- AA0 1FW3156-1 H H 2- AS0 1FW3156-1 H H 2- AM0
200	11.3 (15.2)	300 (221)	23	448	84	84	680	1000	1FW3201-1 H H 2- AA0 1FW3201-1 H H 2- AS0 1FW3201-1 H H 2- AM0
		18.8 (25.2)	500 (369)	37	434	84	670	1000	1FW3202-1 H H 2- AA0 1FW3202-1 H H 2- AS0 1FW3202-1 H H 2- AM0
		28.3 (38.0)	750 (553)	59	409	84	710	1000	1FW3203-1 H H 2- AA0 1FW3203-1 H H 2- AS0 1FW3203-1 H H 2- AM0
		37.7 (50.6)	1000 (738)	74	422	84	670	1000	1FW3204-1 H H 2- AA0 1FW3204-1 H H 2- AS0 1FW3204-1 H H 2- AM0
		56.5 (75.8)	1500 (1106)	118	418	84	700	1000	1FW3206-1 H H 2- AA0 1FW3206-1 H H 2- AS0 1FW3206-1 H H 2- AM0
		75.4 (101)	2000 (1475)	153	412	84	690	1000	1FW3208-1 H H 2- AA0 1FW3208-1 H H 2- AS0 1FW3208-1 H H 2- AM0

**Shaft design:**  
 Hollow shaft      A  
 Plug-on shaft     S  
 Solid shaft         M

For versions, see  
 Order No. supplements  
 on pages 6/80 to 6/82



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3150-1.H..	105 (77.4)	7.3	0.89	0.12 (1.06)	87 (192)	gk230	9	<b>6SL312-1TE21-0AA3</b>
1FW3150-1.H..				0.14 (1.24)	102 (225)			
1FW3150-1.H..				0.06 (0.53)	102 (225)			
1FW3152-1.H..	210 (155)	15	0.92	0.16 (1.42)	108 (238)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3152-1.H..				0.20 (1.77)	124 (273)			
1FW3152-1.H..				0.09 (0.80)	121 (267)			
1FW3154-1.H..	315 (232)	21.5	0.93	0.20 (1.77)	129 (284)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3154-1.H..				0.25 (2.21)	143 (315)			
1FW3154-1.H..				0.13 (1.15)	143 (315)			
1FW3155-1.H..	420 (310)	29	0.94	0.24 (2.12)	150 (331)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3155-1.H..				0.29 (2.57)	163 (359)			
1FW3155-1.H..				0.17 (1.50)	164 (362)			
1FW3156-1.H..	525 (387)	35	0.94	0.28 (2.48)	171 (377)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3156-1.H..				0.34 (3.01)	184 (406)			
1FW3156-1.H..				0.20 (1.77)	187 (412)			
1FW3201-1.H..	315 (232)	24	0.92	0.22 (1.95)	127 (280)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3201-1.H..				0.27 (2.39)	171 (377)			
1FW3201-1.H..				0.23 (2.04)	179 (395)			
1FW3202-1.H..	525 (387)	39	0.94	0.36 (3.19)	156 (344)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3202-1.H..				0.39 (3.45)	200 (441)			
1FW3202-1.H..				0.35 (3.10)	215 (474)			
1FW3203-1.H..	790 (583)	62	0.95	0.49 (4.34)	182 (401)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3203-1.H..				0.52 (4.60)	225 (496)			
1FW3203-1.H..				0.46 (4.07)	240 (529)			
1FW3204-1.H..	1050 (774)	77	0.95	0.70 (6.20)	225 (496)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3204-1.H..				0.70 (6.20)	275 (606)			
1FW3204-1.H..				0.61 (5.40)	285 (628)			
1FW3206-1.H..	1575 (1162)	121	0.95	0.97 (8.59)	280 (617)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3206-1.H..				0.94 (8.32)	330 (728)			
1FW3206-1.H..				0.84 (7.43)	345 (761)			
1FW3208-1.H..	2100 (1549)	160	0.94	1.31 (11.6)	350 (772)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3208-1.H..				1.24 (11.0)	400 (882)			
1FW3208-1.H..				1.11 (9.82)	415 (915)			

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).  
 2) Maximum speed that must not be exceeded.  
 3) Optimum efficiency in continuous duty.  
 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC Active Line Module</b>									
<b>480</b>	280	116 (156)	2300 (1696)	186	462	80	720	1000	<b>1FW3281-3 J 3- AA0</b>
		161 (216)	3200 (2360)	270	442	80	750	1000	<b>1FW3283-3 J 3- AA0</b>
		230 (308)	4600 (3393)	370	458	80	720	1000	<b>1FW3285-3 J 3- AA0</b>
		320 (429)	6400 (4721)	495	480	80	690	1000	<b>1FW3287-3 J 3- AA0</b>
<b>600</b>	150	6.3 (8.45)	100 (73.8)	12	488	70	960	1700	<b>1FW3150-1 L 2- AA0</b> <b>1FW3150-1 L 2- AS0</b> <b>1FW3150-1 L 2- AM0</b>
		12.6 (16.9)	200 (148)	22	497	70	960	1700	<b>1FW3152-1 L 2- AA0</b> <b>1FW3152-1 L 2- AS0</b> <b>1FW3152-1 L 2- AM0</b>
		18.8 (25.2)	300 (221)	32	497	70	950	1700	<b>1FW3154-1 L 2- AA0</b> <b>1FW3154-1 L 2- AS0</b> <b>1FW3154-1 L 2- AM0</b>
		25.1 (33.7)	400 (295)	43	490	70	960	1700	<b>1FW3155-1 L 2- AA0</b> <b>1FW3155-1 L 2- AS0</b> <b>1FW3155-1 L 2- AM0</b>
		31.4 (42.1)	500 (369)	53	497	70	950	1700	<b>1FW3156-1 L 2- AA0</b> <b>1FW3156-1 L 2- AS0</b> <b>1FW3156-1 L 2- AM0</b>
		200	17 (22.8)	270 (199)	33	433	140	1110	1000
		28.3 (38.0)	450 (332)	53	426	140	1070	1000	<b>1FW3202-1 L 2- AA0</b> <b>1FW3202-1 L 2- AS0</b> <b>1FW3202-1 L 2- AM0</b>
			680 (502)	83	415	140	1110	1000	<b>1FW3203-1 L 2- AA0</b> <b>1FW3203-1 L 2- AS0</b> <b>1FW3203-1 L 2- AM0</b>
			900 (664)	106	421	140	1060	1000	<b>1FW3204-1 L 2- AA0</b> <b>1FW3204-1 L 2- AS0</b> <b>1FW3204-1 L 2- AM0</b>
			1260 (929)	152	402	140	1090	1000	<b>1FW3206-1 L 2- AA0</b> <b>1FW3206-1 L 2- AS0</b> <b>1FW3206-1 L 2- AM0</b>
			1680 (1239)	205	419	140	1100	1000	<b>1FW3208-1 L 2- AA0</b> <b>1FW3208-1 L 2- AS0</b> <b>1FW3208-1 L 2- AM0</b>

#### Shaft design:

Hollow shaft	<b>A</b>
Plug-on shaft	<b>S</b>
Solid shaft	<b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3281-3.J..	2500 (1844)	200	0.96	3.78 (33.5)	600 (1323)	1XB7700	200	<b>6SL312-1TE32-0AA4</b>
1FW3283-3.J..	3500 (2582)	292	0.96	4.64 (41.1)	690 (1521)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3285-3.J..	5000 (3688)	400	0.96	5.98 (52.9)	860 (1896)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3287-3.J..	7000 (5163)	534	0.97	7.81 (69.1)	1030 (2271)	1XB7712	605	<b>6SL3320-1TE36-1AA3</b>
1FW3150-1.L..	105 (77.4)	11.5	0.90	0.12 (1.06)	87 (192)	gk230	18	<b>6SL312-1TE21-8AA3</b>
1FW3150-1.L..				0.14 (1.24)	102 (225)			
1FW3150-1.L..				0.06 (0.53)	102 (225)			
1FW3152-1.L..	210 (155)	22.5	0.92	0.16 (1.42)	108 (238)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3152-1.L..				0.20 (1.77)	124 (273)			
1FW3152-1.L..				0.09 (0.80)	121 (267)			
1FW3154-1.L..	315 (232)	33	0.93	0.20 (1.77)	129 (284)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3154-1.L..				0.25 (2.21)	143 (315)			
1FW3154-1.L..				0.13 (1.15)	143 (315)			
1FW3155-1.L..	420 (310)	45	0.94	0.24 (2.12)	150 (331)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3155-1.L..				0.29 (2.57)	163 (359)			
1FW3155-1.L..				0.17 (1.50)	164 (362)			
1FW3156-1.L..	525 (387)	55	0.94	0.28 (2.48)	171 (377)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3156-1.L..				0.34 (3.01)	184 (406)			
1FW3156-1.L..				0.20 (1.77)	187 (412)			
1FW3201-1.L..	315 (232)	38	0.92	0.22 (1.95)	127 (280)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3201-1.L..				0.27 (2.39)	171 (377)			
1FW3201-1.L..				0.23 (2.04)	179 (395)			
1FW3202-1.L..	525 (387)	62	0.94	0.36 (3.19)	156 (344)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3202-1.L..				0.39 (3.45)	200 (441)			
1FW3202-1.L..				0.35 (3.10)	215 (474)			
1FW3203-1.L..	790 (583)	100	0.95	0.49 (4.34)	182 (401)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3203-1.L..				0.52 (4.60)	225 (496)			
1FW3203-1.L..				0.46 (4.07)	240 (529)			
1FW3204-1.L..	1050 (774)	129	0.95	0.70 (6.20)	225 (496)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-1.L..				0.70 (6.20)	275 (606)			
1FW3204-1.L..				0.61 (5.40)	285 (628)			
1FW3206-1.L..	1575 (1162)	189	0.95	0.97 (8.59)	280 (617)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-1.L..				0.94 (8.32)	330 (728)			
1FW3206-1.L..				0.84 (7.43)	345 (761)			
1FW3208-1.L..	2100 (1549)	256	0.94	1.31 (11.6)	350 (772)	gk630	210	<b>6SL3320-1TE32-1AA3</b>
1FW3208-1.L..				1.24 (11.0)	400 (882)			
1FW3208-1.L..				1.11 (9.82)	415 (915)			

**Format:**

Booksized 1  
Chassis 3

**Cooling:**

Internal air cooling 0  
External air cooling 1  
Cold-plate cooling 6

**Motor Module:**

Single Motor Module 1

1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

2) Maximum speed that must not be exceeded.

3) Optimum efficiency in continuous duty.

4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC 480 V Active Line Module</b>									
<b>730</b>	280	157 (210)	2050 (1512)	245	461	121.7	1050	1000	<b>1FW3281-3 ■ M ■ 3- ■ AA0</b>
		220 (295)	2900 (2139)	340	470	121.7	1030	1000	<b>1FW3283-3 ■ M ■ 3- ■ AA0</b>
		315 (422)	4150 (3061)	450	497	121.7	960	1000	<b>1FW3285-3 ■ M ■ 3- ■ AA0</b>
		435 (583)	5700 (4204)	660	464	121.7	1030	1000	<b>1FW3287-3 ■ M ■ 3- ■ AA0</b>
<b>890</b>	150	8.9 (11.9)	95 (70.1)	18	464	103.8	1470	1700	<b>1FW3150-1 ■ P ■ 2- ■ AA0</b> <b>1FW3150-1 ■ P ■ 2- ■ AS0</b> <b>1FW3150-1 ■ P ■ 2- ■ AM0</b>
		18.2 (24.4)	195 (144)	31	482	103.8	1450	1700	<b>1FW3152-1 ■ P ■ 2- ■ AA0</b> <b>1FW3152-1 ■ P ■ 2- ■ AS0</b> <b>1FW3152-1 ■ P ■ 2- ■ AM0</b>
		27.5 (36.9)	295 (218)	46	479	103.8	1420	1700	<b>1FW3154-1 ■ P ■ 2- ■ AA0</b> <b>1FW3154-1 ■ P ■ 2- ■ AS0</b> <b>1FW3154-1 ■ P ■ 2- ■ AM0</b>
		36.8 (49.3)	395 (291)	63	470	103.8	1450	1700	<b>1FW3155-1 ■ P ■ 2- ■ AA0</b> <b>1FW3155-1 ■ P ■ 2- ■ AS0</b> <b>1FW3155-1 ■ P ■ 2- ■ AM0</b>
		45.7 (61.3)	490 (361)	74	492	103.8	1380	1700	<b>1FW3156-1 ■ P ■ 2- ■ AA0</b> <b>1FW3156-1 ■ P ■ 2- ■ AS0</b> <b>1FW3156-1 ■ P ■ 2- ■ AM0</b>

**Shaft design:**

Hollow shaft	<b>A</b>
Plug-on shaft	<b>S</b>
Solid shaft	<b>M</b>

For versions, see  
Order No. supplements  
on pages 6/80 to 6/82

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque  $M_0$ at $\Delta T=100\text{ K}$  Nm (lb <sub>r</sub> -ft)	Stall current  $I_0$ at $\Delta T=100\text{ K}$  A	Effi- ciency <sup>3)</sup>  $\eta$	Moment of inertia  $J$  kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx.  $m$  kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup>  $I_{\text{rated}}$  A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3281-3.M..	2500 (1844)	291	0.96	3.78 (33.5)	600 (1323)	1XB7700	260	<b>6SL3320-1TE32-6AA3</b>
1FW3283-3.M..	3500 (2582)	402	0.96	4.64 (41.1)	690 (1521)	1XB7700	380	<b>6SL3320-1TE33-8AA3</b>
1FW3285-3.M..	5000 (3688)	532	0.97	5.98 (52.9)	860 (1896)	1XB7712	490	<b>6SL3320-1TE35-0AA3</b>
1FW3287-3.M..	6850 (5053)	787	0.97	7.81 (69.1)	1030 (2271)	1XB7712	745	<b>6SL3320-1TE37-5AA3</b>
1FW3150-1.P..	105 (77.4)	17.5	0.90	0.12 (1.06)	87 (192)	gk230	30	<b>6SL312-1TE23-0AA3</b>
1FW3150-1.P..				0.14 (1.24)	102 (225)			
1FW3150-1.P..				0.06 (0.53)	102 (225)			
1FW3152-1.P..	210 (155)	33.5	0.93	0.16 (1.42)	108 (238)	gk230	45	<b>6SL312-1TE24-5AA3</b>
1FW3152-1.P..				0.20 (1.77)	124 (273)			
1FW3152-1.P..				0.09 (0.80)	121 (267)			
1FW3154-1.P..	315 (232)	49	0.93	0.20 (1.77)	129 (284)	gk230	60	<b>6SL312-1TE26-0AA3</b>
1FW3154-1.P..				0.25 (2.21)	143 (315)			
1FW3154-1.P..				0.13 (1.15)	143 (315)			
1FW3155-1.P..	420 (310)	67	0.94	0.24 (2.12)	150 (331)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3155-1.P..				0.29 (2.57)	163 (359)			
1FW3155-1.P..				0.17 (1.50)	164 (362)			
1FW3156-1.P..	525 (387)	80	0.94	0.28 (2.48)	171 (377)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3156-1.P..				0.34 (3.01)	184 (406)			
1FW3156-1.P..				0.20 (1.77)	187 (412)			

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

6

<sup>1)</sup> Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).

<sup>2)</sup> Maximum speed that must not be exceeded.

<sup>3)</sup> Optimum efficiency in continuous duty.

<sup>4)</sup> The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors Water cooling

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Rated torque	Rated current	Rated voltage	Rated frequency	Operating speed, max. <sup>1)</sup>	Speed, max. <sup>2)</sup>	SIMOTICS T-1FW3 complete torque motors Water cooling
$n_{rated}$	SH	$P_{rated}$ at $\Delta T=100$ K	$M_{rated}$ at $\Delta T=100$ K	$I_{rated}$ at $\Delta T=100$ K	$V_{rated}$	$f_{rated}$	$n_{max, Inv}$	$n_{max}$	
rpm		kW (HP)	Nm (lb <sub>r</sub> -ft)	A	V	Hz	rpm	rpm	
<b>Line voltage 480 V 3 AC Active Line Module</b>									
<b>950</b>	200	24 (32.2)	240 (177)	36.5	416	106.7	1320	1800	1FW3201-3 P 3- AS0 1FW3201-3 P 3- AM0
		46 (61.7)	460 (339)	67	425	106.7	1290	1800	1FW3202-3 P 3- AS0 1FW3202-3 P 3- AM0
		66 (88.5)	660 (487)	93	437	106.7	1250	1800	1FW3203-3 P 3- AS0 1FW3203-3 P 3- AM0
		90 (121)	900 (664)	133	419	106.7	1310	1800	1FW3204-3 P 3- AS0 1FW3204-3 P 3- AM0
		130 (174)	1310 (966)	185	437	106.7	1260	1800	1FW3206-3 P 3- AS0 1FW3206-3 P 3- AM0
		182 (244)	1830 (1350)	260	433	106.7	1270	1800	1FW3208-3 P 3- AS0 1FW3208-3 P 3- AM0
<b>1450</b>	200	33.5 (44.9)	220 (162)	48	444	160	1890	1800	1FW3201-3 S 3- AS0 1FW3201-3 S 3- AM0
		64 (85.8)	420 (310)	88	454	160	1850	1800	1FW3202-3 S 3- AS0 1FW3202-3 S 3- AM0
		88 (118)	580 (428)	121	456	160	1840	1800	1FW3203-3 S 3- AS0 1FW3203-3 S 3- AM0
		121 (162)	800 (590)	178	427	160	1970	1800	1FW3204-3 S 3- AS0 1FW3204-3 S 3- AM0
		167 (224)	1100 (811)	245	424	160	1980	1800	1FW3206-3 S 3- AS0 1FW3206-3 S 3- AM0
		235 (315)	1540 (1136)	350	413	160	2050	1800	1FW3208-3 S 3- AS0 1FW3208-3 S 3- AM0

**Shaft design:**  
 Plug-on shaft **S**  
 Solid shaft **M**

For versions, see  
 Order No. supplements  
 on pages 6/81 and 6/82

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

Motor type (repeated)	Static torque $M_0$ at $\Delta T=100\text{ K}$ Nm (lb <sub>r</sub> -ft)	Stall current $I_0$ at $\Delta T=100\text{ K}$ A	Effi- ciency <sup>3)</sup> $\eta$	Moment of inertia $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx. $m$ kg (lb)	Terminal box  Type	SINAMICS S120 Motor Module	
							Rated output current <sup>4)</sup> $I_{\text{rated}}$ A	For additional versions and components see SINAMICS S120 drive system  Order No.
1FW3201-3.P.. 1FW3201-3.P..	260 (192)	38	88.7	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	45	<b>6SL312-1TE24-5AA3</b>
1FW3202-3.P.. 1FW3202-3.P..	500 (369)	72	91	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	85	<b>6SL312-1TE28-5AA3</b>
1FW3203-3.P.. 1FW3203-3.P..	730 (538)	102	92.2	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.P.. 1FW3204-3.P..	1000 (738)	145	92.8	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.P.. 1FW3206-3.P..	1500 (1106)	210	93.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	200	<b>6SL312-1TE32-0AA4</b>
1FW3208-3.P.. 1FW3208-3.P..	2100 (1549)	295	93.7	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3201-3.S.. 1FW3201-3.S..	260 (192)	54	90.1	0.27 (2.39) 0.22 (1.95)	159 (351) 176 (388)	gk420	60	<b>6SL312-1TE26-0AA3</b>
1FW3202-3.S.. 1FW3202-3.S..	500 (369)	102	92.2	0.40 (3.54) 0.34 (3.01)	188 (415) 207 (456)	gk420	132	<b>6SL312-1TE31-3AA3</b>
1FW3203-3.S.. 1FW3203-3.S..	730 (538)	149	93.5	0.52 (4.60) 0.45 (3.98)	215 (474) 237 (523)	gk630	132	<b>6SL312-1TE31-3AA3</b>
1FW3204-3.S.. 1FW3204-3.S..	1000 (738)	220	94	0.69 (6.11) 0.61 (5.40)	259 (571) 283 (624)	gk630	200	<b>6SL312-1TE32-0AA4</b>
1FW3206-3.S.. 1FW3206-3.S..	1500 (1106)	330	94.3	0.94 (8.32) 0.83 (7.35)	342 (754) 370 (816)	1XB7700	310	<b>6SL3320-1TE33-1AA3</b>
1FW3208-3.S.. 1FW3208-3.S..	2100 (1549)	470	94.6	1.24 (11.0) 1.11 (9.82)	412 (908) 446 (983)	1XB7700	490	<b>6SL3320-1TE35-0AA3</b>

<b>Format:</b>	
Booksize	1
Chassis	3
<b>Cooling:</b>	
Internal air cooling	0
External air cooling	1
Cold-plate cooling	6
<b>Motor Module:</b>	
Single Motor Module	1

- 1) Maximum permissible operating speed based on the induced voltage in the motor and the voltage strength of the converter (without protective circuit).
- 2) Maximum speed that must not be exceeded.
- 3) Optimum efficiency in continuous duty.
- 4) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz or 2 kHz.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Water cooling

#### Order No. supplements for shaft design: Hollow shaft

Data position of the Order No.	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z		
<b>Shaft height 150</b>	1	F	W	3	1	5	.	-	1	■	.	■	2	-	■	A	A	0	-	Z		
<b>Shaft height 200</b>	1	F	W	3	2	0	.	-	1	■	.	■	2	-	■	A	A	0	-	Z		
<b>Shaft height 280</b>	1	F	W	3	2	8	.	-	.	■	.	■	3	-	■	A	A	0	-	Z		
<b>Overall length<sup>1)</sup></b>										.												
<b>Standard design 1FW315/1FW320</b>										1												
<b>Standard design 1FW328</b>										2												
<b>High-speed version 1FW328</b>										3												
<b>Encoder systems for motors <u>without</u> DRIVE-CLiQ interface</b>										<b>Mounting</b>												
Without encoder										Coaxial											W	6
IC2048S/R encoder										Over belt drive											A	7
AM2048S/R encoder										Over belt drive											E	7
Multipole resolver										Over belt drive											S	7
<b>Encoder systems for motors <u>with</u> DRIVE-CLiQ interface</b>										<b>Mounting</b>												
IC22DQ encoder										Over belt drive											D	7
AM22DQ encoder										Belt-mounted											F	7
R15DQ resolver										Over belt drive											U	7
<b>Rated speeds at 380 V to 480 V 3 AC (winding design)</b>																						
140 rpm/150 rpm/160 rpm for standard design 1FW320/1FW328										E												
220 rpm/250 rpm/270 rpm for standard design 1FW328										G												
270 rpm/300 rpm/330 rpm for standard design 1FW315/1FW320										H												
350 rpm/400 rpm/430 rpm for standard design 1FW328										J												
450 rpm/500 rpm/550 rpm for standard design 1FW315/1FW320										L												
520 rpm/600 rpm/650 rpm for standard design 1FW328										M												
670 rpm/750 rpm/810 rpm for standard design 1FW315										P												
<b>Type of construction</b>																						
IM B14 for 1FW315/1FW320 (flange-mounted without base, with threaded hole)										2												
IM B35 for 1FW328 (hollow-shaft design (flange-mounted and base-mounted))										3												
<b>Power connection (view of DE)</b>										<b>Cable outlet</b>												
Terminal box top										Transverse right											5	
Terminal box top										Transverse left											6	
Terminal box top										NDE											7	
Terminal box top										DE											8	
<b>Shaft design</b>																						
Hollow shaft										A												
<b>Special version</b> (order codes are required for options)										-											Z	

<sup>1)</sup> Not selectable. Determined by the choice of rated power.



# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

### Order No. supplements for shaft design: Plug-on shaft

Data position of the Order No.	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z	
<b>Shaft height 150</b>	1	F	W	3	1	5	.	-	1	■	.	6	2	-	■	A	S	0	-	Z	
<b>Shaft height 200</b>	1	F	W	3	2	0	.	-	.	■	.	6	2	-	■	A	S	0	-	Z	
<b>Overall length<sup>1)</sup></b>	.																				
<b>Standard design 1FW315/1FW320</b>									1												
<b>High-speed version 1FW320</b>									3												
<b>Encoder systems for motors <u>without</u> DRIVE-CLiQ interface</b>				<b>Mounting</b>																	
Without encoder				Coaxial				W 6													
AM2048S/R encoder				Coaxial				E 6													
<b>Encoder systems for motors <u>with</u> DRIVE-CLiQ interface</b>				<b>Mounting</b>																	
AS24DQI encoder				Coaxial				B 6													
AM24DQI encoder				Coaxial				C 6													
<b>Rated speeds at 380 V to 480 V 3 AC (winding design)</b>																					
140 rpm/150 rpm/160 rpm for standard design 1FW320										E											
270 rpm/300 rpm/330 rpm for standard design 1FW315/1FW320										H											
450 rpm/500 rpm/550 rpm for standard design 1FW315/1FW320										L											
670 rpm/750 rpm/810 rpm for standard design 1FW315										P											
710 rpm/1050 rpm for high-speed design 1FW320										P											
<b>Type of construction</b>																					
IM B14 for 1FW315/1FW320 (flange-mounted without base, with threaded hole)												2									
<b>Power connection (view of DE)</b>						<b>Cable outlet</b>															
Terminal box top						Transverse right 5															
Terminal box top						Transverse left 6															
Terminal box top						NDE 7															
Terminal box top						DE 8															
<b>Shaft design</b>																					
Plug-on shaft																	S				
<b>Special version</b> (order codes are required for options)																			-		Z

6

<sup>1)</sup> Not selectable. Determined by the choice of rated power.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

### SIMOTICS T-1FW3 complete torque motors

#### Water cooling

#### Order No. supplements for shaft design: Solid shaft

Data position of the Order No.	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z	
<b>Shaft height 150</b>	1	F	W	3	1	5	.	-	1	■	.	6	2	-	■	A	M	0	-	Z	
<b>Shaft height 200</b>	1	F	W	3	2	0	.	-	.	■	.	6	2	-	■	A	M	0	-	Z	
<b>Overall length<sup>1)</sup></b>	.																				
<b>Standard design 1FW315/1FW320</b>									1												
<b>High-speed version 1FW320</b>									3												
<b>Encoder systems for motors <u>without</u> DRIVE-CLiQ interface</b>				<b>Mounting</b>																	
Without encoder				Coaxial				W	6												
AM2048S/R encoder				Coaxial				E	6												
<b>Encoder systems for motors <u>with</u> DRIVE-CLiQ interface</b>				<b>Mounting</b>																	
AS24DQI encoder				Coaxial				B	6												
AM24DQI encoder				Coaxial				C	6												
<b>Rated speeds at 380 V to 480 V 3 AC (winding design)</b>																					
140 rpm/150 rpm/160 rpm for standard design 1FW320										E											
270 rpm/300 rpm/330 rpm for standard design 1FW315/1FW320										H											
450 rpm/500 rpm/550 rpm for standard design 1FW315/1FW320										L											
670 rpm/750 rpm/810 rpm for standard design 1FW315										P											
710 rpm/1050 rpm for high-speed design 1FW320										P											
<b>Type of construction</b>																					
IM B14 for 1FW315/1FW320 (flange-mounted without base, with threaded hole)												2									
<b>Power connection (view of DE)</b>								<b>Cable outlet</b>													
Terminal box top				Transverse right				5													
Terminal box top				Transverse left				6													
Terminal box top				NDE				7													
Terminal box top				DE				8													
<b>Shaft design</b>																					
Solid shaft																	M				
<b>Special version</b> (order codes are required for options)																			-		Z

6

<sup>1)</sup> Not selectable. Determined by the choice of rated power.

# SIMOTICS linear and torque motors

## SIMOTICS T torque motors for SINAMICS S120

**SIMOTICS T-1FW3 complete torque motors**  
Water cooling

### Options

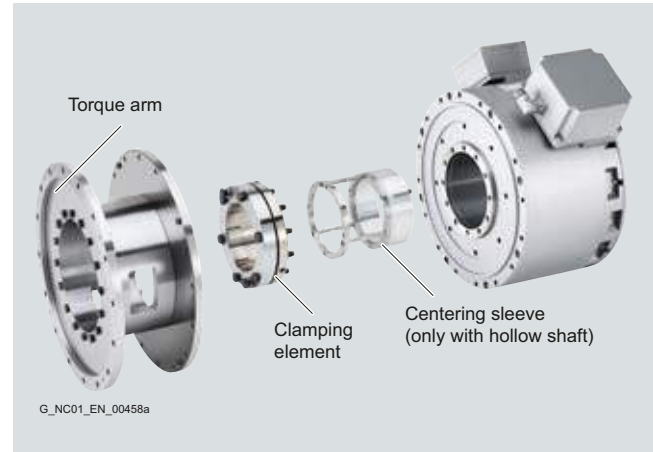
Order code	Description
<b>A11</b>	Motor protection by PTC thermistor (3 × PTC)
<b>K40</b>	Regreasing system
<b>T20</b>	Shaft cover at NDE (not required with coaxial mounted encoder)
<b>V07</b>	Special grease lubrication for low speeds
<b>X01</b>	Paint finish: Jet black, matt RAL 9005
<b>X02</b>	Paint finish: Cream white RAL 9001
<b>X03</b>	Paint finish: Reseda green RAL 6011
<b>X04</b>	Paint finish: Pebble gray RAL 7032
<b>X05</b>	Paint finish: Sky blue RAL 5015
<b>X06</b>	Paint finish: Light ivory RAL 1015

When ordering a motor with options, **-Z** should be added to the order number.

Example:  
1FW3150-1AH72-5AA0-Z  
**A11+X05**

### Accessories

Order code	Description
<b>Q30</b>	Clamping element <sup>5)</sup> <ul style="list-style-type: none"> <li>• One-piece for plug-on shaft</li> <li>• Two-piece for hollow shaft</li> </ul>
<b>T32</b>	Stator torque arm <sup>4)5)</sup>



### Terminal box, max. connectable conductor cross-sections

Terminal box	Cable entry		Max. outer cable diameter <sup>1)</sup> mm (in)	Number of main terminals	Max. cross-section per terminal mm <sup>2</sup>	Operating current, max. <sup>2)</sup> A	Dimensions a × b mm (in)
Type	Power	External signals					
gk230	2 × M32 × 1.5	1 × M16 × 1.5 <sup>3)</sup>	16 (0.63)	Phases: 3 × M5 Grounding: 1 × M4	2 × 16	50	122 × 117 (4.80 × 4.61)
gk420	2 × M40 × 1.5	1 × M16 × 1.5 <sup>3)</sup>	35 (1.38)	Phases: 3 × M10 Grounding: 1 × M6	2 × 35	105	162 × 162 (6.38 × 6.38)
gk630	2 × M50 × 1.5	2 × M16 × 1.5 <sup>3)</sup>	50 (1.97)	Phases: 3 × M10 Grounding: 1 × M10	2 × 50	260	210 × 210 (8.27 × 8.27)
1XB7700	3 × M75 × 1.5	2 × M16 × 1.5 <sup>3)</sup>	120 (4.72)	Phases: 3 × M12 Grounding: 1 × M12	3 × 120	450	306 × 306 (12.05 × 12.05)
1XB7712	4 × M75 × 1.5	4 × PG 13.5 1 × M20 × 1.5 1 × M25 × 1.5 <sup>3)</sup>	120 (4.72)	Phases: 3 × M16 Grounding: 1 × M16	4 × 120	800	371 × 370 (14.61 × 14.57)

<sup>1)</sup> Dependent on the design of the metric gland.

<sup>2)</sup> Current-carrying capacity based on EN 60204-1 and IEC 60364-5-52 for installation type C.

<sup>3)</sup> For option A11 or 9th data position W (without encoder).

<sup>4)</sup> Depending on motor type. Enquire regarding availability.

<sup>5)</sup> Not for solid shaft.

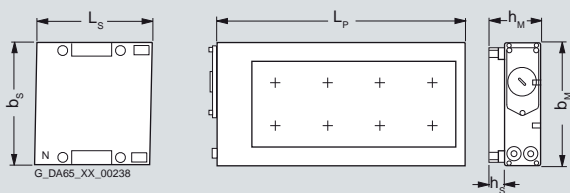
# SIMOTICS linear and torque motors

## Dimensional drawings

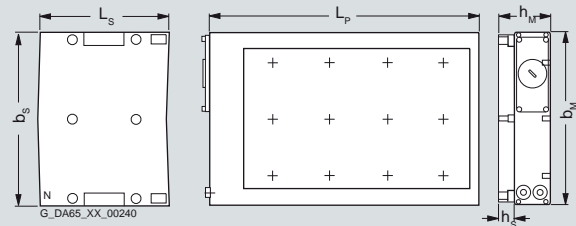
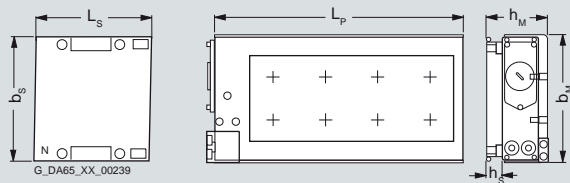
### SIMOTICS L-1FN3 linear motors Version for peak load – Water cooling

#### Dimensional drawings

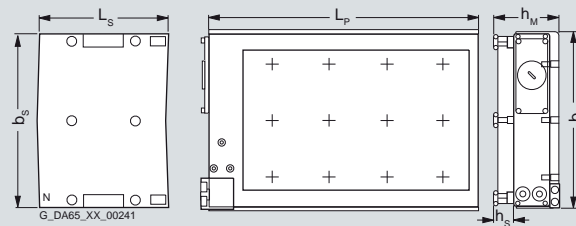
Primary section	Dimensions in mm (inches)					Secondary section	Dimensions in mm (inches)				
	Without precision cooling		With precision cooling		Primary section length		Without precision cooling		With precision cooling and cover		Secondary section length
Type	$b_M$	$h_M$	$b_M$	$h_M$		$L_P$	Type	$b_S$	$h_S$	$b_S$	
<b>SIMOTICS L-1FN3 linear motors, version for peak load – Water cooling</b>											
1FN3050-2W	67 (2.64)	48.5 (1.91)	76 (2.99)	63.4 (2.50)	255 (10.04)	1FN3050-4SA00-0AA0	58 (2.28)	11.8 (0.46)	75 (2.95)	14.8 (0.58)	120 (4.72)
1FN3100-1W	96 (3.78)	48.5 (1.91)	–	–	150 (5.91)	1FN3100-4SA00-0AA0	88 (3.46)	11.8 (0.46)	105 (4.13)	14.8 (0.58)	120 (4.72)
1FN3100-2W			105 (4.13)	63.4 (2.50)	255 (10.04)						
1FN3100-3W					360 (14.17)						
1FN3100-4W					465 (18.31)						
1FN3100-5W					570 (22.44)						
1FN3150-1W	126 (4.96)	50.5 (1.99)	–	–	150 (5.91)						
1FN3150-2W			135 (5.31)	65.4 (2.57)	255 (10.04)	1FN3150-4SA00-0AA0	118 (4.65)	13.8 (0.54)	135 (5.31)	16.8 (0.66)	120 (4.72)
1FN3150-3W					360 (14.17)						
1FN3150-4W					465 (18.31)						
1FN3150-5W					570 (22.44)						
1FN3300-1W	141 (5.55)	64.1 (2.52)	–	–	221 (8.70)						
1FN3300-2W			150 (5.91)	79 (3.11)	382 (15.04)						
1FN3300-3W					543 (21.38)						
1FN3300-4W					704 (27.72)						
1FN3450-2W	188 (7.40)	66.1 (2.60)	197 (7.76)	81 (3.19)	382 (15.04)						
1FN3450-3W					543 (21.38)	1FN3450-4SA00-0AA0	180 (7.09)	18.5 (0.73)	197 (7.76)	21.5 (0.85)	184 (7.24)
1FN3450-4W					704 (27.72)						
1FN3600-2W	248 (9.76)	64.1 (2.52)	257 (10.12)	86 (3.39)	382 (15.04)	1FN3600-4SA00-0AA0	240 (9.45)	16.5 (0.65)	247 (9.72)	26.5 (1.04)	184 (7.24)
1FN3600-3W					543 (21.38)						
1FN3600-4W					704 (27.72)						
1FN3900-2W	342 (13.46)	66.1 (2.60)	351 (13.82)	88 (3.46)	382 (15.04)	1FN3900-4SA00-0AA0	334 (13.15)	18.5 (0.73)	341 (13.43)	28.5 (1.12)	184 (7.24)
1FN3900-3W					543 (21.38)						
1FN3900-4W					704 (27.72)						



1FN3050 to 1FN3450 without precision cooling

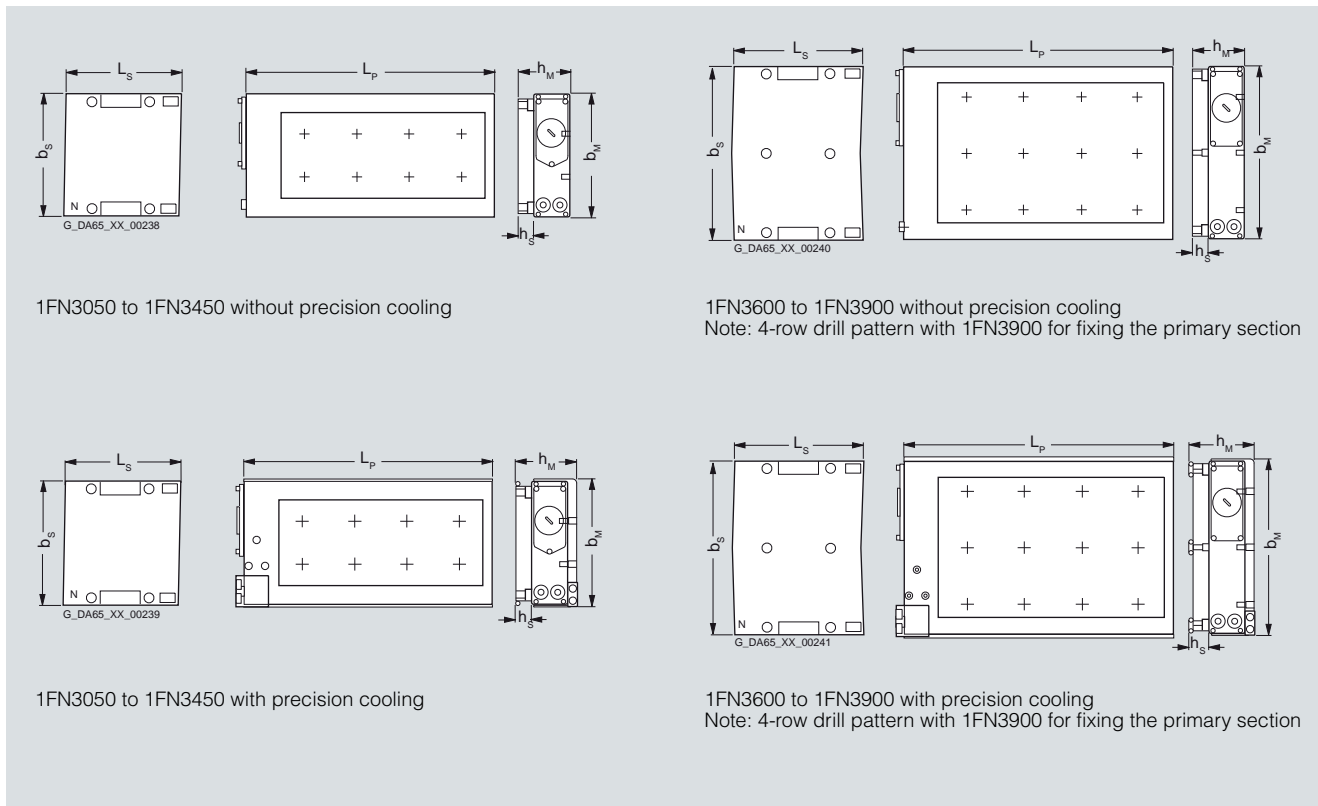
1FN3600 to 1FN3900 without precision cooling  
Note: 4-row drill pattern with 1FN3900 for fixing the primary section

1FN3050 to 1FN3450 with precision cooling

1FN3600 to 1FN3900 with precision cooling  
Note: 4-row drill pattern with 1FN3900 for fixing the primary section

#### Dimensional drawings

Primary section	Dimensions in mm (inches)					Primary section length	Secondary section	Dimensions in mm (inches)				
	Without precision cooling		With precision cooling		L <sub>p</sub>			Without precision cooling		With precision cooling		Secondary section length
Type	b <sub>M</sub>	h <sub>M</sub>	b <sub>M</sub>	h <sub>M</sub>		L <sub>p</sub>	Type	b <sub>S</sub>	h <sub>S</sub>	b <sub>M</sub>	h <sub>M</sub>	
<b>SIMOTICS L-1FN3 linear motors, version for continuous load – Water cooling</b>												
1FN3050-1ND 1FN3050-2NB	67 (2.64)	59.4 (2.34)	76 (2.99)	74.3 (2.93)	162 (6.38)	1FN3050-4SA00-0AA0	58 (2.28)	11.8 (0.46)	75 (2.95)	14.8 (0.58)	120 (4.72)	
1FN3100-1NC 1FN3100-2NC 1FN3100-3NC 1FN3100-4NC	96 (3.78)	59.4 (2.34)	105 (4.13)	74.3 (2.93)	162 (6.38) 267 (10.51) 372 (14.65) 477 (18.78)	1FN3100-4SA00-0AA0	88 (3.46)	11.8 (0.46)	105 (4.13)	14.8 (0.58)	120 (4.72)	
1FN3150-1NC 1FN3150-2NB 1FN3150-3NC 1FN3150-4NB	126 (4.96)	61.4 (2.42)	135 (5.31)	76.3 (3.00)	162 (6.38) 267 (10.51) 372 (14.65) 477 (18.78)	1FN3150-4SA00-0AA0	118 (4.65)	13.8 (0.54)	135 (5.31)	16.8 (0.66)	120 (4.72)	
1FN3300-1NC 1FN3300-2NC 1FN3300-3NC 1FN3300-4NB	141 (5.55)	78 (3.07)	150 (5.91)	92.9 (3.66)	238 (9.37) 399 (15.71) 560 (22.05) 721 (28.39)	1FN3300-4SA00-0AA0	134 (5.28)	16.5 (0.65)	151 (5.94)	19.5 (0.77)	184 (7.24)	
1FN3450-2NC 1FN3450-3NC 1FN3450-4NB	188 (7.40)	80 (3.15)	197 (7.76)	94.9 (3.74)	399 (15.71) 560 (22.05) 721 (28.39)	1FN3450-4SA00-0AA0	180 (7.09)	18.5 (0.73)	197 (7.76)	21.5 (0.85)	184 (7.24)	
1FN3600-2NB 1FN3600-3NB 1FN3600-4NB	248 (9.76)	78 (3.07)	257 (10.12)	99.9 (3.93)	399 (15.71) 560 (22.05) 721 (28.39)	1FN3600-4SA00-0AA0	240 (9.45)	16.5 (0.65)	247 (9.72)	26.5 (1.04)	184 (7.24)	
1FN3900-2NB 1FN3900-3NB 1FN3900-4NB	342 (13.46)	80 (3.15)	351 (13.82)	101.9 (4.01)	399 (15.71) 560 (22.05) 721 (28.39)	1FN3900-4SA00-0AA0	334 (13.15)	18.5 (0.73)	341 (13.43)	28.5 (1.12)	184 (7.24)	



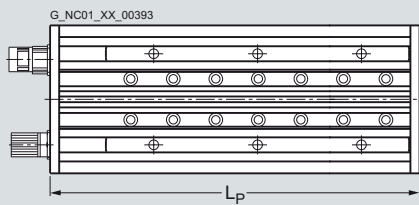
# SIMOTICS linear and torque motors

## Dimensional drawings

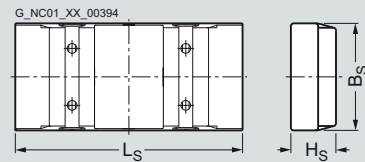
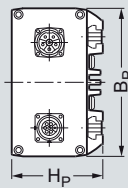
### SIMOTICS L-1FN6 linear motors Natural cooling

#### Dimensional drawings

Primary section Type	Dimensions in mm (inches)			Secondary section Type	Dimensions in mm (inches)		
	$B_p$	$H_p$	Primary section length $L_p$		$B_s$	$H_s$	Secondary section length $L_s$
<b>SIMOTICS L-1FN6 linear motors, natural cooling</b>							
1FN6003-1LC	80 (3.15)	49.4 (1.94)	203 (7.99)	1FN6003-1SC00-0AA0 1FN6003-1SF00-0AA0	75 (2.95)	20 (0.79)	200 (7.87)
1FN6003-1LE			328 (12.91)				500 (19.69)
1FN6003-1LG			453 (17.83)				
1FN6003-1LJ			578 (22.76)				
1FN6003-1LL			703 (27.68)				
1FN6003-1LN			828 (32.60)				
1FN6007-1LC	115 (4.53)	55.4 (2.18)	203 (7.99)	1FN6007-1SC00-0AA0 1FN6007-1SF00-0AA0	110 (4.33)	26 (1.02)	200 (7.87)
1FN6007-1LE			328 (12.91)				500 (19.69)
1FN6007-1LG			453 (17.83)				
1FN6007-1LJ			578 (22.76)				
1FN6007-1LL			703 (27.68)				
1FN6007-1LN			828 (32.60)				
1FN6008-1LC	130 (5.12)	80.4 (3.17)	392 (15.43)	1FN6008-1SC00-0AA0	90 (3.54)	40 (1.57)	200 (7.87)
1FN6008-1LE			642 (25.28)				
1FN6008-1LG			892 (35.12)				
1FN6016-1LC	209 (8.23)	80.4 (3.17)	392 (15.43)	1FN6016-1SC00-0AA0	170 (6.69)	40 (1.57)	200 (7.87)
1FN6016-1LE			642 (25.28)				
1FN6016-1LG			892 (35.12)				
1FN6024-1LC	289 (11.38)	80.4 (3.17)	392 (15.43)	1FN6024-1SC00-0AA0	250 (9.84)	40 (1.57)	200 (7.87)
1FN6024-1LE			642 (25.28)				
1FN6024-1LG			892 (35.12)				



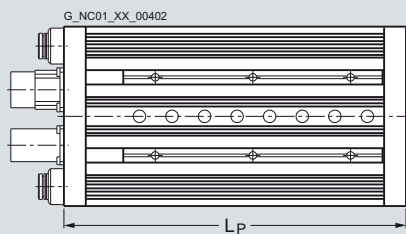
SIMOTICS L-1FN6 primary section



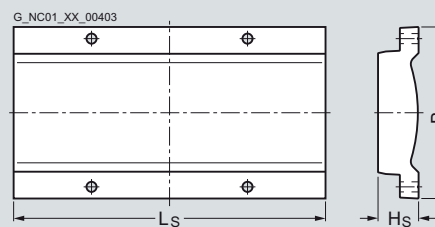
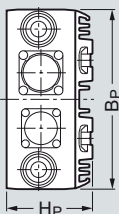
SIMOTICS L-1FN6 secondary section

## Dimensional drawings

Primary section Type	Dimensions in mm (inches)			Secondary section Type	Dimensions in mm (inches)		
	$B_p$	$H_p$	Primary section length $L_p$		$B_s$	$H_s$	Secondary section length $L_s$
<b>SIMOTICS L-1FN6 linear motors, water cooling</b>							
1FN6003-1WC	80 (3.15)	49.4 (1.94)	219 (8.62)	1FN6003-1SC00-0AA0 1FN6003-1SF00-0AA0	75 (2.95)	20 (0.79)	200 (7.87)
1FN6003-1WE			344 (13.54)				500 (19.69)
1FN6003-1WG			469 (18.46)				
1FN6003-1WJ			594 (23.39)				
1FN6003-1WL			719 (28.31)				
1FN6003-1WN			844 (33.23)				
1FN6007-1WC	115 (4.53)	55.4 (2.18)	219 (8.62)	1FN6007-1SC00-0AA0 1FN6007-1SF00-0AA0	110 (4.33)	26 (1.02)	200 (7.87)
1FN6007-1WE			344 (13.54)				500 (19.69)
1FN6007-1WG			469 (18.46)				
1FN6007-1WJ			594 (23.39)				
1FN6007-1WL			719 (28.31)				
1FN6007-1WN			844 (33.23)				



SIMOTICS L-1FN6 primary section



SIMOTICS L-1FN6 secondary section

# SIMOTICS linear and torque motors

## Dimensional drawings

### SIMOTICS T-1FW6 built-in torque motors Water cooling

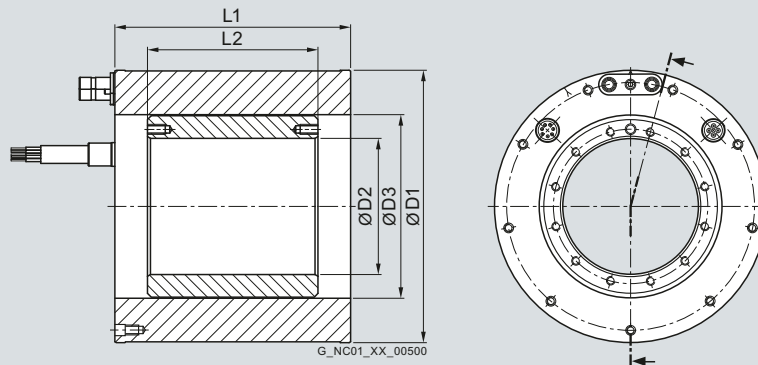
#### Dimensional drawings

For motor Dimensions in mm (inches)

Type	D1	D2	D3	L1	L2
<b>SIMOTICS T-1FW6 built-in torque motors, individual components, water cooling</b>					
1FW6050-0.B03	159 (6.26)	64 (2.52)	96 (3.78)	89 (3.50)	35 (1.38)
1FW6050-0.B05				109 (4.29)	65 (2.56)
1FW6050-0.B07				129 (5.08)	85 (3.35)
1FW6050-0.B10				159 (6.26)	115 (4.53)
1FW6050-0.B15				209 (8.23)	165 (6.50)
1FW6060-0.B03	184 (7.24)	92 (3.62)	124 (4.88)	89 (3.50)	35 (1.38)
1FW6060-0.B05				109 (4.29)	65 (2.56)
1FW6060-0.B07				129 (5.08)	85 (3.35)
1FW6060-0.B10				159 (6.26)	115 (4.53)
1FW6060-0.B15				209 (8.23)	165 (6.50)

6

1FW6050  
1FW6060

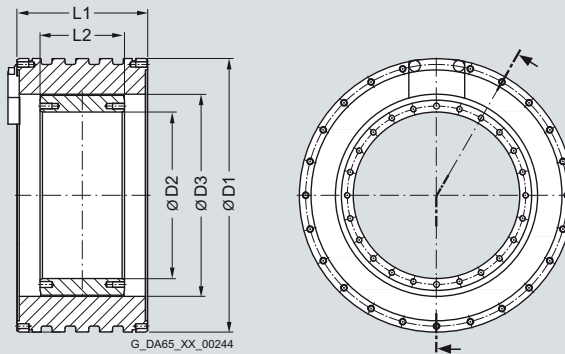




**Dimensional drawings**

For motor	Dimensions in mm (inches)				
Type	D1	D2	D3	L1	L2
<b>SIMOTICS T-1FW6 built-in torque motors, individual components, water cooling</b>					
1FW6090-0.B05	230 (9.06)	140 (5.51)	170 (6.69)	90 (3.54)	51 (2.01)
1FW6090-0.B07				110 (4.33)	71 (2.80)
1FW6090-0.B10				140 (5.51)	101 (3.98)
1FW6090-0.B15				190 (7.48)	151 (5.94)
1FW6130-0.B05	310 (12.20)	220 (8.66)	254 (10.00)	90 (3.54)	51 (2.01)
1FW6130-0.B07				110 (4.33)	71 (2.80)
1FW6130-0.B10				140 (5.51)	101 (3.98)
1FW6130-0.B15				190 (7.48)	151 (5.94)
1FW6150-0.B05	385 (15.16)	265 (10.43)	300 (11.81)	110 (4.33)	51 (2.01)
1FW6150-0.B07				130 (5.12)	71 (2.80)
1FW6150-0.B10				160 (6.30)	101 (3.98)
1FW6150-0.B15				210 (8.27)	151 (5.94)

1FW6090  
1FW6130  
1FW6150



# SIMOTICS linear and torque motors

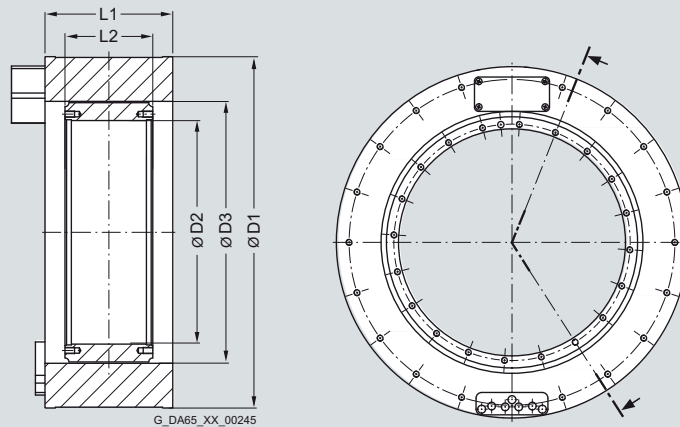
## Dimensional drawings

### SIMOTICS T-1FW6 built-in torque motors Water cooling

#### Dimensional drawings

For motor Type	Dimensions in mm (inches)				
	D1	D2	D3	L1	L2
<b>SIMOTICS T-1FW6 built-in torque motors, individual components, water cooling</b>					
1FW6160-0.B05	440 (17.32)	280 (11.02)	328 (12.91)	110 (4.33)	60 (2.36)
1FW6160-0.B07				130 (5.12)	80 (3.15)
1FW6160-0.B10-.J.2/-5G.2/-8FB2				160 (6.30)	110 (4.33)
1FW6160-0.B10-2PB2				170 (6.69)	110 (4.33)
1FW6160-0.B15-2J.2/-5G.2/-8FB2				210 (8.27)	160 (6.30)
1FW6160-0.B15-2PB2/-0WB2				220 (8.66)	160 (6.30)
1FW6160-0.B20-5G.2/-8FB2				260 (10.23)	210 (8.27)
1FW6160-0.B20-2PB2/-0WB2				270 (10.63)	210 (8.27)
1FW6190-0.B05	502 (19.76)	342 (13.46)	389 (15.31)	110 (4.33)	60 (2.36)
1FW6190-0.B07				130 (5.12)	80 (3.15)
1FW6190-0.B10-.J.2/-5G.2/-8FB2				160 (6.30)	110 (4.33)
1FW6190-0.B10-2PB2				170 (6.69)	110 (4.33)
1FW6190-0.B15-2J.2/-5G.2/-8FB2				210 (8.27)	160 (6.30)
1FW6190-0.B15-2PB2/-0WB2				220 (8.66)	160 (6.30)
1FW6190-0.B20-5G.2/-8FB2				260 (10.24)	210 (8.27)
1FW6190-0.B20-2PB2/-0WB2				270 (10.63)	210 (8.27)
1FW6230-0.B05	576 (22.68)	416 (16.38)	463 (18.23)	110 (4.33)	60 (2.36)
1FW6230-0.B07				130 (5.12)	80 (3.15)
1FW6230-0.B10				160 (6.30)	110 (4.33)
1FW6230-0.B15-4C.2/-5G.2/-8FB2/-2PB2				210 (8.27)	160 (6.30)
1FW6230-0.B15-0WB2				220 (8.66)	160 (6.30)
1FW6230-0.B20-5G.2/-8FB2/-2PB2				260 (10.24)	210 (8.27)
1FW6230-0.B20-0WB2				270 (10.63)	210 (8.27)
1FW6290-0.B07-5G.2/-0LB2	730 (28.74)	520 (20.47)	580 (22.83)	140 (5.51)	90 (3.54)
1FW6290-0.B07-2PB2				160 (6.30)	90 (3.54)
1FW6290-0.B11-7A.2/-0LB2				180 (7.09)	130 (5.12)
1FW6290-0.B11-2PB2				200 (7.87)	130 (5.12)
1FW6290-0.B15-7A.2/-0LB2				220 (8.66)	170 (6.69)
1FW6290-0.B15-2PB2				240 (9.45)	170 (6.69)
1FW6290-0.B20-0LB2				260 (10.24)	210 (8.27)
1FW6290-0.B20-2PB2				280 (11.02)	210 (8.27)

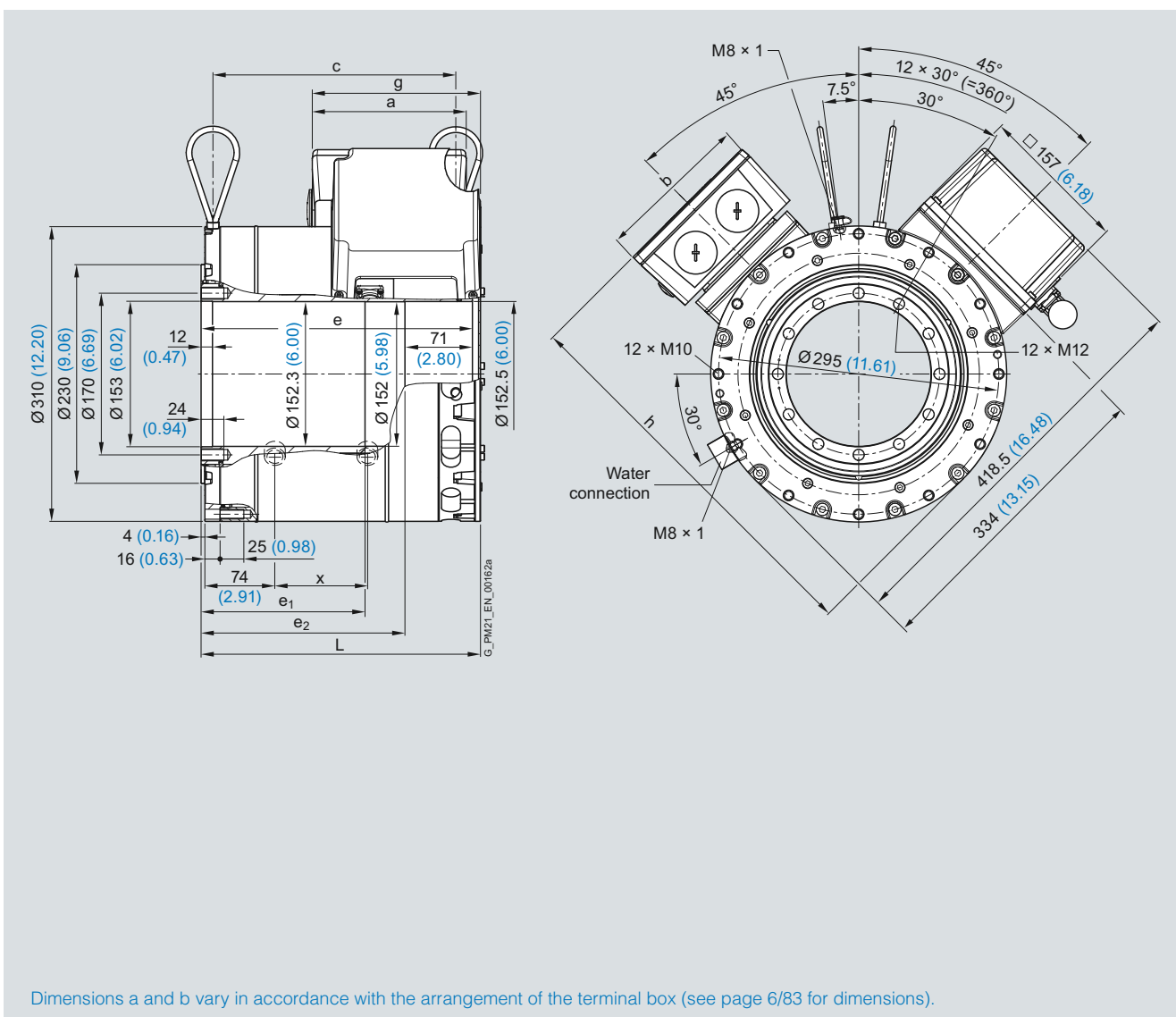
1FW6160  
1FW6190  
1FW6230  
1FW6290



## Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC L <sup>1)</sup>	c	e	e <sub>1</sub>	e <sub>2</sub>	x	Terminal box type			
								gk230 g <sup>2)3)</sup>	h	gk420 g <sup>3)</sup>	h
<b>SIMOTICS T-1FW3 complete torque motors, IM B14 type of construction, hollow shaft</b>											
<b>150</b>	1FW3150	260.5 (10.26)	226 (8.90)	256 (10.08)	141 (5.55)	185 (7.28)	68 (2.68)	159.5 (6.38)	393 (15.47)	–	–
	1FW3152	317.5 (12.50)	283 (11.14)	313 (12.32)	198 (7.80)	242 (9.53)	125 (4.92)	–	–	–	–
	1FW3154	366.5 (14.43)	332 (13.07)	362 (14.52)	247 (9.72)	291 (11.46)	174 (6.85)	–	–	–	–
	1FW3155	418.5 (16.48)	384 (15.12)	414 (16.30)	299 (11.77)	343 (13.50)	226 (8.90)	–	–	177 (6.97)	410 (16.14)
	1FW3156	471.5 (18.56)	437 (17.20)	467 (18.39)	352 (13.86)	396 (15.59)	279 (10.98)	–	–	–	–



1) Version without encoder: + 0.5 mm (0.02 in).

2) Dimension varies in accordance with terminal box arrangement – for crosswise right/left: 154.5 mm (6.08 in).

3) Version without encoder: + 2.5 mm (0.10 in).

# SIMOTICS linear and torque motors

## Dimensional drawings

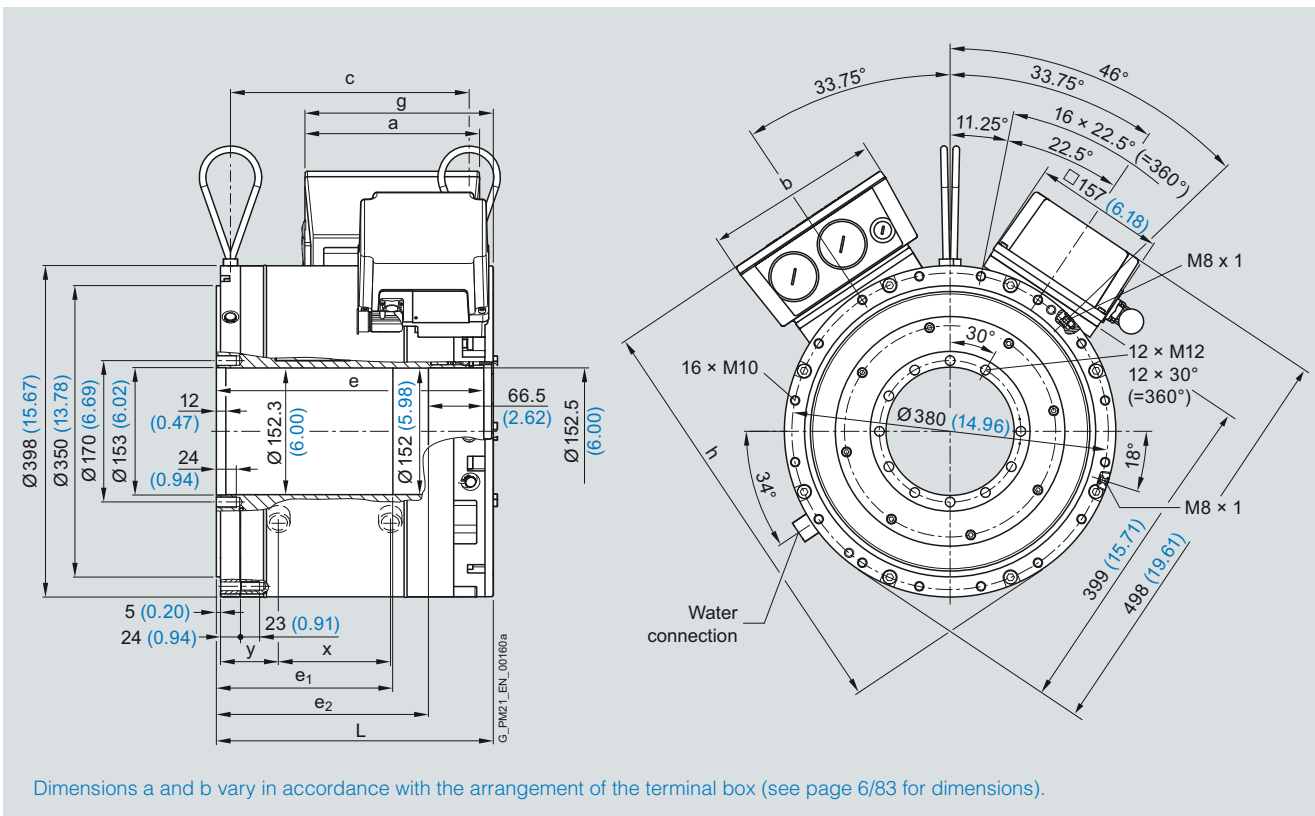
### SIMOTICS T-1FW3 complete torque motors with/without DRIVE-CLiQ – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC L	c	e	e <sub>1</sub>	e <sub>2</sub>	x	y	Terminal box type							
									gk230 g <sup>1)</sup>	h	gk420 g	h	gk630 g	h		
<b>SIMOTICS T-1FW3 complete torque motors, IM B14 type of construction, hollow shaft</b>																
<b>200</b>	1FW3201	235.5 (9.27)	194.5 (7.66)	229 (9.02)	120 (4.72)	162.5 (6.40)	48.5 (1.91)	67.5 (2.66)	158 (6.22)	474 (18.66)	-	-	-	-		
	1FW3202	281.5 (11.08)	240.5 (9.47)	275 (10.83)	166 (6.54)	208.5 (8.21)	94.5 (3.72)			175 (6.89)	490 (19.29)	-	-			
	1FW3203	328 (12.91)	287 (11.30)	321.5 (12.66)	212 (8.35)	255 (10.04)	137 (5.39)	69.5 (2.74)								
	1FW3204	397 (15.63)	356 (14.02)	390.5 (15.37)	281 (11.06)	324 (12.76)	206 (8.11)					226 (8.90)	508 (20.00)			
	1FW3206	489.5 (19.27)	448.5 (17.66)	483 (19.02)	374 (14.72)	416.5 (16.40)	298.5 (11.75)		-	-						
	1FW3208	604.5 (23.80)	563.5 (22.18)	598 (23.54)	489 (19.25)	531.5 (20.93)	413.5 (16.28)		-	-						

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Dimensions a and b vary in accordance with the arrangement of the terminal box (see page 6/83 for dimensions).

<sup>1)</sup> Dimension varies in accordance with terminal box arrangement – for crosswise right/left: 153 mm (6.02 in).

# SIMOTICS linear and torque motors

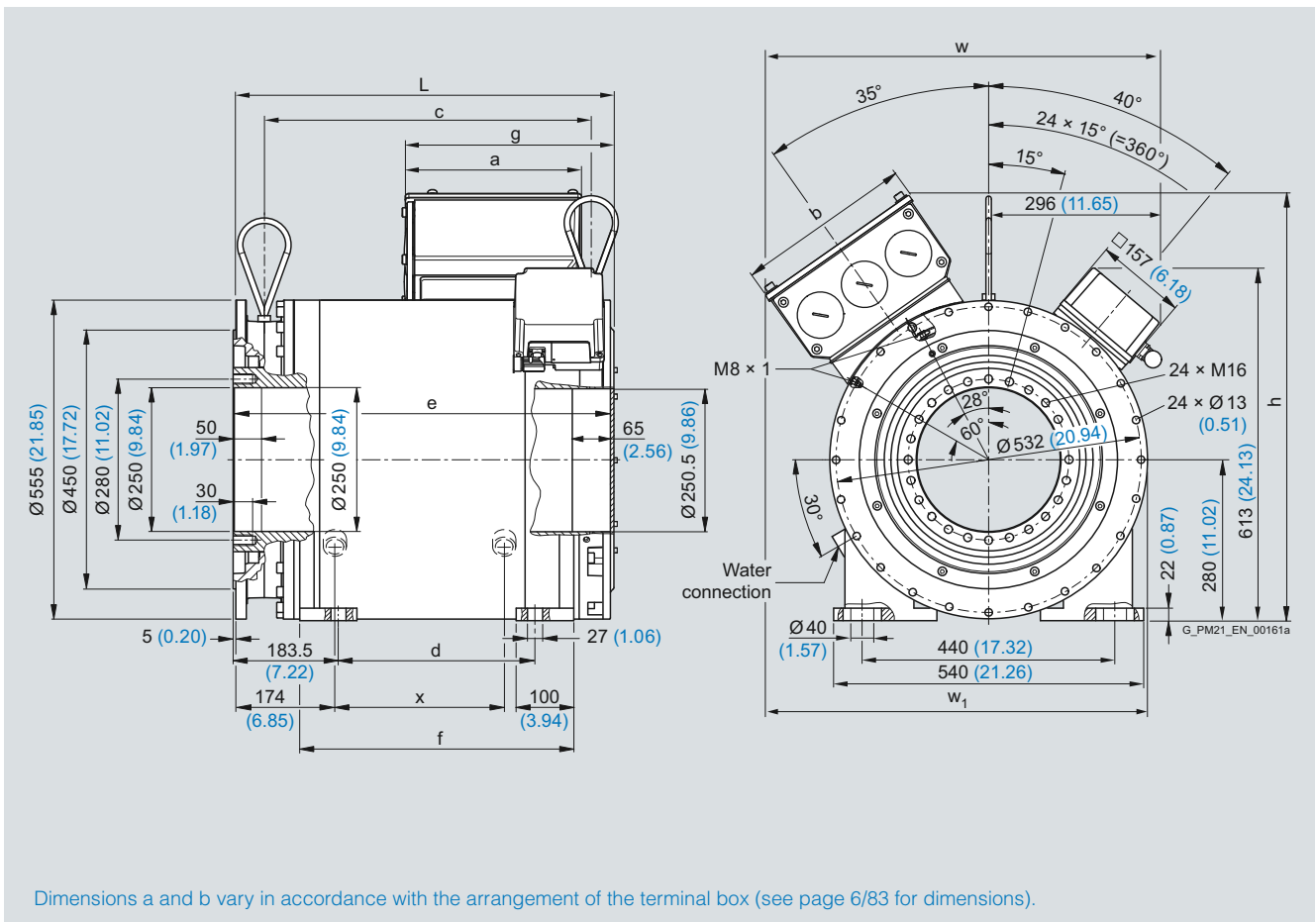
## Dimensional drawings

**SIMOTICS T-1FW3 complete torque motors  
with/without DRIVE-CLiQ – Water cooling**

### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC L	c	d	e	f	x	Terminal box type							
								1XB7700				1XB7712			
								g	h	w	w <sub>1</sub>	g <sup>1)</sup>	h <sup>2)</sup>	w <sup>3)</sup>	w <sub>1</sub> <sup>4)</sup>
<b>SIMOTICS T-1FW3 complete torque motors, IM B35 type of construction, hollow shaft</b>															
<b>280</b>	1FW3281	574 (22.60)	483.5 (19.04)	258 (10.16)	571 (22.48)	393 (15.47)	217 (8.54)	363 (14.29)	743 (29.25)	684 (26.93)	665 (26.18)	-	-	-	-
	1FW3283	685.5 (26.99)	568 (22.36)	342.5 (13.48)	655.5 (25.81)	477.5 (18.80)	301.5 (11.87)					-	-	-	-
	1FW3285	784.5 (30.98)	694 (27.32)	468.5 (18.44)	781.5 (30.77)	603.5 (23.76)	427.5 (16.83)					354 (13.94)	836 (32.91)	764 (30.08)	744 (29.29)
	1FW3287	953 (37.52)	862.5 (33.96)	637 (25.08)	950 (37.40)	772 (30.39)	596 (23.46)								



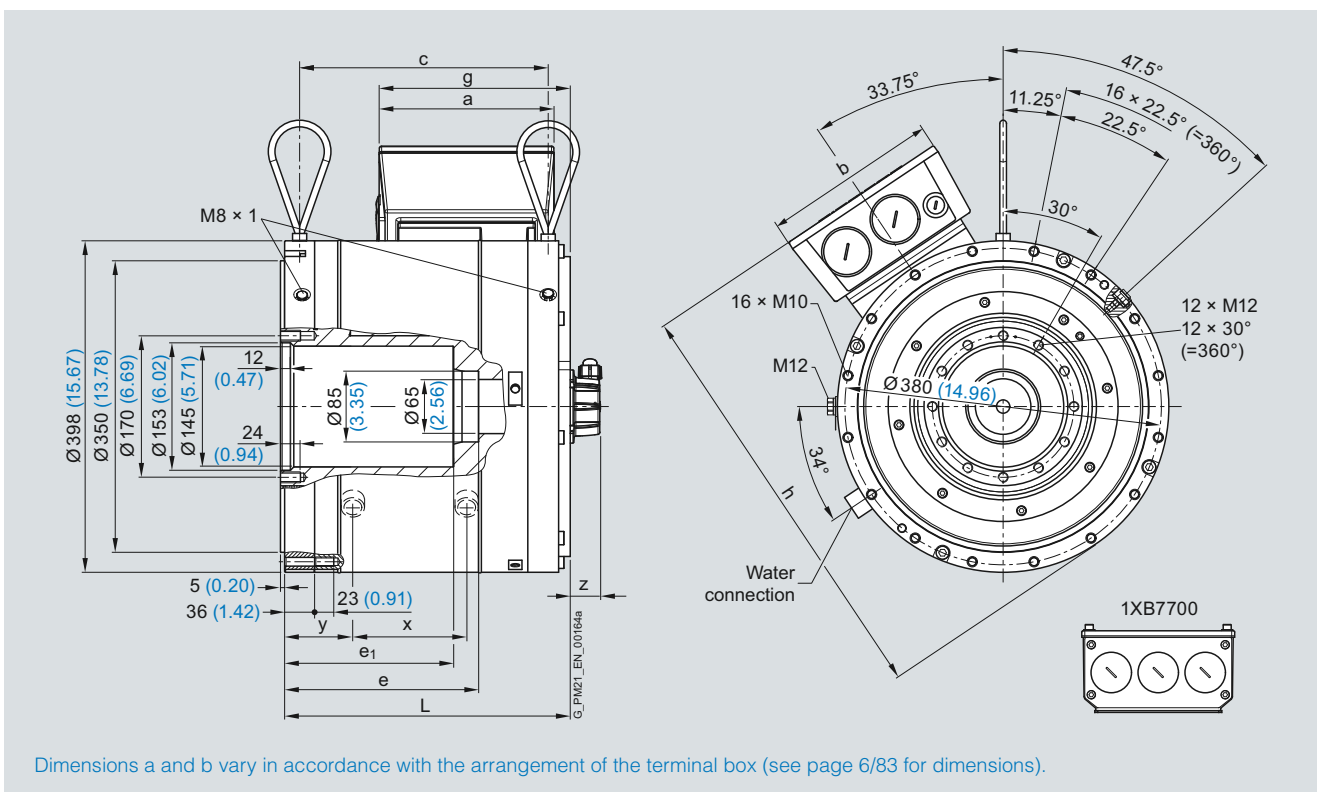
- 1) Dimension varies in accordance with terminal box arrangement – for crosswise right/left: 369 mm (14.53 in) – for NDE: 385 mm (15.16 in).
- 2) Dimension varies in accordance with terminal box arrangement – for crosswise right: 828 mm (32.60 in) – for crosswise left: 846 mm (33.31 in).
- 3) Dimension varies in accordance with terminal box arrangement – for crosswise right: 777 mm (30.59 in) – for crosswise left: 751 mm (29.57 in).
- 4) Dimension varies in accordance with terminal box arrangement – for crosswise right: 758 mm (29.84 in) – for crosswise left: 732 mm (28.82 in).



#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC L	c	e	e <sub>1</sub>	x	y	z <sup>1)</sup>	Terminal box type								
									gk230		gk420		gk630		1XB7700		
									g <sup>2)</sup>	h	g	h	g	h	g	h	
<b>SIMOTICS T-1FW3 complete torque motors, IM B14 type of construction, plug-on shaft</b>																	
<b>200</b>	1FW3201		250.5 (9.86)	206 (8.11)	140.5 (5.53)	110.5 (4.35)	48.5 (1.91)	79.5 (3.13)	36 (1.42)	159 (6.26)	475 (18.70)	179 (7.05)	491 (19.33)	-	-	-	-
	1FW3202		296.5 (11.67)	252 (9.92)	187 (7.36)	157 (6.18)	94.5 (3.72)							-	-	-	-
	1FW3203		343 (13.50)	298.5 (11.75)	233 (9.17)	203 (7.99)	137 (5.39)	81.5 (3.21)					230 (9.06)	507 (19.96)	-	-	
	1FW3204		412 (16.22)	367.5 (14.47)	302 (11.89)	272 (10.71)	206 (8.11)										
	1FW3206		504.5 (19.86)	460 (18.11)	395 (15.55)	365 (14.37)	298.5 (11.75)			-	-					306.5 (12.07)	580 (22.83)
	1FW3208		619.5 (24.39)	575 (22.74)	509.5 (20.06)	479.5 (18.88)	413.5 (16.28)			-	-						



Dimensions a and b vary in accordance with the arrangement of the terminal box (see page 6/83 for dimensions).

<sup>1)</sup> Encoder without DRIVE-CLiQ: 41 mm (1.61 in).

<sup>2)</sup> Dimension varies in accordance with terminal box arrangement – for crosswise right/left: 156.5 mm (6.16 in).

# SIMOTICS linear and torque motors

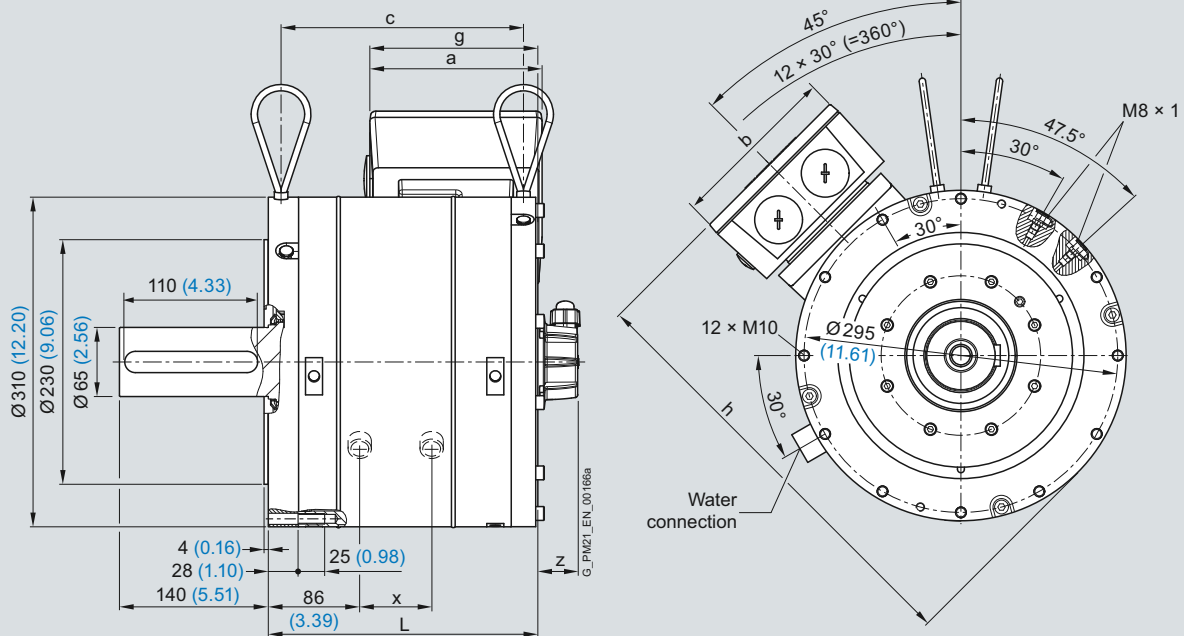
## Dimensional drawings

### SIMOTICS T-1FW3 complete torque motors with/without DRIVE-CLiQ – Water cooling

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC L	c	x	z <sup>1)</sup>	Terminal box type				
						gk230 g <sup>2)</sup>	h	gk420 g	h	
<b>SIMOTICS T-1FW3 complete torque motors, IM B14 type of construction, solid shaft</b>										
<b>150</b>	1FW3150	253.5 (9.98)	228 (8.98)	68 (2.68)	38 (1.50)	140.5 (5.53)	393 (15.47)	–	–	–
	1FW3152	283 (11.14)	257.5 (10.14)	97.5 (3.84)				–	–	
	1FW3154	338 (13.31)	312.5 (12.30)	152.5 (6.00)				–	–	
	1FW3155	386.5 (15.22)	361 (14.21)	201 (7.91)				158 (6.22)	409 (16.10)	
	1FW3156	440.5 (17.34)	415 (16.34)	255 (10.04)						



Dimensions a and b vary in accordance with the arrangement of the terminal box (see page 6/83 for dimensions).

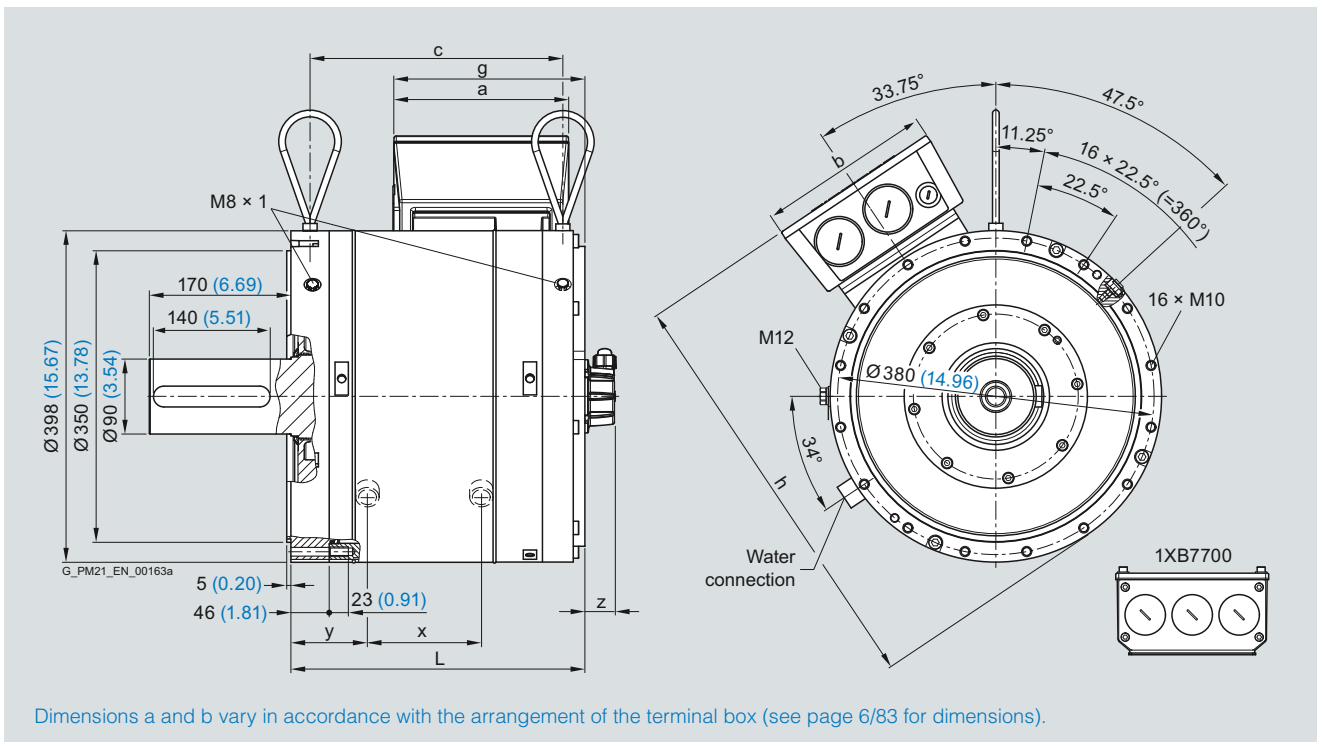
<sup>1)</sup> Encoder without DRIVE-CLiQ: 43 mm (1.69 in).

<sup>2)</sup> Dimension varies in accordance with terminal box arrangement – for NDE/crosswise right/left: 135.5 mm (5.33 in).



#### Dimensional drawings

For motor		Dimensions in mm (inches)						Terminal box type						
Shaft height	Type	DIN IEC L	c	x	y	z <sup>1)</sup>	gk230		gk420		gk630		1XB7700	
							g <sup>2)</sup>	h	g	h	g	h	g	h
<b>SIMOTICS T-1FW3 complete torque motors, IM B14 type of construction, solid shaft</b>														
<b>200</b>	1FW3201	260.5 (10.26)	211 (8.31)	48.5 (1.91)	89.5 (3.52)	36 (1.42)	159 (6.26)	475 (18.70)	178.5 (7.03)	491 (19.33)	–	–	–	–
	1FW3202	306.5 (12.07)	257 (10.12)	94.5 (3.72)							–	–	–	–
	1FW3203	353 (13.90)	303.5 (11.95)	137 (5.39)	91.5 (3.60)						230 (9.06)	507 (19.96)	–	–
	1FW3204	422 (16.61)	372.5 (14.67)	206 (8.11)									–	–
	1FW3206	514.5 (20.26)	465 (18.31)	298.5 (11.75)			–	–					307 (12.09)	580 (22.83)
	1FW3208	629.5 (24.78)	580 (22.83)	413.5 (16.28)			–	–						



<sup>1)</sup> Encoder without DRIVE-CLiQ: 41 mm (1.61 in).

<sup>2)</sup> Dimension varies in accordance with terminal box arrangement – for crosswise right/left: 156.5 mm (6.16 in).

# SIMOTICS linear and torque motors

Notes

6

# Measuring systems



<b>7/2</b>	<b>Overview</b>
<b>7/3</b>	<b>Built-on optoelectronic rotary encoders</b>
7/3	Introduction
7/4	<u>Incremental encoders</u>
7/4	Incremental encoder with sin/cos 1 V <sub>pp</sub>
7/4	Incremental encoder with RS422 (TTL)
7/4	Incremental encoder with HTL
7/4	Double-track incremental encoder with RS422 (TTL)
7/7	<u>Absolute encoders</u>
7/7	Absolute encoder with DRIVE-CLiQ
7/7	Absolute encoder with SSI
7/7	Absolute encoder with EnDat
7/9	Absolute encoder with PROFIBUS DP
7/9	Absolute encoder with PROFINET IO
7/12	Accessories

# Measuring systems

## Overview

Encoder type	Interface	Safety Integrated <sup>1)</sup>	Accuracy in angular seconds	Resolution	Degree of protection without/with shaft input
<b>Incremental encoder</b> 	sin/cos 1 V <sub>pp</sub>	Yes	± 18 mech. × 3600/ number of signals/revolution z	2500 S/R	IP67/IP64
	RS422 (TTL)	<sup>2)</sup>	± 18 mech. × 3600/ number of signals/revolution z	5000 S/R	IP67/IP64
	HTL	<sup>2)</sup>	± 18 mech. × 3600/ number of signals/revolution z	2500 S/R	IP67/IP64
	RS422 (TTL) double track	<sup>2)</sup>	Track 1: ± 63 Track 2: ± 12	Track 1: 1024 S/R Track 2: 9000 S/R	IP67/IP64
<b>Absolute encoder</b> 	DRIVE-CLiQ	<sup>2)</sup>	± 36	Single-turn 22 bit Multi-turn 34 bit (22 bit single-turn + 12 bit multi-turn)	IP67/IP64
		SSI	<sup>2)</sup>	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 25 bit (8192 steps × 4096 revolutions)
EnDat		Yes	± 60 (Incremental track)	Single-turn 13 bit (8192 steps) Multi-turn 25 bit (8192 steps × 4096 revolutions)	IP67/IP64
	PROFIBUS DP	<sup>2)</sup>	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 27 bit (8192 steps × 16384 revolutions)	IP67/IP64
	PROFINET IO	<sup>2)</sup>	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 27 bit (8192 steps × 16384 revolutions)	IP67/IP64

S/R = signals/revolution

<sup>1)</sup> Built-on rotary encoders can be used for Safety Integrated.

<sup>2)</sup> If you require information about the usability of built-on rotary encoders for Safety Integrated, please contact your local Siemens office.

### Overview



Absolute encoders, incremental encoders and mounting accessories

The built-on optoelectronic rotary encoders sense distances, angles of rotation or speeds in machines. They can be used in conjunction with numerical control systems, programmable logic controllers, drives and position displays, e.g. for:

- SINUMERIK CNC systems
- SIMOTION Motion Control systems
- SIMATIC programmable logic controllers
- SINAMICS drive systems
- SIMODRIVE drive systems

### Application

A distinction is made between incremental and absolute measuring procedures:

- In the case of incremental encoders, the machine must travel to a reference point after each power-off state, as the position is not usually stored in the controller, and movements of the machine while the power is off are not recorded.
- Absolute encoders, on the other hand, also record these movements while the power is off and return the actual position with power On. Travel to a reference point is not necessary.

### Design

All encoders are available in Synchro flange and clamp flange versions. Encoders with a Synchro flange can be attached to the machine with 3 clamp straps or mounted with axial screws. The encoder is driven by means of a plug-in coupling or a spring disk coupling. Alternatively, pulleys can also be used.

The encoder supply voltage is 5 V DC or alternatively 10 V to 30 V DC. The 10 V to 30 V DC version supports longer cable lengths. Most control systems apply the supply voltage directly on the measuring circuit connector. With SINAMICS, the power supply for the measuring systems is provided via the Sensor Modules.

The cable length for rotary encoders including connector is 1 m (3.28 ft).

The following bending radii must be observed for the cable to the encoder:

- One-time bending:  $\geq 20$  mm (0.79 in)
- Continuous bending:  $\geq 75$  mm (2.95 in)

# Measuring systems

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Function



Incremental encoder (sin/cos  $1 V_{pp}$ /RS422/HTL) with cable and connector, clamp flange or Synchro flange

Incremental encoders deliver a defined number of electrical pulses per rotation, which represent the measurement of the traveled distance or angle.

Incremental encoders operate on the principle of optoelectronic scanning of dividing disks with the transmitted light principle. The light source is a light emitting diode (LED). The light-dark modulation generated as the encoder shaft rotates is picked up by photoelectronic elements. With an appropriate arrangement of the line pattern on the dividing disk connected to the shaft and the fixed aperture, the photoelectronic elements provide two trace signals A and B at  $90^\circ$  to one another, as well as a reference signal R. The encoder electronics amplify these signals and convert them into different output levels.

The following output levels are available:

- $1 V_{pp}$  analog signals sin/cos  
Better resolution can be achieved for encoders with sinusoidal signals by interpolating them in the higher-level controller.
- RS422 difference signals (TTL)  
In the case of RS422 incremental encoders (TTL), the resolution can be improved by a factor of four by means of edge evaluation.
- HTL (High Voltage Transistor Logic)  
Encoders with HTL interfaces are designed for applications with digital inputs with 24 V levels.

#### Technical specifications

Product name		Incremental encoder with sin/cos $1 V_{pp}$	Incremental encoder with RS422 (TTL)	Incremental encoder with HTL	Double-track incremental encoder with RS422 (TTL)
		6FX2001-3....	6FX2001-2....	6FX2001-4...0	6FX2001-2UK00
Operating voltage DC $V_p$ on encoder	V	5 $\pm 10\%$	5 $\pm 10\%$ or 10 ... 30	10 ... 30	5 $\pm 5\%$
Limit frequency, typ.	kHz	$\geq 180$ (-3 dB) $\geq 450$ (-6 dB)	–	–	–
Scanning frequency, max.	kHz	–	300	300	Track 1: 160 Track 2: 1000
No-load current consumption, max.	mA	150	150	150	Track 1: 150 Track 2: 150
Signal level		Sinusoidal $1 V_{pp}$	RS422 (TTL)	$V_H \geq 21 V$ at $I_H = 20 mA$ at 24 V $V_L \leq 2.8 V$ at $I_L = 20 mA$ at 24 V	RS422 (TTL)
Outputs protected against short-circuit to 0 V		Yes	Yes	Yes	Yes
Switching time (10 ... 90%) rising/falling time $t_r/t_f$ (1 m (3.28 ft) cable and recommended input circuit)	ns	–	$\leq 50$	$\leq 200$	$\leq 100$
Phase angle, signal A to B Edge spacing, min.	Degrees	$90 \pm 10$	90	90	90
• At 160 kHz	$\mu s$	–	–	–	Track 1: $\geq 0.8$
• At 300 kHz	$\mu s$	–	$\geq 0.45$	$\geq 0.45$	–
• Up to 1 MHz	$\mu s$	–	–	–	Track 2: $\geq 0.125$
Cable length to downstream electronics, max. <sup>1)</sup>	m (ft)	150 (492)	100 (328)	300 (984)	Up to 500 kHz: 100 (328) Up to 1 MHz: 50 (164)
LED failure monitoring		–	High-resistance driver	High-resistance driver	–

<sup>1)</sup> With recommended cable and input circuitry of the downstream electronics, observe max. permissible cable length of module to be evaluated.

## Technical specifications (continued)

Product name		Incremental encoder with sin/cos 1 V <sub>pp</sub>	Incremental encoder with RS422 (TTL)	Incremental encoder with HTL	Double-track incremental encoder with RS422 (TTL)
		6FX2001-3....	6FX2001-2....	6FX2001-4...0	6FX2001-2UK00
<b>Resolution, max.</b>	S/R	2500	5000	2500	Track 1: 1024 Track 2: 9000
<b>Accuracy</b>	arcsec	± 18 mech. × 3600/ number of signals/ revolution z	± 18 mech. × 3600/ number of signals/ revolution z	± 18 mech. × 3600/ number of signals/ revolution z	Track 1: ± 63 Track 2: ± 12
<b>Speed, max.</b>					
• Electrical	rpm	(27 × 10 <sup>6</sup> rpm)/ number of signals/ revolution (at - 6 dB)	(18 × 10 <sup>6</sup> rpm)/ number of signals/ revolution	(18 × 10 <sup>6</sup> rpm)/ number of signals/ revolution	Track 1: 9000 Track 2: 6500
• Mechanical	rpm	12000	12000	12000	12000
<b>Friction torque</b> (at 20 °C/68 °F)	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Starting torque</b> (at 20 °C/68 °F)	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Shaft loading capacity</b>					
• n ≤ 6000 rpm					
- Axial	N (lb <sub>f</sub> )	40 (8.99)	40 (8.99)	40 (8.99)	10 (2.25)
- Radial at shaft extension	N (lb <sub>f</sub> )	60 (13.5)	60 (13.5)	60 (13.5)	20 (4.50)
• n > 6000 rpm					
- Axial	N (lb <sub>f</sub> )	10 (2.25)	10 (2.25)	10 (2.25)	–
- Radial at shaft extension	N (lb <sub>f</sub> )	20 (4.50)	20 (4.50)	20 (4.50)	–
<b>Shaft diameter</b>					
• Synchro flange	mm (in)	6 (0.24)	6 (0.24)	6 (0.24)	6 (0.24)
• Clamp flange	mm (in)	10 (0.39)	10 (0.39)	10 (0.39)	–
<b>Wavelength</b>					
• Synchro flange	mm (in)	10 (0.39)	10 (0.39)	10 (0.39)	15 (0.59)
• Clamp flange	mm (in)	20 (0.79)	20 (0.79)	20 (0.79)	–
<b>Angular acceleration, max.</b>	rad/s <sup>2</sup>	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>
<b>Moment of inertia of rotor</b>	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	20 × 10 <sup>-6</sup> (177 × 10 <sup>-6</sup> )
<b>Vibration (55 ... 2000 Hz) in accordance with EN 60068-2-6</b>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 300 (984)	≤ 300 (984)	≤ 300 (984)	≤ 100 (328)
<b>Shock in accordance with EN 60068-2-27</b>					
• 2 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 2000 (6562)	≤ 2000 (6562)	≤ 2000 (6562)	–
• 6 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>					
• Without shaft input		IP67	IP67	IP67	IP67
• With shaft input		IP64	IP64	IP64	IP64
<b>Ambient temperature</b>					
<u>Operation</u>					
• Flange outlet or fixed cable					
- At V <sub>p</sub> = 5 V ± 10 %	°C (°F)	-40 ... +100 (-40 ... +212)	-40 ... +100 (-40 ... +212)	-40 ... +100 (-40 ... +212)	-10 ... +70 (+14 ... +158)
- At V <sub>p</sub> = 10 ... 30 V	°C (°F)	–	-40 ... +70 (-40 ... +158)	–	–
• Flexible cable					
- At V <sub>p</sub> = 5 V ± 10 %	°C (°F)	-10 ... +100 (+14 ... +212)	-10 ... +100 (+14 ... +212)	-10 ... +100 (+14 ... +212)	-10 ... +70 (+14 ... +158)
- At V <sub>p</sub> = 10 ... 30 V	°C (°F)	–	-10 ... +70 (+14 ... +158)	–	–
<b>Weight, approx.</b>	kg (lb)	0.3 (0.66)	0.3 (0.66)	0.3 (0.66)	0.7 (1.54)
<b>EMC</b>	Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EEC and the regulations of the EMC guidelines (applicable basic standards)				
<b>Approvals, according to</b>		CE, cULus	CE, cULus	CE, cULus	CE, cULus

S/R = signals/revolution

# Measuring systems

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Selection and ordering data

Description	Order No.
<b>Incremental encoders with sin/cos 1 V<sub>pp</sub></b>	
5 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-3G</b> ■ ■ ■ ■
• Radial flange outlet	<b>6FX2001-3E</b> ■ ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-3C</b> ■ ■ ■ ■
<u>Resolution</u>	
1000 S/R	<b>B 0 0</b>
1024 S/R	<b>B 0 2</b>
2500 S/R	<b>C 5 0</b>
<b>Incremental encoders with RS422 (TTL)</b>	
5 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2G</b> ■ ■ ■ ■
• Radial flange outlet	<b>6FX2001-2E</b> ■ ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2C</b> ■ ■ ■ ■
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2R</b> ■ ■ ■ ■
• Radial flange outlet	<b>6FX2001-2P</b> ■ ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2M</b> ■ ■ ■ ■
10 ... 30 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2H</b> ■ ■ ■ ■
• Radial flange outlet	<b>6FX2001-2F</b> ■ ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2D</b> ■ ■ ■ ■
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2S</b> ■ ■ ■ ■
• Radial flange outlet	<b>6FX2001-2Q</b> ■ ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2N</b> ■ ■ ■ ■
<u>Resolution</u>	
500 S/R	<b>A 5 0</b>
1000 S/R	<b>B 0 0</b>
1024 S/R	<b>B 0 2</b>
1250 S/R	<b>B 2 5</b>
1500 S/R	<b>B 5 0</b>
2000 S/R	<b>C 0 0</b>
2048 S/R	<b>C 0 4</b>
2500 S/R	<b>C 5 0</b>
3600 S/R	<b>D 6 0</b>
5000 S/R	<b>F 0 0</b>

S/R = signals/revolution

Description	Order No.
<b>Incremental encoders with HTL</b>	
10 ... 30 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-4H</b> ■ ■ 0
• Radial flange outlet	<b>6FX2001-4F</b> ■ ■ 0
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-4D</b> ■ ■ 0
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-4S</b> ■ ■ 0
• Radial flange outlet	<b>6FX2001-4Q</b> ■ ■ 0
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-4N</b> ■ ■ 0
<u>Resolution</u>	
100 S/R	<b>A 1</b>
500 S/R	<b>A 5</b>
1000 S/R	<b>B 0</b>
2500 S/R	<b>C 5</b>
<b>Double-track incremental encoder with RS422 (TTL)</b>	
5 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Cable 1 m (3.28 ft) with axial connector	<b>6FX2001-2UK00</b>
2 types of resolution: 9000/1024 S/R	

1) Universal integrated cable outlet for axial and radial outlet direction.



### Function



Absolute encoders with SSI/EnDat and PROFIBUS DP at the top, and DRIVE-CLiQ and PROFINET IO at the bottom

Absolute encoders (absolute shaft encoders) are designed on the same scanning principle as incremental encoders, but have a greater number of tracks. For example, if there are 13 tracks, then  $2^{13} = 8192$  steps are coded in the case of single-turn encoders. The code used is a one-step code (Gray Code), which prevents any scanning errors from occurring.

After switching on the machine, the position value is transmitted immediately to the controller. There is no need to travel to a reference point.

Absolute encoders with DRIVE-CLiQ, SSI and EnDat are of advantage in time-critical applications.

In plants with a large number of encoders, encoders with PROFIBUS DP and PROFINET IO are more advantageous due to the reduced wiring overhead. Encoders with PROFIBUS DP are programmable and support isochronous mode with direct data exchange. The encoders with PROFINET IO are also parameterizable, additionally have two ports and support the RT and IRT operating modes.

#### Single-turn encoders

Single-turn encoders divide one rotation (360 degrees mechanical) into a specific number of steps, e.g. 8192. A unique code word is assigned to each position. After 360° the position values are repeated.

#### Multi-turn encoders

Multi-turn encoders also record the number of revolutions, in addition to the absolute position within one revolution. To do this, further code discs which are coupled via gear steps with the encoder shaft are scanned. When evaluating 12 additional tracks, this means that  $2^{12} = 4096$  revolutions can be coded.

### Technical specifications

Product name		Absolute encoder with DRIVE-CLiQ 6FX2001-5.D..-0AA1	Absolute encoder with SSI 6FX2001-5.S..	Absolute encoder with EnDat 6FX2001-5.E..
Operating voltage DC $V_p$ on encoder	V	24 - 15 % + 20 %	10 ... 30	5 ± 5 %
Current consumption, approx.				
• Single-turn	mA	245	160	160
• Multi-turn	mA	325	200	200
Interface		DRIVE-CLiQ	SSI	EnDat
Clock input		–	Differential cable receiver acc. to EIA standard RS485	Differential cable receiver acc. to EIA standard RS485
Data output		DRIVE-CLiQ	Differential cable driver acc. to EIA standard RS485	Differential cable driver acc. to EIA standard RS485
Short-circuit strength		Yes	Yes	Yes
Transmission rate	Mbit MHz	100 –	– 100 ... 1000	– 100 ... 2000
Speed, max.				
• Electrical				
- At ± 1 bit accuracy	rpm	14000	–	–
- At ± 100 bit accuracy	rpm	–	5000 10000	5000 10000
• Mechanical				
- Single-turn	rpm	12000	12000	12000
- Multi-turn	rpm	10000	10000	10000
Cable length to downstream electronics, max. <sup>1)</sup>	m (ft)	100 (328)	–	–
• Up to 100-kHz-cycle	m (ft)	–	400 (1312)	–
• Up to 300-kHz-cycle	m (ft)	–	100 (328)	150 (492)
• Up to 1-MHz-cycle	m (ft)	–	50 (164)	50 (164)
Connection		DRIVE-CLiQ connector, radial	Flange outlet, axial/radial	Flange outlet, axial/radial
Resolution				
• Single-turn	bit	22	13 (8192 steps)	13 (8192 steps)
• Multi-turn	bit	34 (22 bit single-turn + 12 bit multi-turn)	25 (8192 steps × 4096 revolutions)	25 (8192 steps × 4096 revolutions)

<sup>1)</sup> Observe the maximum permissible cable length of the connected module.

# Measuring systems

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Technical specifications (continued)

Product name		Absolute encoder with DRIVE-CLiQ 6FX2001-5.D...-0AA1	Absolute encoder with SSI 6FX2001-5.S..	Absolute encoder with EnDat 6FX2001-5.E..
<b>Frame</b>				
• Single-turn	bit	–	13 without parity	According to EnDat specification
• Multi-turn	bit	–	25 without parity	According to EnDat specification
<b>Incremental track</b>	S/R	2048, 1 V <sub>pp</sub> (internal only)	–	512, 1 V <sub>pp</sub>
<b>Code type</b>				
• Sampling		Gray	Gray	Gray
• Transmission		DRIVE-CLiQ	Gray, fir tree format	Binary
<b>Parameterization capability</b>				
• Preset		–	Set to zero	–
• Counting direction		Yes	Yes	–
<b>Accuracy</b>	arcsec	± 36	± 79 (with 8192 steps)	± 60 (Incremental track)
<b>Friction torque</b> (at 20 °C/68 °F)	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Starting torque</b> (at 20 °C/68 °F)	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Shaft loading capacity</b>				
• n ≤ 6000 rpm				
- Axial	N (lb <sub>f</sub> )	40 (8.99)	40 (8.99)	40 (8.99)
- Radial at shaft extension	N (lb <sub>f</sub> )	60 (13.5)	60 (13.5)	60 (13.5)
• n > 6000 rpm				
- Axial	N (lb <sub>f</sub> )	10 (2.25)	10 (2.25)	10 (2.25)
- Radial at shaft extension	N (lb <sub>f</sub> )	20 (4.50)	20 (4.50)	20 (4.50)
<b>Shaft diameter</b>				
• Synchro flange	mm (in)	6 (0.24)	6 (0.24)	6 (0.24)
• Clamp flange	mm (in)	10 (0.39)	10 (0.39)	10 (0.39)
• Torque arm Hollow shaft	mm (in)	10 or 12 (0.39 or 0.47)	–	–
<b>Shaft length</b>				
• Synchro flange	mm (in)	10 (0.39)	10 (0.39)	10 (0.39)
• Clamp flange	mm (in)	20 (0.79)	20 (0.79)	20 (0.79)
<b>Angular acceleration, max.</b>	rad/s <sup>2</sup>	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>
<b>Moment of inertia of rotor</b>				
• Solid shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	1.90 × 10 <sup>-6</sup> (16.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )
• Hollow shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	2.80 × 10 <sup>-6</sup> (24.8 × 10 <sup>-6</sup> )	–	–
<b>Vibration (55 ... 2000 Hz) in accordance with EN 60068-2-6</b>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 100 (328)	≤ 300 (984)	≤ 300 (984)
<b>Shock in accordance with EN 60068-2-27</b>				
• 2 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 2000 (6562)	≤ 2000 (6562)	≤ 2000 (6562)
• 6 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>				
• Without shaft input		IP67	IP67	IP67
• With shaft input		IP64	IP64	IP64
<b>Ambient temperature</b>				
• Operation	°C (°F)	-20 ... +100 (-4 ... +212)	-40 ... +85 (-40 ... +185)	-40 ... +100 (-40 ... +212)
<b>Weight, approx.</b>				
• Single-turn	kg (lb)	0.4 (0.88)	0.35 (0.77)	0.35 (0.77)
• Multi-turn	kg (lb)	0.5 (1.10)	0.35 (0.77)	0.35 (0.77)
<b>EMC</b>		Tested in accordance with DIN EN 50081 and EN 50082	Tested in accordance with DIN EN 50081 and EN 50082	Tested in accordance with DIN EN 50081 and EN 50082
<b>Approvals, according to</b>		CE, cULus	CE, cULus	CE, cULus

S/R = signals/revolution

### Technical specifications (continued)

Product name		Absolute encoder with PROFIBUS DP	Absolute encoder with PROFINET IO
		6FX2001-5.P..	6FX2001-5.N..
Operating voltage DC $V_p$ on encoder	V	10 ... 30	10 ... 30
<b>Current consumption, approx.</b>			
• Single-turn	mA	300 ... 100 (2.5 W)	400 ... 130 (< 4 W)
• Multi-turn	mA	300 ... 100 (2.5 W)	400 ... 130 (< 4 W)
<b>Interface</b>		PROFIBUS DP-V2	PROFINET IO with RT/IRT
<b>Clock input</b>		Differential cable receiver acc. to EIA standard RS485	2 IRT ports
<b>Data output</b>		Differential cable driver acc. to EIA standard RS485	2 IRT ports
<b>Short-circuit strength</b>		Yes	Yes
<b>Transmission rate</b>	Mbit/s	12	100
<b>LED for diagnostics</b>		Green/red	Green/red/yellow
<b>Speed, max.</b>			
• Electrical			
- At $\pm 1$ bit accuracy	rpm	5800	5800
• Mechanical			
- Single-turn	rpm	12000	12000
- Multi-turn	rpm	6000	6000
<b>Cable length to downstream electronics, max.<sup>1)</sup></b>			
• Up to 93.75 kbit/s	m (ft)	1200 (3937)	–
• Up to 1.5 Mbit/s	m (ft)	200 (656)	–
• Up to 12 Mbit/s	m (ft)	100 (328)	100 (328)
<b>Number of nodes</b>		99	–
<b>Connection</b>		Terminal block with address selector switch and bus terminating resistor in removable cover with radial cable glands (3 units)	2 x M12 plug connectors, 4-pole for PROFINET ports 1 x M12 plug connector, 4-pole for operating voltage
• Cable diameter	mm (in)	6.5 ... 9 (0.26 ... 0.35) Removal of cover possible without interrupting bus	–
<b>Resolution</b>			
• Single-turn	bit	13 (8192 steps)	13 (8192 steps)
• Multi-turn	bit	27 (8192 steps x 16384 revolutions)	27 (8192 steps x 16384 revolutions)
<b>Frame</b>		According to PNO encoder profile V 4.1 Class 1, Class 2, Class 3 Standard frame 81	According to PNO encoder profile V 4.1 Class 1, Class 2, Class 3, Class 4 Standard frames 81/82/83/84 Siemens frame 860
<b>Code type</b>			
• Sampling		Gray	Gray
• Transmission		Binary, PROFIBUS	Binary, PROFINET
<b>Bus load, approx.</b>			
• At 12 Mbit/s per encoder	$\mu$ s	20	–
<b>Cycle time</b>	ms	0.667	1 ... 100

<sup>1)</sup> Observe the maximum permissible cable length of the connected module.

# Measuring systems

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Technical specifications (continued)

Product name		Absolute encoder with PROFIBUS DP 6FX2001-5.P..	Absolute encoder with PROFINET IO 6FX2001-5.N..
<b>Parameterization capability</b>			
• Resolution per revolution		1 ... 8192	1 ... 8192
• Total resolution		1 ... 16384	1 ... 16384
• Preset		Yes	Yes
• Counting direction		Yes	Yes
• Speed signal		Yes	Yes
• Limit switches		Yes, 2 units	No
• Isochronous mode		Yes	Yes
• Direct data exchange		Yes	No
<b>Online parameterization</b>		Yes	Yes
<b>PNO certificate</b>		Yes	Yes
<b>Supported profiles</b>		PNO encoder profile V 4.1	PNO encoder profile V 4.1
<b>Accuracy with 8192 steps</b>	arcsec	± 79 (± ½ LSB)	± 79 (± ½ LSB)
<b>Frictional torque</b> (at 20 °C/68 °F)	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Starting torque</b> (at 20 °C/68 °F)	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Shaft loading capacity</b>			
• $n \leq 6000$ rpm			
- Axial	N (lb <sub>f</sub> )	40 (8.99)	40 (8.99)
- Radial at shaft extension	N (lb <sub>f</sub> )	110 (24.73)	110 (24.73)
• $n > 6000$ rpm			
- Axial	N (lb <sub>f</sub> )	10 (2.25)	10 (2.25)
- Radial at shaft extension	N (lb <sub>f</sub> )	20 (4.50)	20 (4.50)
<b>Shaft diameter</b>			
• Synchro flange	mm (in)	6 (0.24)	6 (0.24)
• Clamp flange	mm (in)	10 (0.39)	10 (0.39)
• Torque arm Hollow shaft	mm (in)	15 (0.59) <sup>1)</sup>	15 (0.59) <sup>1)</sup>
<b>Shaft length</b>			
• Synchro flange	mm (in)	10 (0.39)	10 (0.39)
• Clamp flange	mm (in)	20 (0.79)	20 (0.79)
<b>Angular acceleration, max.</b>	rad/s <sup>2</sup>	10 <sup>5</sup>	10 <sup>5</sup>
<b>Moment of inertia of rotor</b>			
• Solid shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	1.90 × 10 <sup>-6</sup> (16.8 × 10 <sup>-6</sup> )	1.90 × 10 <sup>-6</sup> (16.8 × 10 <sup>-6</sup> )
• Hollow shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	2.80 × 10 <sup>-6</sup> (24.8 × 10 <sup>-6</sup> )	2.80 × 10 <sup>-6</sup> (24.8 × 10 <sup>-6</sup> )
<b>Vibration (55 ... 2000 Hz) in accordance with EN 60068-2-6</b>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 100 (328)	≤ 100 (328)
<b>Shock in accordance with EN 60068-2-27</b>			
• 2 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 2000 (6562)	≤ 2000 (6562)
• 6 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 1000 (3281)	≤ 1000 (3281)
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>			
• Without shaft input		IP67	IP67
• With shaft input		IP64	IP64
<b>Ambient temperature</b>			
• Operation	°C (°F)	-40 ... +85 (-40 ... +185)	-40 ... +85 (-40 ... +185)
<b>Weight, approx.</b>			
• Single-turn	kg (lb)	0.4 (0.88)	0.4 (0.88)
• Multi-turn	kg (lb)	0.5 (1.10)	0.5 (1.10)
<b>EMC</b>		Tested in accordance with DIN EN 50081 and EN 50082	Tested in accordance with DIN EN 50081 and EN 50082
<b>Approvals, according to</b>		CE, cULus	CE, cULus

<sup>1)</sup> Hollow shaft diameter 12 mm, 10 mm or 8 mm (0.47 in, 0.39 in or 0.31 in) possible using supplied reducing sleeves.

### Selection and ordering data

Description	Order No.
<b>Absolute encoders with DRIVE-CLiQ</b> 24 V DC supply voltage	
<u>Radial connection</u>	
• Synchro flange Solid shaft	<b>6FX2001-5FD</b> ■ ■ -0AA1
• Clamp flange Solid shaft	<b>6FX2001-5QD</b> ■ ■ -0AA1
• Torque arm - Hollow shaft Ø 10 mm (0.39 in) - Hollow shaft Ø 12 mm (0.47 in)	<b>6FX2001-5VD</b> ■ ■ -0AA1 <b>6FX2001-5WD</b> ■ ■ -0AA1
<u>Resolution</u>	
• Single-turn 22 bit	<b>1 3</b>
• Multi-turn 34 bit	<b>2 5</b>
<b>Absolute encoders with SSI</b> 10 ... 30 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-5HS</b> ■ ■
• Radial flange outlet	<b>6FX2001-5FS</b> ■ ■
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-5SS</b> ■ ■
• Radial flange outlet	<b>6FX2001-5QS</b> ■ ■
<u>Resolution</u>	
• Single-turn 8192 steps/revolution (13 bit)	<b>1 2</b>
• Multi-turn 8192 steps/revolution, 4096 revolutions (25 bit)	<b>2 4</b>
<b>Absolute encoders with EnDat</b> 5 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-5HE</b> ■ ■
• Radial flange outlet	<b>6FX2001-5FE</b> ■ ■
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-5SE</b> ■ ■
• Radial flange outlet	<b>6FX2001-5QE</b> ■ ■
<u>Resolution</u>	
• Single-turn 8192 steps/revolution (13 bit)	<b>1 3</b>
• Multi-turn 8192 steps/revolution, 4096 revolutions (25 bit)	<b>2 5</b>

Description	Order No.
<b>Absolute encoders with PROFIBUS DP</b> 10 ... 30 V DC supply voltage	
<u>Radial connection</u>	
• Synchro flange Solid shaft	<b>6FX2001-5FP</b> ■ ■
• Clamp flange Solid shaft	<b>6FX2001-5QP</b> ■ ■
• Torque arm Hollow shaft Ø 15 mm (0.59 in) <sup>1)</sup>	<b>6FX2001-5WP</b> ■ ■
<u>Resolution</u>	
• Single-turn 8192 steps/revolution (13 bit)	<b>1 2</b>
• Multi-turn 8192 steps/revolution, 16384 revolutions (27 bit)	<b>2 4</b>
<b>Absolute encoders with PROFINET IO</b> 10 ... 30 V DC supply voltage	
<u>Radial connection</u>	
• Synchro flange Solid shaft	<b>6FX2001-5FN</b> ■ ■
• Clamp flange Solid shaft	<b>6FX2001-5QN</b> ■ ■
• Torque arm Hollow shaft Ø 15 mm (0.59 in) <sup>1)</sup>	<b>6FX2001-5WN</b> ■ ■
<u>Resolution</u>	
• Single-turn 8192 steps/revolution (13 bit)	<b>1 3</b>
• Multi-turn 8192 steps/revolution, 16384 revolutions (27 bit)	<b>2 5</b>

### More information

Description	Order No.
<b>Decentralization with PROFIBUS DP/DPV1</b>	Via bookstore <b>ISBN: 978-3-89578-218-3</b>

<sup>1)</sup> Hollow shaft diameter 12 mm, 10 mm or 8 mm (0.47 in, 0.39 in or 0.31 in) possible using supplied reducing sleeves.

# Measuring systems

## Built-on optoelectronic rotary encoders

### Accessories

#### Overview



Couplings and clamp straps

#### Couplings and clamp straps

Couplings and clamp straps are available as mounting accessories for the built-on rotary encoders. The clamp straps are used to fix the encoders with Synchro flange.

#### Signal connector as mating connector

A signal connector with mating connector is available for encoders with flange outlet or with cable and connector. The connector with 12 contacts is suitable for all incremental encoders. The connector with 17 contacts is suitable for absolute encoders with EnDat.

#### Signal connector

A signal connector is available as replacement for encoders with cable and connector.

#### Technical specifications

Product name		Spring disk coupling 6FX2001-7KF..	Plug-in coupling 6FX2001-7KS..
<b>Transmission torque, max.</b>	Nm (oz <sub>f</sub> )	0.8 (2.88)	0.7 (2.52)
<b>Shaft diameter</b>			
• Both ends	mm (in)	6 (0.24)	6 or 10 (0.24 or 0.39)
• $d_1/d_2$	mm (in)	6/5 (0.24/0.20)	–
<b>Center offset of shafts, max.</b>	mm (in)	0.4 (0.02)	0.5 (0.02)
<b>Axial offset</b>	mm (in)	± 0.4 (0.02)	± 0.5 (0.02)
<b>Angular displacement of shafts, max.</b>	Degrees	3	1
<b>Torsional rigidity</b>	Nm/rad (oz <sub>f</sub> /rad)	150 (539.51)	31 (111.5)
<b>Lateral spring stiffness</b>	N/mm (lb <sub>f</sub> )	6 (1.35)	10 (2.25)
<b>Moment of inertia</b>	gcm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	19 (168 × 10 <sup>-7</sup> )	20 (177 × 10 <sup>-7</sup> )
<b>Speed, max.</b>	rpm	12000	12000
<b>Ambient temperature</b>			
• Operation	°C (°F)	-40 ... +150 (-40 ... +302)	-40 ... +80 (-40 ... +176)
<b>Weight, approx.</b>	g (oz)	16 (0.56)	20 (0.71)

#### Selection and ordering data

Description	Order No.
<b>Spring disk coupling</b> Shaft diameter: • 6 mm/6 mm (0.24 in/0.24 in) • 6 mm/5 mm (0.24 in/0.20 in)	<b>6FX2001-7KF10</b> <b>6FX2001-7KF06</b>
<b>Plug-in coupling</b> Shaft diameter: • 6 mm/6 mm (0.24 in/0.24 in) • 10 mm/10 mm (0.39 in/0.39 in)	<b>6FX2001-7KS06</b> <b>6FX2001-7KS10</b>
<b>Clamp strap (1 unit)</b> For double-track encoders and encoders with Synchro flange (3 units are required)	<b>6FX2001-7KP01</b>
<b>Signal connector with union nut (1 unit)</b> Mating connector for incremental encoder with TTL, sin/cos 1 V <sub>pp</sub> , HTL and absolute encoder with SSI 12-pole, insulator body each with 12 socket contacts 0,08 ... 0.22 mm <sup>2</sup> and 0.20 ... 0.56 mm <sup>2</sup> , 2 × cable clamp 6.5 ... 10 mm, and 10.1 ... 13 mm	<b>6FX2003-0SU12</b>
<b>Signal connector with union nut (1 unit)</b> Mating connector for absolute encoder with EnDat 17-pole, insulator body with 17 socket contacts 0,20 ... 0.56 mm <sup>2</sup> , 2 × cable clamp 6.5 ... 10 mm, and 10.1 ... 13 mm	<b>6FX2003-0SU17</b>
<b>Signal connector with external thread for encoders with cable (1 unit)</b> Replacement connector for incremental encoder with RS422, sin/cos 1 V <sub>pp</sub> and HTL 12-pole, insulator body with 12 pin contacts 0.20 ... 0.56 mm <sup>2</sup> , 2 × cable clamp 6.5 ... 10 mm, and 10.1 ... 13 mm	<b>6FX2003-0SA12</b>
<b>Power connecting cable</b> Pre-assembled cable for power supply of the absolute encoders with PROFINET IO with M12 plug connector and M12 plug socket, A-coded, 4-pole • Length 2 m (6.56 ft) • Length 3 m (9.84 ft) • Length 5 m (16.4 ft) • Length 10 m (32.8 ft) • Length 15 m (49.21 ft)	<b>6XV1801-5DH20</b> <b>6XV1801-5DH30</b> <b>6XV1801-5DH50</b> <b>6XV1801-5DN10</b> <b>6XV1801-5DN15</b>
<b>IE connecting cable</b> Pre-assembled signal cable for absolute encoders PROFINET IO with M12 plug connector and RJ45, D-coded, 4-pole • Length 2 m (6.56 ft) • Length 3 m (9.84 ft) • Length 5 m (16.4 ft) • Length 10 m (32.8 ft) • Length 15 m (49.21 ft)	<b>6XV1871-5TH20</b> <b>6XV1871-5TH30</b> <b>6XV1871-5TH50</b> <b>6XV1871-5TN10</b> <b>6XV1871-5TN15</b>
<b>IE FC RJ45 Plug 145 (1 unit)</b> 2 × 2 RJ45 connector with rugged metal enclosure and FC connection technology, 145° cable outlet	<b>6GK1901-1BB30-0AA0</b>
<b>IE FC M12 Plug PRO (1 unit)</b> M12 connector with metal enclosure and FC connection technology, axial cable outlet, D-coded	<b>6GK1901-0DB20-6AA0</b>
<b>IE FC TP Trailing Cable 2 × 2 (PROFINET Type C)</b> 4-wire, shielded, PROFINET-compliant, TP installation cable for trailing cable use Sold by the meter Max. length 2000 m (6562 ft) Minimum order 20 m (65.5 ft)	<b>6XV1840-3AH10</b>





# MOTION-CONNECT connection systems



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# MOTION-CONNECT connection systems

## Overview

Cable	For motor	MOTION-CONNECT 500	MOTION-CONNECT 800PLUS	Page
Dynamic requirements	SIMOTICS	Medium	High	
Environmental requirements		Medium	High	
UL/CSA		✓	✓	
Halogen-free		–	✓	
RoHS		✓	✓	
<b>Power cables with SPEED-CONNECT connector</b>				
	S-1FT7	✓	✓	8/9
	S-1FK7	✓	✓	8/10
	M-1PH808 M-1PH810	✓	✓	8/9
	L-1FN6	–	✓	8/18
	<b>Power cables with full-thread connector</b>			
	S-1FT7	✓	✓	8/11 ... 8/13
	S-1FK7	✓	✓	8/13
	M-1PH808 M-1PH810 M-1PH813	✓	✓	8/11, 8/13
	L-1FN3	–	✓	8/17
	T-1FW6	–	✓	8/20
	<b>Extensions for power cables with SPEED-CONNECT or full-thread connector</b>			
	S-1FT7	✓	✓	8/14
	S-1FK7	✓	✓	8/14
	M-1PH808 M-1PH810 M-1PH813	✓	✓	8/14
	L-1FN3	–	✓	8/17
	L-1FN6	–	✓	8/18
	T-1FW6	–	✓	8/20
<b>Power cables for motors with terminal box</b>				
	M-1PH808 M-1PH810 M-1PH813 M-1PH816	✓ 35 mm <sup>2</sup> or larger	✓ up to 16 mm <sup>2</sup>	8/15, 8/16
	T-1FW3	✓	✓ up to 16 mm <sup>2</sup>	8/19

✓ = Possible  
– = Not possible



Cable	For motor	MOTION-CONNECT 500	MOTION-CONNECT 800PLUS	Page
Dynamic requirements	SIMOTICS	Medium	High	
Environmental requirements		Medium	High	
UL/CSA		✓	✓	
Halogen-free		–	✓	
RoHS		✓	✓	
<b>MOTION-CONNECT DRIVE-CLiQ signal cables</b>				
	S-1FT7	✓	✓	8/25
	S-1FK7	✓	✓	8/25
	M-1PH8	✓	✓	8/25
	T-1FW3	✓	✓	8/25
<b>DRIVE-CLiQ signal cables for connecting non-Siemens direct measuring systems</b>				
	Non-Siemens direct measuring systems with DRIVE-CLiQ interface	✓	✓	8/25
<b>Extensions for connecting non-Siemens direct measuring systems</b>				
	with DRIVE-CLiQ interface	✓	✓	8/25
<b>Signal cables with SPEED-CONNECT connector</b>				
	S-1FT7	✓	✓	8/26
	S-1FK7	✓	✓	8/26
	M-1PH808	✓	✓	8/26
	M-1PH810			
	M-1PH813			
M-1PH816				
<b>Extensions for signal cables with SPEED-CONNECT connector</b>				
	S-1FT7	✓	✓	8/26
	S-1FK7	✓	✓	8/26
	M-1PH808	✓	✓	8/26
	M-1PH810			
	M-1PH813			
M-1PH816				
<b>Signal cables with full-thread connector</b>				
	M-1PH8	✓	✓	8/26, 8/27
	L-1FN3	–	✓	8/26, 8/27
	L-1FN6	–	✓	8/26, 8/27
	T-1FW3	✓	✓	8/26
	T-1FW6	–	✓	8/26, 8/27
<b>Extensions for signal cables with full-thread connector</b>				
	M-1PH8	✓	✓	8/26, 8/27
	T-1FW3	✓	✓	8/26

✓ = Possible  
– = Not possible

# MOTION-CONNECT connection systems

## Introduction

### General information

#### Overview

MOTION-CONNECT cables are suitable for use with many different types of machine tools and production machinery.

The following variants of MOTION-CONNECT cable are available as fully-assembled power and signal cables or sold by the meter:

- **MOTION-CONNECT 500**
  - Cost-effective solution for predominantly fixed installation
  - Suitable for low mechanical loading
  - Tested for travel distances of up to 5 m (16.41 ft)
- **MOTION-CONNECT 800PLUS**
  - Meets requirements for use in cable carriers
  - Suitable for high mechanical loading
  - Oil resistance
  - Tested for travel distances of up to 50 m (164 ft)

#### Benefits

Pre-assembled MOTION-CONNECT cables provide high quality and perfect, system-tested functionality.

#### SPEED-CONNECT

Fast, stable and reliable connections can be made with the new, pre-assembled cables with SPEED-CONNECT connectors. With a short rotation as far as the stop, the cap nut of the connector secures the connection.

The cables with SPEED-CONNECT connectors supplement the previous offering of MOTION-CONNECT cables with full-thread connectors.

#### Application

MOTION-CONNECT cables are intended for use in machines. They are not suitable for building technology applications or outdoor installation.

MOTION-CONNECT cables are tested in a cable carrier with horizontal travel distance and are also designed for cable carrier installation. They are not self-supporting.

The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

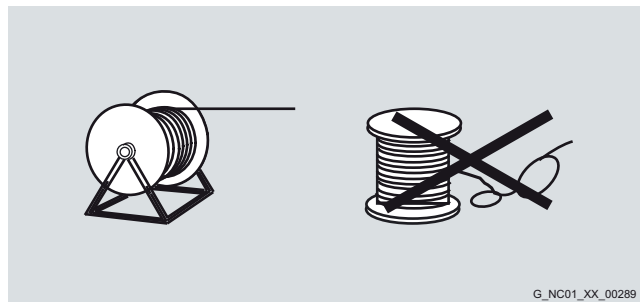
When cable lengths (basic cables and extensions) are determined for the systems and applications described in this catalog, the technically permissible maximum cable lengths (e.g. 25 m (82 ft)) specified in the catalog must be observed. Malfunctions can occur if longer cables are used.

Siemens AG assumes no liability for correct transmission of signals or power in this case.

Compatibility between SPEED-CONNECT and full-thread connectors:

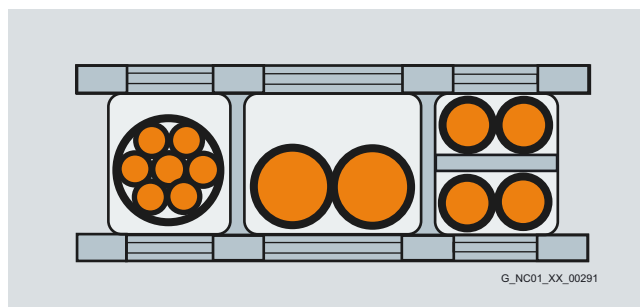
Connector on motor with external thread	Connector with cap nut on cable	Compatibility
SPEED-CONNECT	SPEED-CONNECT	✓
SPEED-CONNECT	Full-thread	✓
Full-thread	Full-thread	✓
Full-thread	SPEED-CONNECT	–

#### Function



G\_NC01\_XX\_00289

The cables must be removed from the drum without twisting, i.e. the cables must be unwound and must never be lifted over the drum flange in loops.

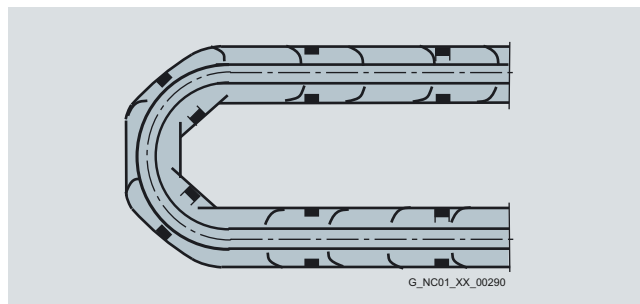


G\_NC01\_XX\_00291

To maximize the service life of the cable carrier and cables, cables in the carrier made from different materials must be separated by spacers in the cable carrier. The spacers must be filled evenly to ensure that the position of the cables does not change during operation. The cables should be distributed as symmetrically as possible according to their weights and dimensions. Cables with very different outer diameters should also be separated by spacers.

When inserting pre-assembled cables into the cable carrier, do **not** pull at the connector, as this may damage the strain relief or cable clamping.

The cables must not be fixed in the cable carrier. They must be freely movable.

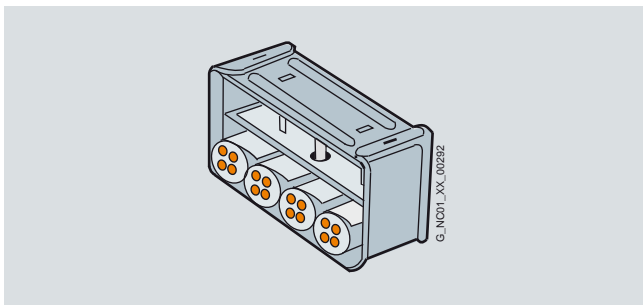


G\_NC01\_XX\_00290

The cables must be able to be moved without applying force in particular in the bending radii of the carrier. The specified minimum bending radii must be adhered to.

The cable fixings must be attached at both ends at an appropriate distance away from the end points of the moving parts in a dead zone.

#### Function (continued)



MOTION-CONNECT cables are tested in a cable carrier. The cables are attached at one end by means of strain relief to the moving ends of the cable carrier. Strain relief is applied over a wide area of the cable jacket surface without crimping the cable.

Cables must be installed in accordance with the instructions supplied by the cable carrier manufacturer.

#### Notes:

If, for example, pre-assembled cables are installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connector can also be supplied (power and signal cables<sup>1)</sup>). In this case, the contacts of the cables are crimped and the connector enclosure is supplied separately. After installing the cables, the customer assembles the connector enclosure.

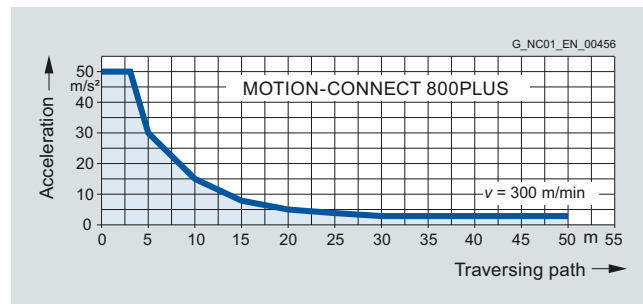
In case of vibration load and with horizontal or vertical cable entries, we recommend that the cable is additionally fixed if between the cable strain relief on the cable carrier and the terminal at the motor part of the cable is hanging loose or is not routed. To prevent machine vibrations being transmitted to the connectors, the cable should be fixed at the moving part where the motor is mounted.

#### Representation in connection overviews

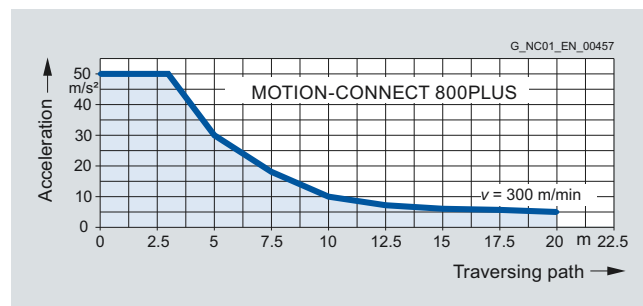
Symbol	Explanation
	Connector with pin contacts
	Connector with socket contacts
	Exposed core ends

#### Characteristics for MOTION-CONNECT 800PLUS

The shaded area beneath the characteristic represents the potential range of use for the cables. The characteristics represent the tested operating points.



Acceleration for signal and power cables  
MOTION-CONNECT 800PLUS up to 16 mm<sup>2</sup>



Acceleration for power cables  
MOTION-CONNECT 800PLUS with 25 mm<sup>2</sup>, 35 mm<sup>2</sup> and 50 mm<sup>2</sup>

<sup>1)</sup> Not applicable to DRIVE-CLiQ signal cables.

# MOTION-CONNECT connection systems

## Introduction

### General information

#### More information

##### Current carrying capacity for power and signal cables

The current carrying capacity of PVC/PUR-insulated copper cables is specified for installation types B1, B2, C and E under continuous operating conditions in the table with reference to an ambient air temperature of 40 °C (104 °F). For other ambient temperatures, the values must be corrected by the derating factors from the table.

Cross-section mm <sup>2</sup>	Current carrying capacity rms AC 50/60 Hz or DC in amps for installation type			
	B1 Single-core cables in protection tubes or installation ducts	B2 Multi-core cables in protection tubes or installation ducts	C Multi-core cables, vertically or horizontally on walls/open, without protection tubes and installation ducts/with contact	E Multi-core cables, horizontally or vertically on perforated cable racks/open, without protection tubes and installation ducts/with contact
<b>Electronics<sup>1)</sup></b>				
0.20	–	4.3	4.4	4.4
0.50	–	7.5	7.5	7.8
0.75	–	9	9.5	10
<b>Power<sup>2)</sup></b>				
0.75	8.6	8.5	9.8	10.4
1.00	10.3	10.1	11.7	12.4
1.50	13.5	13.1	15.2	16.1
2.50	18.3	17.4	21	22
4	24	23	28	30
6	31	30	36	37
10	44	40	50	52
16	59	54	66	70
25	77	70	84	88
35	96	86	104	110
50	117	103	125	133
70	149	130	160	171
95	180	165	194	207
120	208	179	225	240

##### Derating factors for power and signal cables

Ambient air temperature °C (°F)	Derating factor according to EN 60204-1, Table D.1
30 (86)	1.15
35 (95)	1.08
40 (104)	1.00
45 (113)	0.91
50 (122)	0.82
55 (131)	0.71
60 (140)	0.58

<sup>1)</sup> One control circuit pair.

<sup>2)</sup> One symmetrically loaded AC cable.

### Overview



Power cable for connecting a SIMOTICS M-1PH8 motor with terminal box to a SINAMICS S120 Motor Module

The synchronous and asynchronous motors are connected to the Motor Modules or Power Modules by means of MOTION-CONNECT power cables.

The pre-assembled MOTION-CONNECT power cables are of high quality and offer safety with problem-free functioning.

Depending on the design, the MOTION-CONNECT power cables are either pre-assembled at one end or at both ends.

If pre-assembled power cables are to be installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connector can also be supplied. In this case, the contacts of the cables are crimped and the connector enclosure is supplied separately. After installing the cables, the customer assembles the connector enclosure.

The 6FX.002-5.... power cables are available with crimped contacts and with the connector enclosure supplied separately (not applicable to DRIVE-CLiQ power cables).

Power cables with separately supplied motor-end connector enclosure. In this case, the 6th position of the Order No. must be changed from **0** to **4**: 6FX.042-5....-....

Power cables with separately supplied module-end connector enclosure. In this case, the 6th position of the Order No. must be changed from **0** to **1**: 6FX.012-5....-....



Power cable with supplied connector for connecting a SIMOTICS S -1FT7/-1FK7/SIMOTICS M-1PH8 motor to a SINAMICS S120 Motor Module

#### Type of delivery for pre-assembled power cables

Pre-assembled power cables can be ordered in units of 10 cm (3.94 in) up to a maximum length of 299.8 m (984 ft).

The cables are supplied on reels up to 30 kg or 100 m (66.2 lb or 328 ft). Above 30 kg or 100 m (66.2 lb or 328 ft), cable drums are used instead of reels. This applies to both pre-assembled power cables and for cables sold by the meter.

#### Type of delivery for power cables sold by the meter

##### Fixed lengths

Cross-section	Brake cores	MOTION-CONNECT 500 MOTION-CONNECT 800PLUS
1.5 mm <sup>2</sup>	without/with	50 m (164 ft), 100 m (328 ft), 200 m (656 ft), 500 m (1641 ft)
2.5 mm <sup>2</sup>	without/with	50 m (164 ft), 100 m (328 ft), 200 m (656 ft), 500 m (1641 ft)

##### Variable length, available in exact meter lengths

Cross-section	Brake cores	MOTION-CONNECT 500	MOTION-CONNECT 800PLUS
4 mm <sup>2</sup>	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
6 mm <sup>2</sup>	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
10 mm <sup>2</sup>	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
16 mm <sup>2</sup>	without/with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
25 mm <sup>2</sup>	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
35 mm <sup>2</sup>	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
50 mm <sup>2</sup>	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
70 mm <sup>2</sup>	without	≤ 100 m (328 ft)	≤ 100 m (328 ft)
95 mm <sup>2</sup>	without	≤ 100 m (328 ft)	≤ 100 m (328 ft)
120 mm <sup>2</sup>	without	≤ 100 m (328 ft)	≤ 100 m (328 ft)

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Technical specifications

Power cables	MOTION-CONNECT 500 6FX500-.....-.....	MOTION-CONNECT 800PLUS 6FX800-.....-.....
<b>Approvals, according to</b>		
• VDE <sup>1)</sup>	Yes	Yes
• cURus or UR/CSA	UL 758, CSA-C22.2-N.210.2-M90	UL 758, CSA-C22.2-N.210.2-M90
• UR-CSA File No. <sup>2)</sup>	Yes	Yes
• RoHS conformity	Yes	Yes
<b>Rated voltage <math>V_0/V</math> in accordance with EN 50395</b>		
• Power conductors	600 V/1000 V	600 V/1000 V
• Signal conductors	24 V (EN) 1000 V (UL/CSA)	24 V (EN) 1000 V (UL/CSA)
<b>Test voltage, rms</b>		
• Power conductors	4 kV	4 kV
• Signal conductors	2 kV	2 kV
<b>Operating temperature on the surface</b>		
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile stress, max.</b>		
• Fixed installation	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>		
• Fixed installation	5 × $D_{max}$	4 × $D_{max}$
• Flexible installation	<a href="#">See selection and ordering data</a>	<a href="#">See selection and ordering data</a>
<b>Torsional stress</b>	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	100000	10 million
<b>Traversing velocity</b>	30 m/min (98.4 ft/min)	Up to 300 m/min (984 ft/min)
<b>Acceleration</b>	2 m/s <sup>2</sup> (6.56 ft/s <sup>2</sup> )	Up to 50 m/s <sup>2</sup> (164 ft/s <sup>2</sup> ), <a href="#">see characteristics</a>
<b>Insulation material, incl. jacket</b>	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
<b>Outer jacket</b>	PVC DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color orange RAL 2003
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled power cables and their extensions when closed and inserted: IP67.

<sup>1)</sup> The respective registration number is printed on the cable jacket (only applies to power cables).

<sup>2)</sup> The File No. is printed on the cable jacket.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Power cables for SIMOTICS S-1FT7/-1FK7/ SIMOTICS M-1PH8 motors with SPEED-CONNECT connector

#### Selection and ordering data

For SIMOTICS S-1FT7 motors *without* holding brake/SIMOTICS M-1PH80/-1PH810 motors with SPEED-CONNECT connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	Number of cores x cross-section  mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable without brake cores	Cable sold by the meter <sup>1)</sup> without brake cores	$D_{max}$	Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
			Order No.	Order No.		6FX5	6FX8	6FX5	6FX8	
					mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Connector <sup>3)</sup>	4 × 1.5	1	6FX002-5CN01-....	6FX008-1BB11-....	8.4 (0.33)	9.5 (0.37)	0.12 (0.08)	0.15 (0.10)	155 (6.10)	75 (2.95)
		1.5	6FX002-5CN21-....							
	4 × 2.5	1	6FX002-5CN11-....	6FX008-1BB21-....	10.0 (0.39)	11.0 (0.43)	0.21 (0.14)	0.20 (0.13)	180 (7.09)	90 (3.54)
		1.5	6FX002-5CN31-....							
	4 × 4	1.5	6FX002-5CN41-....	6FX008-1BB31-....	11.4 (0.45)	12.3 (0.48)	0.27 (0.18)	0.27 (0.18)	210 (8.27)	100 (3.94)
	4 × 6	1.5	6FX002-5CN51-....	6FX008-1BB41-....	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
4 × 10	1.5	6FX002-5CN61-....	6FX008-1BB51-....	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)	
Ring cable lugs <sup>4)</sup>	4 × 6	1.5	6FX002-5CN54-....	6FX008-1BB41-....	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
	4 × 10	1.5	6FX002-5CN64-....	6FX008-1BB51-....	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

For SIMOTICS S-1FT7 motors *with* holding brake and with SPEED-CONNECT connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	Number of cores x cross-section  mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable with brake cores	Cable sold by the meter <sup>1)</sup> with brake cores	$D_{max}$	Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
			Order No.	Order No.		6FX5	6FX8	6FX5	6FX8	
					mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Connector <sup>3)</sup>	4 × 1.5+2 × 1.5	0.5	6FX002-5DN20-....	6FX008-1BA11-....	10.8 (0.43)	12.0 (0.47)	0.22 (0.15)	0.23 (0.16)	195 (7.68)	90 (3.54)
		1	6FX002-5DN01-....							
		1.5	6FX002-5DN21-....							
	4 × 2.5+2 × 1.5	1	6FX002-5DN11-....	6FX008-1BA21-....	12.4 (0.49)	13.8 (0.54)	0.25 (0.17)	0.30 (0.20)	225 (8.86)	105 (4.13)
		1.5	6FX002-5DN31-....							
	4 × 4+2 × 1.5	1.5	6FX002-5DN41-....	6FX008-1BA31-....	14.0 (0.55)	15.2 (0.60)	0.35 (0.24)	0.38 (0.26)	255 (10.04)	115 (4.53)
4 × 6+2 × 1.5	1.5	6FX002-5DN51-....	6FX008-1BA41-....	16.1 (0.63)	17.3 (0.68)	0.49 (0.33)	0.50 (0.34)	290 (11.42)	130 (5.12)	
4 × 10+2 × 1.5	1.5	6FX002-5DN61-....	6FX008-1BA51-....	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)	
Ring cable lugs <sup>4)</sup>	4 × 6+2 × 1.5	1.5	6FX002-5DN54-....	6FX008-1BA41-....	16.1 (0.63)	17.3 (0.68)	0.49 (0.33)	0.50 (0.34)	290 (11.42)	130 (5.12)
	4 × 10+2 × 1.5	1.5	6FX002-5DN64-....	6FX008-1BA51-....	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>3)</sup> For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.

<sup>4)</sup> For SINAMICS S120 Motor Modules 45 A and 60 A in booksize format.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

Power cables for SIMOTICS S-1FT7/-1FK7/  
SIMOTICS M-1PH8 motors with SPEED-CONNECT connector

### Selection and ordering data (continued)

#### For SIMOTICS S-1FK7 motors without holding brake and with SPEED-CONNECT connector on SINAMICS S120 Power Modules

Connection method, Power Module end	Number of cores × cross-section mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable <u>without</u> brake cores	Cable sold by the meter <sup>1)</sup> <u>without</u> brake cores	$D_{max}$	Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
			Order No.	Order No.		6FX5	6FX8	6FX5	6FX8	6FX5
					mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5	1	6FX002-5CG10-....	6FX008-1BB11-....	8.4 (0.33)	9.5 (0.37)	0.12 (0.08)	0.15 (0.10)	155 (6.10)	75 (2.95)
		1.5	6FX002-5CG22-....							
	4 × 2.5	1	6FX002-5CG12-....	6FX008-1BB21-....	10.0 (0.39)	11.0 (0.43)	0.21 (0.14)	0.20 (0.13)	180 (7.09)	90 (3.54)
		1.5	6FX002-5CG32-....							
	4 × 4	1.5	6FX002-5CG42-....	6FX008-1BB31-....	11.4 (0.45)	12.3 (0.48)	0.27 (0.18)	0.27 (0.18)	210 (8.27)	100 (3.94)
	4 × 6	1.5	6FX002-5CG52-....	6FX008-1BB41-....	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
4 × 10	1.5	6FX002-5CG62-....	6FX008-1BB51-....	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)	
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

#### For SIMOTICS S-1FK7 motors with holding brake and with SPEED-CONNECT connector on SINAMICS S120 Power Modules

Connection method, Power Module end	Number of cores × cross-section mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable <u>with</u> brake cores	Cable sold by the meter <sup>1)</sup> <u>with</u> brake cores	$D_{max}$	Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
			Order No.	Order No.		6FX5	6FX8	6FX5	6FX8	6FX5
					mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5+2 × 1.5	0.5	6FX002-5DN30-....	6FX008-1BA11-....	10.8 (0.43)	12.0 (0.47)	0.22 (0.15)	0.23 (0.16)	195 (7.68)	90 (3.54)
		1	6FX002-5DG10-....							
	4 × 2.5+2 × 1.5	1	6FX002-5DG12-....	6FX008-1BA21-....	12.4 (0.49)	13.8 (0.54)	0.25 (0.17)	0.30 (0.20)	225 (8.86)	105 (4.13)
		1.5	6FX002-5DG32-....							
	4 × 4+2 × 1.5	1.5	6FX002-5DG42-....	6FX008-1BA31-....	14.0 (0.55)	15.2 (0.60)	0.35 (0.24)	0.38 (0.26)	255 (10.04)	115 (4.53)
	4 × 6+2 × 1.5	1.5	6FX002-5DG52-....	6FX008-1BA41-....	16.1 (0.63)	17.3 (0.68)	0.49 (0.33)	0.50 (0.34)	290 (11.42)	130 (5.12)
4 × 10+2 × 1.5	1.5	6FX002-5DG62-....	6FX008-1BA51-....	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)	
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.



# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Power cables for SIMOTICS S-1FT7/-1FK7/ SIMOTICS M-1PH8 motors with full-thread connector

#### Selection and ordering data

For SIMOTICS S-1FT7 motors without holding brake/SIMOTICS M-1PH808/-1PH810/-1PH813 motors with full-thread connector on SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	Number of cores x cross-section  mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable without brake cores	Cable sold by the meter <sup>1)</sup> without brake cores	$D_{max}$		Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>	
			Order No.	Order No.	6FX5 mm (in)	6FX8 mm (in)	6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)
Connector <sup>3)</sup>	4 x 1.5	1	6FX002-5CS01-....	6FX008-1BB11-....	8.4 (0.33)	9.5 (0.37)	0.12 (0.08)	0.15 (0.10)	155 (6.10)	75 (2.95)
		1.5	6FX002-5CS21-....							
		e. c. <sup>4)</sup>	6FX5002-5CS02-....							
	4 x 2.5	1	6FX002-5CS11-....	6FX008-1BB21-....	10.0 (0.39)	11.0 (0.43)	0.21 (0.14)	0.20 (0.13)	180 (7.09)	90 (3.54)
		1.5	6FX002-5CS31-....							
		e. c. <sup>4)</sup>	6FX5002-5CS12-....							
	4 x 4	1.5	6FX002-5CS41-....	6FX008-1BB31-....	11.4 (0.45)	12.3 (0.48)	0.27 (0.18)	0.27 (0.18)	210 (8.27)	100 (3.94)
		e. c. <sup>4)</sup>	6FX5002-5CS42-....							
	4 x 6	1.5	6FX002-5CS51-....	6FX008-1BB41-....	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
		e. c. <sup>4)</sup>	6FX5002-5CS52-....							
	4 x 10	1.5	6FX002-5CS61-....	6FX008-1BB51-....	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)
		3	6FX002-5CS13-....							
e. c. <sup>4)</sup>		6FX5002-5CS62-....								
Ring cable lugs <sup>5)</sup>	4 x 6	1.5	6FX002-5CS54-....	6FX008-1BB41-....	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
		3	6FX002-5CS14-....							
	4 x 10	1.5	6FX002-5CS64-....	6FX008-1BB51-....	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)
		3	6FX002-5CS14-....							
	4 x 16	1.5	6FX8002-5CS24-....	6FX008-1BB61-....	24.2 (0.95)	22.3 (0.88)	1.10 (0.74)	1.01 (0.68)	440 (17.32)	170 (6.69)
		3	6FX002-5CS23-....							
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>3)</sup> For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.

<sup>4)</sup> e. c. = exposed core ends; suitable for motors with terminal box.

<sup>5)</sup> For SINAMICS S120 Motor Modules 45 A and 60 A in booksize format.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

Power cables for SIMOTICS S-1FT7/-1FK7/  
SIMOTICS M-1PH8 motors with full-thread connector

### Selection and ordering data (continued)

For SIMOTICS S-1FT7 motors with holding brake and with full-thread connector on  
SINAMICS S120 Motor Modules in booksize format

Connection method, Motor Module end	Number of cores x cross-section  mm <sup>2</sup>	Connec- tor size, motor end	Pre-assembled cable with brake cores  Order No.	Cable sold by the meter <sup>1)</sup> with brake cores  Order No.	$D_{max}$		Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
					6FX5 mm (in)	6FX8 mm (in)	6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)	
Connector <sup>3)</sup>	4 × 1.5+2 × 1.5	0.5	6FX5002-5DA20-....	6FX5008-1BA11-....	10.8 (0.43)	–	0.22 (0.15)	–	195 (7.68)	–	
			1	6FX002-5DS01-....	6FX008-1BA11-....	10.8 (0.43)	12.0 (0.47)	0.22 (0.15)	0.23 (0.16)	195 (7.68)	90 (3.54)
			1.5	6FX002-5DS21-....							
	4 × 2.5+2 × 1.5	1	6FX002-5DS11-....	6FX008-1BA21-....	12.4 (0.49)	13.8 (0.54)	0.25 (0.17)	0.30 (0.20)	225 (8.86)	105 (4.13)	
			1.5	6FX002-5DS31-....							
	4 × 4+2 × 1.5	1.5	6FX002-5DS41-....	6FX008-1BA31-....	14.0 (0.55)	15.2 (0.60)	0.35 (0.24)	0.38 (0.26)	255 (10.04)	115 (4.53)	
	4 × 6+2 × 1.5	1.5	6FX002-5DS51-....	6FX008-1BA41-....	16.1 (0.63)	17.3 (0.68)	0.49 (0.33)	0.50 (0.34)	290 (11.42)	130 (5.12)	
4 × 10+2 × 1.5	1.5	6FX002-5DS61-....	6FX008-1BA51-....	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)		
		3	6FX002-5DS13-....								
Ring cable lugs <sup>4)</sup>	4 × 6+2 × 1.5	1.5	6FX002-5DS54-....	6FX008-1BA41-....	16.1 (0.63)	17.3 (0.68)	0.49 (0.33)	0.50 (0.34)	290 (11.42)	130 (5.12)	
	4 × 10+2 × 1.5	1.5	6FX002-5DS64-....	6FX008-1BA51-....	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)	
			3	6FX002-5DS14-....							
4 × 16+2 × 1.5	3	6FX002-5DS23-....	6FX008-1BA61-....	25.0 (0.98)	23.8 (0.94)	1.12 (0.75)	1.03 (0.69)	450 (17.72)	180 (7.09)		
Exposed core ends <sup>5)</sup>	4 × 16+2 × 1.5	3	6FX002-5DG23-....	6FX008-1BA61-....	25.0 (0.98)	23.8 (0.94)	1.12 (0.75)	1.03 (0.69)	450 (17.72)	180 (7.09)	
	4 × 25+2 × 1.5	3	6FX002-5DG33-....	6FX008-1BA25-....	29.4 (1.16)	27.6 (1.09)	1.62 (1.09)	1.47 (0.99)	530 (20.87)	280 (11.02)	
	4 × 35+2 × 1.5	3	6FX002-5DG43-....	6FX008-1BA35-....	32.6 (1.28)	31.9 (1.26)	2.06 (1.38)	1.92 (1.29)	590 (23.23)	320 (12.60)	
	4 × 50+2 × 1.5	3	6FX002-5DG53-....	6FX008-1BA50-....	38.0 (1.50)	35.0 (1.38)	3.04 (2.04)	2.56 (1.72)	685 (26.97)	350 (13.78)	
<b>MOTION-CONNECT 500</b>			<b>5</b>								
<b>MOTION-CONNECT 800PLUS</b>			<b>8</b>								
Length code			....							....	

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>3)</sup> For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.

<sup>4)</sup> For SINAMICS S120 Motor Modules 45 A and 60 A in booksize format.

<sup>5)</sup> Length of core ends: 300 mm (11.81 in). 4 M8 cable lugs, 1 M6 cable lug and 1 spring-loaded terminal are also included in the scope of supply of the cables.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Power cables for SIMOTICS S-1FT7/-1FK7/ SIMOTICS M-1PH8 motors with full-thread connector

#### Selection and ordering data (continued)

**For SIMOTICS S-1FT7 motors without holding brake/SIMOTICS S-1FK7 motors without holding brake/  
SIMOTICS M-1PH808/-1PH810/-1PH813 motors with full-thread connector on SINAMICS S120 Motor Modules  
in booksize compact format and Power Modules**

Connection method, Power Module end	Number of cores x cross-section  mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable without brake cores	Cable sold by the meter <sup>1)</sup> without brake cores	$D_{max}$		Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>	
			Order No.	Order No.	6FX5 mm (in)	6FX8 mm (in)	6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)
Exposed core ends	4 x 1.5	1	6FX002-5CG01-....	6FX008-1BB11-....	8.4 (0.33)	9.5 (0.37)	0.12 (0.08)	0.15 (0.10)	155 (6.10)	75 (2.95)
		1.5	6FX002-5CG21-....							
	4 x 2.5	1	6FX002-5CG11-....	6FX008-1BB21-....	10.0 (0.39)	11.0 (0.43)	0.21 (0.14)	0.20 (0.13)	180 (7.09)	90 (3.54)
		1.5	6FX002-5CG31-....							
	4 x 4	1.5	6FX002-5CG41-....	6FX008-1BB31-....	11.4 (0.45)	12.3 (0.48)	0.27 (0.18)	0.27 (0.18)	210 (8.27)	100 (3.94)
	4 x 6	1.5	6FX002-5CG51-....	6FX008-1BB41-....	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
4 x 10	1.5	6FX002-5CG61-....	6FX008-1BB51-....	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)	
	3	6FX002-5CG13-....								
4 x 16	3	6FX002-5CG23-....	6FX008-1BB61-....	24.2 (0.95)	22.3 (0.88)	1.10 (0.74)	1.01 (0.68)	440 (17.32)	170 (6.69)	
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

**For SIMOTICS S-1FT7 motors with holding brake/SIMOTICS S-1FK7 motors with holding brake and with full-thread connector on SINAMICS S120 Motor Modules in booksize compact format and Power Modules**

Connection method, Power Module end	Number of cores x cross-section  mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable with brake cores	Cable sold by the meter <sup>1)</sup> with brake cores	$D_{max}$		Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>	
			Order No.	Order No.	6FX5 mm (in)	6FX8 mm (in)	6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)
Exposed core ends	4 x 1.5+2 x 1.5	0.5	6FX5002-5DA30-....	6FX5008-1BA11-....	10.8 (0.43)	–	0.22 (0.15)	–	195 (7.68)	–
		1	6FX002-5DG01-....	6FX008-1BA11-....	10.8 (0.43)	12.0 (0.47)	0.22 (0.15)	0.23 (0.16)	195 (7.68)	90 (3.54)
		1.5	6FX002-5DG21-....							
4 x 2.5+2 x 1.5	1	1	6FX002-5DG11-....	6FX008-1BA21-....	12.4 (0.49)	13.8 (0.54)	0.25 (0.17)	0.30 (0.20)	225 (8.86)	105 (4.13)
		1.5	6FX002-5DG31-....							
4 x 4+2 x 1.5	1.5	6FX002-5DG41-....	6FX008-1BA31-....	14.0 (0.55)	15.2 (0.60)	0.35 (0.24)	0.38 (0.26)	255 (10.04)	115 (4.53)	
4 x 6+2 x 1.5	1.5	6FX002-5DG51-....	6FX008-1BA41-....	16.1 (0.63)	17.3 (0.68)	0.49 (0.33)	0.50 (0.34)	290 (11.42)	130 (5.12)	
4 x 10+2 x 1.5	1.5	1	6FX002-5DG61-....	6FX008-1BA51-....	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)
		3	6FX002-5DG13-....							
4 x 16+2 x 1.5	3	6FX002-5DG23-....	6FX008-1BA61-....	25.0 (0.98)	23.8 (0.94)	1.12 (0.75)	1.03 (0.69)	450 (17.72)	180 (7.09)	
4 x 25+2 x 1.5	3	6FX002-5DG33-....	6FX008-1BA25-....	29.4 (1.16)	27.6 (1.09)	1.62 (1.09)	1.47 (0.99)	530 (20.87)	280 (11.02)	
4 x 35+2 x 1.5	3	6FX002-5DG43-....	6FX008-1BA35-....	32.6 (1.28)	31.9 (1.26)	2.06 (1.38)	1.92 (1.29)	590 (23.23)	320 (12.60)	
4 x 50+2 x 1.5	3	6FX002-5DG53-....	6FX008-1BA50-....	38.0 (1.50)	35.0 (1.38)	3.04 (2.04)	2.56 (1.72)	685 (26.97)	350 (13.78)	
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

Extensions for power cables  
with SPEED-CONNECT or full-thread connector

### Accessories

#### Extensions for power cables with SPEED-CONNECT or full-thread connector

Number of cores × cross-section without brake cores mm <sup>2</sup>		Connector size, motor end	Basic cable for motors on SINAMICS S120		Extension
with brake cores mm <sup>2</sup>			Motor Modules	Power Modules	Order No.
			Type	Type	
–	4 × 1.5+2 × 1.5	0.5	6FX . 002-5DA20-.... 6FX . 002-5DN20-....	6FX . 002-5DA30-.... 6FX . 002-5DN30-....	<b>6FX</b> ■002-5ME05-.... <b>6FX</b> ■002-5MN05-....
4 × 1.5	4 × 1.5+2 × 1.5	1	6FX . 002-5 . S01-.... 6FX . 002-5 . N01-....	6FX . 002-5 . G01-.... 6FX . 002-5 . G10-....	<b>6FX</b> ■002-5■A05-.... <b>6FX</b> ■002-5■N05-....
		1.5	6FX . 002-5 . S21-.... 6FX . 002-5 . N21-....	6FX . 002-5 . G21-.... 6FX . 002-5 . G22-....	<b>6FX</b> ■002-5■A28-.... <b>6FX</b> ■002-5■Q28-....
4 × 2.5	4 × 2.5+2 × 1.5	1	6FX . 002-5 . S11-.... 6FX . 002-5 . N11-....	6FX . 002-5 . G11-.... 6FX . 002-5 . G12-....	<b>6FX</b> ■002-5■A15-.... <b>6FX</b> ■002-5■Q15-....
		1.5	6FX . 002-5 . S31-.... 6FX . 002-5 . N31-....	6FX . 002-5 . G31-.... 6FX . 002-5 . G32-....	<b>6FX</b> ■002-5■A38-.... <b>6FX</b> ■002-5■Q38-....
4 × 4	4 × 4+2 × 1.5	1.5	6FX . 002-5 . S41-.... 6FX . 002-5 . N41-....	6FX . 002-5 . G41-.... 6FX . 002-5 . G42-....	<b>6FX</b> ■002-5■A48-.... <b>6FX</b> ■002-5■Q48-....
4 × 6	4 × 6+2 × 1.5	1.5	6FX . 002-5 . S51-.... 6FX . 002-5 . S54-....	6FX . 002-5 . G51-.... –	<b>6FX</b> ■002-5■A58-.... <b>6FX</b> ■002-5■A58-....
			6FX . 002-5 . N51-.... 6FX . 002-5 . N54-....	6FX . 002-5 . G52-.... –	<b>6FX</b> ■002-5■Q58-.... <b>6FX</b> ■002-5■Q58-....
4 × 10	4 × 10+2 × 1.5	1.5	6FX . 002-5 . S61-.... 6FX . 002-5 . S64-....	6FX . 002-5 . G61-.... –	<b>6FX</b> ■002-5■A68-.... <b>6FX</b> ■002-5■A68-....
			6FX . 002-5 . N61-.... 6FX . 002-5 . N64-....	6FX . 002-5 . G62-.... –	<b>6FX</b> ■002-5■Q68-.... <b>6FX</b> ■002-5■Q68-....
		3 <sup>1)</sup>	6FX . 002-5 . S13-.... 6FX . 002-5 . S14-....	6FX . 002-5 . G13-.... –	<b>6FX</b> ■002-5■X18-.... <b>6FX</b> ■002-5■X18-....
4 × 16	4 × 16+2 × 1.5	3 <sup>1)</sup>	6FX . 002-5 . S23-.... 6FX . 002-5CS24-....	6FX . 002-5 . G23-.... –	<b>6FX</b> ■002-5■X28-.... <b>6FX</b> ■002-5■X28-....
			6FX . 002-5 . G23-....	–	<b>6FX</b> ■002-5■X28-....
–	4 × 25+2 × 1.5	3 <sup>1)</sup>	6FX . 002-5DG33-....	6FX . 002-5DG33-....	<b>6FX</b> ■002-5DX38-....
–	4 × 35+2 × 1.5	3 <sup>1)</sup>	6FX . 002-5DG43-....	6FX . 002-5DG43-....	<b>6FX</b> ■002-5DX48-....
–	4 × 50+2 × 1.5	3 <sup>1)</sup>	6FX . 002-5DG53-....	6FX . 002-5DG53-....	<b>6FX</b> ■002-5DX58-....
<b>MOTION-CONNECT 500</b>					5
<b>MOTION-CONNECT 800PLUS</b>					8
<b>Without brake cores</b>					C
<b>With brake cores</b>					D
Length code					....

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length of power cables with brake cores is reduced by 2 m (6.56 ft) for each interruption point.

<sup>1)</sup> Motor-end connector with full thread only.

## Selection and ordering data

## For SIMOTICS M-1PH808/-1PH810/-1PH813/-1PH816 motors with terminal box on SINAMICS S120 Motor Modules

Motor	Thread	No. of cores x cross-section	Connection method Motor Module end	Pre-assembled cable	Cable sold by the meter <sup>1)</sup>	$D_{max}$	Weight (without gland)	Smallest perm. bending radius <sup>2)</sup>
Type		mm <sup>2</sup>		Order No.	Order No.	mm (in)	kg/m (lb/ft)	mm (in)
M-1PH808	M25	4 x 2.5	Connector <sup>3)</sup>	6FX8002-5CP10-....	6FX8008-1BB21-....	11.0 (0.43)	0.20 (0.13)	90 (3.54)
		4 x 4		6FX8002-5CP20-....	6FX8008-1BB31-....	12.3 (0.48)	0.27 (0.18)	100 (3.94)
M-1PH810	M32	4 x 2.5	Connector <sup>3)</sup>	6FX8002-5CP11-....	6FX8008-1BB21-....	11.0 (0.43)	0.20 (0.13)	90 (3.54)
		4 x 4		6FX8002-5CP21-....	6FX8008-1BB31-....	12.3 (0.48)	0.27 (0.18)	100 (3.94)
		4 x 10	Exposed core ends <sup>4)</sup>	6FX8002-5CP41-....	6FX8008-1BB51-....	18.2 (0.72)	0.62 (0.42)	140 (5.51)
		4 x 10		6FX8002-5CR41-....				
M-1PH813	M40	4 x 10	Connector <sup>3)</sup>	6FX8002-5CP42-....	6FX8008-1BB51-....	18.2 (0.72)	0.62 (0.42)	140 (5.51)
			Exposed core ends <sup>4)</sup>	6FX8002-5CR42-....				
	M50	4 x 10	Connector <sup>3)</sup>	6FX8002-5CP43-....				
			Exposed core ends <sup>4)</sup>	6FX8002-5CR43-....				
	M40	4 x 16	Exposed core ends <sup>4)</sup>	6FX8002-5CR52-....	6FX8008-1BB61-....	22.3 (0.88)	1.01 (0.68)	170 (6.69)
	M50	4 x 16		6FX8002-5CR53-....				
		4 x 35		6FX5002-5CR73-....	6FX5008-1BB35-....	31.5 (1.24)	1.93 (1.30)	570 (22.44)
		4 x 50		6FX5002-5CR83-....	6FX5008-1BB50-....	38.0 (1.50)	3.04 (2.04)	685 (26.97)
M-1PH816	M50	4 x 16	Exposed core ends <sup>4)</sup>	6FX8002-5CR53-....	6FX8008-1BB61-....	22.3 (0.88)	1.01 (0.68)	170 (6.69)
				–	6FX5008-1BB61-....	24.2 (0.95)	1.10 (0.74)	440 (17.32)
		4 x 35		6FX5002-5CR73-....	6FX5008-1BB35-....	31.5 (1.24)	1.93 (1.30)	570 (22.44)
			–	6FX8008-1BA35-....	29.6 (1.17)	2.00 (1.34)	300 (11.81)	
		4 x 50		6FX5002-5CR83-....	6FX5008-1BB50-....	38.0 (1.50)	3.04 (2.04)	685 (26.97)
			–	6FX8008-1BA50-....	35.0 (1.38)	2.56 (1.72)	350 (13.78)	
	M63	4 x 25		–	6FX5008-1BB25-....	28.0 (1.10)	1.62 (1.09)	505 (19.88)
				–	6FX8008-1BA25-....	27.6 (1.09)	1.51 (1.01)	280 (11.02)
		4 x 35		–	6FX5008-1BB35-....	31.5 (1.24)	1.93 (1.30)	570 (22.44)
				–	6FX8008-1BA35-....	29.6 (1.17)	2.00 (1.34)	300 (11.81)
	4 x 50		–	6FX5008-1BB50-....	38.0 (1.50)	3.04 (2.04)	685 (26.97)	
		–	6FX8008-1BA50-....	35.0 (1.38)	2.56 (1.72)	350 (13.78)		
	4 x 70		–	6FX5008-1BB70-....	42.6 (1.68)	3.96 (2.66)	770 (30.31)	
M-1PH8	4 x 95		–	6FX5008-1BB05-....	51.7 (2.04)	5.55 (3.73)	935 (36.81)	
	4 x 120		–	6FX5008-1BB12-....	56.0 (2.20)	6.60 (4.43)	1010 (39.76)	
<b>MOTION-CONNECT 500</b>				5		5		
<b>MOTION-CONNECT 800PLUS</b>				8		8		
Length code				....		....		

1) Note type of delivery.

2) Valid for installation in a cable carrier.

3) For SINAMICS S120 Motor Modules 3 A to 30 A in booksize format.

4) Length of core ends: 300 mm (11.81 in). 4 M8 cable lugs and 4 M6 cable lugs are also included in the scope of supply of the cables.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Power cables for motors SIMOTICS M-1PH8 with terminal box

#### Selection and ordering data (continued)

#### For SIMOTICS M-1PH808/-1PH810/-1PH813/-1PH816 motors with terminal box on SINAMICS S120 Power Modules

Motor	Thread	No. of cores x cross-section	Connection method Power Module end	Pre-assembled cable	Cable sold by the meter <sup>1)</sup>	$D_{max}$	Weight (without gland)	Smallest perm. bending radius <sup>2)</sup>	
Type		mm <sup>2</sup>		Order No.	Order No.	mm (in)	kg/m (lb/ft)	mm (in)	
M-1PH808	M25	4 x 2.5	Exposed core ends <sup>3)</sup>	6FX8002-5CR10-....	6FX8008-1BB21-....	11.0 (0.43)	0.20 (0.13)	90 (3.54)	
		–		6FX5008-1BB21-....	10.0 (0.39)	0.21 (0.14)	180 (7.09)		
		4 x 4		6FX8002-5CR20-....	6FX8008-1BB31-....	12.3 (0.48)	0.27 (0.18)	100 (3.94)	
				–	6FX5008-1BB31-....	11.4 (0.45)	0.27 (0.18)	210 (8.27)	
M-1PH810	M32	4 x 2.5	Exposed core ends <sup>3)</sup>	6FX8002-5CR11-....	6FX8008-1BB21-....	11.0 (0.43)	0.20 (0.13)	90 (3.54)	
		–		6FX5008-1BB21-....	10.0 (0.39)	0.21 (0.14)	180 (7.09)		
		4 x 4		6FX8002-5CR21-....	6FX8008-1BB31-....	12.3 (0.48)	0.27 (0.18)	100 (3.94)	
				–	6FX5008-1BB31-....	11.4 (0.45)	0.27 (0.18)	210 (8.27)	
		4 x 10		6FX8002-5CR41-....	6FX8008-1BB51-....	18.2 (0.72)	0.62 (0.42)	140 (5.51)	
				–	6FX5008-1BB51-....	20.0 (0.79)	0.73 (0.49)	360 (14.17)	
M-1PH813	M40	4 x 10	Exposed core ends <sup>3)</sup>	6FX8002-5CR42-....	6FX8008-1BB51-....	18.2 (0.72)	0.62 (0.42)	140 (5.51)	
				–	6FX5008-1BB51-....				20.0 (0.79)
		M50		6FX8002-5CR43-....					
					–				
		M40	4 x 16		6FX8002-5CR52-....	6FX8008-1BB61-....	22.3 (0.88)	1.01 (0.68)	170 (6.69)
					–	6FX5008-1BB61-....	24.2 (0.95)	1.10 (0.74)	440 (17.32)
	M50			6FX8002-5CR53-....					
				–					
	M40	4 x 35		6FX5002-5CR72-....	6FX5008-1BB35-....	31.5 (1.24)	1.93 (1.30)	570 (22.44)	
				–	6FX8008-1BA35-....	29.6 (1.17)	2.00 (1.34)	300 (11.81)	
	M50			6FX5002-5CR73-....					
				–					
	M50	4 x 50		6FX5002-5CR83-....	6FX5008-1BB50-....	38.0 (1.50)	3.04 (2.04)	685 (26.97)	
				–	6FX8008-1BA50-....	35.0 (1.38)	2.56 (1.72)	350 (13.78)	
M-1PH816	M50	4 x 16	Exposed core ends <sup>3)</sup>	6FX8002-5CR53-....	6FX8008-1BB61-....	22.3 (0.88)	1.01 (0.68)	170 (6.69)	
		–		6FX5008-1BB61-....	24.2 (0.95)	1.10 (0.74)	440 (17.32)		
		4 x 35		6FX5002-5CR73-....	6FX5008-1BB35-....	31.5 (1.24)	1.93 (1.30)	570 (22.44)	
				–	6FX8008-1BA35-....	29.6 (1.17)	2.00 (1.34)	300 (11.81)	
			4 x 50		6FX5002-5CR83-....	6FX5008-1BB50-....	38.0 (1.50)	3.04 (2.04)	685 (26.97)
					–	6FX8008-1BA50-....	35.0 (1.38)	2.56 (1.72)	350 (13.78)
	M63	4 x 25		–	6FX5008-1BB25-....	28.0 (1.10)	1.62 (1.09)	505 (19.88)	
				–	6FX8008-1BA25-....	27.6 (1.09)	1.51 (1.01)	280 (11.02)	
4 x 35				–	6FX5008-1BB35-....	31.5 (1.24)	1.93 (1.30)	570 (22.44)	
				–	6FX8008-1BA35-....	29.6 (1.17)	2.00 (1.34)	300 (11.81)	
		4 x 50		–	6FX5008-1BB50-....	38.0 (1.50)	3.04 (2.04)	685 (26.97)	
				–	6FX8008-1BA50-....	35.0 (1.38)	2.56 (1.72)	350 (13.78)	
		4 x 70		–	6FX5008-1BB70-....	42.6 (1.68)	3.96 (2.66)	770 (30.31)	
M-1PH8		4 x 95		–	6FX5008-1BB05-....	51.7 (2.04)	5.55 (3.73)	935 (36.81)	
		4 x 120		–	6FX5008-1BB12-....	56.0 (2.20)	6.60 (4.43)	1010 (39.76)	
<b>MOTION-CONNECT 500</b>				5	5				
<b>MOTION-CONNECT 800PLUS</b>				8	8				
Length code				....	....				

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>3)</sup> Length of core ends: 300 mm (11.81 in). 4 M8 cable lugs and 4 M6 cable lugs are also included in the scope of supply of the cables.

## Selection and ordering data

For SIMOTICS L-1FN3 linear motors, peak/continuous load versions, connection to SINAMICS S120 through adapter cable with full-thread connector

Number of cores × cross-section	Thread	Pre-assembled adapter cable	Connector size Interface	Pre-assembled basic cable to the drive system	Cable sold by meter <sup>1)</sup> for pre-assembled adapter cable	D <sub>max</sub>	Weight (without connector)	Smallest perm. bending radius <sup>2)</sup>
mm <sup>2</sup>		Order No. <sup>3)</sup>		Order No.	Order No.	mm (in)	kg/m (lb/ft)	mm (in)
4 × 2.5	M20	6FX7002-5LM42-.... <sup>*)</sup>	1	6FX8002-5CS11-....	6FX8008-1BB21-....	11.0 (0.43)	0.20 (0.13)	90 (3.54)
4 × 2.5	M20	6FX7002-5LM62-.... <sup>**)</sup>	1	6FX8002-5CS11-....	6FX8008-1BB21-....	11.0 (0.43)	0.20 (0.13)	90 (3.54)
4 × 4	M32	6FX7002-5LM72-....	1.5	6FX8002-5CS41-.... <sup>***)</sup>	6FX8008-1BB31-....	12.3 (0.48)	0.27 (0.18)	100 (3.94)
4 × 6	M32	6FX7002-5LM82-....	1.5	6FX8002-5CS54-....	6FX8008-1BB41-....	14.9 (0.59)	0.41 (0.28)	120 (4.72)
4 × 10	M32	6FX7002-5LM32-....	1.5	6FX8002-5CS64-....	6FX8008-1BB51-....	18.2 (0.72)	0.62 (0.42)	140 (5.51)
4 × 16	M32	6FX7002-5LM02-....	1.5	6FX8002-5CS24-....	6FX8008-1BB61-....	22.3 (0.88)	1.01 (0.68)	170 (6.69)
<b>MOTION-CONNECT 700</b>		7						
<b>MOTION-CONNECT 800PLUS</b>				8	8			
Length code		....		....	....			

## Accessories

Power cable extensions for SIMOTICS L-1FN3 linear motors, peak/continuous load versions with full-thread connector

Number of cores × cross-section	Connector size	Pre-assembled basic cable to the drive system	Extension
mm <sup>2</sup>		Type	Order No.
4 × 2.5	1	6FX8002-5CS11-....	6FX8002-5CA15-....
4 × 4	1.5	6FX8002-5CS41-.... <sup>***)</sup>	6FX8002-5CA48-....
4 × 6	1.5	6FX8002-5CS54-....	6FX8002-5CA58-....
4 × 10	1.5	6FX8002-5CS64-....	6FX8002-5CA68-....
4 × 16	1.5	6FX8002-5CS24-....	6FX8002-5YW12-....
<b>MOTION-CONNECT 800PLUS</b>			8
Length code			....

The combinations of power cable extensions shown are only provided by way of example.

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>3)</sup> The 6FX7002-5LM.. cables comprise MOTION-CONNECT 800PLUS cables which are sold by the meter.

<sup>\*)</sup> For SIMOTICS L-1FN30/-1FN31 motors only.

<sup>\*\*)</sup> For SIMOTICS L-1FN33/-1FN34/-1FN36/-1FN39 motors only.

<sup>\*\*\*)</sup> For SIMOTICS L-1FN3 linear motors in the peak load version, the pre-assembled basic cable 6FX8002-5CS54-.... (4 × 6 mm<sup>2</sup>) to the SINAMICS S120 drive system must be used.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Power cables for motors SIMOTICS L-1FN6

#### Selection and ordering data

##### For SIMOTICS L-1FN6 linear motors with SPEED-CONNECT connector on SINAMICS S120

Number of cores × cross-section mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable to the drive system Order No.	Cable sold by the meter <sup>1)</sup> Order No.	D <sub>max</sub> mm (in)	Weight (without connector) kg/m (lb/ft)	Smallest perm. bending radius <sup>2)</sup> mm (in)
4 × 1.5	1	<b>6FX8002-5CN01-....</b>	<b>6FX8008-1BB11-....</b>	9.5 (0.37)	0.15 (0.10)	75 (2.95)
4 × 2.5	1	<b>6FX8002-5CN11-....</b>	<b>6FX8008-1BB21-....</b>	11.0 (0.43)	0.20 (0.13)	90 (3.54)
4 × 4	1.5	<b>6FX8002-5CN41-....</b>	<b>6FX8008-1BB31-....</b>	12.3 (0.48)	0.27 (0.18)	100 (3.94)
4 × 10	1.5	<b>6FX8002-5CN64-....<sup>*)</sup></b>	<b>6FX8008-1BB51-....</b>	18.2 (0.72)	0.62 (0.42)	140 (5.51)
<b>MOTION-CONNECT 800PLUS</b>		<b>8</b>	<b>8</b>			
Length code		....	....			

#### Accessories

##### Power cable extensions for SIMOTICS L-1FN6 linear motors with SPEED-CONNECT connector

Number of cores × cross-section mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable to the drive system Type	Extension Order No.
4 × 1.5	1	6FX8002-5CN01-....	<b>6FX8002-5CN05-....</b>
4 × 2.5	1	6FX8002-5CN11-....	<b>6FX8002-5CQ15-....</b>
4 × 4	1.5	6FX8002-5CN41-....	<b>6FX8002-5DQ48-....</b>
4 × 10	1.5	6FX8002-5CN64-.... <sup>*)</sup>	<b>6FX8002-5DQ68-....</b>
<b>MOTION-CONNECT 800PLUS</b>			<b>8</b>
Length code			....

The combinations of power cable extensions shown are only provided by way of example.

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>\*)</sup> Module end with ring cable lugs.



**Selection and ordering data****For SIMOTICS T-1FW3 complete torque motors with terminal box**

Number of cores × cross-section mm <sup>2</sup>	Cable sold by the meter <sup>1)</sup> Order No.	$D_{max}$		Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>	
		6FX5 mm (in)	6FX8 mm (in)	6FX5 kg/m (lb/ft)	6FX8 kg/m (lb/ft)	6FX5 mm (in)	6FX8 mm (in)
4 × 1.5	<b>6FX008-1BB11-....</b>	8.4 (0.33)	9.5 (0.37)	0.12 (0.08)	0.15 (0.10)	155 (6.10)	75 (2.95)
4 × 2.5	<b>6FX008-1BB21-....</b>	10.0 (0.39)	11.0 (0.43)	0.21 (0.14)	0.20 (0.13)	180 (7.09)	90 (3.54)
4 × 4	<b>6FX008-1BB31-....</b>	11.4 (0.45)	12.3 (0.48)	0.27 (0.18)	0.27 (0.18)	210 (8.27)	100 (3.94)
4 × 6	<b>6FX008-1BB41-....</b>	13.6 (0.54)	14.9 (0.59)	0.37 (0.25)	0.41 (0.28)	245 (9.65)	120 (4.72)
4 × 10	<b>6FX008-1BB51-....</b>	20.0 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)
4 × 16	<b>6FX008-1BB61-....</b>	24.2 (0.95)	22.3 (0.88)	1.10 (0.74)	1.01 (0.68)	440 (17.32)	170 (6.69)
4 × 25	<b>6FX5008-1BB25-....</b>	28.0 (1.10)	–	1.62 (1.09)	–	505 (19.88)	–
4 × 35	<b>6FX5008-1BB35-....</b>	31.5 (1.24)	–	1.93 (1.30)	–	570 (22.44)	–
4 × 50	<b>6FX5008-1BB50-....</b>	38.0 (1.50)	–	3.04 (2.04)	–	685 (26.97)	–
4 × 70	<b>6FX5008-1BB70-....</b>	42.6 (1.68)	–	3.96 (2.66)	–	770 (30.31)	–
4 × 95	<b>6FX5008-1BB05-....</b>	51.7 (2.04)	–	5.55 (3.73)	–	935 (36.81)	–
4 × 120	<b>6FX5008-1BB12-....</b>	56.0 (2.20)	–	6.60 (4.43)	–	1010 (39.76)	–
<b>MOTION-CONNECT 500</b>	<b>5</b>						
<b>MOTION-CONNECT 800PLUS</b>	<b>8</b>						
Length code							

1) Note type of delivery.

2) Valid for installation in a cable carrier.

# MOTION-CONNECT connection systems

## Power cables for SINAMICS S120

### Power cables for motors SIMOTICS T-1FW6

#### Selection and ordering data

##### For SIMOTICS T-1FW6 built-in torque motors with connection via adapter cable with full-thread connector

Number of cores × cross-section mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable to the drive system Order No.	Cable sold by the meter <sup>1)</sup> Order No.	D <sub>max</sub> mm (in)	Weight (without connector) kg/m (lb/ft)	Smallest perm. bending radius <sup>2)</sup> mm (in)
4 × 2.5	1	<b>6FX8002-5CS11-....</b>	<b>6FX8008-1BB21-....</b>	11.0 (0.43)	0.20 (0.13)	90 (3.54)
4 × 4	1.5	<b>6FX8002-5CS41-....</b>	<b>6FX8008-1BB31-....</b>	12.3 (0.48)	0.27 (0.18)	100 (3.94)
4 × 6	1.5	<b>6FX8002-5CS54-....</b>	<b>6FX8008-1BB41-....</b>	14.9 (0.59)	0.41 (0.28)	120 (4.72)
4 × 10	1.5	<b>6FX8002-5CS64-....</b>	<b>6FX8008-1BB51-....</b>	18.2 (0.72)	0.62 (0.42)	140 (5.51)
4 × 16	1.5	<b>6FX8002-5CS24-....</b>	<b>6FX8008-1BB61-....</b>	22.3 (0.88)	1.01 (0.68)	170 (6.69)
<b>MOTION-CONNECT 800PLUS</b>		<b>8</b>	<b>8</b>			
Length code		....	....			

#### Accessories

##### Power cable extensions for SIMOTICS T-1FW6 built-in torque motors with full-thread connector

Number of cores × cross-section mm <sup>2</sup>	Connector size	Pre-assembled cable to the drive system Type	Extension Order No.
4 × 2.5	1	6FX8002-5CS11-....	<b>6FX8002-5CA15-....</b>
4 × 4	1.5	6FX8002-5CS41-....	<b>6FX8002-5CA48-....</b>
4 × 6	1.5	6FX8002-5CS54-....	<b>6FX8002-5CA58-....</b>
4 × 10	1.5	6FX8002-5CS64-....	<b>6FX8002-5CA68-....</b>
4 × 16	1.5	6FX8002-5CS24-....	<b>6FX8002-5YW12-....</b>
<b>MOTION-CONNECT 800PLUS</b>			<b>8</b>
Length code			....

The combinations of power cable extensions shown are only provided by way of example.

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

### Overview



MOTION-CONNECT DRIVE-CLiQ signal cable with IP20/IP67 connector  
Signal cables are pre-assembled and are sold by the meter for the connection of a variety of components.

The following different types of cable are available:

- DRIVE-CLiQ signal cables
- MOTION-CONNECT DRIVE-CLiQ signal cables
- MOTION-CONNECT pre-assembled signal cables

#### Type of delivery for pre-assembled signal cables

Pre-assembled signal cables are available in units of 10 cm (3.94 in).

The cables are supplied on reels up to 30 kg or 100 m (66.2 lb or 328 ft). Above 30 kg or 100 m (66.2 lb or 328 ft), cable drums are used instead of reels.

### Application

#### DRIVE-CLiQ signal cables

are used to connect components with DRIVE-CLiQ connections which have a separate or external 24 V DC power supply.

#### MOTION-CONNECT DRIVE-CLiQ signal cables

are used whenever components with DRIVE-CLiQ connections must meet high requirements such as mechanical stress and oil resistance, e.g. where a connection is made outside the cabinet between

- Motor Modules and Sensor Modules
- Motor Modules and motors with DRIVE-CLiQ interface
- Motor Modules and direct measuring systems with DRIVE-CLiQ interface (incl. non-Siemens measuring systems)

MOTION-CONNECT DRIVE-CLiQ signal cables have 24 V DC cores.

#### MOTION-CONNECT pre-assembled signal cables

are used whenever motor encoders on motors without DRIVE-CLiQ interface are connected to Sensor Modules.

If pre-assembled signal cables are to be installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connector can also be supplied. In this case, the contacts of the cables are crimped and the connector enclosure is supplied separately. After installing the cables, the customer assembles the connector enclosure.

The 6FX.002-2C...-.... and 6FX.002-2E...-.... signal cables are available with crimped contacts and with the connector enclosure supplied separately (not in the case of DRIVE-CLiQ signal cables).

Signal cables with enclosed connector enclosure for the **motor end**. In this case, the 6th position of the Order No. must be changed from **0** to **4**:  
6FX.042-2C...-....

Signal cables with enclosed connector enclosure for the **module end**. In this case, the 6th position of the Order No. must be changed from **0** to **1**:  
6FX.012-2C...-....

Once the contacts have latched into the insulator, they can no longer be removed.

# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

### Technical specifications

DRIVE-CLiQ signal cables	DRIVE-CLiQ	DRIVE-CLiQ MOTION-CONNECT 500	DRIVE-CLiQ MOTION-CONNECT 800PLUS
	6FX2...-1DC...-....	6FX5...-DC...-....	6FX8...-DC...-....
<b>Approvals, according to</b>			
• cURus or UR/CSA	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90
• UR-CSA File No. <sup>1)</sup>	Yes	Yes	Yes
• RoHS conformity	Yes	Yes	Yes
<b>Rated voltage according to EN 50395</b>	30 V	30 V	30 V
<b>Test voltage, rms</b>	500 V	500 V	500 V
<b>Operating temperature on the surface</b>			
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	–	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile stress, max.</b>			
• Fixed installation	45 N/mm <sup>2</sup> (6526 lb <sub>f</sub> /in <sup>2</sup> )	80 N/mm <sup>2</sup> (11603 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	–	30 N/mm <sup>2</sup> (4351 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>			
• Fixed installation	50 mm (1.97 in)	35 mm (1.38 in)	35 mm (1.38 in)
• Flexible installation	–	125 mm (4.92 in)	75 mm (2.95 in)
<b>Torsional stress</b>	–	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	–	100000	10 million
<b>Traversing velocity</b>	–	30 m/min (98.4 ft/min)	300 m/min (984 ft/min)
<b>Acceleration</b>	–	2 m/s <sup>2</sup>	Up to 50 m/s <sup>2</sup> (164 ft/s <sup>2</sup> ), <a href="#">see characteristics</a>
<b>Insulation material, incl. jacket</b>	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
<b>Outer jacket</b>	PVC	PVC	PUR, HD22.10 S2 (VDE 0282, Part 10)
	Gray RAL 7032	DESINA color green RAL 6018	DESINA color green RAL 6018
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and inserted: IP67.

<sup>1)</sup> The File No. is printed on the cable jacket.

# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

### Technical specifications (continued)

Signal cables	MOTION-CONNECT 500 6FX500.-.....-.....	MOTION-CONNECT 800PLUS 6FX800.-.....-.....
<b>Approvals, according to</b>		
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No. <sup>1)</sup>	Yes	Yes
• RoHS conformity	Yes	Yes
<b>Rated voltage according to EN 50395</b>	30 V	30 V
<b>Test voltage, rms</b>	500 V	500 V
<b>Operating temperature on the surface</b>		
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile stress, max.</b>		
• Fixed installation	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>		
• Fixed installation	60 mm (2.36 in)	4 × D <sub>max</sub>
• Flexible installation	100 mm (3.94 in)	70 mm (2.75 in)
<b>Torsional stress</b>	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	2 million	10 million
<b>Traversing velocity</b>	180 m/min (591 ft/min)	Up to 300 m/min (984 ft/min)
<b>Acceleration</b>	5 m/s <sup>2</sup> (16.41 ft/s <sup>2</sup> )	Up to 50 m/s <sup>2</sup> (164 ft/s <sup>2</sup> ), <a href="#">see characteristics</a>
<b>Insulation material, incl. jacket</b>	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
<b>Outer jacket</b>	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and inserted: IP67.

<sup>1)</sup> The File No. is printed on the cable jacket.

# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

### DRIVE-CLiQ signal cables without 24 V DC cores

#### Selection and ordering data

##### Pre-assembled DRIVE-CLiQ signal cables without 24 V DC cores

Type	Length m (ft)	$D_{max}$ mm (in)	Degree of protection Connector	DRIVE-CLiQ signal cable without 24 V DC cores Order No.
	0.11 (0.36)		IP20/IP20	<b>6SL3060-4AB00-0AA0</b>
	0.16 (0.52)			<b>6SL3060-4AD00-0AA0</b>
	0.21 (0.69)			<b>6SL3060-4AF00-0AA0</b>
	0.26 (0.85)			<b>6SL3060-4AH00-0AA0</b>
	0.31 (1.02)			<b>6SL3060-4AK00-0AA0</b>
	0.36 (1.18)			<b>6SL3060-4AM00-0AA0</b>
	0.41 (1.35)			<b>6SL3060-4AP00-0AA0</b>
	0.60 (1.97)			<b>6SL3060-4AU00-0AA0</b>
	0.95 (3.12)			<b>6SL3060-4AA10-0AA0</b>
	1.20 (3.94)			<b>6SL3060-4AW00-0AA0</b>
	1.45 (4.76)			<b>6SL3060-4AF10-0AA0</b>
	2.80 (9.19)			<b>6SL3060-4AJ20-0AA0</b>
5.00 (16.4)		<b>6SL3060-4AA50-0AA0</b>		
To the decimeter	max. 70 (230)	7.0 (0.28)	IP20/IP20	<b>6FX2002-1DC00-....</b>
				
To the decimeter	max. 70 (230)	7.0 (0.28)	IP67/IP67	<b>6FX2002-1DC20-....</b>
				
Length code			....	





# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

DRIVE-CLiQ signal cables  
MOTION-CONNECT with 24 V DC cores

### Selection and ordering data

#### Pre-assembled MOTION-CONNECT DRIVE-CLiQ signal cables for SINAMICS S120 and motors with 24 V DC cores

Type	Usage	Connector/ motor- end degree of protection	Connector/ module- end degree of protection	Length, max.	$D_{max}$	Cable length	MOTION-CONNECT DRIVE-CLiQ signal cable with 24 V DC cores
				m (ft)	mm (in)	m (ft)	Order No.
	For components with DRIVE-CLiQ interface in the control cabinet.  For example, for making the connection between SINAMICS S120 Motor Modules or Power Modules and the cabinet bushing.	RJ45/IP20	RJ45/IP20	100 (328)	7.1 (0.28)		<b>6FX5002-2DC00-....</b>
		RJ45/IP20	RJ45/IP20	75 (246)	7.1 (0.28)		<b>6FX8002-2DC00-....</b>
	For built-in or built-on encoder systems with DRIVE-CLiQ.  For example, for making the connection between SIMOTICS S-1FT7/-1FK7/SIMOTICS M-1PH8/SIMOTICS T-1FW3 motors and SINAMICS S120 Motor Modules or Power Modules.	RJ45/IP20	RJ45/IP67	100 (328)	7.1 (0.28)		<b>6FX5002-2DC10-....</b>
		RJ45/IP20	RJ45/IP67	75 (246)	7.1 (0.28)		<b>6FX8002-2DC10-....</b>
	For built-in or built-on encoder systems with DRIVE-CLiQ.  For example, for making the connection between SIMOTICS S-1FT7/-1FK7/SIMOTICS M-1PH8/SIMOTICS T-1FW3 motors and SINAMICS S120 cabinet bushings, couplers or DME20 Hub Module or 2 couplers or 2 DME20 Hub Modules.	RJ45/IP67	RJ45/IP67	100 (328)	7.1 (0.28)		<b>6FX5002-2DC20-....</b>
		RJ45/IP67	RJ45/IP67	75 (246)	7.1 (0.28)		<b>6FX8002-2DC20-....</b>
	For built-on encoder systems with DRIVE-CLiQ.  For example, as a <u>basic cable</u> between non-Siemens direct measuring systems with DRIVE-CLiQ interface and SINAMICS S120 Motor Modules and Power Modules.	RJ45/IP20	M12/IP67	30 (98.4)	7.1 (0.28)	3 (9.8)	<b>6FX■002-2DC30-1AD0</b>
							6 (19.7)
						15 (49.2)	<b>6FX■002-2DC30-1BF0</b>
						30 (98.4)	<b>6FX■002-2DC30-1DA0</b>
	For example, as an extension to the <u>basic cable</u> 6FX.002-2DC30. <sup>1)</sup>	M12/IP67	M12/IP67	30 (98.4)	7.1 (0.28)	3 (9.8)	<b>6FX■002-2DC34-1AD0</b>
							6 (19.7)

MOTION-CONNECT 500

MOTION-CONNECT 800PLUS

Length code

5

8

....

<sup>1)</sup> The total cable length (basic cable plus extension cable) must not exceed 30 m (98.4 ft).

# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

Signal cables for motors  
with SPEED-CONNECT/full-thread connector

### Selection and ordering data

#### Pre-assembled MOTION-CONNECT signal cables for motors with SPEED-CONNECT connector

Encoder system	Motor type	Connection via	Length, max.	$D_{max}$	Degree of protection Connector	Basic cable	Extension
	SIMOTICS		m (ft)	mm (in)		Order No.	Order No.
Absolute encoder with EnDat	S-1FK701	SMC20	50 (164)	9.8 (0.39)	IP20/IP67	6FX002-2EN20-....	6FX8002-2EN24-....
Absolute encoder with EnDat	S-1FK7/-1FT7/M-1PH8 <sup>1)</sup>	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	6FX002-2EQ31-....	6FX002-2EQ34-....
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R	S-1FK701	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	6FX002-2CN20-....	6FX8002-2CN24-....
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks	S-1FK7/-1FT7/M-1PH8 <sup>1)</sup>	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	6FX002-2CQ31-....	6FX002-2CQ34-....
Incremental encoder sin/cos 1 V <sub>pp</sub> 256 and 512 S/R without C and D tracks	M-1PH8 <sup>1)</sup>	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	6FX002-2CQ80-....	6FX002-2CQ34-....
Resolver							
• Multi-pole	S-1FK701	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	6FX002-2FN20-....	6FX8002-2FN24-....
• 2-pole	S-1FK701	SMC10	130 (426)	9.2 (0.36)	IP20/IP67	6FX002-2FN20-....	6FX8002-2FN24-....
<b>MOTION-CONNECT 500</b>						5	5
<b>MOTION-CONNECT 800PLUS</b>						8	8
Length code						....	....

#### Pre-assembled signal cables for motors with full-thread connector

Encoder system	Motor type	Connection via	Length, max.	$D_{max}$	Degree of protection Connector	Basic cable	Extension
	SIMOTICS		m (ft)	mm (in)		Order No.	Order No.
Absolute encoder with EnDat	M-1PH8/T-1FW3	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	6FX002-2EQ10-....	6FX002-2EQ14-....
Absolute encoder with EnDat 5 V DC		SME25	3 (9.84) <sup>2)</sup>	9.2 (0.36)	IP67/IP67	6FX002-2AD04-....	–
Direct absolute encoder with EnDat	L-1FN3/-1FN6/T-1FW6	SME125	3 (9.84) <sup>2)</sup>	9.2 (0.36)	IP67/IP67	6FX8002-2AD04-....	–
Resolver							
• Multi-pole	S-1FK7 <sup>3)</sup> /T-1FW3	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	6FX002-2CF02-....	6FX002-2CF04-....
• 2-pole	S-1FK7 <sup>3)</sup> /T-1FW3	SMC10	130 (426)	9.2 (0.36)	IP20/IP67	6FX002-2CF02-....	6FX002-2CF04-....
Absolute encoder with EnDat 6FX2001-5.E..		SMC20	100 (328)	9.2 (0.36)	IP20/IP67	6FX002-2CH00-....	6FX002-2AD04-....
Absolute encoder with SSI 5 V DC		SME25	3 (9.84)	9.2 (0.36)	IP67/IP67	6FX002-2AD04-....	–
Absolute encoder with SSI 6FX2001-5.S.. Clock-pulse rate 100 ... 250 kHz		SMC30	100 (328)	9.3 (0.37)	IP20/IP67	6FX002-2CC11-....	6FX002-2CB54-....
<b>MOTION-CONNECT 500</b>						5	5
<b>MOTION-CONNECT 800PLUS</b>						8	8
Length code						....	....

The combinations of signal cable extensions shown are only provided by way of example.

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

<sup>1)</sup> Possible for SIMOTICS M-1PH808/-1PH810/-1PH813/-1PH816 motors.

<sup>2)</sup> Up to 10 m (32.8 ft) possible, depending on the current consumption of the encoder.

<sup>3)</sup> Not for SIMOTICS S-1FK701.



# MOTION-CONNECT connection systems

## Signal cables for SINAMICS S120/SIMOTION D

Signal cables for motors  
with full-thread connector

### Selection and ordering data

#### Pre-assembled signal cables for motors with full-thread connector

Encoder system	Motor type	Connection via	Length, $D_{max}$		Degree of protection Connector	Basic cable	Extension
			m (ft)	mm (in)		Order No.	Order No.
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks	M-1PH8/T-1FW3	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	<b>6FX002-2CA31-....</b>	<b>6FX002-2CA34-....</b>
Incremental encoder sin/cos 1 V <sub>pp</sub> 256 and 512 S/R without C and D tracks	M-1PH8	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	<b>6FX8002-2CA80-....</b>	<b>6FX002-2CA34-....</b>
HTL incremental encoder	M-1PH8	SMC30	300 (984) <sup>1)</sup>	9.3 (0.37)	IP20/IP67	<b>6FX002-2AH00-....</b>	<b>6FX002-2AH04-....</b>
HTL incremental encoder	M-1PH8	CU310-2/D410-2	100 (328)	9.3 (0.37)	IP20/IP67	<b>6FX002-2AH11-....</b>	–
Incremental encoder sin/cos 1 V <sub>pp</sub> without C and D tracks 6FX2001-3		SMC20	50 (164)	9.3 (0.37)	IP20/IP67	<b>6FX002-2CG00-....</b>	<b>6FX002-2CB54-....</b>
HTL incremental encoder 24 V DC 6FX2001-4		SMC30	100 (328)	9.3 (0.37)	–/IP67	<b>6FX5002-2CA12-....</b>	–
TTL incremental encoder RS 422 6FX2001-2							
• 5 V DC		SMC30	100 (328)	9.3 (0.37)	IP20/IP67	<b>6FX002-2CR00-....</b>	<b>6FX002-2CB54-....</b>
• 24 V DC		SMC30	100 (328)	9.3 (0.37)	IP20/IP67	<b>6FX002-2CD24-....</b>	<b>6FX002-2CB54-....</b>
Incremental encoder sin/cos 1 V <sub>pp</sub> 5 V DC without C and D tracks		SME20	3 (9.84) <sup>2)</sup>	9.3 (0.37)	IP67/IP67	<b>6FX002-2CB54-....</b>	–
Direct incremental encoder sin/cos 1 V <sub>pp</sub>	L-1FN3/-1FN6/T-1FW6	SME120	3 (9.84) <sup>2)</sup>	9.3 (0.37)	IP67/IP67	<b>6FX8002-2CB54-....</b>	–
<b>MOTION-CONNECT 500</b>						5	5
<b>MOTION-CONNECT 800PLUS</b>						8	8
Length code						....	....

Encoder system	Motor type	Connection via	Length, $D_{max}$		Degree of protection Connector	Basic cable <sup>3)</sup>	Adapter cable <sup>3)</sup>
			m (ft)	mm (in)		Order No.	Order No.
Temperature sensor	L-1FN3100/-1FN3150 <sup>4)</sup>	SME120/SME125	10 (32.8)	11.9 (0.47)	IP67/IP67	<b>6FX7002-2SL10-....</b>	<b>6FX7002-2SL01-....</b>
Temperature sensor	L-1FN3300 ... L-1FN3900 <sup>4)</sup>	SME120/SME125	10 (32.8)	11.9 (0.47)	IP67/IP67	<b>6FX7002-2SL10-....</b>	<b>6FX7002-2SL02-....</b>
Temperature sensor	L-1FN6/T-1FW6	SME120/SME125	10 (32.8)	11.9 (0.47)	IP67/IP67	<b>6FX7002-2SL10-....</b>	–
Temperature sensor	L-1FN3100/-1FN3150 <sup>4)</sup>	TM120	100 (328)	11.9 (0.47)	IP67/IP67	<b>6FX7002-2SL20-....</b>	<b>6FX7002-2SL01-....</b>
Temperature sensor	L-1FN3300 ... L-1FN3900 <sup>4)</sup>	TM120	100 (328)	11.9 (0.47)	IP67/IP67	<b>6FX7002-2SL20-....</b>	<b>6FX7002-2SL02-....</b>
Temperature sensor	L-1FN6/T-1FW6	TM120	100 (328)	11.9 (0.47)	IP67/IP67	<b>6FX7002-2SL20-....</b>	–
Length code						....	....

The combinations of signal cable extensions shown are only provided by way of example.

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

<sup>1)</sup> With evaluation of difference signals A\*, A, B\*, B, otherwise ≤ 100 m (328 ft).

<sup>2)</sup> Up to 10 m (32.8 ft) possible, depending on the current consumption of the encoder.

<sup>3)</sup> The smallest permissible bending radius (in motion) for signal cables 6FX7002-2SL.. is 85 mm (3.35 in).

<sup>4)</sup> Continuous load version.

# MOTION-CONNECT connection systems

## Order number code

### Power cables

#### Overview

Data position of the Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>MOTION-CONNECT 500</b>	6	F	X	5	0	.	2	-	5	.	.	.	-	.	.	.
<b>MOTION-CONNECT 800PLUS</b>	6	F	X	8	0	.	2	-	5	.	.	.	-	.	.	.
Pre-assembled at motor and module ends						0										
Pre-assembled at motor end, connector at module end supplied separately						1										
Motor-end connector supplied separately, pre-assembled at module end						4										
Without brake cores								5	C							
With brake cores								5	D							
<u>Basic cable between</u>																
<u>and</u>																
SINAMICS S120 Motor Module, booksize format up to 30 A								5	D	A	2	0				
Motor connector, full-thread, size 0.5								5		S		1				
Motor connector, full-thread, size 1/1.5								5		S	1	3				
Motor connector, full-thread, size 3								5		S		2				
Motor with terminal box (exposed core ends)								5		S		2				
Motor connector, SPEED-CONNECT, size 0.5								5	D	N	2	0				
Motor connector, SPEED-CONNECT, size 1/1.5								5		N		1				
SINAMICS S120 Motor Module, booksize format, 45 A or higher								5		S		4				
Motor connector, full-thread, size 1/1.5								5		S	2	3				
Motor connector, full-thread, size 3								5		N		4				
Motor connector, SPEED-CONNECT, size 1/1.5								5		N		4				
SINAMICS S120 Power Module/Motor Module, booksize compact format								5	D	A	3	0				
Motor connector, full-thread, size 0.5								5		G		1				
Motor connector, full-thread, size 1/1.5								5		G		3				
Motor connector, full-thread, size 3								5	D	N	3	0				
Motor connector, SPEED-CONNECT, size 0.5								5		G	1	0				
Motor connector, SPEED-CONNECT, size 1/1.5								5		G		1	0			
SINAMICS S120 Power Module/Motor Module, booksize format								5	C	R						
SIMOTICS M-1PH8 with terminal box								5	C	R						
<u>Extension between basic cable with connector</u>																
<u>and motor connector</u>																
Full-thread, size 0.5								5	M	E	0	5				
Full-thread, size 1								5		A		5				
Full-thread, size 1.5								5		A		8				
Full-thread, size 3								5		X		8				
SPEED-CONNECT, size 0.5								5	M	N	0	5				
SPEED-CONNECT, size 1								5		Q		5				
SPEED-CONNECT, size 1.5								5		Q		8				
SPEED-CONNECT, size 1.5								5		Q		8				
Adapter cable for SIMOTICS L-1FN3	6	F	X	7	0	0	2	-	L	M						
Cross-section																
<b>Length code</b>																
Units of 10 cm (3.94 in) or 1 meter (3.28 ft) or in fixed lengths																

## Overview

Data position of the Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<b>MOTION-CONNECT 500</b>	6	F	X	5	0	.	2	-	2	.	.	.	.	-	.	.	.
<b>MOTION-CONNECT 800PLUS</b>	6	F	X	8	0	.	2	-	2	.	.	.	.	-	.	.	.
<b>6FX2 cables</b>	6	F	X	2	0	0	2	-	2	.	.	.	.	-	.	.	.

Pre-assembled at motor and module ends	0
Pre-assembled at motor end, connector at module end supplied separately	1
Motor-end connector supplied separately, pre-assembled at module end	4

## Variant: Signal cables for integrated encoder

DRIVE-CLiQ cables between	and								
Power Module/Motor Module/SMC with IP20 connector	Power Module/Motor Module/SMC with IP20 connector	2	D	C	0	0			
Power Module/Motor Module/SMC with IP20 connector	Motor/encoder/SME IP67 connector	2	D	C	1	0			
DME20/cabinet bushing/coupler	Motor/encoder/SME IP67 connector	2	D	C	2	0			
Basic cable between	and motor with								
SMC20	Incremental encoder (sin/cos 1 V <sub>pp</sub> ) full-thread connector M23	2	C	A	3	1			
SMC30	Incremental encoder (HTL) full-thread connector M23	2	A	H	0	0			
CU310-2/ D410-2	Incremental encoder (HTL) full-thread connector M23	2	A	H	1	1			
SMC20	Absolute encoder full-thread connector M23	2	E	Q	1	0			
SMC10	Resolver full-thread connector M23	2	C	F	0	2			
SMC20	Incremental encoder (sin/cos 1 V <sub>pp</sub> ) SPEED-CONNECT connector M23	2	C	Q	3	1			
SMC20	Incremental encoder SPEED-CONNECT connector M17	2	C	N	2	0			
SMC20	Absolute encoder SPEED-CONNECT connector M23	2	E	Q	3	1			
SMC20	Absolute encoder SPEED-CONNECT connector M17	2	E	N	2	0			
SMC10	Resolver SPEED-CONNECT connector M17	2	C	N	2	0			
Extension between basic cable with connector	and motor connector								
Full-thread or SPEED-CONNECT	Full-thread or SPEED-CONNECT	2				4			

## Variant: Signal cables for external encoder

Basic cable between	and								
SMC30	Incremental encoder 6FX2001-2 (TTL/5 V supply) Full-thread connector	2	C	R	0	0			
SMC30	Incremental encoder 6FX2001-2 (TTL/24 V supply) Full-thread connector	2	C	D	2	4			
SMC20	Incremental encoder 6FX2001-3 (sin/cos 1 V <sub>pp</sub> ) Full-thread connector	2	C	G	0	0			
SMC30	Incremental encoder 6FX2001-4 (HTL) full-thread connector	2	C	A	1	2			
SMC30	Absolute encoder 6FX2001-5.S (SSI) full-thread connector	2	C	C	1	1			
SMC20	Absolute encoder 6FX2001-5.E (EnDat) full-thread connector	2	E	Q	1	0			
Extension between basic cable with connector	and motor connector								
Full-thread	Full-thread	2				4			

## Variant: Signal cables for temperature sensor

Adapter cable for SIMOTICS L-1FN3 for connecting the basic cable for SME12x/TM120	6	F	X	7	0	0	2	-	2	S	L	0				
Basic cable between SME12x and SIMOTICS L-1FN3 <sup>1)</sup> /-1FN6/T-1FW6	6	F	X	7	0	0	2	-	2	S	L	1	0			
Basic cable between TM120 and SIMOTICS L-1FN3 <sup>1)</sup> /-1FN6/T-1FW6	6	F	X	7	0	0	2	-	2	S	L	2	0			

## Length code

Units of 10 cm (3.94 in) or 1 meter (3.28 ft) or in fixed lengths

<sup>1)</sup> Adapter cable required for connecting to SIMOTICS L-1FN3.

# MOTION-CONNECT connection systems

## Order number code

### Length code

#### Overview

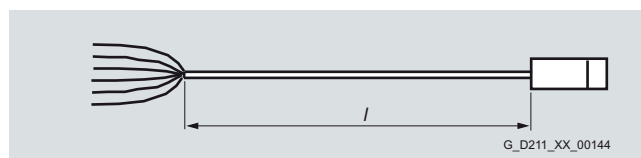
Data position of the Order No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<b>MOTION-CONNECT 500</b>	6	F	X	5	0	0	8	-	1	B	.	.	.	-	.	.	.
<b>MOTION-CONNECT 800PLUS</b>	6	F	X	8	0	0	8	-	1	B	.	.	.	-	.	.	.
Power cable without brake cores, sold by the meter											B						
Power cable with brake cores, sold by the meter											A						
No. of cores and cross-sections																	
<b>Length code</b>																	
Units of 10 cm (3.94 in) or 1 meter (3.28 ft) or in fixed lengths																	

#### Overview

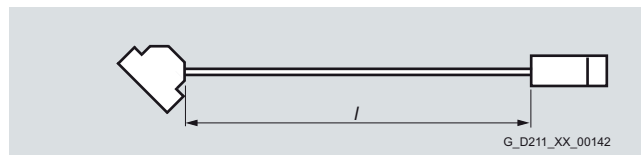
Description	Order No. supplement
<b>Length code for pre-assembled cables</b>	<b>6FX.0.2-.....- ■ ■ ■ ■</b>
0 m	1
100 m (328 ft)	2
200 m (656 ft)	3
0 m	A
10 m (32.8 ft)	B
20 m (65.6 ft)	C
30 m (98.4 ft)	D
40 m (131 ft)	E
50 m (164 ft)	F
60 m (197 ft)	G
70 m (230 ft)	H
80 m (262 ft)	J
90 m (295 ft)	K
0 m	A
1 m (3.28 ft)	B
2 m (6.56 ft)	C
3 m (9.84 ft)	D
4 m (13.1 ft)	E
5 m (16.4 ft)	F
6 m (19.7 ft)	G
7 m (22.9 ft)	H
8 m (26.3 ft)	J
9 m (29.5 ft)	K
0 m	0
0.1 m (3.94 in)	1
0.2 m (7.87 in)	2
0.3 m (11.81 in)	3
0.4 m (15.75 in)	4
0.5 m (19.69 in)	5
0.6 m (23.62 in)	6
0.7 m (27.56 in)	7
0.8 m (31.5 in)	8
Examples:	1.0 m (3.28 ft): 1 A B 0
	2.2 m (7.22 ft): 1 A C 2
	8.0 m (26.3 ft): 1 A J 0
	299.0 m (981 ft): 3 K K 0

#### More information

##### Definition of lengths for pre-assembled cables



Cable with exposed core ends and pre-assembled connector



Cable with pre-assembled connectors at both ends

Tolerances:

- Cable lengths up to 10 m (32.8 ft): ± 2 %
- Cable lengths of 10 m (32.8 ft) and longer: ± 1 %

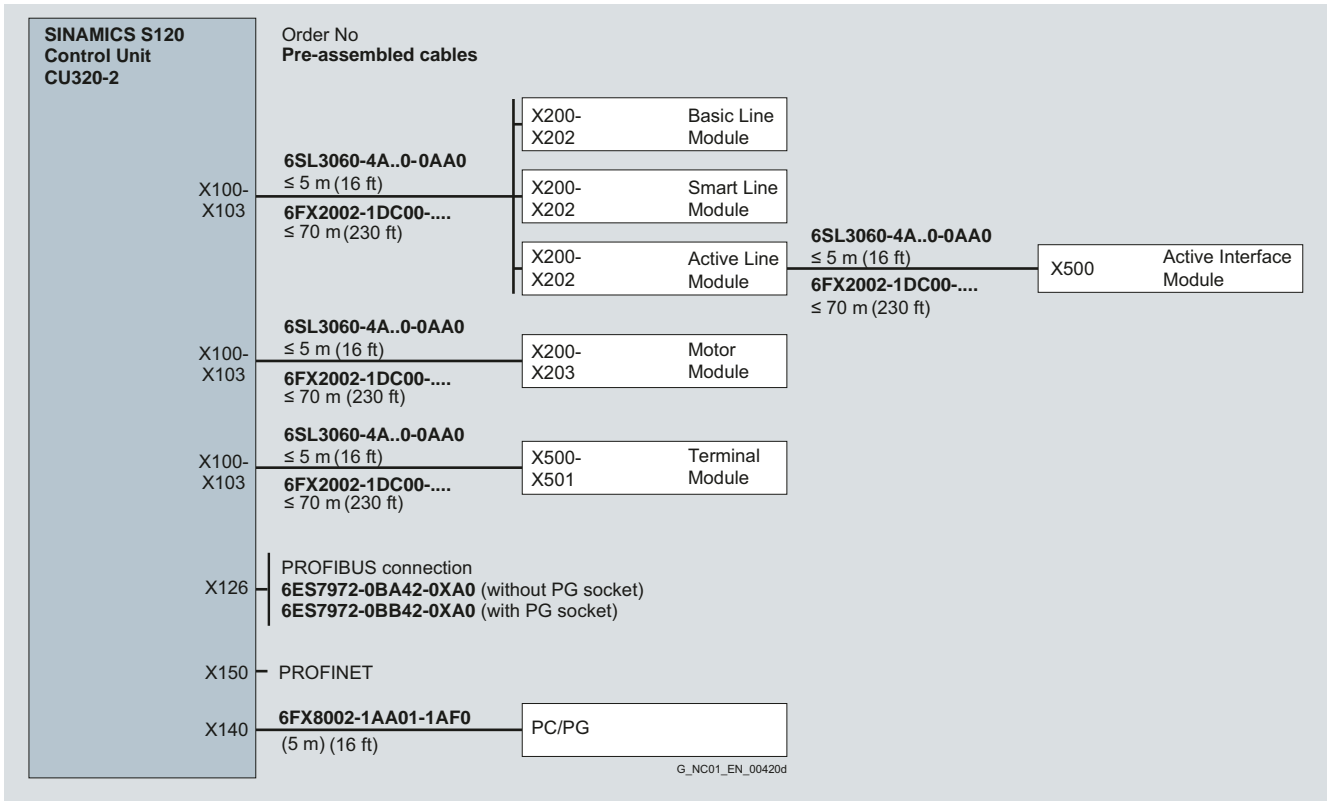
Description	Order No. supplement
<b>Length code for power and signal cables, sold by the meter<sup>1)</sup></b>	<b>6FX.008-.....- ■ ■ A 0</b>
50 m (164 ft)	1 F
100 m (328 ft)	2 A
200 m (656 ft)	3 A
500 m (1640 ft)	6 A

<sup>1)</sup> Note type of delivery.

**Integration**

The DRIVE-CLiQ signal cables of type 6SL3060-4A..0-0AA0 required for the standard configuration are part of the scope of supply of the Line Modules and Motor Modules. In this case, the modules must be mounted directly adjacent in a line.

The same components can be connected to the DRIVE-CLiQ interfaces X100-X103 (SIMOTION D425-2, SIMOTION CX32-2) or X100-X105 (SIMOTION D435-2/ D445-2/D455-2) as can be connected to the DRIVE-CLiQ interfaces X100-X103 of a CU320-2.

**Connection overview of CU320-2 Control Unit with SINAMICS S120 in booksize compact and booksize formats**

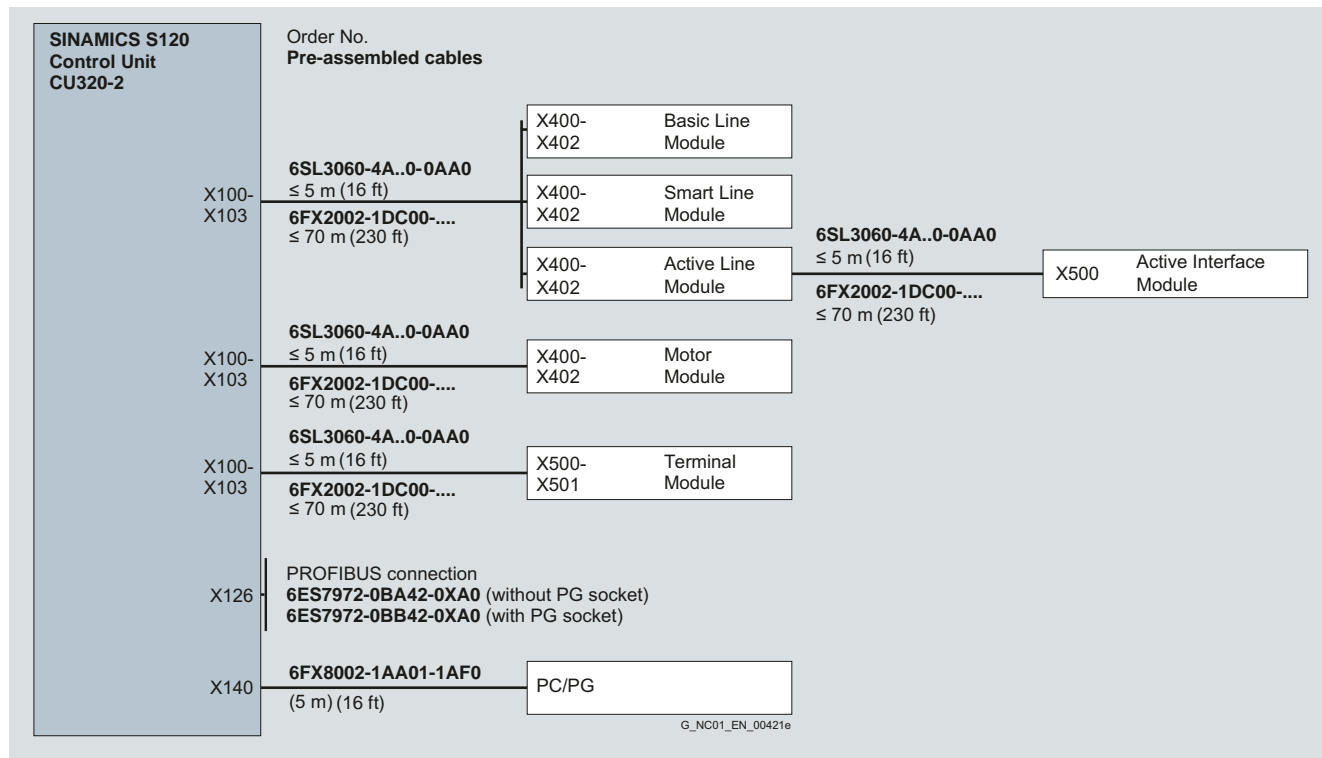
# MOTION-CONNECT connection systems

## Connection overviews

### CU320-2 Control Unit

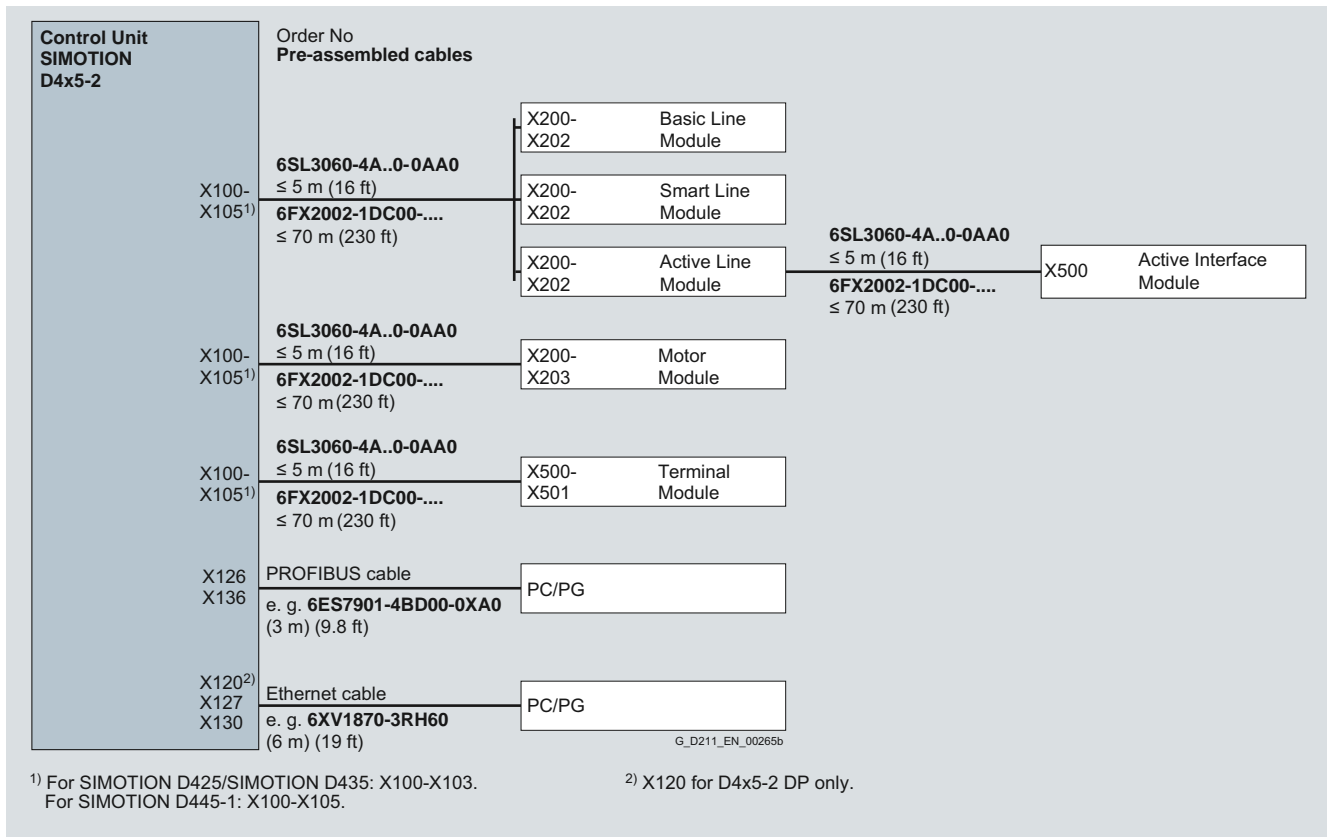
#### Integration (continued)

#### Connection overview of CU320-2 Control Unit with SINAMICS S120 in chassis format

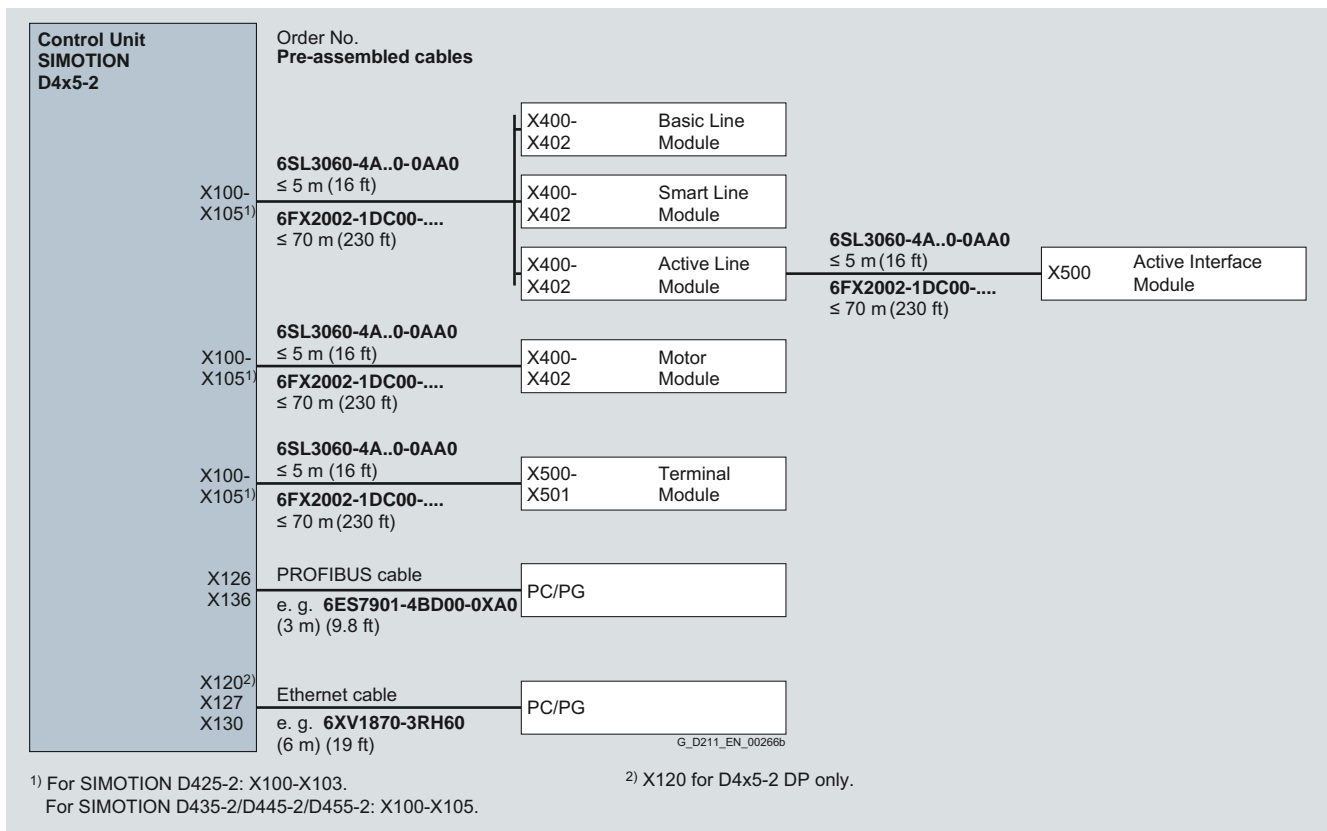


### Integration

#### Connection overview of SIMOTION D4x5-2 Control Unit with SINAMICS S120 in booksize format



#### Connection overview of SIMOTION D4x5-2 Control Unit with SINAMICS S120 in chassis format



# MOTION-CONNECT connection systems

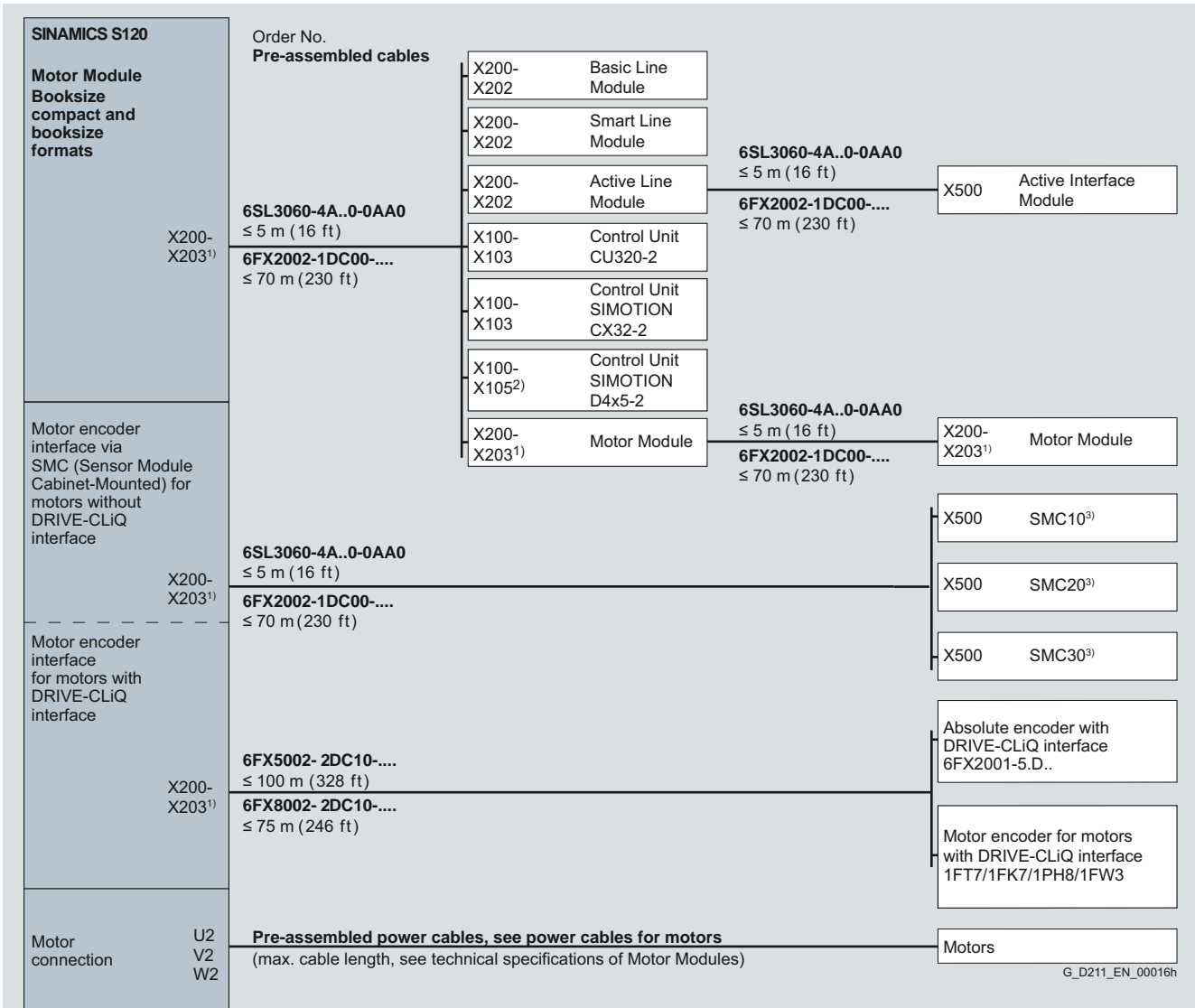
## Connection overviews

### SINAMICS S120 Motor Modules

#### Integration

Connection overview of SINAMICS S120 Motor Modules in booksize compact and booksize formats for SIMOTICS motors with DRIVE-CLiQ interface

The DRIVE-CLiQ signal cables of type 6SL3060-4A..0-0AA0 required for the standard configuration are part of the scope of supply of the Line Modules and Motor Modules. In this case, the modules must be mounted directly adjacent in a line.



1) For Single Motor Module: X200-X202.  
 For Double Motor Module: X200-X203.  
 2) For SIMOTION D425-2: X100-X103.  
 For SIMOTION D435-2/D445-2/D455-2: X100-X105.  
 3) See connection overviews of SMC10/SMC20/SMC30.

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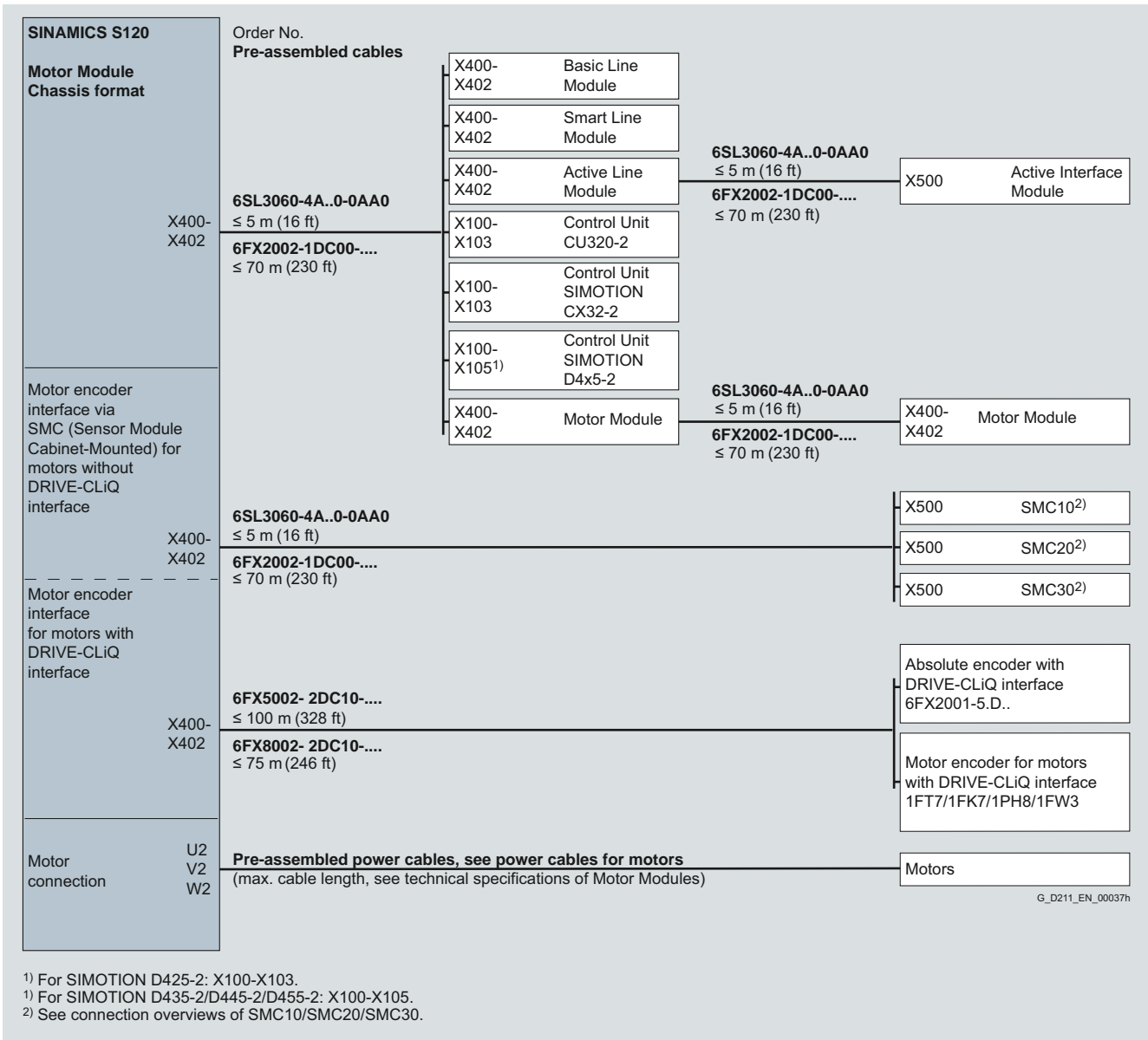
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### SINAMICS S120 Motor Modules

#### Integration (continued)

#### Connection overview of SINAMICS S120 Line Modules and Motor Modules in chassis format for SIMOTICS motors with DRIVE-CLiQ interface



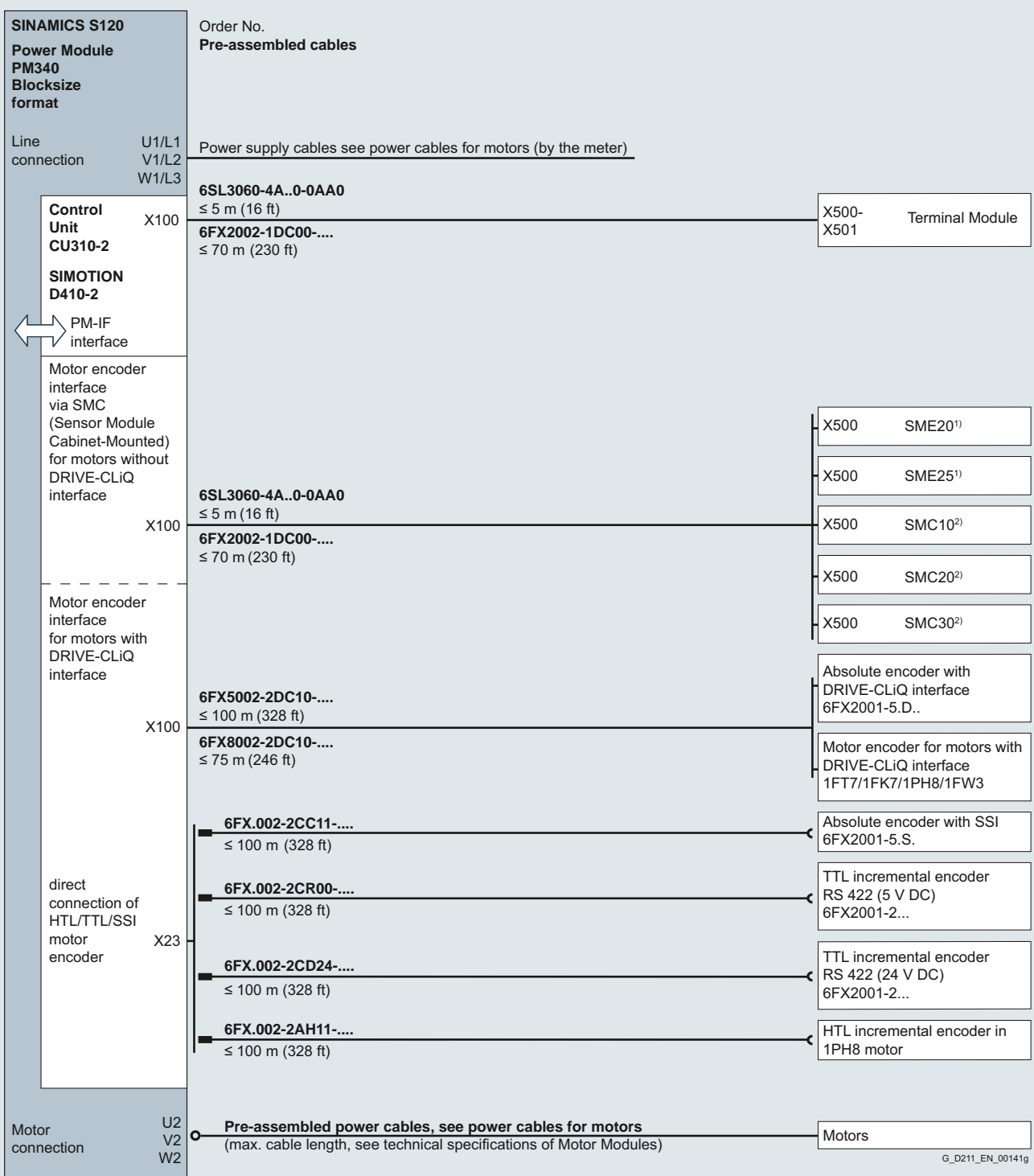
# MOTION-CONNECT connection systems

## Connection overviews

### SINAMICS S120 Power Modules

#### Integration

Connection overview of SINAMICS S120 Power Modules in blocksize format with CU310-2/SIMOTION D410-2 Control Unit for SIMOTICS motors with DRIVE-CLiQ interface



<sup>1)</sup> See connection overview for connection of a machine encoder.  
<sup>2)</sup> See connection overviews of SMC10/SMC20/SMC30.

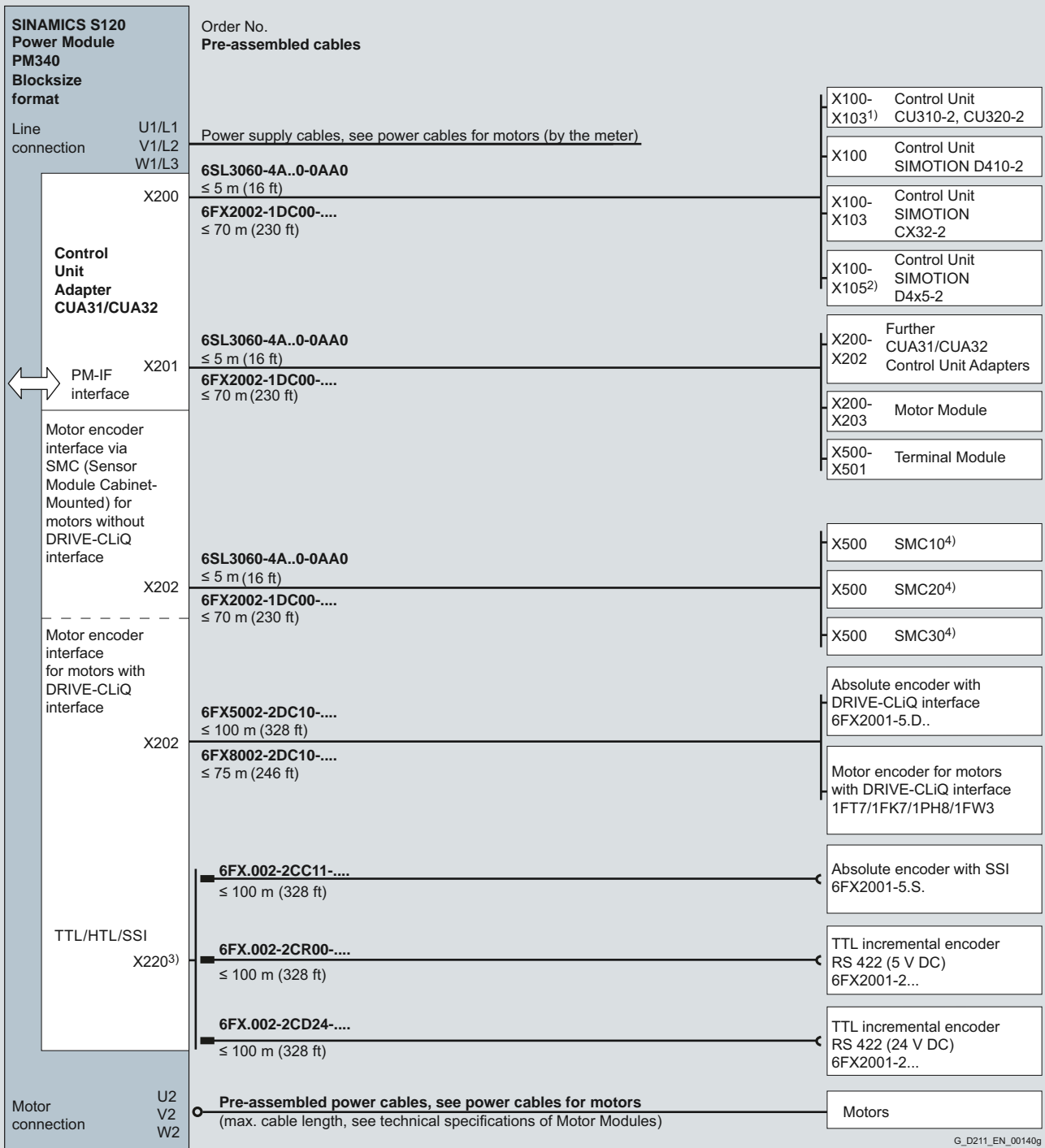
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### SINAMICS S120 Power Modules

#### Integration (continued)

#### Connection overview of SINAMICS S120 Power Modules in blocksize format with CUA31/CUA32 Control Unit Adapter for SIMOTICS motors with DRIVE-CLiQ interface



1) For Control Unit CU310-2: X100.  
For Control Unit CU320-2: X100-X103.  
2) For SIMOTION D425-2: X100-X103.  
For SIMOTION D435-2/D445-2/D455-2: X100-X105.

3) Only for CUA32 Control Unit Adapter.  
4) See connection overviews of SMC10/SMC20/SMC30.

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# MOTION-CONNECT connection systems

## Connection overviews

### SINAMICS S120 Power Modules

#### Integration (continued)

#### Connection overview for SINAMICS S120 Power Modules in chassis format

A DRIVE-CLiQ signal cable of type 6SL3060-4A..0-0AA0 for connection to the chassis-mounted CU310-2 Control Unit/SIMOTION D410-2 Control Unit is already included in the scope of supply.

SINAMICS S120		Order No.	
<b>Power Module Chassis format</b>		<b>Pre-assembled cables</b>	
Line connection	U1/L1 V1/L2 W1/L3	Power supply cables, see power cables for motors (by the meter)	
	X400- X402	<b>6SL3060-4A..0-0AA0</b> ≤ 5 m (16 ft)	X100 SINAMICS S120 Control Unit CU310-2
		<b>6FX2002-1DC00-....</b> ≤ 70 m (230 ft)	X100- X103 SINAMICS S120 Control Unit CU320-2
			X100 Control Unit SIMOTION D410-2
			X100- X105 <sup>1)</sup> Control Unit SIMOTION D4x5-2
			X100- X103 Control Unit SIMOTION CX32-2
			X500- X501 Terminal Module
			X400- X402 Power Module
Motor encoder interface via SMC (Sensor Module Cabinet-Mounted) for motors without DRIVE-CLiQ interface	X402	<b>6SL3060-4A..0-0AA0</b> ≤ 5 m (16 ft)	X500 SMC10 <sup>2)</sup>
		<b>6FX2002-1DC00-....</b> ≤ 70 m (230 ft)	X500 SMC20 <sup>2)</sup>
			X500 SMC30 <sup>2)</sup>
Motor encoder interface for motors with DRIVE-CLiQ interface	X402	<b>6FX5002-2DC10-....</b> ≤ 100 m (328 ft)	Motor encoder for motors with DRIVE-CLiQ interface 1FT7/1FK7/1PH8/1FW3
		<b>6FX8002-2DC10-....</b> ≤ 75 m (246 ft)	
Motor connection	U2 V2 W2	<b>Pre-assembled power cables, see power cables for motors</b> (max. cable length, see technical specifications of Motor Modules)	
			Motors

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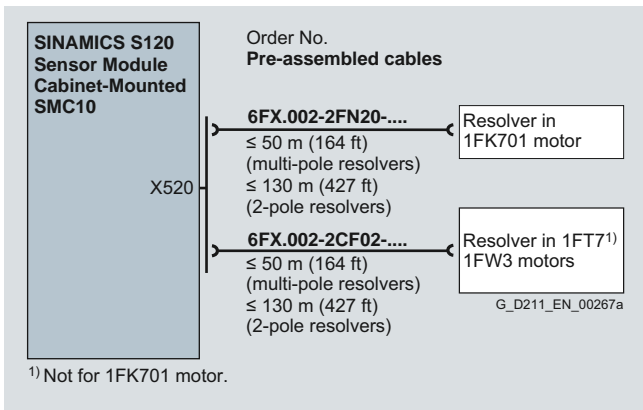
<sup>1)</sup> For SIMOTION D425-2: X100-X103.

For SIMOTION D435-2/D445-2/D455-2: X100-X105.

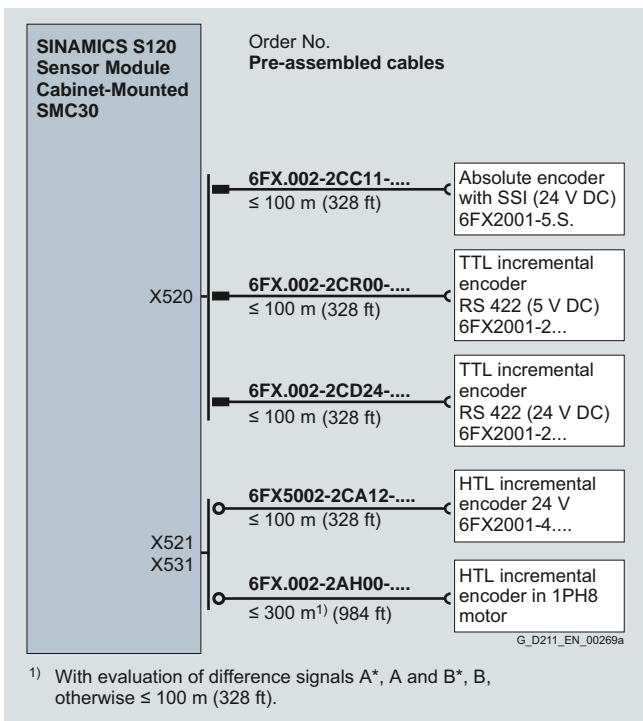
<sup>2)</sup> See connection overviews of SMC10/SMC20/SMC30.

### Integration

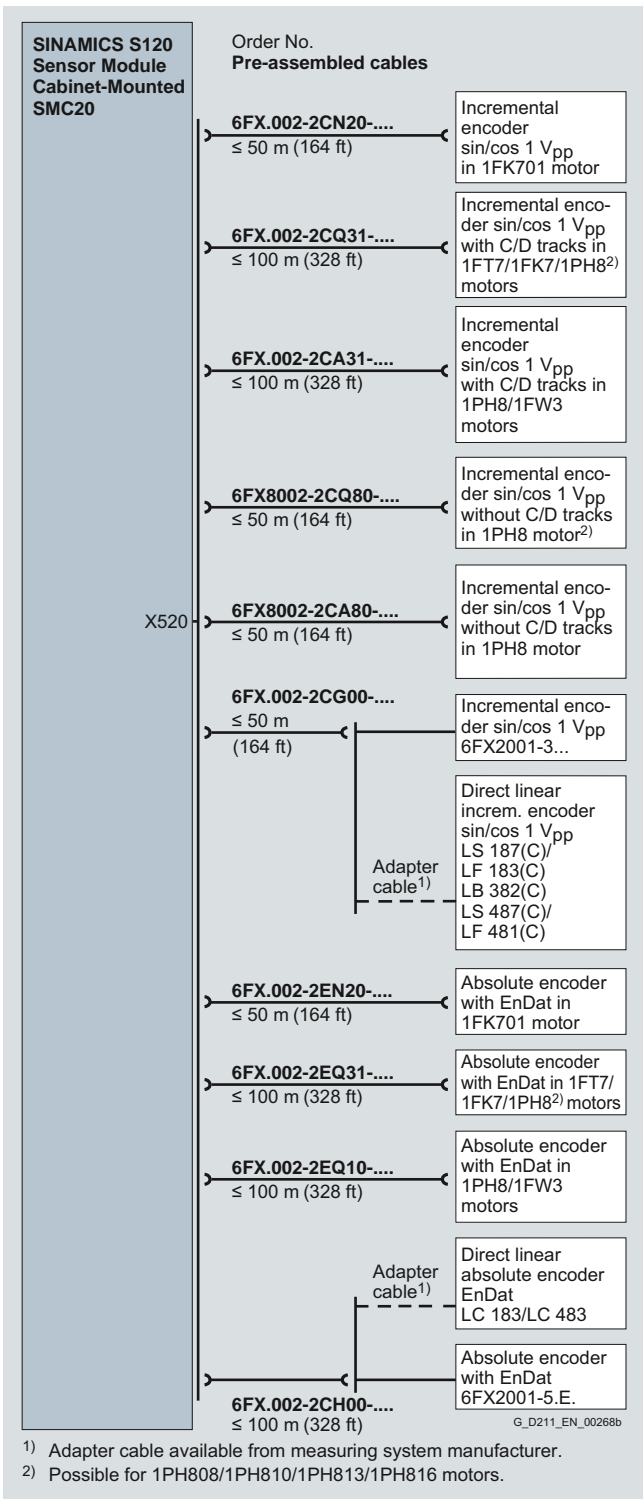
**Connection overview of SINAMICS S120  
Sensor Module Cabinet-Mounted SMC10**



**Connection overview of SINAMICS S120  
Sensor Module Cabinet-Mounted SMC30**



**Connection overview of SINAMICS S120  
Sensor Module Cabinet-Mounted SMC20**



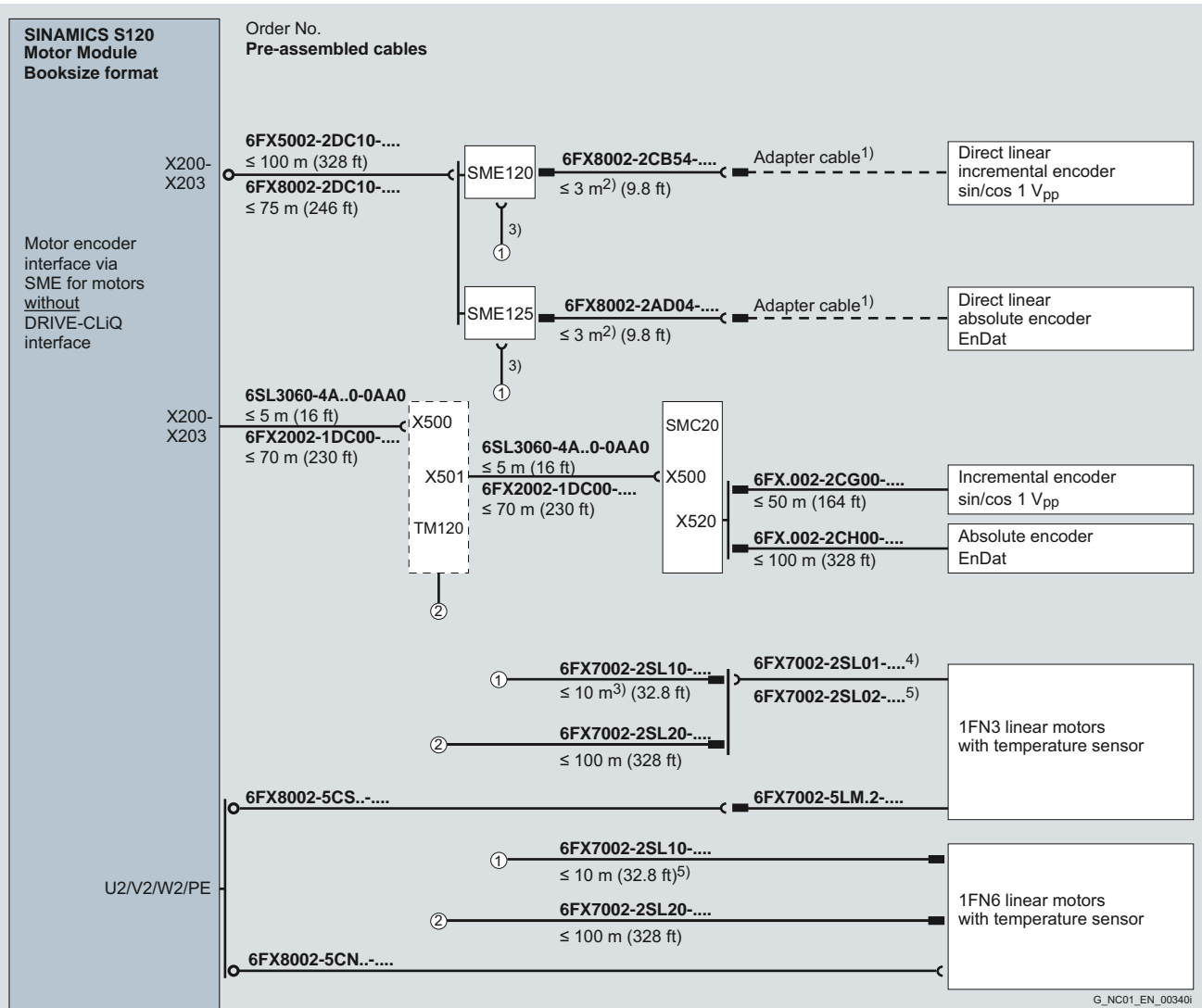
# MOTION-CONNECT connection systems

## Connection overviews

### SIMOTICS direct drives

#### Integration

Connection overview of SINAMICS S120 Motor Modules in booksize format SME120/SME125 or TM120/SMC20 and SIMOTICS L-1FN3/-1FN6 linear motors



1) Adapter cable available from measuring system manufacturer.

2) Up to 10 m (32.8 ft) possible, depending on encoder current consumption.

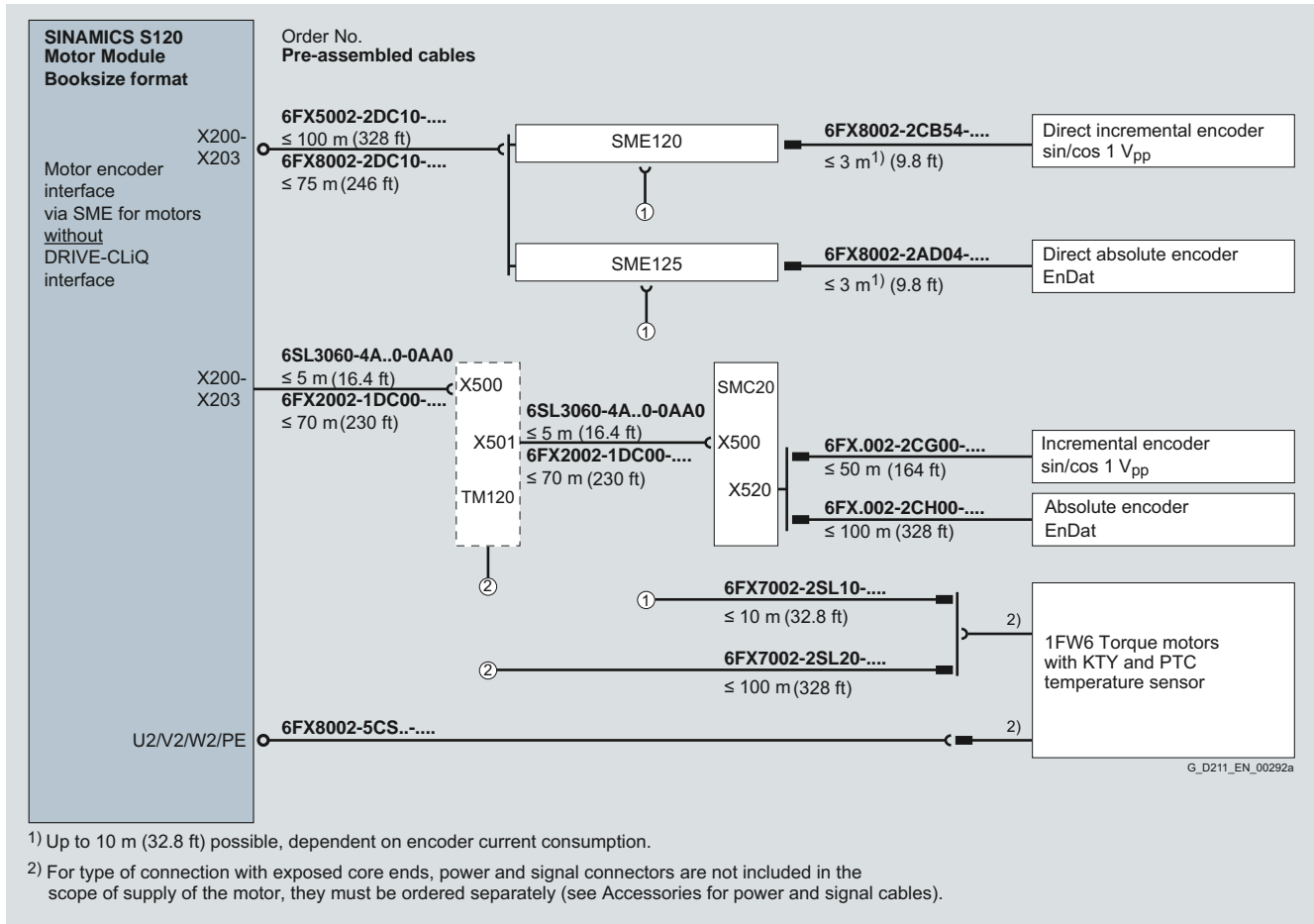
3) The total cable length between SME120/SME125 and 1FN3 must not exceed 10 m (32.8 ft).

4) Adapter cable for 1FN3100/1FN3150 motors.

5) Adapter cable for 1FN3300 to 1FN3900 motors.

**Integration** (continued)

**Connection overview of SINAMICS S120 Motor Modules in booksize format SME120/SME125 or TM120/SMC20 and SIMOTICS T-1FW6 torque motors**



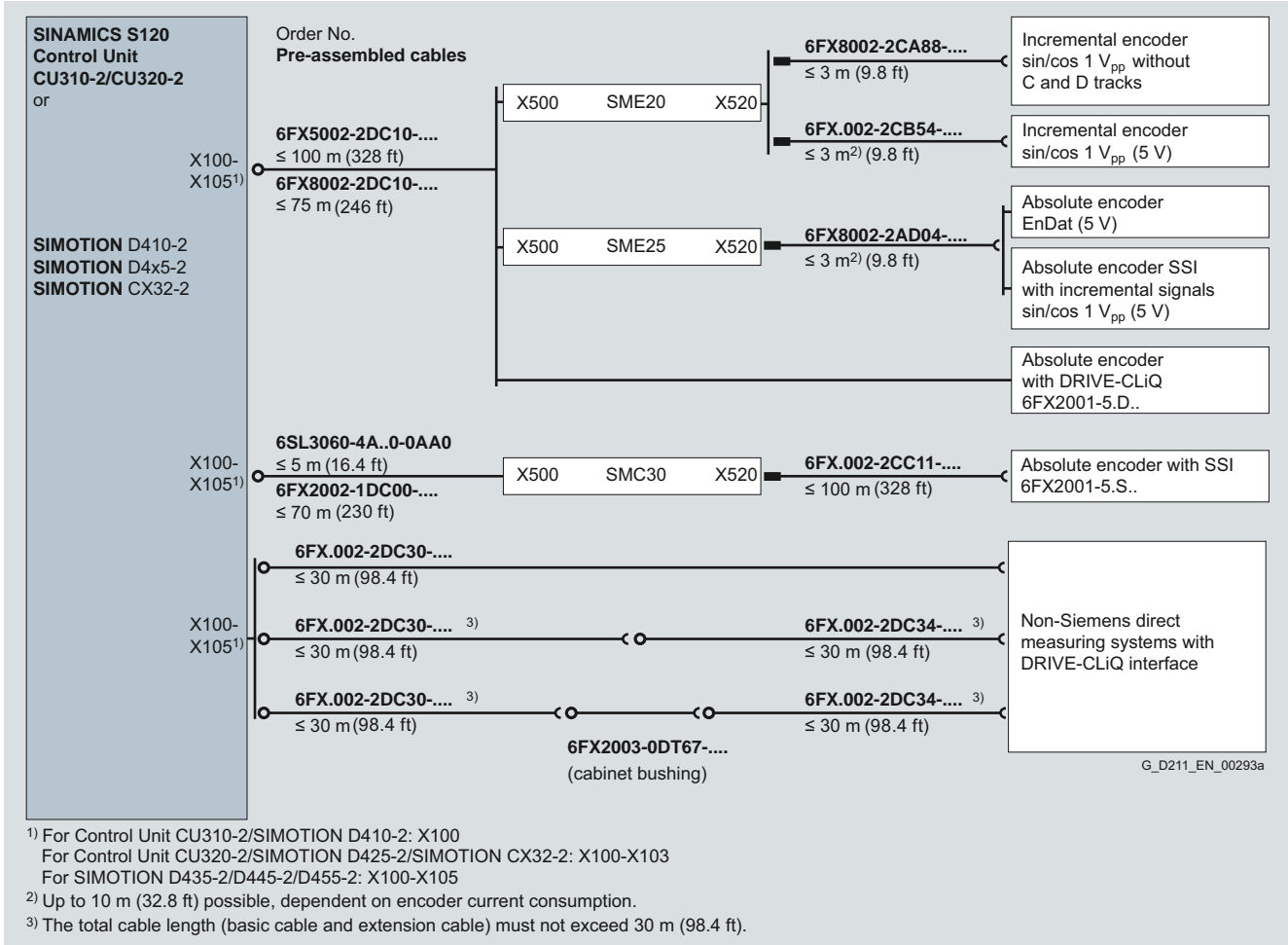
# MOTION-CONNECT connection systems

## Connection overviews

### Machine encoder

#### Integration

#### Connection of a machine encoder (direct measuring system)



<sup>1)</sup> For Control Unit CU310-2/SIMOTION D410-2: X100  
For Control Unit CU320-2/SIMOTION D425-2/SIMOTION CX32-2: X100-X103  
For SIMOTION D435-2/D445-2/D455-2: X100-X105

<sup>2)</sup> Up to 10 m (32.8 ft) possible, dependent on encoder current consumption.

<sup>3)</sup> The total cable length (basic cable and extension cable) must not exceed 30 m (98.4 ft).



# MOTION-CONNECT connection systems

## Accessories for power and signal cables

### Power connector

### Power and signal connectors for SIMOTICS T-1FW6 built-in torque motors

#### Overview



Power connector with screw-type connection

3 A to 30 A Motor Modules in booksize format are shipped without power connector, as this is already connected to the MOTION-CONNECT power cables.

Power connectors can also be ordered separately, e.g. for applications where installation of the motor cable would be difficult if a power connector were attached.

#### Overview



Power and signal connectors for SIMOTICS T-1FW6 built-in torque motors

Power and signal connectors 6FX2003 are designed to ensure optimum connection of SIMOTICS T-1FW6 built-in torque motors to the drive system.

#### Selection and ordering data

Description	Order No.
<b>Power connector</b> For Motor Modules 3 ... 30 A booksize format with screw-type connection (enclosure, insulator, 4 coding pins and 1 interlock bolt, screw-type connections Motor: 1.5 ... 10 mm <sup>2</sup> , Holding brake: 1.5 mm <sup>2</sup> )	<b>6SL3162-2MA00-0AA0</b>

#### Selection and ordering data

Description	Order No.
<b>Power connectors for SIMOTICS T-1FW6 built-in torque motors</b> <ul style="list-style-type: none"> <li>Size 1 for 4 × 2.5 mm<sup>2</sup> connectors with pins and full external thread</li> <li>Size 1.5 for 4 × 4 mm<sup>2</sup>/4 × 6 mm<sup>2</sup>/4 × 10 mm<sup>2</sup>/4 × 16 mm<sup>2</sup> connectors with pins and full external thread</li> </ul>	<b>6FX2003-0LA00</b>  <b>6FX2003-0LA10</b>
<b>Signal connectors for SIMOTICS T-1FW6 built-in torque motors</b> <ul style="list-style-type: none"> <li>M17 for 5 × 0.5 mm<sup>2</sup> + 1 × 1.0 mm<sup>2</sup> connectors with sockets and full-thread lock nut</li> </ul>	<b>6FX2003-0SU07</b>

#### More information

A special tool is needed to crimp the contacts. For further information, please go to:

[www.intercontec.biz](http://www.intercontec.biz)

# MOTION-CONNECT connection systems

## Accessories for power and signal cables

### Mounting flange

#### Overview



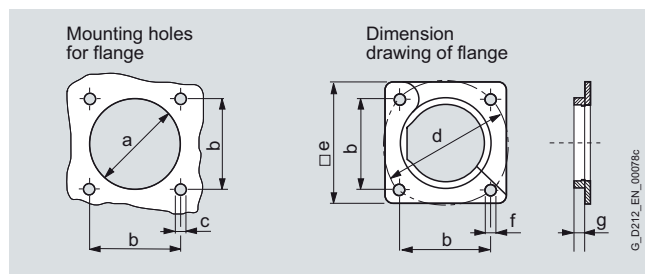
Mounting flange for power connectors

Mounting flanges are used to route or fix connectors in IP67 degree of protection, for example, in control cabinets. With the exception of angled connectors, a mounting flange can be retro-mounted on connectors with a cap nut or with external thread.

#### Selection and ordering data

Description	Order No.
<b>Mounting flange for</b>	
• Power connector size 0.5 and signal connector M17	<b>6FX2003-7HX00</b>
• Power connector, size 1	<b>6FX2003-7BX00</b>
• Power connector, size 1.5	<b>6FX2003-7CX00</b>
• Power connector, size 3	<b>6FX2003-7AX00</b>
• Signal connector M23	<b>6FX2003-7DX00</b>

#### Dimensional drawings



Dimensions	Power connector				Signal connector	
	Connec- tor size 0.5 mm (in)	Connec- tor size 1 mm (in)	Connec- tor size 1.5 mm (in)	Connec- tor size 3 mm (in)	M17 mm (in)	M23 mm (in)
a	Ø 23 (0.91)	Ø 28.6 (1.13)	Ø 47 (1.85)	Ø 66 (2.6)	Ø 23 (0.91)	Ø 27.6 (1.09)
b	22.6 (0.89)	28.3 (1.11)	42.4 (1.67)	75 (2.95)	22.6 (0.89)	28.3 (1.11)
c	4 × M2.5	4 × M3	4 × M4	4 × M4	4 × M2.5	4 × M3
d	Ø 32 (1.26)	Ø 40 (1.57)	Ø 60 (2.36)	Ø 63 (2.48)	Ø 32 (1.26)	Ø 40 (1.57)
e	32 (1.26)	35 (1.38)	55 (2.17)	84.9 (3.34)	32 (1.26)	35 (1.38)
f	M3	M4	M5	M6	M3	M4
g	6.5 (0.26)	6.5 (0.26)	7 (0.28)	10 (0.39)	6.5 (0.26)	6.5 (0.26)

### HF (high-frequency) clamp

#### Overview



HF (high-frequency) clamp for power connectors

To ensure correct grounding at the cable duct or cabinet wall, a ground clamp is optionally available together with the flanges for large-area discharging of high-frequency interferences. An HF (high-frequency) clamp is not required for size 3 power connectors.

#### Selection and ordering data

Description	Order No.
<b>HF (high-frequency) clamp for</b>	
• Power connector size 0.5 and signal connector M17	<b>6FX2003-7FA00</b>
• Power connector size 1 and signal connector M23	<b>6FX2003-7FX00</b>
• Power connector, size 1.5	<b>6FX2003-7GX00</b>

# MOTION-CONNECT connection systems

## Accessories for power and signal cables

### DRIVE-CLiQ cabinet bushing (RJ45)

#### Overview



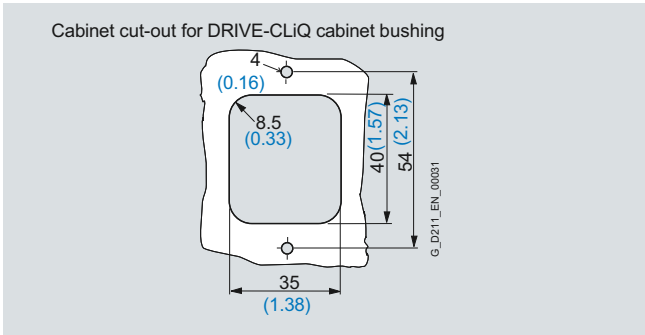
DRIVE-CLiQ cabinet bushing for signal cables (RJ45)

The DRIVE-CLiQ cabinet bushing (RJ45) provides the high IP67 degree of protection for the appropriate MOTION-CONNECT DRIVE-CLiQ signal cables routed through openings in control cabinets. The DRIVE-CLiQ cabinet bushing features IP54 degree of protection on the outside and IP20 on the inside of the control cabinet.

#### Selection and ordering data

Description	Order No.
<b>DRIVE-CLiQ cabinet bushing</b> For MOTION-CONNECT DRIVE-CLiQ signal cables (RJ45)	<b>6SL3066-2DA00-0AA0</b>

#### Dimensional drawings



Dimensions in mm (in)

### DRIVE-CLiQ cabinet bushing (M12)

#### Overview



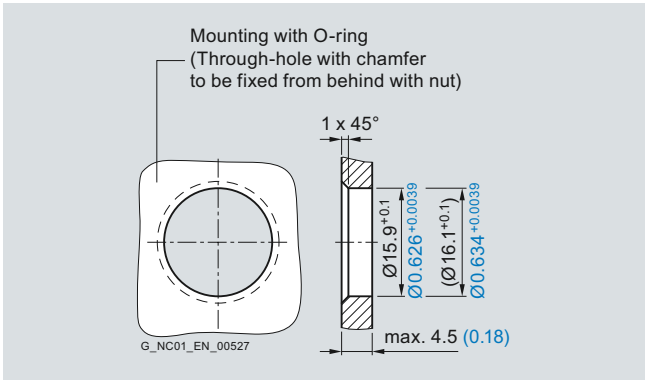
DRIVE-CLiQ cabinet bushing for signal cables (M12)

The DRIVE-CLiQ cabinet bushing (M12) provides the high IP67 degree of protection for the appropriate MOTION-CONNECT DRIVE-CLiQ signal cables routed through openings in control cabinets. The DRIVE-CLiQ cabinet bushing (M12) has degree of protection IP67 at both ends and is designed as a socket with internal thread on the outside of the cabinet and as pins with an external thread on the inside of the cabinet.

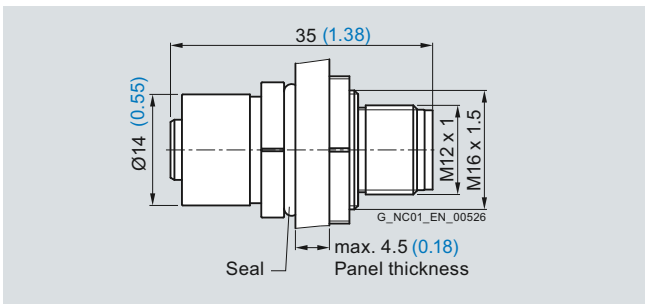
#### Selection and ordering data

Description	Order No.
<b>DRIVE-CLiQ cabinet bushing</b> For MOTION-CONNECT DRIVE-CLiQ signal cables (M12)	<b>6FX2003-0DT67</b>

#### Dimensional drawings



Dimensions in mm (in)



Cutout in cabinet for DRIVE-CLiQ cabinet bushing

# MOTION-CONNECT connection systems

## Accessories for power and signal cables

### DRIVE-CLiQ coupler

#### Overview



DRIVE-CLiQ coupler for signal cables

The DRIVE-CLiQ coupler makes it possible to join two MOTION-CONNECT DRIVE-CLiQ signal cables with degree of protection IP67.

#### Selection and ordering data

Description	Order No.
<b>DRIVE-CLiQ coupler</b> For MOTION-CONNECT DRIVE-CLiQ signal cables	<b>6SL3066-2DA00-0AB0</b>

# SIMOTION Motion Control System



# 9



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Part 3	<b>Engineering software</b> STARTER commissioning tool Drive Control Chart (DCC) Drive ES engineering software
Part 13	<b>SIZER for Siemens Drives engineering tool</b>
Part 14	<b>CAD CREATOR</b> Dimension drawing and 2D/3D CAD generator <a href="http://www.siemens.com/cadcreator">www.siemens.com/cadcreator</a>


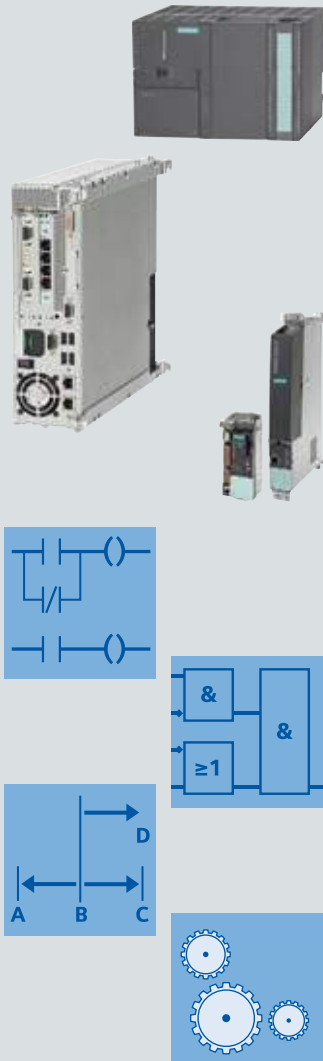
# SIMOTION Motion Control System

## Overview

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	Supplementary components		
	SIMATIC Panel PC Remote Kit	The SIMATIC Flat Panels and the Panel PC Remote Kit allow the Motion Controller and control unit to be installed at a distance from one another	9/24
	Standard PC keyboard	PC keyboard with palm rest for ergonomic working	9/25
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# SIMOTION Motion Control System

## Overview

	Designation	Description	Page
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		Description of basic functions SCOUT Workbench, hardware and network configuration, generation of technological objects, generation of cams, Structured Text (ST), Motion Control Chart (MCC), ladder logic/function block diagram (LAD/FBD), diagnostics for testing and commissioning	<b>9/84</b>
	Optional packages for SIMOTION SCOUT	Description of optional packages CamTool (graphical cam editor), Drive Control Chart (DCC)	<b>9/91</b>
	Free extras for SIMOTION SCOUT	Increase in efficiency when creating projects by using SIMOTION easyProject	<b>9/93</b>
		SIMOTION Utilities & Applications – a comprehensive library with applications, examples, tools, scripts, FAQs, ...	<b>9/95</b>
<b>Overview of SIMOTION functions</b>			
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	Memory and address ranges	Memory sizes and address ranges of the Motion Controller	<b>9/98</b>
	Drives on SIMOTION	Which drives can be operated on SIMOTION?	<b>9/99</b>
	Encoders on SIMOTION	Which encoders can be directly connected to SIMOTION? Are there other connection options?	<b>9/101</b>
	Measuring inputs	How many measuring inputs are provided on the SIMOTION platforms? Are there further options for implementing measuring inputs?	<b>9/102</b>
	Output cams	How many onboard output cams are provided on the SIMOTION platforms? Are there further options for implementing output cams?	<b>9/102</b>
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	Software for extended communication with SIMOTION	Communication according to the standards OPC and OPC XML-DA, SIMOTION Multipurpose Information Interface	<b>9/105</b>
	Communication	How many communication interfaces are provided on the SIMOTION platforms?	<b>9/106</b>
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# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### Overview of SIMOTION C

#### Overview



SIMOTION C is the controller variant of the SIMOTION family with the proven design of the SIMATIC S7-300. Flexible modular expansion of SIMOTION C is possible thanks to use of the SIMATIC S7 module spectrum. The SIMOTION C240 and C240 PN designs represent two powerful Motion Controllers for advanced control and motion control tasks.

Depending on the SIMOTION C platform, HMI devices can be operated directly on the onboard PROFIBUS, Ethernet or PROFINET interfaces for operator control and monitoring. Functions such as remote maintenance, diagnostics and tele-service can also be used via these interfaces.

#### Benefits

- Flexible application thanks to use of the SIMATIC S7-300 module spectrum and thus optimal adaptation to the automation task
- For universal use with digital and analog coupling to servo/ vector, stepper and hydraulic drives (depending on the variant)
- User-friendly mounting and simple design with no moving parts
- Versatile networking through onboard PROFIBUS DP, Industrial Ethernet and PROFINET IO interfaces
- Powerful thanks to a range of integrated functions
- Easy engineering for open-loop control and motion control applications in the same program

#### Application

##### *SIMOTION C can be used wherever:*

- Motion Control, technology and PLC functionalities are to be programmed, configured and executed in a single unit,
- a modularly expandable device is to be placed near or in the machine,
- communication with other programmable controllers is necessary.

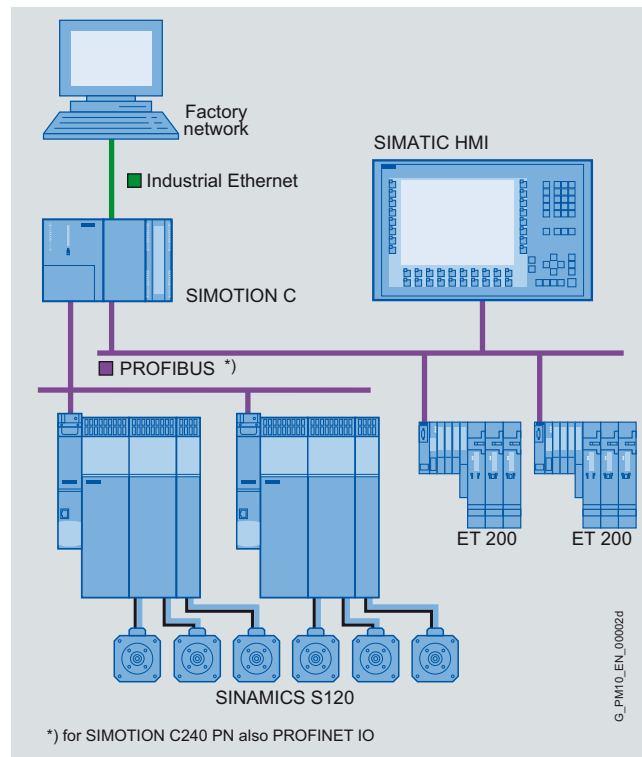
SIMOTION C is universally applicable and meets the highest standards with respect to suitability for industrial use, thanks to high EMC compatibility and resistance against shock and vibration loads.

##### *Important applications include:*

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Retrofit

Due to the increasing use of servo drives, these machines require a high degree of integration of PLC, Motion Control and technology functions.

#### Design



SIMOTION C with central and distributed I/O

The SIMOTION C motion control system is designed with modular principles in mind. It consists of a comprehensive and individually combinable hardware spectrum that uses components of the SIMATIC S7-300 series and Siemens drive technology.



#### Design (continued)

##### Components and interfaces of the SIMOTION C Motion Controller:

- Analog drive interfaces (for C240)
  - For setpoint outputs to servo/vector drives
  - For setpoint outputs to the actuating valves of hydraulic drives
  - As analog outputs for optional use
- Pulse outputs for controlling stepper drives (for C240)
- Interfaces for incremental/absolute encoders for cyclic acquisition of an actual position value or as freely assignable up/down counter (for C240)
- Onboard I/O for high-speed I/O signals
- SIMOTION Micro Memory Card (MMC) for storing:
  - SIMOTION Kernel
  - User programs
  - User variables
- Integrated communications interfaces for linking:
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other Motion Control and automation systems
  - Drives with digital setpoint interface
- Various status/error displays and mode selectors

##### The following components make up a SIMOTION C system:

- Motion Controller and Micro Memory Card (MMC)
- Other system components (depending on requirements) such as:
  - Load power supplies (PS) for connecting SIMOTION C to a power supply of 120 V/230 V AC
  - Central (not onboard) and distributed I/O components
  - Servo/vector drives with analog or digital setpoint interface or stepper drives

##### Mounting and connection technology

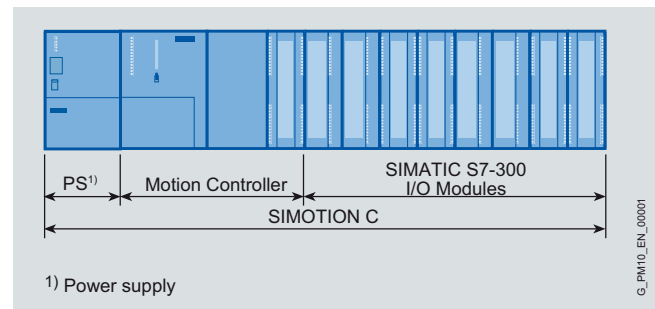
The simple design makes SIMOTION C flexible and easy to maintain:

- Rail mounting  
Simply attach the module to the standard mounting rail, swing it in and screw it tight.
- Integrated backplane bus  
The backplane bus is integrated in the Motion Controller. The Motion Controller is connected to the I/O modules via bus connectors which are plugged into the rear of the housing.
- The front connector design prevents front connectors from being plugged into the wrong module type.
- Screw-type terminals, spring-loaded terminals or FastConnect system for I/O modules.
- TOP connect  
This connection method provides pre-assembled wiring with 1 to 3-wire connection systems with screw-type or spring-loaded terminal as an alternative to wiring directly on the I/O module.
- This system uses a standard mounting depth since all connections and connectors are recessed in the module and are protected and covered by doors on the front.
- No slot rules.

##### Expansion with central I/O modules

Up to 8 slots can be used to the right of the Motion Controller for SIMATIC S7-300 I/O modules.

The IM 365 can be used to connect an expansion rack (two-tier design) to increase the number of slots available for I/O modules from 8 to 16. Multi-tier configuration with IM 360/IM 361 is not supported by SIMOTION C.



SIMOTION C can be mounted horizontally or vertically.

If additional I/O modules are required, the distributed SIMATIC ET 200 I/O can be connected to a SIMOTION C via PROFIBUS DP or PROFINET IO (for C240 PN).

The number of pluggable I/O modules is also limited by the power required from the backplane bus. The power consumption of all modules which are connected to the same backplane bus must not exceed 1.2 A.

##### Expansion using distributed I/Os

Distributed I/Os can be assembled with intelligent I/O system components:

- SIMATIC ET 200S
- SIMATIC ET 200SP (for C240 PN)
- SIMATIC ET 200M
- SIMATIC ET 200pro
- SIMATIC ET 200eco
- SIMATIC ET 200eco PN (for C240 PN)

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### Overview of SIMOTION C

#### Function

##### Basic functionality

SIMOTION C provides the following basic functionality for a wide variety of automation requirements:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion Control functions (Motion Control Basic)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

##### SIMOTION technology packages

A special feature of SIMOTION is that the operating system functionality can be expanded by loading technology packages, such as:

- Motion Control with the functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation
- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you use.

##### Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

##### Operator control and monitoring (HMI)

Communication utilities which support user-friendly data exchange with HMI devices are integrated in the basic functionality of the SIMOTION C Controller. Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to a SIMOTION C via Industrial Ethernet, PROFIBUS or PROFINET (for C240 PN). They are configured using ProTool/Pro or WinCC flexible.

With the SIMATIC NET communication software, the open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

SIMOTION IT provides SIMOTION C with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Motion Controller variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

##### Process and data communication

Thanks to its integrated interfaces, SIMOTION C supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

#### More information

##### More information

- about power supplies and I/O modules can be found in chapter SIMOTION I/O components.
- about TOP connect can be found in Catalog KT 10.2 and in the Industry Mall under Automation Technology/Automation Systems/System cabling/ control cabinets/SIMATIC TOP connect system cabling.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about runtime software and engineering software can be found in section SIMOTION software.
- about the communication functions of the Motion Controllers can be found in section SIMOTION Runtime software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Overview



SIMOTION C is a Motion Controller in S7-300 design. In addition to the already integrated interfaces, the controller can be expanded using I/O modules from the SIMATIC S7-300 range.

The Motion Controller is available in two versions: SIMOTION C240 and SIMOTION C240 PN. Although the two C240 and C240 PN versions have the same PLC and motion control performance, they differ in their interfaces.

#### Design

##### Interfaces

###### Operation, display and diagnostics

- 1 × mode selector
- 1 × LED strip for fault and status indicators

###### Integrated I/Os

- 18 digital inputs (C240: of which 2 for local measuring inputs and 4 for global measuring inputs/zero marks, C240 PN: of which four for global measuring inputs)
- 8 digital outputs

###### Drive interfaces (C240)

- 1 × setpoint output interface for up to 4 axes (optionally for analog, stepper or hydraulic drives; also as freely assignable analog outputs)
- 4 × encoder inputs for incremental or absolute encoders (can also be used as freely assignable up/down counters)

###### Communication

- 1 × interface for Industrial Ethernet
- 2 × interfaces for PROFIBUS DP (of which one interface is for MPI)
- 3 × ports for PROFINET IO (C240 PN)

###### Data backup

- 1 × slot for SIMOTION Micro Memory Card (MMC)

###### Additional interfaces

- Power supply terminals

##### Data storage/data backup

SIMOTION C Motion Controllers have an integrated non-volatile data memory for storing process variables.

The data is backed up on a SIMOTION Micro Memory Card (MMC).

##### Expansion with central I/O modules

The central I/O is plugged directly into the SIMOTION C Motion Controller. The I/O configuration for centralized I/O can comprise of two tiers (second tier using IM 365 interface) with up to 8 I/O modules each and a total of 4 analog modules. I/O modules from the SIMATIC S7-300 spectrum can be used here.

##### Expansion using distributed I/Os

The following can be used as distributed I/O components:

###### PROFIBUS DP:

- All certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- Servo converters of the MASTERDRIVES, SIMODRIVE and SINAMICS series over PROFIBUS DP interface with PROFIdrive
- MICROMASTER and COMBIMASTER frequency inverters
- Stepper drives over PROFIBUS DP interface with PROFIdrive

###### PROFINET IO (C240 PN):

- SIMATIC ET 200S/SP/M/pro/eco PN distributed I/O systems
- SINAMICS S120 servo converters over PROFINET IO with IRT (PROFIdrive)

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Function

The control and motion control functionality runs centrally on the SIMOTION C controller.

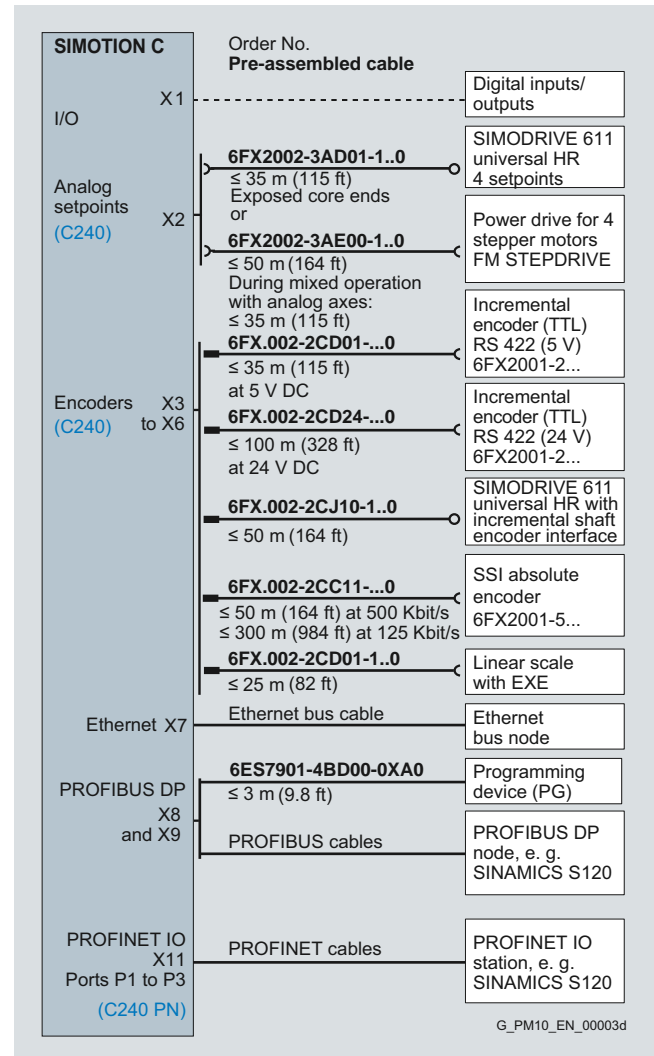
The functionality ranges from simple positioning to complex motion control tasks over cams and interpolation.

#### Position-controlled motion control

##### Setpoint output/actual value acquisition

- Position control with analog setpoint output  
For each axis, the SIMOTION C240 Motion Controller provides one analog output for the speed setpoint and one encoder input for cyclic detection of the actual position value. In the case of hydraulic drives, the setpoint for the positioning valve is specified via the analog output.
- Position control with pulse direction output for stepper drives  
For each axis, the SIMOTION C240 Motion Controller provides one pulse output for the position setpoint. Stepper drives can either be operated without an encoder or be position-controlled with an encoder.
- Position control with digital setpoint output  
The PROFIBUS DP interface with PROFIdrive or the PROFINET interface for the C240 PN is available for this purpose. The actual position value is fetched over PROFIBUS DP or PROFINET and the speed setpoint is output.
- Position control with mixed setpoint output  
Analog, stepper and PROFIBUS drives can be used in a mixed configuration on the SIMOTION C240 Motion Controller. The channels of the 4 onboard interfaces can be used for analog, stepper or hydraulic drives. PROFIBUS and PROFINET drives can be operated as mixed configuration for the C240 PN.
- Incremental position sensing (C240)  
Incremental encoders supply counter pulses for the traversed distance according to their resolution. It is usually necessary to search for homing references. The following can be used:
  - Rotary encoders
  - Linear encoders (length dimensions)
- Absolute position sensing (C240)  
Absolute encoders with serial interface can be used (SSI absolute encoders). It is not necessary to search for homing references.
- Position control/position sensing over ADI 4 or IM 174  
The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog setpoint interfaces. The IM 174 also supports the connection of stepper drives with a pulse direction interface. Both modules are connected over PROFIBUS DP. The following can be connected to an ADI 4 or IM 174 module:
  - 4 drives
  - 4 encoders
  - Digital inputs and outputs
- Isochronous PROFIBUS encoder

#### Integration



Overview of connections for SIMOTION C

The maximum permissible cable lengths should be taken into account when planning the cable layout.

Functional faults can occur when using longer cables.

The permissible length of PROFIBUS DP cables depends on the configuration.

#### Technical specifications

PLC and motion control performance	
Maximum number of axes	32
Minimum PROFIBUS cycle	1 ms
Minimum PROFINET send cycle (C240 PN only)	0.5 ms
Minimum servo/interpolator clock cycle	0.5 ms
Memory	
RAM (Random Access Memory)	50 MB
RAM disk (load memory)	29 MB
Retentive memory	107 KB
Persistent memory (user data on MMC)	50 MB
Communication	
Ethernet interfaces	1
PROFIBUS interfaces	2
PROFINET interfaces (C240 PN only)	<ul style="list-style-type: none"> <li>• 1 interface with 3 ports</li> <li>• Supports PROFINET IO with IRT and RT</li> <li>• Can be configured as PROFINET IO controller and/or device</li> </ul>
General technical specifications	
<b>Supply voltage</b>	
• Rated value	24 V DC
• Permissible range	20.4 ... 28.8 V
<b>Current consumption, typ.</b>	1.2 A
<b>Starting current, typ.</b>	8.0 A
<b>Power loss</b>	15 W
<b>Permissible ambient temperature</b>	
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Permissible relative humidity (without condensation)</b>	5 ... 95 %
<b>Atmospheric pressure</b>	700 ... 1060 hPa
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>	IP20
<b>Dimensions (W x H x D)</b>	200 x 125 x 118 mm (7.87 x 4.92 x 4.65 in)
<b>Weight</b>	
• SIMOTION C2xx	1150 g (2.54 lb)
• Memory card	16 g (0.56 oz)
<b>Relay outputs</b>	<b>5 (C240)</b> <b>1 (C240 PN)</b>
of which for	
• Controller enable (C240 only)	4
• READY	1
<b>Electrical data</b>	
• Max. operational voltage	50 V DC
• Max. switching current	1 A
• Max. switching capacity	30 W
<b>Operating cycles</b>	
• at 24 V, 1 A	3 x 10 <sup>6</sup>

<b>Drive interfaces (C240 only)</b>	<b>4</b>
Can be optionally used for analog, stepper or hydraulic drives, alternatively also as standard analog outputs	
<b>When used as an analog output</b>	
• Voltage range	± 10.5 V
• Resolution	16 bit, including sign
• Galvanic isolation	No
• Load impedance	≥ 3 kOhm
• Max. cable length	35 m (114 ft)
<b>When used as a pulse output for stepper drives</b>	
• Output voltage for "1" signal, I <sub>O</sub> = -20 mA	3.7 V
• Output voltage for "0" signal, I <sub>O</sub> = 20 mA, max.	1 V
• Load resistance, min.	55 Ω
• Max. cable length	50 m (164 ft)
• Max. pulse frequency	750 kHz
<b>Integrated digital inputs</b>	<b>18</b>
of which with special functions for:	
• Measuring input (C240 only)	2
• BERO connection (can also be used as measuring input for C240, can only be used as measuring input for C240 PN)	4
(all inputs can be used as standard inputs)	
<b>Input voltage</b>	
• Rated value	24 V DC
• For "1" signal	11 ... 30 V
• For "0" signal	-3 ... +5 V
<b>Galvanic isolation</b>	
• Inputs in groups of	18
<b>Input current</b>	
• For signal "1", min. / typ.	6 mA/8 mA
<b>Input delay (at rated value of input voltage)</b>	
• 0 → 1, typ./max.	6 μs/15 μs
• 1 → 0, typ./max.	40 μs/150 μs
<b>Connection of 2-wire BERO</b>	Yes
• Permitted quiescent current	2 mA
<b>Integrated digital outputs</b>	<b>8</b>
• of which for fast output cam, max.	8
<b>Rated load voltage</b>	24 V DC
• Permissible range	20.4 ... 28.8 V
<b>Output voltage</b>	
• For signal "1", max.	L+
<b>Galvanic isolation in groups of</b>	8

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Technical specifications (continued)

<b>Output current</b>	
• For signal "1", minimum current per channel	5 mA
• For signal "0", max.	0.5 mA
<b>Residual current, max.</b>	2 mA
<b>Derated loading</b>	
• at 40 °C (104 °F)	4 A
• at 55 °C (131 °F)	2 A
<b>Switching frequency of the outputs</b>	
• With resistive load	100 Hz
• With inductive load	2 Hz
<b>Lamp load</b>	5 W
<b>Purge energy/channel</b>	400 mJ (not simultaneous)
<b>Typ. output delay</b>	150 µs
<b>Short-circuit protection</b>	Yes
<b>Encoder inputs, max. (C240 only)</b>	<b>4</b>
Optionally for incremental or absolute encoder Can be used alternatively as up/down counter	
<b>Incremental encoder inputs</b>	
• Interface type (RS 422)	5 V
• Encoder supply	5 V/0.3 A
• Galvanic isolation	No
• Encoder frequency, max.	1 MHz
• Max. cable length	
- at 1 MHz	10 m (32.81 ft)
- at 500 kHz and 300 mA	25 m (82.03 ft)
- at 500 kHz and 210 mA	35 m (114 ft)
<b>Inputs, SSI absolute encoder</b>	
• Interface type (RS 422)	5 V synchronous serial, single or multiturn
• Encoder supply	24 V/0.3 A
• Galvanic isolation	No
• Transfer rate	187.5/375/750/1500 kbit/s
• Message length, max.	25 bit
• Max. cable length	
- at 187.5 kbit/s	250 m (820 ft)
- at 1500 kbit/s	10 m (32.81 ft)
<b>Monitoring</b>	
• Short-circuit of the sensor supply	Yes
• Wire break	Yes
<b>Additional technical specifications</b>	
<b>Real-time clock buffering</b>	
• Buffer time, typ.	4 weeks
• Charging time, typ.	1 h
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SIMOTION C240 Motion Controller</b> (SIMOTION V4.0 HF2 is required)	<b>6AU1240-1AA00-0AA0</b>
<b>MultiAxes Bundle SIMOTION C240</b> Consists of 1 item each	<b>6AU1240-1AA00-0CA0</b>
• SIMOTION C240 Motion Controller	
• Micro Memory Card (MMC) 64 MB with MultiAxes Package license for SIMOTION C	
<b>SIMOTION C240 PN Motion Controller</b> (≥ SIMOTION V4.1 SP2 HF 3/4)	<b>6AU1240-1AB00-0AA0</b>
<b>MultiAxes Bundle SIMOTION C240 PN</b> Consists of 1 item each	<b>6AU1240-1AB00-0CA0</b>
• SIMOTION C240 PN Motion Controller	
• Micro Memory Card (MMC) 64 MB with MultiAxes Package license for SIMOTION C	
<b>Micro Memory Card (MMC) 64 MB</b> for SIMOTION C240/C240 PN Pre-installed license can be obtained using additional order codes <sup>1)</sup>	<b>6AU1720-1KA00-0AA0</b>
<b>Micro Memory Card (MMC) 64 MB</b> for SIMOTION C240/C240 PN with MultiAxes Package license for SIMOTION C	<b>6AU1720-1KA00-0AA0 -Z M24</b>

<sup>1)</sup> See Ordering of licenses for runtime software on page 9/63.

# SIMOTION Motion Control System

## SIMOTION C – Controller-based

### SIMOTION C240/C240 PN Motion Controller

#### Accessories

Description	Order No.
<b>Accessories for SIMOTION C240/C240 PN</b>	
<b>Front connector, 40-pin</b> for connection of onboard I/Os	
• With screw contacts	<b>6ES7392-1AM00-0AA0</b>
• With spring-loaded contacts	<b>6ES7392-1BM01-0AA0</b>
• With FastConnect fast connection method	<b>6ES7392-1CM00-0AA0</b>
<b>Connecting comb PS – C2xx</b> for PS307 power supply	<b>6ES7390-7BA00-0AA0</b>
<b>IM 365 Interface Module</b> for expanding the Motion Controller with max. 1 expansion unit, 2 modules with permanent connecting cable (1 m (3.28 ft))	
• Standard temperature range	<b>6ES7365-0BA01-0AA0</b>
<b>SIMATIC S7-300 mounting rail</b>	
• L = 160 mm (6.30 in)	<b>6ES7390-1AB60-0AA0</b>
• L = 480 mm (18.90 in)	<b>6ES7390-1AE80-0AA0</b>
• L = 530 mm (20.87 in)	<b>6ES7390-1AF30-0AA0</b>
• L = 830 mm (32.68 in)	<b>6ES7390-1AJ30-0AA0</b>
• L = 2000 mm (78.74 in)	<b>6ES7390-1BC00-0AA0</b>
<b>Accessories for PROFINET</b>	
<b>RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET</b>	
• 145° cable outlet	
- 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET<sup>1)</sup></b>	
• IE FC Standard Cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC Flexible Cable GP 2x2	<b>6XV1870-2B</b>
• IE FC Trailing Cable GP 2x2	<b>6XV1870-2D</b>
• IE FC Trailing Cable 2x2	<b>6XV1840-3AH10</b>
• IE FC Marine Cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

#### More information

For more information about PROFIBUS DP, Industrial Ethernet and PROFINET, please refer to Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.

#### **SIZER for Siemens Drives engineering tool**

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft)

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Overview of SIMOTION P

#### Overview



#### *SIMOTION P – the PC-based variant*

SIMOTION P is a PC-based, open Motion Control System which is available in two variants:

- SIMOTION P320-3 for **embedded** PC solutions operating on Windows Embedded Standard 2009
- SIMOTION P350-3 for high-performance applications operating on Windows XP.

PLC, Motion Control, and HMI functions are executed together with standard PC applications on one platform. Benefits to the user: Using the PC platform and the Microsoft Windows operating system, with a real-time expansion for SIMOTION – the advantages of both worlds are combined in SIMOTION P:

#### *Openness thanks to the Windows operating system*

With SIMOTION P, you can enhance your machine's performance using technology normally associated with the office environment:

- Flexible networking
- High storage capacity for data
- Data backup concepts
- Integrated communication

Complex data evaluation, visualization tasks and even engineering can be easily implemented with SIMOTION P directly on the PC. When HMI software from other engineering systems is needed, the standardized OPC server interface can be used.

Functions such as remote maintenance, diagnostics and tele-service can also be used via the integrated Ethernet interface. The standard applications of the PC world are also available for your motion applications for example:

- Hardware, such as a printer, keyboard, mouse
- Software, such as visualization software or Microsoft Office programs.

#### *Real-time capability thanks to the SIMOTION operating system*

The fully independent SIMOTION operating system runs parallel with Windows on SIMOTION P. This real-time expansion makes it possible to implement complex motion control applications with high performance requirements on platforms of the SIMOTION P range. A Windows "bluescreen" does not interrupt the motion control application, as the real-time operating system of SIMOTION P can continue running despite this type of error condition.

#### *Powerful PC technology*

- The latest PC processor technology ensures optimum performance.
- Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

#### Benefits

- Open-loop control, motion control, technology, visualization and standard Microsoft applications on the same platform – ready to use without the need for time-consuming installation
- Performance gains due to the latest, powerful PC processor architecture
- Easy configuration of HMI functions using WinCC flexible
- Openness to standard applications on the basis of the Windows operating system
- Standard PC communication mechanisms can be used over Industrial Ethernet
- Easy software updates
- User-friendly operation
- Flexible networking over the communication interfaces provided. For example, PROFIBUS DP, PROFINET and Industrial Ethernet available.
- Powerful thanks to a range of integrated functions
- Easy engineering for open-loop control and motion control applications in the same program

#### Application

##### *SIMOTION P320-3 is ideal for applications for which*

- the available mounting space is minimal
- rugged hardware is extremely important, without rotating parts such as fan or hard disk
- no display is needed in normal operation (headless mode). Connections are available for operation of a monitor or display.
- Windows Embedded Standard is required as the operating system.

##### *SIMOTION P350-3 is ideal for high-performance applications for which*

- complex data management and data evaluation are required
- motion control, open-loop control and HMI functions need to be implemented on one platform to save space
- highly dynamic position and pressure control loops are needed for hydraulic applications
- the openness provided by the Windows operating system can be optimally utilized (software, drivers, etc.)

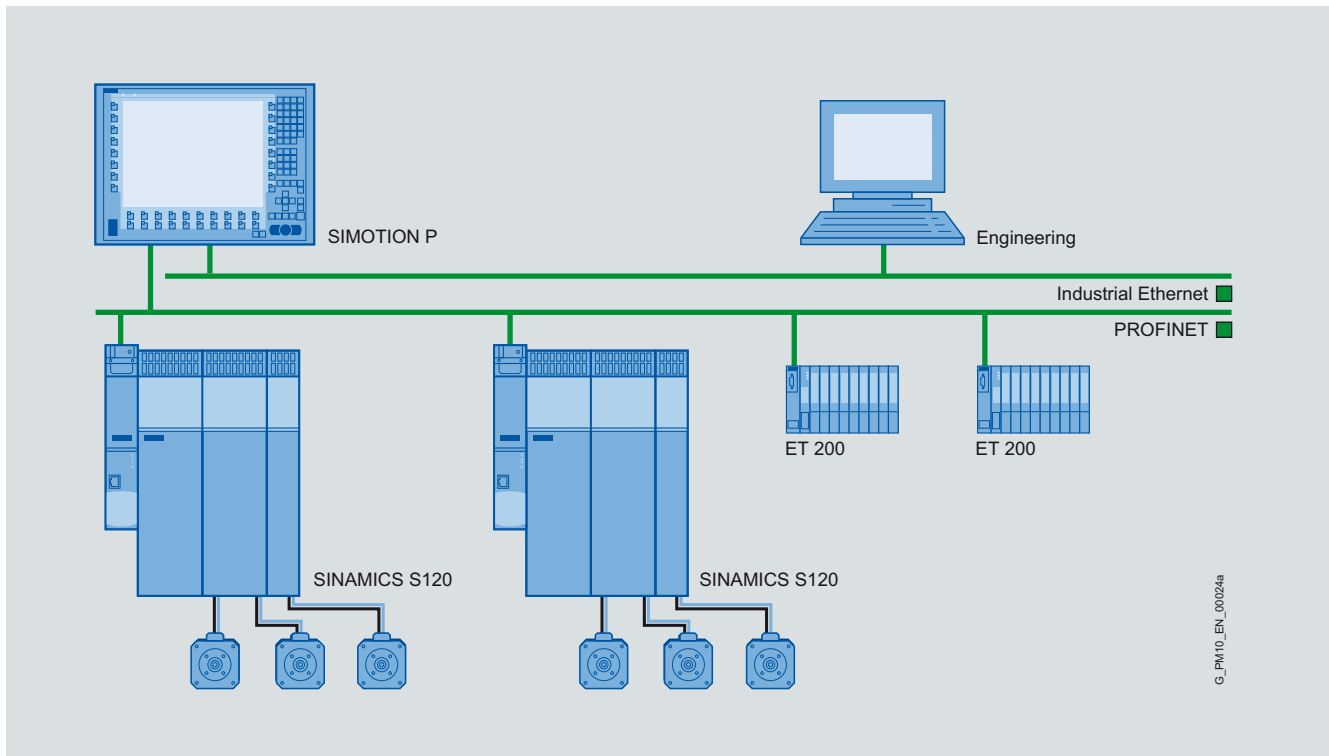
##### *Important applications include:*

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Production lines in the renewable energy sector, e.g. solar technology, wind power installations.

Due to the increasing use of servo drives, these machines require a high degree of integration of PLC, motion control and technology functions.



## Design



Typical design of an automation solution using SIMOTION P

### Equipment provided on SIMOTION P basic units

The SIMOTION P320-3 and P350-3 Motion Controllers are ready-to-run PC systems comprising:

- SIMOTION P320-3 or P350-3 hardware platform
- Windows operating system and real-time expansion for SIMOTION P
- SIMOTION Kernel
- Communication interfaces for flexible networking, e.g. PROFIBUS DP, PROFINET IO and Industrial Ethernet, depending on the device and device variant.

### Power supplies for SIMOTION P

SIMOTION P systems require a 24 V operating voltage. We recommend that you use an uninterruptible power supply (UPS). For the connection to a 120/230/400 V voltage source, you will require one of the following power supplies, for example:

- SIMATIC PS 307 or
- SITOP power and DC-UPS module.

### Operator control and monitoring

Displays and monitors can be directly connected to SIMOTION P320-3 and SIMOTION P350-3 Motion Controllers by means of the graphics interfaces featured on both types of controller. With the Panel PC Remote Kit, it is possible to operate SIMOTION P panel fronts at a distance of up to 30 m (98.4 ft) from Motion Controllers. SIMATIC Flat Panels offer the additional option of distributed configuration.

### Engineering

Engineering is performed either using a separate programming device or, in the case of SIMOTION P350-3, directly on the SIMOTION P system.

### Communication interfaces on SIMOTION P320-3

With its integrated PROFINET Communication Board with 3 ports, SIMOTION P320-3 can be connected to a PROFINET IO network. The PROFINET board supports PROFINET IO with IRT and RT. Standard Ethernet communication (TCP/IP) is also possible over this interface.

### Communication interfaces on SIMOTION P350-3

#### PROFIBUS version

The connection to a PROFIBUS network is made via the integrated IsoPROFIBUS board. This is a PCI card with two ports for PROFIBUS DP (max. 12 Mbit/s). Users can parameterize the clock-pulse rate on the bus. Optionally, the user can define one of the two PROFIBUS DP interfaces as programming interface (MPI protocol).

If required, PROFINET can also be retrofitted to the PROFIBUS version which will then support PROFIBUS and PROFINET communication in the same device.

#### PROFINET version

The connection to a PROFINET network is made via the integrated MCI-PN board. This Programming of motion PCI card with four Ethernet ports and integrated switch functionality. The PROFINET board supports PROFINET IO with IRT and RT. Standard Ethernet communication (TCP/IP) is also possible over this interface.

### Integration in Local Area Networks

With the onboard Industrial Ethernet interface, the SIMOTION P systems are prepared for integration in LANs (Local Area Networks). An external operator station or an engineering system can also be connected (e.g. for remote maintenance).

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Overview of SIMOTION P

#### Design (continued)

##### Expansion using distributed I/Os

SIMOTION P320-3 and P350-3 Motion Controllers can control (depending on device and device variant) drives and distributed I/O modules over PROFIBUS DP or PROFINET. Suitable I/O systems include, for example:

- SIMATIC ET 200S
- SIMATIC ET 200SP
- SIMATIC ET 200M
- SIMATIC ET 200pro
- SIMATIC ET 200eco, ET 200eco PN

The high-performance I/O systems transfer the required process signals digitally and free of interference to the SIMOTION P system.

##### High-speed I/Os for time-critical applications

Cycle times of 250 µs can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed. This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

#### Function

##### System concept

The control and motion control software execute on the SIMOTION Kernel basic system.

The internal PC communication provides high-performance data exchange between the SIMOTION Kernel and the Microsoft Windows operating system. Further processing of this data, e.g. using OPC server, is possible in any Microsoft programs.

##### SIMOTION basic functionality

The SIMOTION P systems provide the following basic functionality for a wide variety of automation requirements:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Technology functions for Motion Control Basic
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

##### SIMOTION technology packages

A special feature of SIMOTION is that the operating system functionality can be expanded by loading technology packages, such as:

- Motion Control with the functions
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation
- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you will actually use: "pay only for what you need"

##### Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

##### Operator control and monitoring (HMI)

Operator control and monitoring can be performed

- separately on an HMI panel or
- directly on the SIMOTION P panel.

Communication utilities which support user-friendly data exchange with HMI systems are integrated in the basic functionality of SIMOTION P. Both PROFIBUS/PROFINET and Industrial Ethernet can be used for communication. The SIMOTION Kernel processes the data exchange independently.

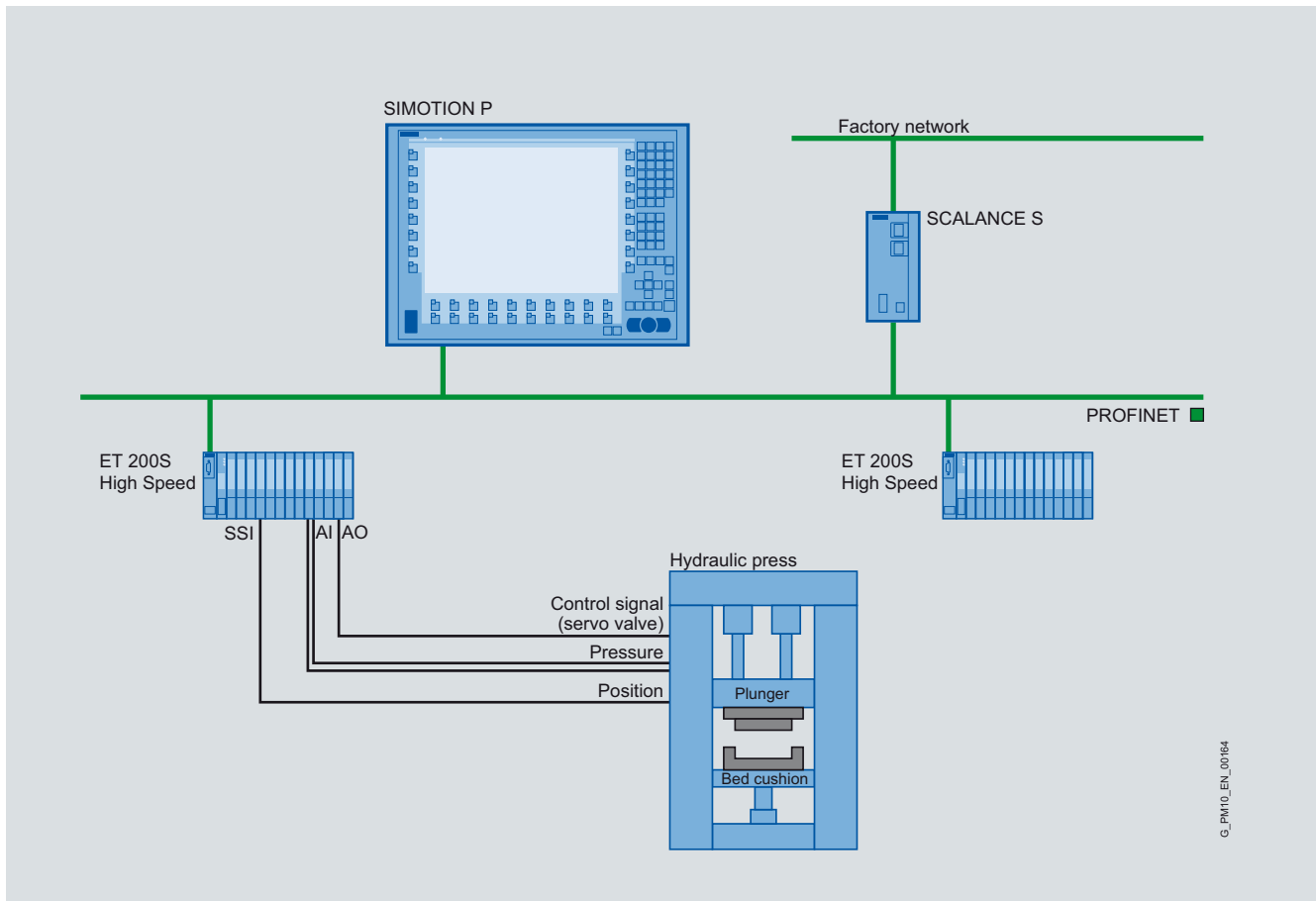
SIMATIC WinCC flexible is the standard HMI system for SIMOTION P. This HMI system can directly configure the data from a SIMOTION project. SIMOTION panel fronts can be used for operation and visualization. SIMOTION P panel fronts are connected directly via the LVDS interface in the case of SIMOTION P350-3 and by means of the Panel PC Remote Kit in the case of SIMOTION P320-3.

With the SIMATIC NET communication software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

##### Process and data communication

Thanks to its integrated interfaces, SIMOTION P supports both process and data communication. The SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

#### Function (continued)



G\_PM10\_EN\_00164

Example: Closed-loop control of a hydraulic press with SIMOTION P350-3

#### Position-controlled motion control for servo drives

##### Drives with digital setpoint interface

SIMOTION P Motion Controllers enable position-controlled motion control for drives with digital setpoint interfaces via PROFIBUS DP (P350) or PROFINET IO with PROFIdrive.

##### Drives with analog setpoint interface (for retrofitting)

The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog  $\pm 10$  V setpoint interface in the case of SIMOTION P350-3.

The IM 174 Interface Module also supports the connection of stepper drives with a pulse direction interface. Both modules are connected over PROFIBUS DP. The following can be connected to an ADI 4 or IM 174 module:

- 4 drives
- 4 encoders
- Digital inputs and outputs.

#### Position control and pressure control for hydraulic drives

With SIMOTION P and the new SIMATIC ET 200S High Speed I/O, cycle times down to 250  $\mu$ s can be achieved over PROFINET with IRT (Isochronous Real Time).

Highly dynamic control loops can therefore be achieved for hydraulic applications with position and pressure control.

The necessary sensors and actuators, such as

- position encoders connected through the SSI interface,
- pressure sensors connected through analog inputs (AI),
- servo valves connected through analog outputs (AO) and
- digital I/O for tool safety and cam signal output

are connected over the SIMATIC ET 200S distributed I/O system, which was equipped with the necessary high-speed I/O modules beforehand to suit the application.

On the basis of PROFINET, it is therefore possible to synchronize hydraulic drives as well as electrical drives. In conveyor systems and press lines in the automotive industry, plant-wide automation solutions can be implemented in which both electrical drives (winders, cross cutters, roller feeds) and hydraulic drives (e.g. deep-drawing presses) are implemented.

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Overview of SIMOTION P

#### Function (continued)

##### Indication and diagnostics of operating status

A SIMOTION P system does not have any pushbuttons or switches for changing operating modes (RUN/STOP). This task is performed (when a monitor/display is connected) by a software monitor (SIMOTION P State), which is operated using the keyboard or mouse.



SIMOTION P State

This monitor shows the operating states during start-up and operation. Other functions are, for example, loading (Restore) and saving (Save) user programs or starting (Restart) or shutting down (Terminate) the Motion Controller. During shutdown, important data (retain data) are stored on the IsoPROFIBUS board or MCI-PN PROFINET board (internally on SIMOTION P320-3) while the device's power supply is shutting down so that the most up-to-date data is ready for use as soon as the device is restarted.

The SIMOTION P intelligent diagnostic system constantly controls the functionality of the system and registers errors or specific system events (e.g., timing errors, module or network failures). In addition, PC-specific functions, such as fan speeds or temperatures, are continuously controlled and alarms generated in the case of failure on SIMOTION P350-3.

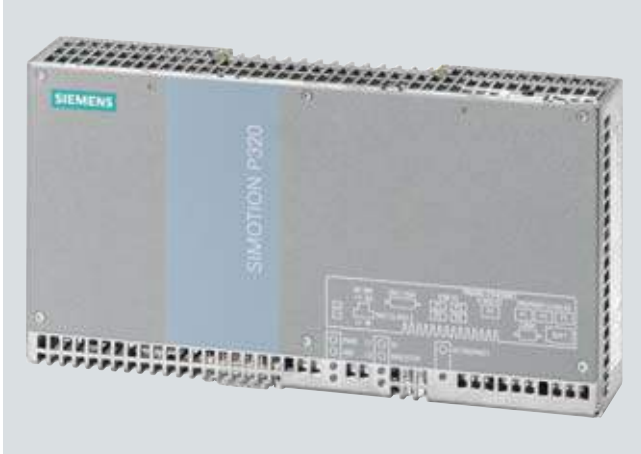
The stability of the SIMOTION Kernel is **independent** of the Windows operating system. Even in the event of a Windows operating system crash (Windows bluescreen), SIMOTION P continues to run and the machine can be shut down safely according to user specifications.

#### More information

##### More information

- about suitable I/O modules for SIMOTION can be found in chapter SIMOTION I/O components.
- about the functionality of SIMOTION platforms can be found in section Overview of SIMOTION functions.
- about engineering and the SIMOTION runtime system can be found in section SIMOTION software.
- about operator control and monitoring can be found in chapter SIMOTION HMI devices.
- about SIMATIC NET communication software can be found in section SIMOTION runtime software.
- about the SIMATIC Panel PC Remote Kit can be found in section Supplementary components.

#### Overview



The SIMOTION P320-3 Motion Controller is a high-performance, ultra compact and maintenance-free embedded industrial PC. This product expands the PC-based hardware platform of the SIMOTION range by an Embedded PC for motion control tasks.

The SIMOTION P320-3 hardware is based on the latest generation of the SIMATIC Microbox PC and therefore offers the following benefits:

- High performance: Thanks to state-of-the-art Intel processor technology
- Rugged: No rotating parts (no fan, no hard disk)
- Compact: With very small mounting dimensions
- Flexible in use: Thanks to a variety of installation methods.

In addition to the Windows Embedded Standard 2009 operating system, the proven successful real-time expansion for SIMOTION is also installed.

#### Flexible application in operation

SIMOTION P320-3 can be operated in a variety of different modes:

- Headless mode:  
SIMOTION P320-3 can be operated in so-called "headless" mode: In other words, it can be operated without display, monitor or panel front.
- Operation with display or monitor:  
Standard SIMATIC displays or monitors can be connected at a distance of up to 5 m (16.4 ft) via the integrated DVI interface.
- Operation with SIMOTION P panel fronts:  
The SIMATIC Panel PC Remote Kit can be used to connect SIMOTION P320-3 to the panel fronts for SIMOTION P. The panel fronts can be installed at a distance of up to 30 m (98.4 ft) from SIMOTION P320-3.

#### PC-based CompactFlash card replaces hard disk

In order to enhance the rugged design of the system, SIMOTION P320-3 contains no rotating parts at all. A PC-based CompactFlash card is used instead of a hard disk. No tools are needed to insert or remove this card.

#### Enhanced Write Filter (EWF) reduces write cycles

When a computer with Windows operating system is running, large volumes of information are buffered on the hard disk or, alternatively, on a CompactFlash memory. However, frequent write cycles reduce the service life of the hard disk or CompactFlash memory.

Using the Enhanced Write Filter avoids this problem. The data is initially written to RAM. This ensures, for example, that changes made at the commissioning stage do not take effect until they are stored by command on the PC-based CompactFlash card.

Changes made by mistake are not permanent. When the PC is switched on again, it boots to the initial delivery state again until changes have been stored on the CompactFlash card. The PC is always restarted from the data stored on the PC-based CompactFlash card.

The Enhanced Write Filter (EWF) is deactivated in the delivery state.

#### High system availability

The following features of the SIMOTION P320-3 Motion Controller afford an especially high degree of system availability:

- Integrated monitoring functions for battery, temperature and program execution
- LEDs on front panel for efficient diagnosis
- Integrated power supply with bridging of supply failures

#### PC technology

- Processor: Intel Core 2 Solo, 1.2 GHz
- Operating system: Windows Embedded Standard 2009
- Memory: 2 GB DDR3 SDRAM
- 4 GB CompactFlash card
- Data backup/restore using the SIMATIC IPC Image & Partition Creator data backup software (optional)

#### Series commissioning with optional USB Flash Drive

For the purpose of commissioning several Motion Controllers at once, it is possible to copy a pregenerated data image to the CompactFlash drive using SIMATIC IPC Image & Partition Creator (own software).

The SIMATIC IPC Image & Partition Creator must either be ordered separately, or is pre-installed on the SIMATIC IPC USB Flash Drive (USB stick) ([see selection and ordering data](#)).

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P320-3 Motion Controller

#### Design

##### Interfaces

###### Display and diagnostics

With SIMOTION P320-3, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an application window on a connected screen. This software monitor can be operated using your keyboard, mouse or touch panel.

###### Integrated interfaces

- 1 x COM 1 (V.24)
- 1 x DVI
- 4 x USB 2.0
- 1 x Industrial Ethernet (10/100/1000 Mbit/s)
- 1 x PROFINET IO (1 interface with 3 ports)

##### Operator control and monitoring

- SIMOTION P320-3 can be operated without display, monitor or panel front ("headless" mode).
- Monitors and displays can be connected by means of the integrated DVI interface.
- SIMOTION P panel fronts can be connected to SIMOTION P320-3 by means of the SIMATIC Panel PC Remote Kit.

##### Panel fronts for SIMOTION P

The following SIMOTION P panel fronts are available:

- 12" with membrane-type keys
- 12" for touch screen operation, and
- 15" for touch screen operation.

##### Communication via PROFINET

SIMOTION P320-3 can be linked to a PROFINET IO network by means of the integrated PROFINET interface with 3 ports. This means that in terms of PROFINET, SIMOTION P320-3 is a PROFINET IO controller that offers the following functions:

- Communication as PROFINET-IO controller, I-Device (controller and device simultaneously)
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (real-time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 3-port switch with 3 RJ45 sockets. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

##### SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION P with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with standard Internet browser.

##### Expansion with distributed I/O by means of PROFINET

The following distributed I/O can be added to the SIMOTION P320-3 system by means of PROFINET:

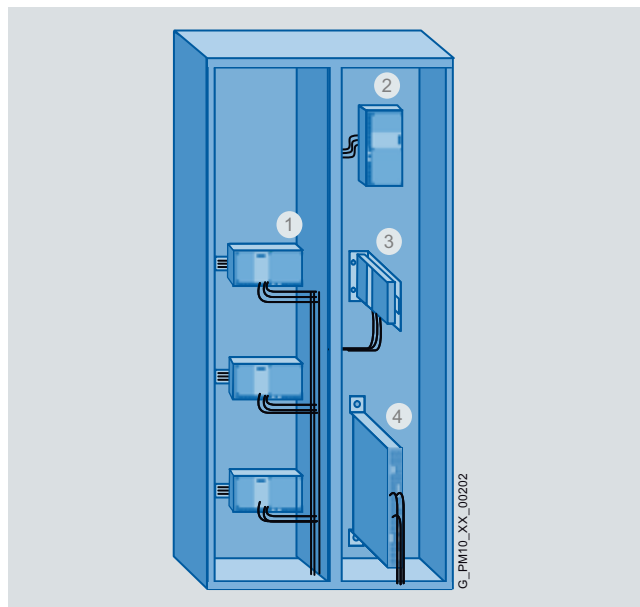
- Distributed drives (e.g. SINAMICS S120)
- Distributed I/O (SIMATIC ET 200S/SP/M/pro/eco PN)
- Engineering systems (PG/PC) or
- HMI devices (e.g.: MP, TP, OP)

##### High-speed I/Os for time-critical applications

Cycle times of 250  $\mu$ s can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed. This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

##### Flexible mounting in the control cabinet

SIMOTION P320-3 can be mounted in a variety of positions in the control cabinet, e.g. on a standard rail, cabinet wall or by portrait assembly kit. This means that valuable space inside the cabinet can be saved for other purposes.



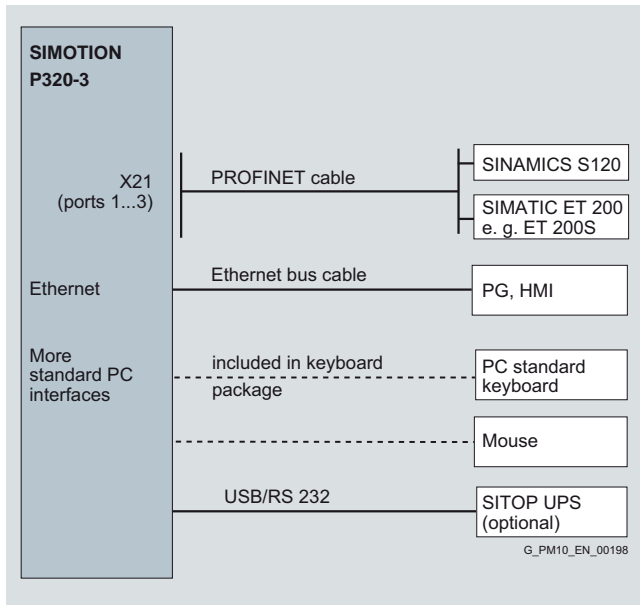
Flexible mounting in the control cabinet: (1) Standard rail mounting, (2) Wall mounting, (3) Portrait assembly, (4) Front portrait assembly

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P320-3 Motion Controller

#### Integration



Overview of the SIMOTION P320-3 connections

#### Selection and ordering data

Description	Order No.
<b>SIMOTION P320-3 Motion Controller</b> <sup>1)</sup> with Intel Core 2 Solo, 1.2 GHz, Windows Embedded Standard 2009, 2 GB DDR3 SDRAM, 24 V DC, incl. 4 GB CompactFlash card, front portrait assembly and wall mounting kit, with current runtime version (earlier software versions are stored on the recovery CD)	<b>6AU1320-7AB55-3AF0</b>

#### Accessories

Description	Order No.
<b>SIMATIC IPC portrait assembly kit</b>	<b>6ES7648-1AA20-0YB0</b>
<b>SIMATIC IPC Image &amp; Partition Creator V3.2</b>	<b>6ES7648-6AA03-2YA0</b>
<b>SIMATIC IPC USB Flash Drive</b> 8 GB, USB 2.0 SIMATIC IPC Image & Partition Creator software pre-installed	<b>6AV7672-8JD01-0AA0</b>
<b>Touch pen</b> (for use with a touch-operated panel front)	<b>6AV7672-1JB00-0AA0</b>
<b>Spare parts</b> • Motherboard battery	<b>6FC5247-0AA18-0AA0</b>

#### Technical specifications

PLC and motion control performance	
<b>Maximum number of axes</b>	64
<b>Minimum PROFINET transmission cycle</b>	250 µs
<b>Minimum servo/interpolator clock cycle</b>	250 µs
Memory	
<b>RAM (Random Access Memory)</b>	2 GB DDR3 SDRAM
<b>Retentive memory</b>	15 KB (256 KB with UPS)
<b>CompactFlash card</b>	4 GB
<b>Persistent memory</b> (user data on CF)	64 MB
Communication	
<b>USB interfaces</b>	4 x USB 2.0
<b>Ethernet interfaces</b>	1
<b>PROFINET interfaces</b>	<ul style="list-style-type: none"> <li>• 1 interface with 3 ports</li> <li>• Supports PROFINET IO with IRT and RT</li> <li>• Can be configured as PROFINET IO controller and/or device</li> </ul>

#### General technical specifications

<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	72 W
<b>Mains buffering, max.</b>	5 ms
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>	IP20
<b>Temperature change, max.</b>	10°K/h
<b>Limit values for rel. humidity in accordance with EN 60068-2-78, EN 60068-2-30</b>	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	
- Portrait assembly, front and wall mounting	0 ... 45 °C (32 ... 113 °F)
- Standard rail mounting	0 ... 55 °C (32 ... 131 °F)
<b>Weight, approx.</b>	2 kg (4.41 lb)
<b>Dimensions (W x H x D)</b>	262 x 142 x 47 mm (10.31 x 5.59 x 1.85 in)
<b>Approvals, according to</b>	UL/CSA

#### More information

##### *SIZER for Siemens Drives engineering tool*

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> Note about licenses for runtime software:  
Licenses for runtime software for SIMOTION P320-3 can be ordered individually or by means of order code (Z option).  
See [Ordering of licenses for runtime software on page 9/63](#).

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P350-3 Motion Controller

#### Overview



The SIMOTION P350-3 Motion Controller is a PC-based, open Motion Control System. The use of an industrial PC platform facilitates the running of the SIMOTION machine application comprising of PLC, motion control and HMI functions alongside standard PC applications in one platform. This is particularly useful in the case of applications that involve complex PC-based data management and sophisticated analysis systems.

The operating system is Windows XP Professional, with a real-time expansion for SIMOTION.

To facilitate the connection of distributed components, SIMOTION P350-3 is available in both PROFINET and PROFIBUS versions. A PROFINET Communication Board can be retrofitted to the PROFIBUS version for applications which require both PROFIBUS and PROFINET.

#### Design

##### Interfaces

###### Display and diagnostics

With SIMOTION P, the display and diagnostics functions for the operating states are performed by a software monitor, which takes the form of an on-screen application window. This software monitor can be operated using your keyboard, mouse or touch panel.

###### Integrated interfaces

- 1 x COM 1 (V.24), VGA (via DVI adapter)
- 4 x USB 2.0
- 2 x Industrial Ethernet 10/100 Mbits (integrated)
- PROFIBUS version:  
2 x PROFIBUS DP (not isochronous, isolated), one of the interfaces can be used as an MPI interface
- PROFINET version:  
1 x PROFINET interface with 4 ports, supports PROFINET IO with IRT and RT

###### Expansion slots

- 1 x PCI slot 265 mm (10.43 in)
  - PROFIBUS version: occupied by IsoPROFIBUS board
  - PROFINET version: occupied by MCI-PN Communication Board
- 1 x PCI/ISA slot 170 mm (6.69 in) (free)  
e.g., for the purpose of retrofitting an additional Communication Board (simultaneous communication via PROFIBUS and PROFINET)

##### Communication via PROFIBUS

The PROFIBUS version features an integrated IsoPROFIBUS board, which offers two PROFIBUS DP interfaces with PROFIdrive.

The free PCI slot can be used for the purpose of retrofitting an optional MCI-PN Communication Board. This means that the PROFIBUS version can support both PROFIBUS and PROFINET on the same PC.

##### Communication via PROFINET

The MCI-PN Communication Board that has been integrated in the PROFINET version enables the SIMOTION P350-3 to be connected to a PROFINET IO network. From a PROFINET perspective, the SIMOTION P350-3 thus assumes the role of a PROFINET IO controller.

To enable it to communicate with other PROFINET controllers, the SIMOTION P350-3 can be configured as both a PROFINET controller and a PROFINET device at the same time (I-Device).

##### Operator control and monitoring

SIMOTION P350-3 can be operated in a variety of different modes:

- Headless mode:  
It can be operated without display, monitor or panel front.
- Operation with display or monitor:  
Standard SIMATIC displays or monitors can be connected at a distance of up to 5 m (16.4 ft) via the integrated DVI or VGA interface.
- Operation with SIMOTION P panel fronts:  
SIMOTION P350-3 can be directly connected to the panel fronts for SIMOTION P via the internal LVDS interface. In this case, SIMOTION P350-3 and the panel front are operated as a single unit. The SIMATIC Panel PC Remote Kit allows SIMOTION P350-3 and the panel front to be operated at separate locations. The kit is capable of bridging a distance of up to 30 m (98.4 ft).

##### SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION P with an integrated Web server on which, for example, user-specific Web pages can be stored. Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with standard Internet browser.

##### Panel fronts for SIMOTION P

Various panel fronts are available for the SIMOTION P Motion Controller:

- 12" with membrane-type keys
- 12" for touch screen operation, and
- 15" for touch screen operation



# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P350-3 Motion Controller

#### Design (continued)

##### Expansion using distributed I/Os

###### PROFINET version

- Distributed I/Os (SIMATIC ET 200S/SP/M/pro/eco PN)
- Distributed drives (e.g. SINAMICS S120)
- Engineering systems (PG/PC) or
- HMI devices (e.g.: MP, TP, OP)

###### PROFIBUS version

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- Distributed I/Os (SIMATIC ET 200S/M/eco/pro)
- Distributed drives (e.g.: SINAMICS S120)
- Engineering systems (PG/PC) or
- HMI devices (e.g.: MP, TP, OP)

##### High-speed I/Os for time-critical applications

Cycle times of 250  $\mu$ s can be achieved with SIMOTION P, PROFINET and the ET 200S distributed I/O system with interface module IM 151-3 PN High Speed. This is particularly necessary for applications with fast response times (e.g. hydraulic axes).

##### PC technology

- Processor: Intel Pentium M 2 GHz
- Operating system: Windows XP Professional, English
- Memory: 512 MB SDRAM, upgradable to 2 GB
- Hard disk with shock damping, approx. 40 GB
- DVD-ROM drive (optional)
- Data backup/restore using the Symantec Ghost data backup software (pre-installed)

#### More information

##### More information

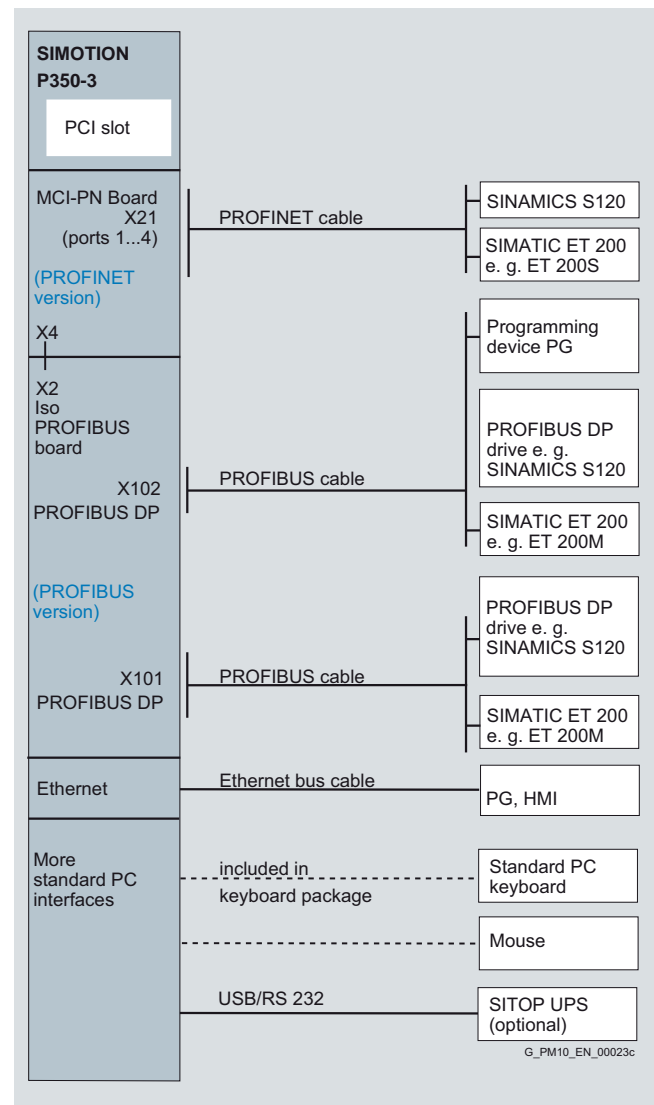
- about connectable I/O modules for SIMOTION can be found in chapter SIMOTION I/O components and section Overview of SIMOTION functions.
- about the connection of panel fronts for SIMOTION P can be found in section Panel fronts for SIMOTION P.

##### SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S120 drive family including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

#### Integration



Overview of the SIMOTION P350-3 connections

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### SIMOTION P350-3 Motion Controller

#### Technical specifications

PLC and motion control performance	
<b>Number of axes</b>	Up to 64 depending on the set clock-pulse rate
<b>Minimum PROFIBUS cycle</b>	1 ms (PROFIBUS version)
<b>Minimum PROFINET transmission cycle</b>	0.25 ms (PROFINET version)
<b>Minimum servo/interpolator clock cycle</b>	0.25 ms
Memory	
<b>RAM (Random Access Memory)</b>	512 MB SDRAM, upgradable to 2 GB
<b>Retentive memory</b>	15 KB
<b>Persistent memory</b>	64 MB/256 MB when a UPS is used
Communication	
<b>USB interfaces</b>	4 x USB 2.0
<b>Ethernet interfaces</b>	2 x 10/100 Mbit/s
<b>PROFIBUS interfaces</b>	PROFIBUS version: <ul style="list-style-type: none"> <li>• 2 interfaces, of which one can be used as an MPI interface</li> <li>• Not isochronous, isolated</li> </ul>
<b>PROFINET interfaces</b>	PROFINET version: <ul style="list-style-type: none"> <li>• 1 interface with 4 ports</li> <li>• Supports PROFINET IO with IRT and RT</li> <li>• Can be configured as PROFINET IO controller and/or device</li> </ul>
General technical specifications	
<b>Input voltage</b>	24 V DC
<b>Power consumption, max.</b>	190 W
<b>Mains buffering, max.</b>	20 ms
<b>Degree of protection acc. to EN 60529 (IEC 60529)</b>	IP20
<b>Temperature change, max.</b>	10°K/h
<b>Relative humidity limit values in accordance with IEC 68-2-3, IEC 68-2-30, IEC 68-2-56</b>	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Humidity rating based on EN 60721-3-3</b>	Class 3K5 Condensation and icing excluded Low air temperature 0 °C (32 °F)
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 45 °C (41 ... 113 °F)
<b>Weight, approx.</b>	6 kg (13.2 lb)
<b>Dimensions (W x H x D)</b>	297 x 267 x 85 mm (11.69 x 10.51 x 3.35 in) (excluding DVD drive) 297 x 267 x 106 mm (11.69 x 10.51 x 4.17 in) (including DVD drive)
<b>Approvals, according to</b>	cULus, C-Tick

#### Selection and ordering data

Description	Order No.
<b>SIMOTION P350-3, PROFIBUS version</b> with Intel Pentium M, 2 GHz, Windows XP Professional, English, 512 MB SDRAM, 24 V DC, <b>with IsoPROFIBUS board</b>	
• Without DVD drive	<b>6AU1350-3AK41-1BE2 -Z<sup>1)</sup></b>
• With DVD drive	<b>6AU1350-3AK43-1BE2 -Z<sup>1)</sup></b>
<b>SIMOTION P350-3, PROFINET version</b> with Intel Pentium M, 2 GHz, Windows XP Professional, English, 512 MB SDRAM, 24 V DC, <b>with MCI-PN board</b>	
• Without DVD drive	<b>6AU1350-3AK41-2BE2 -Z<sup>1)</sup></b>
• With DVD drive	<b>6AU1350-3AK43-2BE2 -Z<sup>1)</sup></b>
	Order code
<b>HMI Bundle</b> SIMOTION P350-3 can be ordered together with the HMI software WinCC flexible for a bundle price.  The following is also included in the scope of supply: WinCC flexible 2008 Runtime, 2048 Powertags WinCC flexible Runtime, 2048 Powertags, WinCC flexible/Archives + Recipes	<b>A03</b>
<b>Example for ordering</b> SIMOTION P350-3, PROFIBUS version, without DVD drive, with HMI Bundle: <b>6AU1350-3AK41-1BE2 -Z V41 W05 A03</b>	

#### Accessories

Description	Order No.
<b>Memory expansion</b>	
• 512 MB DDR2 533 SODIMM	<b>6ES7648-2AG30-0GA0</b>
• 1 GB DDR2 533 SODIMM	<b>6ES7648-2AG40-0GA0</b>
<b>MCI PN Communication Board</b> (for PROFINET upgrade)	<b>6AU1390-0BA00-0AA0</b>
<b>Replacement parts</b>	
• Motherboard battery	<b>6FC5247-0AA18-0AA0</b>
<b>Hard disk</b>	
• Hard disk 3.5" SATA	On request

<sup>1)</sup> Note about runtime software:  
When ordering SIMOTION P 350-3, the pre-installed runtime version must be specified. The software version is ordered with the order code (Z option) "V" and the service pack with the order code "W". If no options are specified, it will be supplied with the current software version.

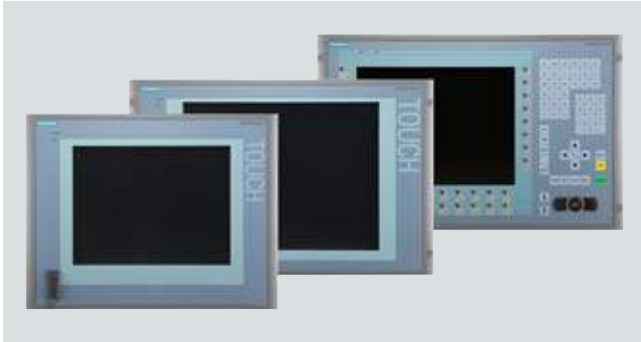
Example:  
When 6AU1350-3AK41-1BE2 -Z V41 W05 is specified, SIMOTION P350-3 with the above order number and runtime version V4.1 SP5 is supplied.

"W00" must be specified to order earlier runtime versions without service pack (V4.0).

Other licenses for runtime software can be ordered individually or by means of order code (Z option).

See [Ordering of licenses for runtime software on page 9/63](#).

#### Overview



Three different panel fronts with TFT color display are available for the SIMOTION P Motion Controller:

- 12" with membrane-type keys, resolution: 800 x 600 pixels
- 12" for touch screen operation, resolution: 800 x 600 pixels, and
- 15" for touch screen operation, resolution: 1024 x 768 pixels

The panel fronts are suitable for installation in consoles, control cabinets and support arm systems.

#### Connection to SIMOTION P320-3

SIMOTION P320-3 is connected to the panel fronts for SIMOTION P by means of the SIMATIC Panel PC Remote Kit. The panel front can be installed at a distance of up to 30 m (98.4 ft) from the Motion Controller.

#### Connection to SIMOTION P350-3

SIMOTION P350-3 can be directly connected to the panel fronts for SIMOTION P via the internal LVDS interface. The standard method of installing the Motion Controller is to mount it directly behind the panel front. Four knurled-head screws are used to form a mechanical interlock between the SIMOTION P350-3 and the panel front. No special tool is needed for this.

The Panel PC Remote Kit also allows SIMOTION P350-3 and the panel front to be operated at separate locations. In this case, a distance of up to 30 m (98.4 ft) can also be bridged.

#### Technical specifications

Panel fronts for SIMOTION P	
<b>Degree of protection at the front according to EN 60529 (IEC 60529)</b>	IP65
<b>Relative humidity limit values in accordance with IEC 68-2-3, IEC 68-2-30, IEC 68-2-56</b>	
• Storage and transport	5 ... 95 % at 25 °C (77 °F)
• Operation	5 ... 80 % at 25 °C (77 °F)
<b>Condensation</b>	Not permissible
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 45 °C (41 ... 113 °F)
<b>Weight</b>	
• 12" P012K panel front, membrane keys	6 kg (13.2 lb)
• 12" P012T panel front, touch screen operation	6 kg (13.2 lb)
• 15" P015T panel front, touch screen operation	6 kg (13.2 lb)
<b>Dimensions (W x H x D)</b>	
• 12" P012K panel front, membrane keys	483 x 310 x 100 mm (19.02 x 12.2 x 3.94 in)
• 12" P012T panel front, touch screen operation	400 x 310 x 125 mm (15.75 x 12.2 x 4.92 in)
• 15" P015T panel front, touch screen operation	483 x 310 x 130 mm (19.02 x 12.2 x 5.12 in)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>12" P012K panel front, membrane keys</b>	<b>6AU1300-0DB00-0AA0</b>
<b>12" P012T panel front, touch screen operation</b>	<b>6AU1300-0CB00-0AA0</b>
<b>15" P015T panel front, touch screen operation</b>	<b>6AU1300-0EB00-0AA0</b>

#### Accessories

Description	Order No.
<b>Key labeling strips</b> For labeling softkeys and function keys, blank, plastic, supplied in sets of 3	<b>6AV7671-3CA00-0AA0</b>

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Supplementary components SIMATIC Panel PC Remote Kit

#### Overview



The SIMATIC Panel PC Remote Kit allows the computer and operating unit to be installed at a distance from one another. It is designed for use with SIMOTION P320-3 and SIMOTION P350-3 Motion Controllers. It can bridge a distance of up to 30 m (98.4 ft) between the computer/Motion Controller and the operating unit.

The Remote Kit must always be operated with the cables supplied with the unit.

#### Benefits

- Operating unit can be located up to 30 m (98.4 ft) from the computer
- Suitable for retrospective conversion/upgrade
- Allows the use of ultra compact operating units
- Pure hardware solution and therefore operating-system-neutral
- Remotely installed front with AC or DC power supply
- 2 additional USB interfaces, on the rear, USB 2.0: High speed up to 5 m (16.4 ft), full speed up to 30 m (98.4 ft)

#### Technical specifications

SIMATIC Panel PC Remote Kit	
<b>Supported operating units</b>	• All panel fronts for SIMOTION P
<b>Front functionality</b>	Same as for central mounting, but with following limits with respect to USB functions: <ul style="list-style-type: none"> <li>• Distance &gt; 5 m (16.4 ft) : USB 1.1, and only one external 1.1 hub</li> </ul>
<b>External interfaces</b>	2 additional USB interfaces on the remote module on the rear of the remote operating unit
<b>Power supply</b>	24 V DC or 110 ... 240 V AC, 50/60 Hz
<b>Certifications and approvals</b>	CE, cULus (UL 508)
<b>Scope of supply</b>	Remote module, cable set, assembly materials, Europe power cable (for the AC option)

#### Design

The Remote Kit consists of the following components:

- Remote module (mounted on the rear of the operating unit)
- Video connecting cable (industrial-grade DVI-D cable)
- USB connecting cable (standard USB cable for a distance up to 5 m (16.4 ft), the USB signal is externally amplified and transferred via a CAT6 cable for distances over 5 m (16.4 ft))
- Mechanical assembly kit (for mounting the computer unit in the control cabinet, console or machine)

#### Selection and ordering data

Description	Order No.
<b>SIMATIC Panel PC Remote Kits</b>	
• With cable set 5 m (16.4 ft), 24 V DC	<b>6AV7671-1EA00-5AA1</b>
• With cable set 10 m (32.8 ft), 24 V DC	<b>6AV7671-1EA01-0AA1</b>
• With cable set 15 m (49.2 ft), 24 V DC	<b>6AV7671-1EA01-5AA1</b>
• With cable set 20 m (65.6 ft), 24 V DC	<b>6AV7671-1EA02-0AA1</b>
• With cable set 30 m (98.4 ft), 24 V DC	<b>6AV7671-1EA03-0AA1</b>
• With cable set 5 m (16.4 ft), 100/240 V AC	<b>6AV7671-1EA10-5AA1</b>
• With cable set 10 m (32.8 ft), 100/240 V AC	<b>6AV7671-1EA11-0AA1</b>
• With cable set 15 m (49.2 ft), 100/240 V AC	<b>6AV7671-1EA11-5AA1</b>
• With cable set 20 m (65.6 ft), 100/240 V AC	<b>6AV7671-1EA12-0AA1</b>
• With cable set 30 m (98.4 ft), 100/240 V AC	<b>6AV7671-1EA13-0AA1</b>

#### Accessories

Description	Order No.
<b>Power cable</b>	
• Europe: D/F/NL/E/B/A/S/FIN <sup>1)</sup>	<b>6ES7900-1AA00-0XA0</b>
• United Kingdom	<b>6ES7900-1BA00-0XA0</b>
• Switzerland	<b>6ES7900-1CA00-0XA0</b>
• USA	<b>6ES7900-1DA00-0XA0</b>
• Italy	<b>6ES7900-1EA00-0XA0</b>
• China	<b>6ES7900-1FA00-0XA0</b>

#### Components of the Remote Kit

(available individually only as spare part)

• Remote module 24 V DC with mounting material	<b>6AV7671-1EX01-0AD0</b>
• Remote module 110 ... 240 V AC with mounting material	<b>6AV7671-1EX01-0BD0</b>
• USB amplifier/CAT6 converter	<b>6AV7671-1EX02-0AA0</b>
• Cable set 5 m (16.4 ft) (DVI, USB standard cable)	<b>6AV7671-1EX10-5AA0</b>
• Cable set 10 m (32.8 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX11-0AA0</b>
• Cable set 15 m (49.2 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX11-5AA0</b>
• Cable set 20 m (65.6 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX12-0AA0</b>
• Cable set 30 m (98.4 ft) (DVI, Cat6 cable)	<b>6AV7671-1EX13-0AA0</b>

<sup>1)</sup> A Europe power cable is included in the scope of supply for AC variants (100 ... 240 V) of the Remote Kit.

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Supplementary components KBPC CG US standard PC keyboard

#### Overview



Programs and texts can be edited easily with the compact KBPC CG US standard PC keyboard.

The standard PC keyboard is not suitable for industrial use (EMC) and should not be used as a permanent installation. It may be used only for servicing and commissioning.

#### Integration

The KBPC CG US standard PC keyboard can be used for:

- SINUMERIK 840D with PCU 50.3
- SINUMERIK 840Di sl
- SINUMERIK 840D sl with PCU 50.3
- SINUMERIK 840D sl Type 1B with PCU 50.5
- SIMOTION P3x0

The standard PC keyboard cannot be used in conjunction with the full CNC keyboard.

#### Technical specifications

	<b>6FC5203-0AC01-3AA0</b> SINUMERIK KBPC CG US standard PC keyboard
<b>Input voltage</b>	5.25 V DC
<b>Power consumption, max.</b>	0.1 W
<b>Degree of protection according to EN 60529 (IEC 60529)</b>	IP20
<b>Humidity rating based on EN 60721-3-3</b>	Class 3K5 condensation and icing excluded. Low air temperature 0 °C (32 °F).
<b>Ambient temperature</b>	
• Storage	-20 ... +60 °C (-4 ... +140 °F)
• Transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	0 ... 50 °C (32 ... 122 °F)
<b>Dimensions</b>	
• Width	405 mm (15.95 in)
• Height	44 mm (1.73 in)
• Depth	180 mm (7.09 in)
<b>Weight, approx.</b>	1.3 kg (2.87 lb)
<b>Approvals, according to</b>	FCC, GS, CE, C-Tick, cURus

#### Selection and ordering data

Description	Order No.
<b>SINUMERIK KBPC CG US standard PC keyboard</b> MF-II compatible, 104 key layout, connection: USB, incl. connecting cable, length: 1.7 m (5.58 ft)	<b>6FC5203-0AC01-3AA0</b>

# SIMOTION Motion Control System

## SIMOTION P – PC-based

### Supplementary components

#### MCI-PN Communication Board

#### Overview



The MCI-PN Communication Board for SIMOTION P350-3 enables connection to a PROFINET IO network. This means that in terms of PROFINET, SIMOTION P350-3 is a PROFINET IO controller that offers the following functions:

- Communication as: PROFINET IO Controller, I-Device (controller and device simultaneously)
- 100 Mbit/s full duplex
- Supports real-time classes of PROFINET IO:
  - RT (Real Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with 4 RJ45 sockets. The optimal topology (line, star, tree or ring) can therefore be constructed without the need for additional external switches.

#### Integration

The MCI-PN Communication Board is inserted in the free PCI slot of the SIMOTION P350-3 Motion Controller.

#### Technical specifications

MCI-PN Communication Board	
<b>Current consumption</b>	900 mA at 5 V
<b>Permissible ambient temperature</b>	
• Storage and transport	-20 ... +60 °C (-4 ... +140 °F)
• Operation	5 ... 55 °C (41 ... 131 °F)
<b>Weight, approx.</b>	110 g (0.24 lb)
<b>Dimensions (W X H)</b>	107 x 167 mm (4.21 x 6.57 in)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>MCI-PN Communication Board</b>	<b>6AU1390-0BA00-0AA0</b>

#### Accessories

Description	Order No.
<b>RJ45 FastConnect plug connector for Industrial Ethernet/PROFINET</b>	
• 145° cable outlet	
- 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
• 180° cable outlet	
- 1 pack = 1 unit	<b>6GK1901-1BB10-2AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB10-2AB0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC Standard Cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC Flexible Cable GP 2x2	<b>6XV1870-2B</b>
• IE FC Trailing Cable GP 2x2	<b>6XV1870-2D</b>
• IE FC Trailing Cable 2x2	<b>6XV1840-3AH10</b>
• IE FC Marine Cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

#### More information

[More information about cables for Ethernet/PROFINET can be found in Catalog IK PI \(Industrial Communication\) and the Industry Mall under Automation Technology/Industrial Communication/PROFINET/Network components.](#)

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Overview



SIMOTION D Control Units: D410-2, D4x5-2 (4 performance classes)

SIMOTION D is the compact, drive-based version of SIMOTION based on the SINAMICS S120 drives family.

The SIMOTION D Control Units are available in the following variants:

- SIMOTION D410-2 are compact Control Units for single-axis applications with multi-axis option. The Control Units are available in variants D410-2 DP and D410-2 DP/PN and are snapped onto the SINAMICS S120 PM340 Power Modules in blocksize format.
- SIMOTION D4x5-2 are Control Units for multi-axis applications in the SINAMICS S120 booksize format and are available in the following performance variants:
  - SIMOTION D425-2 DP and D425-2 DP/PN Control Units (BASIC Performance) for up to 16 axes
  - SIMOTION D435-2 DP and D435-2 DP/PN Control Units (STANDARD Performance) for up to 32 axes
  - SIMOTION D445-2 DP/PN (HIGH Performance) Control Unit for up to 64 axes
  - SIMOTION D455-2 DP/PN Control Unit (ULTRA-HIGH Performance) for up to 128 axes or applications with very short control cycle clocks

This fine scalability ensures a quick response to changing requirements in automation without having to change the system.

#### Device concept

With SIMOTION D, the PLC and motion control functionalities as well as the SINAMICS S120 drive software run on a shared control hardware. The IEC 61131-3-compliant PLC integrated in SIMOTION D means that the system is not just capable of controlling motion sequences, but that the entire machine can also be controlled with a single compact unit.

Depending on the SIMOTION D platform, HMI devices can be operated on the onboard PROFIBUS, Ethernet or PROFINET interface for operator control and monitoring. Functions such as remote maintenance, diagnostics and teleservice can also be used via these interfaces.

#### Benefits

- Cost-effective thanks to the integration of PLC, motion control and technology functions direct in the drive
- Employs the innovative SINAMICS S120 design
- Compact form-factor reduces control cabinet size
- Ideally suited to modular and distributed machine concepts
- User-friendly operation
- Variable networking via a wide range of communication interfaces:
  - D410-2 DP, D4x5-2 DP: Industrial Ethernet and PROFIBUS DP onboard
  - D410-2 DP/PN, D4x5-2 DP/PN: Industrial Ethernet, PROFIBUS DP and PROFINET IO onboard
- Powerful thanks to a range of technology functions
- Very simple engineering, from drive commissioning to open-loop control and Motion Control applications
- Easy to service thanks to the CompactFlash card, which can be easily replaced and contains all data (programs, data, drive parameters, and licenses)
- Very dynamic because the interfaces between PLC and Motion Control are no longer required

#### Application

##### *SIMOTION D can be used optimally wherever*

- the SINAMICS S120 drive family is used
- the motion control and PLC functionality are directly executed in the drive (SINAMICS S120)
- compact, space-saving construction is required
- high performance is required for motion control and high-speed I/O
- high electromagnetic compatibility and a high resistance to shock and vibration are required due to harsh ambient conditions
- modular machine concepts with high-speed isochronous coupling is required

##### *The flexible solution for modular machine concepts*

SIMOTION D optimally supports the implementation of modular machine concepts in which single-axis drives and high-performance multi-axis drives have to be combined:

- SIMOTION D410-2 (blocksize format) is the most cost-effective solution for the design of compact drives, ranging from single units to small-scale multi-axis solutions with typically 2 to 3 axes.
- SIMOTION D4x5-2 (booksize format) performs the open-loop and closed-loop control functions for multi-axis groups with up to 128 axes.

##### *Important applications include:*

- Packaging machines
- Plastic and rubber processing machines
- Presses, wire-drawing machines
- Textile machines
- Printing machines
- Wood, glass, ceramics and stone working machines
- Converting
- Handling devices

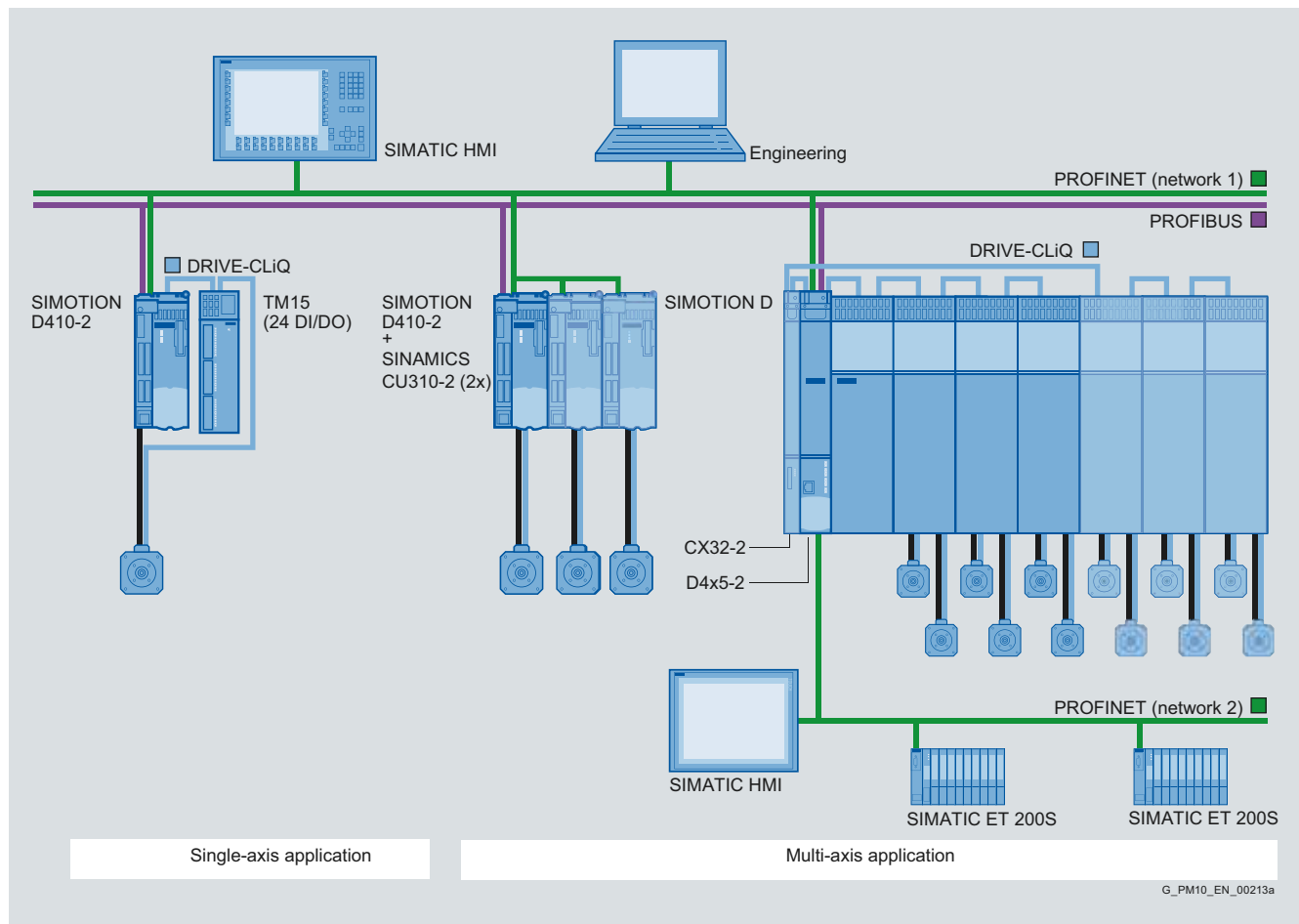
Due to the increasing use of servo and vector drives, these machines require a high degree of integration of PLC, motion control and technology functions.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Design



Typical design of an automation solution using SIMOTION D

#### **SIMOTION D components and interfaces**

- Various status/error displays
- Onboard digital inputs and outputs
- Option slot (receptacle, only for D4x5-2), e.g. for expansion with additional I/Os with the TB30 Terminal Board
- Integrated communications interfaces for linking:
  - SINAMICS S120 drive modules
  - Distributed I/Os
  - HMI systems
  - PG/PC
  - Other motion control and automation systems
  - Other SINAMICS S110/S120 drives with digital setpoint interface
- Slot for CompactFlash card for data backup

#### **Construction of a single axis with SIMOTION D410-2**

The following components make up a SIMOTION D410-2 single axis system:

- A SIMOTION D410-2 Control Unit, designed for open and closed-loop control of a single drive
- A SINAMICS S120 PM340 Power Module, blocksize format (combined infeed and power module)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.

The connection between SIMOTION D410-2 and the SINAMICS S120 PM340 Power Module is made via the inte-

grated PM-IF interface or, when the CUA31/CUA32 Control Unit Adapter is used, via DRIVE-CLiQ.

#### **Structure of an axis grouping with SIMOTION D410-2**

In order to create a multi-axis grouping with SIMOTION D410-2, additional SINAMICS S110/S120 Control Units are connected to the SIMOTION D410-2 by means of PROFIBUS or PROFINET.

Motion control is performed centrally by the SIMOTION D410-2 using the SIMOTION technology objects.

#### **Structure of an axis grouping with SIMOTION D4x5-2**

The following components comprise a SIMOTION D4x5-2 axis grouping:

- A SIMOTION D4x5-2 Control Unit, designed for open and closed-loop control of a multiple axis grouping
- A SINAMICS S120 Line Module (infeed module)
- One or more SINAMICS S120 Motor Modules (power modules)
- Other drive components, such as
  - Power supply
  - Filter
  - Choke, etc.

The connection between the SIMOTION D Control Unit and the SINAMICS S120 drive modules is made via DRIVE-CLiQ.

#### **Note:**

SINAMICS S120 PM340 Power Modules in blocksize format can be operated on a SIMOTION D4x5-2/CX32-2 with the Control Unit Adapters CUA31/CUA32.



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Design (continued)

##### Expansion using I/O

SIMOTION D can be expanded with the following I/O:

- Distributed I/O systems (e.g. SIMATIC ET 200S)
- Drive-based control cabinet I/O (e.g. TM15, TM31 Terminal Modules, etc.)
- I/Os in booksize compact format (e.g. TMC1080 PN, ...)

#### Function

##### Basic functionality

The SIMOTION D basic functionality is supplied with the CompactFlash card (CF) and is loaded when the voltage is switched on. The basic functionality includes:

- SIMOTION runtime system
  - User-programmable with several languages conforming to IEC 61131
  - Various methods of program execution (cyclic, sequential, event-driven)
  - PLC and arithmetic functionality
  - Communication and management functions
  - Motion control functions (Motion Control Basic)
- SINAMICS S120 drive control
  - SIMOTION D410-2:
    - Current/speed control (based on CU310-2, firmware version V4.x) for up to 1 servo axis, 1 vector axis or 1 V/f axis
  - SIMOTION D4x5-2:
    - Current/speed control (based on CU320-2, firmware version V4.x) for up to 6 servo axes, 6 vector axes or 12 V/f axes, closed-loop control for infeed (Active Line Module)
- Testing and diagnostic tools

This basic functionality can be expanded with loadable technology packages, if required.

##### Position-controlled motion control for drives

- Integrated drives (SINAMICS Integrated):
  - The power units are connected over DRIVE-CLiQ or over the integrated PM-IF interface optionally for the SIMOTION D410-2.
- Drives with digital setpoint interface:
  - SIMOTION D enables position-controlled motion control for drives with digital setpoint interfaces via PROFIBUS DP/PROFINET IO with PROFIdrive.
- Drives with analog setpoint interface, e.g. for retrofit or hydraulic applications:
  - The ADI 4 (Analog Drive Interface for 4 Axes) or IM 174 (Interface Module for 4 Axes) module can be used to connect drives with analog  $\pm 10$  V setpoint interfaces. The IM 174 also makes it possible to connect stepper drives with a pulse direction interface.
  - Both modules are connected over PROFIBUS DP. The following can be connected to one ADI 4 or IM 174 module:
    - 4 drives
    - 4 encoders
    - Digital inputs and outputs

##### SIMOTION technology packages

A special feature of SIMOTION is that the basic functionality can be expanded by loading technology packages, such as:

- Motion Control with the technology functions:
  - POS – Positioning
  - GEAR – Synchronous operation/electronic gear
  - CAM – Cam
  - PATH – Path interpolation (not D410-2)

- TControl – Temperature controller
- MIIF – Multipurpose Information Interface

Since the technology functions have modular licenses, you only pay for what you will actually use.

##### Performance

Hardware-supported floating-point arithmetic enables complex arithmetic functions to be used effectively.

Fast instruction execution opens up completely new application possibilities in the mid-performance to high-performance range.

##### Configuring/parameterizing/programming

SIMOTION SCOUT is a powerful and user-friendly engineering tool. It is an integrated system for all engineering steps, from configuring and parameterization, through programming, to testing and diagnostics. Graphical operator prompting, using dialog boxes and wizards, as well as text-based and graphical languages for programming, considerably reduce the familiarization and training periods.

##### Operator control and monitoring (HMI)

Communication services which support user-friendly data exchange with HMI devices are integrated in the basic functionality of SIMOTION D.

Operator control and monitoring can be implemented using SIMATIC HMI devices, such as TPs (Touch Panels), OPs (Operator Panels) or MPs (Multi Panels).

These devices can be connected to SIMOTION D over PROFIBUS, Industrial Ethernet or PROFINET and they are configured using WinCC flexible.

Version V7.0 and higher of the SCADA system WinCC features a SIMOTION channel which is included as standard on the WinCC DVD.

With the SIMATIC NET communications software, an open, standardized OPC interface is available for accessing SIMOTION from other Windows-based HMI systems.

##### SIMOTION IT service and diagnostic functions

SIMOTION IT provides SIMOTION D with an integrated Web server on which, for example, user-specific Web pages can be stored.

Read and write access can be made to the Control Unit variables. Java scripts or applets also allow the implementation of active operation and display functions in the Web pages that can be executed on a client PC with an Internet browser.

##### Process and data communication

Thanks to its integrated interfaces, SIMOTION D supports both process and data communication.

PROFINET IO with IRT is available for exacting motion control applications. In addition to cycle clock synchronization, cycle times of minimum 250  $\mu$ s and safety-related communication (PROFIsafe), the PROFINET interfaces on the SIMOTION D4x5-2 Control Units also support media redundancy (MRP/MRPD).

The SIMOTION SCOUT engineering system is provided for user-friendly communication configuration and diagnostics.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Overview of SIMOTION D

#### Function (continued)

##### Safety Integrated functions

The integrated safety functions of SINAMICS S120 allow SIMOTION D to provide practical, highly-effective protection for personnel and machinery.

The following Safety Integrated functions are currently available for the integrated SINAMICS S120 drive system: (Terms in accordance with IEC 61800-5-2)

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop1 (SS1)
- Safe Stop2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

##### Activation of Safety Integrated functions

Safety Integrated functions can be activated by the following methods:

- Via terminals on the D4x5-2/CX32-2 and on the power unit (STO, SBC, SS1 only)
- Via fail-safe inputs on the TM54F Terminal Module
- Via fail-safe outputs on the D410-2
- Via PROFINET/PROFIBUS with PROFIsafe.

The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

##### Safety Integrated functions via PROFIsafe

Safety Integrated functions are activated via "PROFINET with PROFIsafe" or "PROFIBUS with PROFIsafe" safe communication. The control (F logic) is implemented using an F-CPU connected via PROFINET or PROFIBUS, for example, a SIMATIC S7-300 F-CPU.

Safety Integrated functions are routed through from the SIMOTION D410-2 and D4x5-2 Control Units to the following drives:

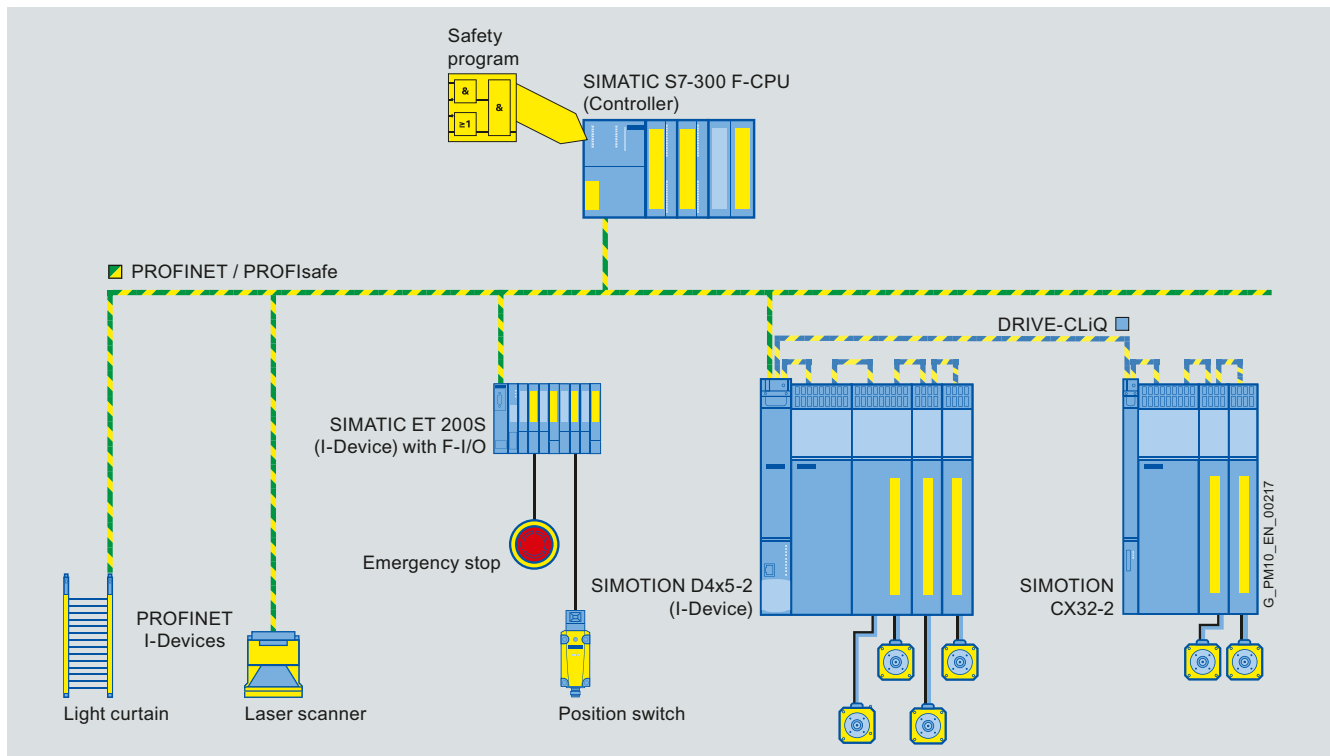
- Integrated SINAMICS S120 drives on SIMOTION D410-2 and D4x5-2
- Drives on the SIMOTION CX32-2 Controller Extension
- Drives on SINAMICS Control Units connected via PROFIBUS to SIMOTION D.
- Drives on SINAMICS Control Units connected to SIMOTION D via PROFINET (F-CPU must be connected via PROFINET in this case).

##### Note

For more information about possible topologies, axis quantity structures and suitable components, please contact your local Siemens sales office.

Detailed information can be found in the SIMOTION D Commissioning Manuals as well as in the SINAMICS documentation.

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Safety Integrated solution using a SIMOTION D4x5-2 as an example: Control of the safety functions via PROFINET with PROFIsafe

#### Overview



Left: SIMOTION D410-2 Control Unit attached to mounting plate  
Right: SIMOTION D410-2 Control Unit, snapped onto PM340 Power Module

SIMOTION D410-2 is the SIMOTION D variant for single-axis applications with multi-axis option in blocksize format. The Control Units form part of the SIMOTION D4x5-2 controller family which is the preferred option for multi-axis applications in book-size format. The SIMOTION D410-2 Control Unit is available in a PROFIBUS variant (D410-2 DP) and in a PROFIBUS/PROFINET variant (D410-2 DP/PN).

The SIMOTION D410-2 Control Units are specially designed for use with the SINAMICS S120 PM340 Power Modules in block-size format and can be directly connected to the Power Modules of this series. The SIMOTION D410-2 can also be installed on a mounting plate if required (to be ordered separately).



SIMOTION D410-2 Control Unit and mounting plate

The SIMOTION D410-2 handles the motion control, technology and PLC functions associated with a single axis and is also responsible for the drive control of that axis. The integrated inputs/outputs support up to 8 high-speed output cams or 8 measuring inputs.

The drive control supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and V/f control.

SIMOTION D410-2 can be used in synchronized groups:

- For PROFINET: with controller – controller or controller – device relationship
- For PROFIBUS: with master – slave relationship

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

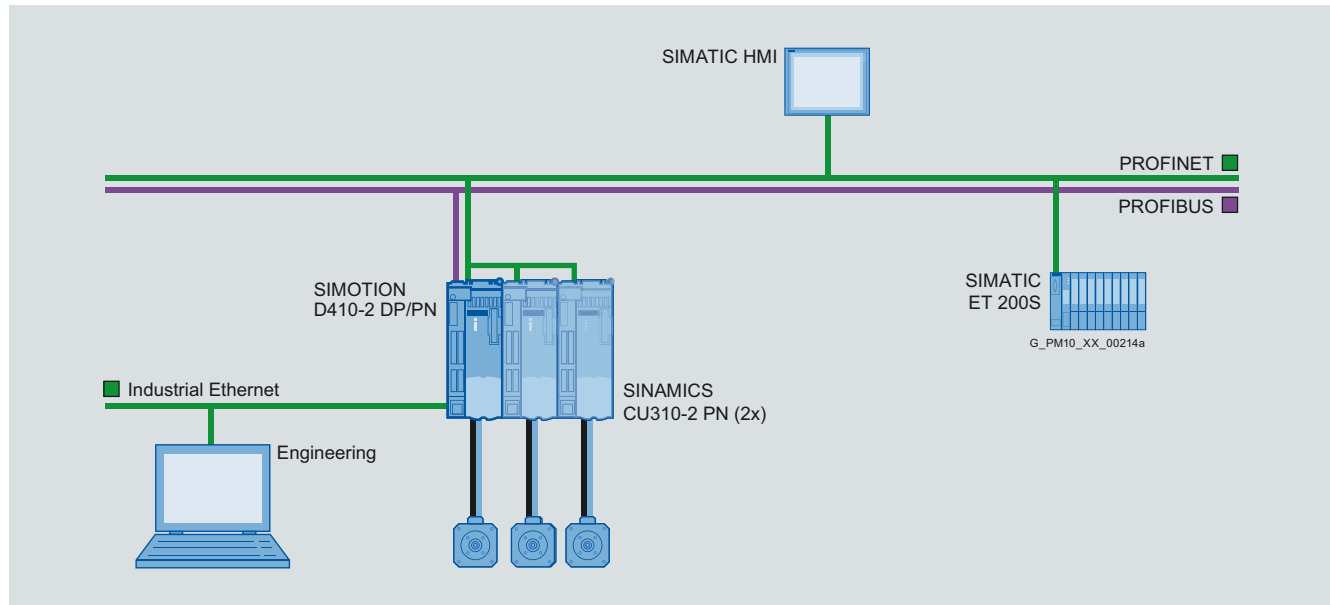
#### Application

SIMOTION D410-2 is the ideal solution when motion control for one axis and PLC functionality are required in compact format. However, it can also be used for small multi-axis groupings with typically 2 to 3 axes in blocksize format. With these applications, the SINAMICS Control Units are connected to the SIMOTION D410-2 via PROFIBUS or PROFINET.

Examples of SIMOTION D410-2 applications include:

- Autonomous control of single axes
- Cross cutters

- Winder applications
- Feeder devices/roller infeed/press feeders
- Synchronized machining equipment
- Compact machine modules, e.g.
  - Feeders in post press applications
  - Shrink wrapping machines.
- Small multi-axis groupings (typically 2 to 3 axes) in blocksize format



SIMOTION D410-2 axis grouping with 3 axes (1 × D410-2 DP/PN, 2 × CU310-2 PN)

SIMOTION D410-2 supports motion control with the technology functions "positioning" (POS), "synchronous operation/electronic gear" (GEAR) and "cam" (CAM). "Path interpolation" (PATH) is not supported.

## Design

### Interfaces

#### Display and diagnostics

- LEDs to display operating states and errors
- 3 measuring sockets
- Service switch and mode selector
- Diagnostics button

#### Onboard I/Os

- 5 digital inputs
- 8 digital inputs/outputs (max. 8 as output cams or 8 as measuring inputs)
- 3 fail-safe, two-channel inputs (F-DI); can also be used as 6 DI
- 1 fail-safe output (F-DO); can also be used as 1 DO
- 1 analog input (either  $\pm 10$  V or  $\pm 20$  mA)

#### Communication

- 1  $\times$  DRIVE-CLiQ
- 1  $\times$  PROFINET IO  
(1 interface with 2 ports, D410-2 DP/PN only)
- 1  $\times$  PROFIBUS DP (D410-2 DP: 2  $\times$  PROFIBUS DP)

#### Data backup

- 1  $\times$  slot for SIMOTION CompactFlash card

#### Additional interfaces

- Terminals for 24 V electronics power supply
- 1  $\times$  encoder input for
  - HTL/TTL incremental encoder
  - SSI absolute encoder (without incremental signals)
- 1  $\times$  temperature sensor input (KTY84-130 or PTC)
- PM IF interface (Power Module interface) on rear for direct operation with a SINAMICS S120 PM340 Power Module in blocksize format

### Assembly/Installation

SIMOTION D410-2 can be directly plugged in to the SINAMICS S120 PM340 Power Module in blocksize format.

Alternatively, the SIMOTION D410-2 can be mounted on a mounting plate (to be ordered separately) and connected to the PM340 Power Module via DRIVE-CLiQ. In this case, the CUA31/CUA32 Control Unit Adapter has to be connected to the PM340 Power Module. No more than one Control Unit Adapter can be connected to the SIMOTION D410-2.

#### Note:

It is not possible to use the Safety Integrated Extended Functions via the onboard terminals (F-DI, F-DO) when the PM340 Power Module is connected via CUA31/CUA32.

Power Modules in AC/AC chassis format are connected to the SIMOTION D410-2 over the DRIVE-CLiQ interface. Motor Modules in booksize format cannot be connected to SIMOTION D410-2.

A SIMOTION D410-2 mounted on the mounting plate can also be operated without the PM340, e.g.

- for hydraulic applications using a TM31 for the analog inputs and analog outputs
- for the connection of drives with analog  $\pm 10$  V setpoint interface (IM 174/ADI 4)

### Data storage/data backup

The SIMOTION D410-2 Control Units store the retentive process data permanently in a manner that requires no maintenance (refer to technical data for memory size). The real-time clock is backed up for several days via a SuperCap.

The runtime software, user data and user programs are backed up on the SIMOTION CompactFlash card. The retentive process data of the Control Unit can also be stored on this CompactFlash card via system command, e.g. if spare parts are required.

### Connectable I/Os

#### PROFINET IO: (D410-2 DP/PN only)

- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/SP/M/eco PN/pro and TMC
- HMI

#### PROFIBUS DP:

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/O systems
- HMI

#### DRIVE-CLiQ:

Modules from the SINAMICS range:

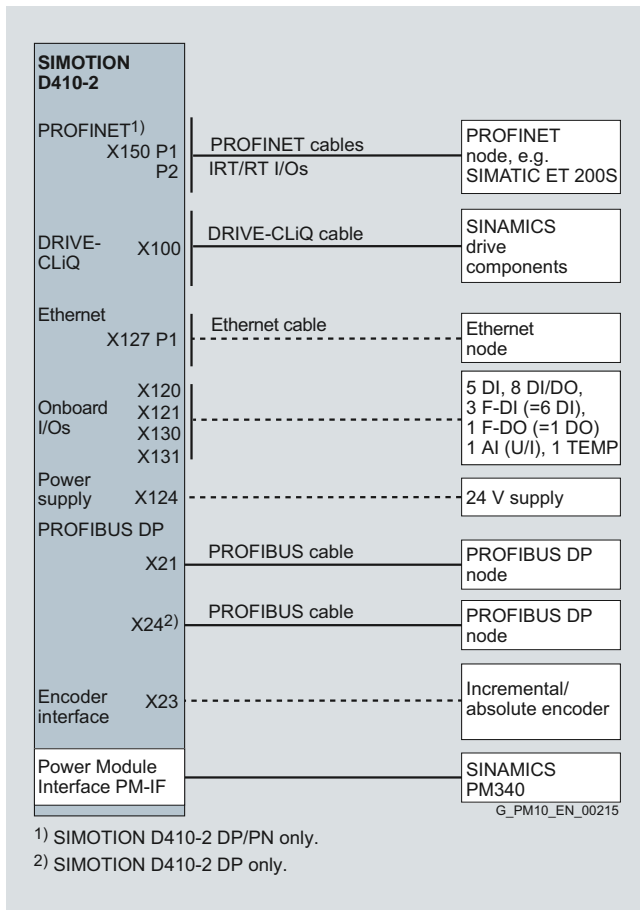
- Terminal Modules (max. 8), of which
  - maximum 3 are TM15, TM17 High Feature, TM41
  - maximum 8 are TM15 DI/DO, TM31
  - maximum 1 is TM54F
- SMC/SME Sensor Modules  
(max. 5 encoder systems via DRIVE-CLiQ)
- DMC20/DME20 DRIVE-CLiQ Hub Module (max. 1)
- Motors with DRIVE-CLiQ interface

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### Integration



When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ and encoder cables used for the SINAMICS S120 CU310-2 Control Unit can also be used for SIMOTION D410-2.

For more information about signal cables, refer to chapter MOTION-CONNECT connection systems.

SIMOTION D410-2 connection overview

### Technical specifications

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION
<b>Product-type designation</b>		D410-2 DP	D410-2 DP/PN
<b>Version of the motion control system</b>		Single-axis system with multi-axis option	Single-axis system with multi-axis option
<b>PLC and motion control performance</b>			
<b>Maximum number of axes</b>		8	8
<b>Minimum PROFIBUS cycle clock</b>	ms	1	1
<b>Minimum PROFINET send cycle clock</b>	ms	–	0.25
<b>Minimum servo cycle clock</b>	ms	0.5	0.5
<b>Minimum interpolator cycle clock</b>	ms	0.5	0.5
<b>Servo/IPO clock cycle, remark</b>		1 ms when using the TO axis and the integrated closed-loop drive control	1 ms when using the TO axis and the integrated closed-loop drive control
<b>Integrated drive control</b>			
<b>Maximum number of axes for integrated drive control</b>			
• servo		1	1
• vector		1	1
• V/f		1	1
• remark		Alternative control modes; drive control based on SINAMICS S120 CU310-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU310-2, firmware version V4.x
<b>Memory</b>			
<b>RAM (work memory)</b>	MB	48	48
<b>Additional RAM work memory for Java applications</b>	MB	20	20
<b>RAM disk (load memory)</b>	MB	31	31
<b>Retentive memory</b>	KB	108	108
<b>Persistent memory (user data on CF)</b>	MB	300	300
<b>Communication</b>			
<b>DRIVE-CLiQ interfaces</b>		1	1
<b>Industrial Ethernet interfaces</b>		1	1
<b>PROFIBUS interfaces</b>		2	1
• remark		Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave
<b>PROFINET interfaces</b>		0	1
• remark		–	Interface with 2 ports; supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device
<b>General technical data</b>			
<b>Fan</b>		Integrated	Integrated
<b>DC supply voltage</b>			
• rated value	V	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption, typ.</b>	mA	800	800
• remark		without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface
<b>Making current, typ.</b>	A	3	3
<b>Power loss, typ.</b>	W	20	20
<b>Ambient temperature</b>			
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).
<b>Relative humidity without condensation during operating phase</b>	%	5 ... 95	5 ... 95

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### Technical specifications (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
Product brand name		SIMOTION	SIMOTION
Product-type designation		D410-2 DP	D410-2 DP/PN
<b>General technical data (continued)</b>			
Air pressure	hPa	620 ... 1 060	620 ... 1 060
Protection class IP		IP20	IP20
Height	mm (in)	186.8 (7.35)	190.7 (7.51)
Width	mm (in)	73 (2.87)	73 (2.87)
Depth	mm (in)	74.4 (2.93)	74.4 (2.93)
Weight, approx.	g (lb)	830 (1.83)	830 (1.83)
<b>Digital inputs</b>			
Number of digital inputs		11	11
• remark		Of which: 5 DI and 3 F-DI (= 6 DI)	Of which: 5 DI and 3 F-DI (= 6 DI)
DC input voltage			
• rated value	V	24	24
• for signal "1"	V	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5
Electrical isolation		Yes	Yes
Current consumption for "1" signal level, typ.	mA	6	6
Input delay for			
• signal "0" → "1", typ.	µs	50	50
• signal "1" → "0", typ.	µs	150	150
<b>Digital inputs/outputs</b>			
Number of digital inputs/outputs		8	8
Parameterization possibility of the digital inputs/outputs		Can be parameterized as DI, as DO, as measuring input (max. 8), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 8), as output cam (max. 8)
<b>If used as an input</b>			
DC input voltage			
• rated value	V	24	24
• for signal "1"	V	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5
Electrical isolation		No	No
Current consumption for "1" signal level, typ.	mA	5	5
Input delay for			
• signal "0" → "1", typ.	µs	5	5
• signal "1" → "0", typ.	µs	50	50
Measuring input, reproducibility	µs	5	5
• remark		Typical value	Typical value
Measuring input, resolution	µs	1	1
<b>If used as an output</b>			
Load voltage			
• rated value	V	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8
Electrical isolation		No	No
Current carrying capacity for each output, max.	mA	500	500
Leakage current, max.	mA	2	2
Output delay for			
• signal "0" → "1", typ.	µs	150	150
• signal "0" → "1", max.	µs	400	400
• signal "1" → "0", typ.	µs	75	75
• signal "1" → "0", max.	µs	100	100
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut



### Technical specifications (continued)

Order No.		6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION
<b>Product-type designation</b>		D410-2 DP	D410-2 DP/PN
<b>If used as an output (continued)</b>			
<b>Output cam, reproducibility</b>	μs	125	125
• remark		Typical value	Typical value
<b>Output cam, resolution</b>	μs	125	125
• remark		Typical value	Typical value
<b>Switching frequency of the outputs for</b>			
• ohmic load, max.	Hz	100	100
• inductive load, max.	Hz	0.5	0.5
• lamp load, max.	Hz	10	10
<b>Short-circuit protection</b>		Yes	Yes
<b>Digital outputs</b>			
<b>Number of digital outputs</b>		1	1
<b>Parameterization possibility of the digital outputs</b>		Can be parameterized as F-DO or DO	Can be parameterized as F-DO or DO
<b>Load voltage</b>			
• rated value	V	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Electrical isolation</b>		Yes	Yes
<b>Current carrying capacity for each output, max.</b>	mA	500	500
<b>Leakage current, max.</b>	mA	2	2
<b>Output delay for</b>			
• signal "0" → "1", typ.	μs	150	150
• signal "0" → "1", max.	μs	400	400
• signal "1" → "0", typ.	μs	75	75
• signal "1" → "0", max.	μs	100	100
- remark		Data for V <sub>cc</sub> = 24 V; load 48 Ohm; "1" = 90 % V <sub>Out</sub> , "0" = 10 % V <sub>Out</sub>	Data for V <sub>cc</sub> = 24 V; load 48 Ohm; "1" = 90 % V <sub>Out</sub> , "0" = 10 % V <sub>Out</sub>
<b>Short-circuit protection</b>		Yes	Yes
<b>Analog input</b>			
<b>Number of analog inputs</b>		1	1
<b>If used as an analog voltage input</b>			
<b>Input voltage</b>	V	-10 ... +10	-10 ... +10
<b>Resolution</b>	bit	12	12
• remark		+ sign	+ sign
<b>Input resistance (R<sub>i</sub>)</b>	kΩ	100	100
<b>If used as an analog current input</b>			
<b>Input current</b>	mA	-20 ... +20	-20 ... +20
<b>Resolution</b>	bit	11	11
• remark		+ sign	+ sign
<b>Input resistance (R<sub>i</sub>)</b>	Ω	250	250
<b>Onboard encoder interface</b>			
<b>Encoder interface</b>		Optional incremental encoder TTL, incremental encoder HTL or absolute encoder SSI without incremental signals TTL/HTL	Optional incremental encoder TTL, incremental encoder HTL or absolute encoder SSI without incremental signals TTL/HTL
<b>Encoder supply for</b>			
• 24 V DC	A	0.35	0.35
• 5 V DC	A	0.35	0.35
<b>Limiting frequency, max.</b>	kHz	500	500
<b>SSI baud rate</b>	kBd	100 ... 250	100 ... 250
<b>Resolution of absolute position SSI</b>	bit	30	30

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### Technical specifications (continued)

Order No.	6AU1410-2AA00-0AA0	6AU1410-2AD00-0AA0
<b>Product brand name</b>	SIMOTION	SIMOTION
<b>Product-type designation</b>	D410-2 DP	D410-2 DP/PN
<b>Onboard encoder interface (continued)</b>		
<b>Cable length for</b>		
• TTL incremental encoder, max.	m (ft) 100 (328)	100 (328)
• HTL incremental encoder for		
- unipolar signals, max.	m (ft) 100 (328)	100 (328)
- bipolar signals, max.	m (ft) 300 (984)	300 (984)
- remark	TTL only bipolar signals; for bipolar signals, the signal lines must be twisted in pairs and shielded	TTL only bipolar signals; for bipolar signals, the signal lines must be twisted in pairs and shielded
• SSI absolute encoder, max.	m (ft) 100 (328)	100 (328)
<b>Additional technical data</b>		
<b>Input for the temperature measurement</b>	KTY84-130 or PTC	KTY84-130 or PTC
<b>Backup of non-volatile data</b>		
• Backup of retentive data	Unlimited buffer duration	Unlimited buffer duration
• Buffer time real-time clock	5 days min.	5 days min.
• remark	Data backup is maintenance-free	Data backup is maintenance-free
<b>Approvals</b>		
• USA	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04
• Canada	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04
• Australia	C-Tick	C-Tick

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#### Selection and ordering data

Description	Order No.
<b>SIMOTION D410-2 DP Control Unit</b> (SIMOTION V4.3 SP1 HF2 or higher)	<b>6AU1410-2AA00-0AA0</b>
<b>SIMOTION D410-2 DP/PN Control Unit</b> (SIMOTION V4.3 SP1 HF3 or higher)	<b>6AU1410-2AD00-0AA0</b>
<b>SIMOTION CompactFlash card (CF) 1 GB</b> with the current SIMOTION Kernel and SINAMICS S120 drive software V4.x <i>Pre-installed license can be obtained using additional order codes <sup>1)</sup></i> <b>Note:</b> A separate CompactFlash card is available for the SIMOTION D4x5-2 Control Units. (6AU1400-2PA22-0AA0)	<b>6AU1400-1PA22-0AA0</b>
<b>MultiAxes Package license for SIMOTION D410-2</b> • As Z option • As single license	<b>M41</b> <b>6AU1820-0AA41-0AB0</b>

<sup>1)</sup> Note about licenses for runtime software:  
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.  
[See Ordering licenses for runtime software on page 9/63.](#)

### Accessories

Description	Order No.
<b>Accessories for SIMOTION D410-2</b>	
<b>Rear panel mounting plate</b> For installing the SIMOTION D410-2 in a different location if you do not wish to connect it to the Power Module.	<b>6AU1400-7AA05-0AA0</b>
<b>Accessories for PROFIBUS</b>	
<b>PROFIBUS RS485 bus connector with axial cable outlet (180°)</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG socket, with terminal blocks</li> <li>Without PG socket, with FastConnect insulation displacement method</li> </ul>	<b>6GK1500-0EA02</b> <b>6GK1500-0FC10</b>
<b>PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	<b>6ES7972-0BA42-0XA0</b> <b>6ES7972-0BB42-0XA0</b>
<b>PROFIBUS FastConnect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	<b>6ES7972-0BA60-0XA0</b> <b>6ES7972-0BB60-0XA0</b>
<b>PROFIBUS RS485 bus connector with cable outlet (90°) and screw-type terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	<b>6ES7972-0BA12-0XA0</b> <b>6ES7972-0BB12-0XA0</b>
<b>PROFIBUS FastConnect RS485 bus connector with cable outlet (90°) and insulation displacement terminals</b> Max. transmission rate 12 Mbit/s	
<ul style="list-style-type: none"> <li>Without PG interface</li> <li>With PG interface</li> </ul>	<b>6ES7972-0BA52-0XA0</b> <b>6ES7972-0BB52-0XA0</b>

Description	Order No.
<b>Accessories for PROFINET</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 180° cable outlet	
<ul style="list-style-type: none"> <li>1 pack = 1 unit</li> <li>1 pack = 10 units</li> <li>1 pack = 50 units</li> </ul>	<b>6GK1901-1BB10-2AA0</b> <b>6GK1901-1BB10-2AB0</b> <b>6GK1901-1BB10-2AE0</b>
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 145° cable outlet	
<ul style="list-style-type: none"> <li>1 pack = 1 unit</li> <li>1 pack = 10 units</li> <li>1 pack = 50 units</li> </ul>	<b>6GK1901-1BB30-0AA0</b> <b>6GK1901-1BB30-0AB0</b> <b>6GK1901-1BB30-0AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET<sup>1)</sup></b>	
<ul style="list-style-type: none"> <li>IE FC Standard Cable GP 2x2</li> <li>IE FC Flexible Cable GP 2x2</li> <li>IE FC Trailing Cable GP 2x2</li> <li>IE FC Trailing Cable 2x2</li> <li>IE FC Marine Cable 2x2</li> </ul>	<b>6XV1840-2AH10</b> <b>6XV1870-2B</b> <b>6XV1870-2D</b> <b>6XV1840-3AH10</b> <b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
<ul style="list-style-type: none"> <li>IE FC stripping tool</li> </ul>	<b>6GK1901-1GA00</b>
<b>Other accessories</b>	
<b>Dust-proof blanking plugs</b> (50 units) for sealing unused DRIVE-CLiQ, Ethernet and PROFINET ports	<b>6SL3066-4CA00-0AA0</b>

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D410-2 Control Units

#### More information

##### More information

- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in chapter MOTION-CONNECT connection systems.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.
- about the ordering data for SINAMICS drive components such as Power Modules, DRIVE-CLiQ cables, etc. can be found in chapter SINAMICS S120 drive system and the Industry Mall under Drive Technology/Converters/...

#### Integrated drive control

The drive control functions integrated in a SIMOTION D410-2 are based on the drive control of a SINAMICS S120 CU310-2 (firmware version V4.x), although there is a slight difference in functionality. For example, the SIMOTION D410-2 does not have a basic positioner function (EPos), as this is already covered by SIMOTION technology functions.

For more information, refer to chapter [System description – Dimensioning](#) and the documentation for SIMOTION and SINAMICS.

#### Licensing notes

SIMOTION D410-2 has an integrated drive control for either a servo, a vector or a V/f axis and is therefore ideal for single-axis applications.

One real axis can be used without license on the Control Unit. Speed-controlled axes and virtual axes never require a license.

SIMOTION D410-2 can be extended with additional SINAMICS S110/S120 Control Units (e.g. CU305) and so can also be used for smaller multi-axis applications (e.g. with 2 – 3 axes). A license is required for any additional axes. Where a license is required for a POS axis, the POS single-axis license is the ideal solution. It is better to use the MultiAxes Package D410-2 in the case of GEAR/CAM or more than one POS license.

The axis license with the highest functionality is covered by the inclusive license (a real axis).

The functionality has the following granularity:  
CAM > GEAR > POS.

#### Example:

Application with 2 real axes: 1 POS, 1 CAM.

Only a POS license needs to be purchased because the higher-order CAM license is already included.

Licenses are also required for runtime functions such as SIMOTION IT Virtual Machine. These can be pre-installed on the CompactFlash card (CF card) or ordered separately.

For more information, refer to section [Ordering of licenses for runtime software](#).

#### SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S110, S120 drive families including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter [System description – Dimensioning](#).

#### Overview



SIMOTION D4x5-2 are drive-based Control Units for multi-axis systems. The individual variants essentially differ in terms of their PLC and motion control performance, memory size and interfaces. The main distinguishing features are:

Distinguishing features <sup>2)</sup>	SIMOTION D425-2 DP	SIMOTION D425-2 DP/PN	SIMOTION D435-2 DP	SIMOTION D435-2 DP/PN	SIMOTION D445-2 DP/PN	SIMOTION D455-2 DP/PN
<b>Performance class</b>	BASIC	BASIC	STANDARD	STANDARD	HIGH	ULTRA-HIGH
<b>Maximum number of axes</b>	16	16	32	32	64	128
<b>Second runtime level</b> SERVO <sub>Fast</sub> / IPO <sub>Fast</sub>	–	–	–	•	•	•
<b>DRIVE-CLiQ interfaces</b>	4	4	6	6	6	6
<b>Communication interfaces</b>						
• PROFIBUS	2	2	2	2	2	2
• PROFINET	–	1 (3 ports) <sup>1)</sup>	–	1 (3 ports) <sup>1)</sup>	1 (3 ports) <sup>1)</sup>	1 (3 ports) <sup>1)</sup>
• Ethernet	3	2	3	2	2	2

- available
- not available

The SIMOTION D425-2, D435-2, D445-2 and D455-2 Control Units feature PLC and motion control performance (open-loop control and motion control) for up to 16, 32, 64 or 128 axes, as required.

The integrated drive control enables each D4x5-2 Control Unit to operate up to 6 servo, 6 vector or 12 *V/f* axes.

The integrated drive control is based on the drive control of a SINAMICS S120 CU320-2 Control Unit (firmware version V4.x) and supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and *V/f* control.

#### Extension of the drive computing performance

The motion control performance of a SIMOTION D4x5-2 can be utilized in full by expanding the computing performance at the drive in two different ways:

- SINAMICS S120 Control Units (e.g. CU320-2) can be connected together with further SINAMICS S120 drive modules via PROFIBUS or PROFINET.
- The SIMOTION CX32-2 Controller Extension can be connected via DRIVE-CLiQ. This module is extremely compact and can control up to 6 servo, 6 vector or 12 *V/f* axes.

<sup>1)</sup> Optional second PROFINET interface via CBE30-2 (4 ports)

<sup>2)</sup> For further details such as cycle times, memory configuration, etc., refer to technical specifications.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Application

Field of application for the SIMOTION D4x5-2 Control Units are applications with a large number of coordinated axes and short cycle times.

Typical fields of application are:

- Compact multi-axis machines
- High-performance applications with short machine cycles
- Compact machines
  - Including the complete machine control in the drive
  - With extensive connection possibilities for communication, HMI and I/O
- Distributed drive concepts
  - Applications with a large number of axes
  - Synchronization of several SIMOTION D Control Units via distributed synchronous operation

#### Design



SIMOTION D425-2 DP (on left) and SIMOTION D435-2 DP/PN with CBE30-2 inserted (on right)

#### Interfaces

##### Display and diagnostics

- LEDs to display operating states and errors
- 3 measuring sockets
- Service switch and mode selector
- Diagnostics button

##### Onboard I/Os

- 12 digital inputs
- 16 digital inputs/outputs (max. 16 as high-speed measuring inputs, max. 8 as high-speed output cams)

##### Communication

- 6 x DRIVE-CLiQ (4 x DRIVE-CLiQ for D425-2)
- 2 x Industrial Ethernet (3 x Industrial Ethernet for D4x5-2 DP), of which one interface easily accessible on the module front
- 2 x PROFIBUS DP
- 1 x PROFINET IO (1 interface with 3 ports, with D4x5-2 DP/PN only)
- 2 x USB

##### Data backup

- 1 x slot for SIMOTION CompactFlash card

##### Additional interfaces

- Terminals for 24 V electronics power supply

#### Option modules

With the TB30 Terminal Board, the SIMOTION D4x5-2 Control Units can be extended with 4 digital inputs, 4 digital outputs, 2 analog inputs and 2 analog outputs. The TB30 Terminal Board is plugged into the option slot on the Control Unit.

Using the CBE30-2 Communication Board for PROFINET IO, it is possible to equip the SIMOTION D4x5-2 DP/PN Control Units with a second PROFINET interface with 4 ports.

Applications for a second PROFINET interface:

- 2 separate networks (e.g. one local and one higher-level network)
- Address space can be doubled to 2 x 4 KB
- Maximum number of connectable devices can be doubled to 2 x 64
- Separation into a high-speed and a slow bus system/execution system in order to make efficient use of the controller's capacity (applies only to SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN)
  - PROFINET onboard: SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>
  - PROFINET via CBE30-2: SERVO / IPO / IPO2

#### Note:

The CBE30-2 cannot be used in SIMOTION D4x5-2 DP Control Units. If the CBE30-2 is used without SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>, then both PROFINET interfaces are assigned to SERVO / IPO / IPO2.

#### Assembly/Installation

The SIMOTION D4x5-2 Control Units can be mounted in the control cabinet in one of three ways:

- Mounting with spacers
- Mounting without spacers (D425-2 and D435-2 only)
- Mounting without spacers (external cooling, D445-2 and D455-2 only)

With external air cooling, the cooling fins of the D445-2/D455-2 Control Unit are outside of the control cabinet. A seal (option) is required so that the Control Unit can be hermetically mounted in the rear cabinet panel.

The SIMOTION D4x5-2 Control Units are supplied with pre-assembled spacers. These can be removed if necessary.

#### Data storage/data backup

The SIMOTION D4x5-2 Control Units store the retentive process data permanently in a manner that requires no maintenance (refer to technical data for memory size).

The real-time clock is backed up for several days via a Super-Cap. The backup time can be extended via a battery in the double fan/battery module.

The double fan/battery module incl. battery is contained in the scope of supply of the SIMOTION D4x5-2.

The runtime software, user data and user programs are stored retentively on the CompactFlash card (CF). The retentive process data of the Control Unit can also be stored on this CompactFlash card via system command, e.g. if spare parts are required.

#### Design (continued)

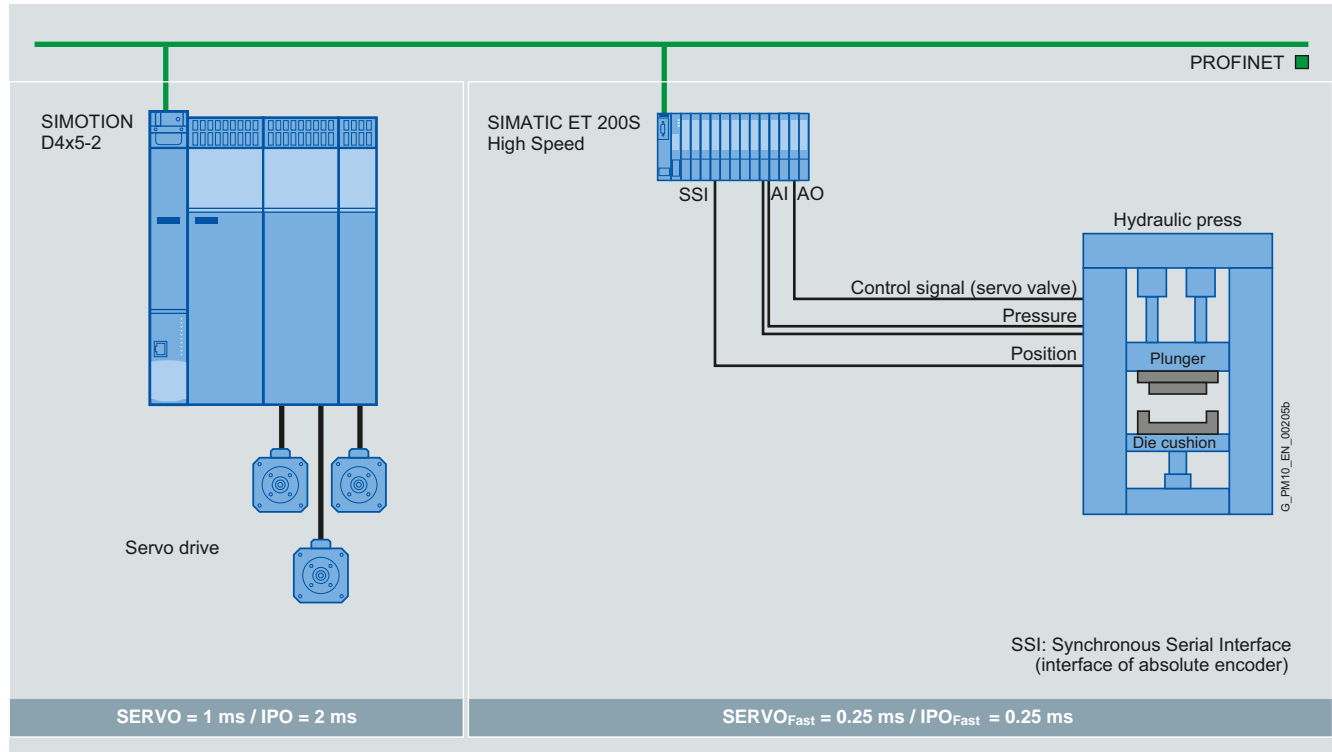
#### Extended execution system (SERVO<sub>Fast</sub> / IPO<sub>Fast</sub>)

The SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN Control Units have (in addition to SERVO, IPO and IPO2) an additional second runtime level (SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>).

The additional runtime level allows the distribution of electric and/or hydraulic axes with different dynamic responses on a slow and a fast bus system so that the performance of the controller can be used more efficiently.

It also enables a particularly fast I/O processing in conjunction with high-speed PROFINET I/O modules.

Thanks to the extended execution system, electrical positioning drives can be controlled with cycle times in the millisecond range requiring fewer resources and at the same time the pressure-controlled axes of an hydraulic press can be controlled with a high dynamic response and short cycle times.



Closed-loop control of an hydraulic press with SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>

If SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> are activated, the following assignment applies:

- SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> are assigned to the PROFINET.
- SERVO, IPO and IPO2 are assigned to the PROFIBUS or the integrated drives of the SIMOTION D4x5-2/CX32-2.

If a second PROFINET interface is provided by means of a CBE30-2, this will also be assigned to SERVO, IPO and IPO2. In this case, the onboard PROFINET interface is always assigned to SERVO<sub>Fast</sub> and IPO<sub>Fast</sub>.

#### Connectable I/Os

##### PROFINET IO:

- Certified PROFINET devices
- Distributed I/Os SIMATIC ET 200S/SP/M/eco PN/pro and TMC
- Drive systems (e.g. SINAMICS S110/S120)

##### PROFIBUS DP:

- Certified PROFIBUS standard slaves (DP-V0, DP-V1, DP-V2)
- SIMATIC ET 200S/M/eco/pro distributed I/Os
- Drive systems (e.g. SINAMICS S110/S120)

##### DRIVE-CLiQ:

Modules from the SINAMICS S120 range:

- TM15, TM17 High Feature Terminal Modules, TM31, etc.
- SMC/SME Sensor Modules
- DMC20/DME20 DRIVE-CLiQ Hub Module

##### USB:

The integrated USB interface allows, for example, a USB memory stick to be connected for a project or firmware update.

##### Expansion with SINAMICS S120 drive modules

SINAMICS S120 drive modules in booksize format (Line Modules, Motor Modules, etc.) are connected to the SIMOTION D4x5-2 Control Unit via DRIVE-CLiQ.

SINAMICS S120 PM340 Power Modules in blocksize format can be operated on the SIMOTION D4x5-2 Control Units with the CUA31/CUA32 Control Unit Adapters.

##### Note:

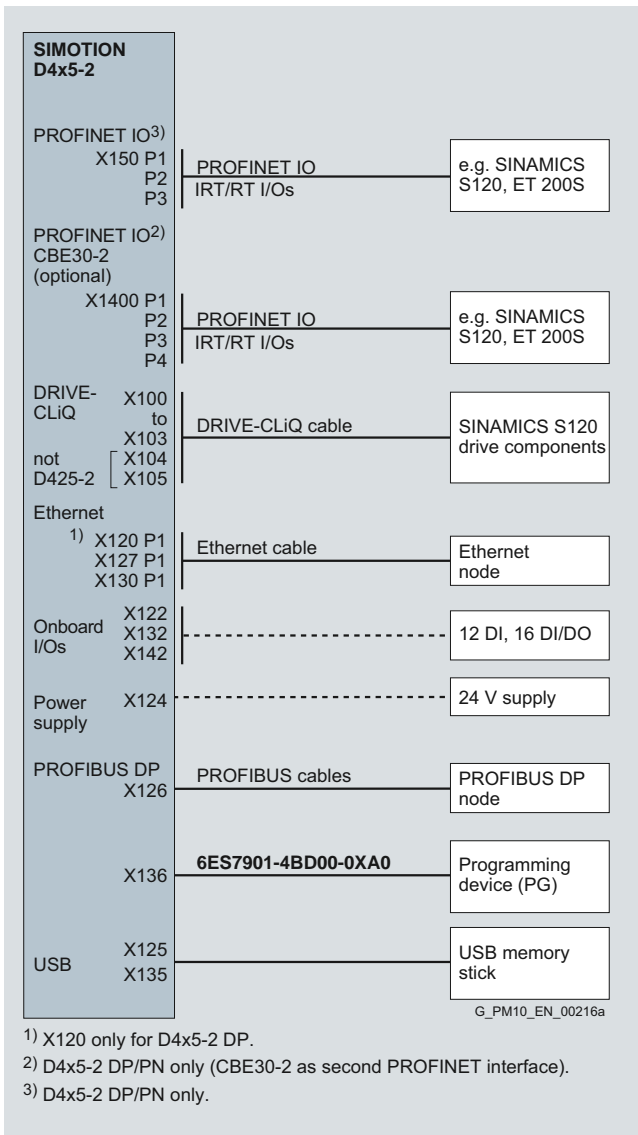
DRIVE-CLiQ cables which are required to connect Line/Motor Modules to SIMOTION D are supplied in a standard length with the Line/Motor Modules.

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Integration



When dimensioning cables, you must always observe the maximum permissible cable lengths.

If these maximum lengths are exceeded, malfunctions can occur.

The permissible length of PROFIBUS DP cables depends on the configuration.

The DRIVE-CLiQ cables used for the SINAMICS S120 CU320-2 Control Unit can also be used for SIMOTION D4x5-2 Control Units.

[For more information about signal cables, refer to chapter MOTION-CONNECT connection systems.](#)

SIMOTION D4x5-2 Control Unit connection overview



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>Performance class for motion control system</b>		BASIC Performance	BASIC Performance	STANDARD Performance	STANDARD Performance	HIGH Performance	ULTRA-HIGH Performance
<b>Version of the motion control system</b>		Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system	Multiple-axis system
<b>PLC and motion control performance</b>							
<b>Maximum number of axes</b>		16	16	32	32	64	128
<b>Minimum PROFIBUS cycle clock</b>	ms	1	1	1	1	1	1
<b>Minimum PROFINET send cycle clock</b>	ms	0.25	0.25	0.25	0.25	0.25	0.25
<b>Minimum servo cycle clock</b>	ms	0.5	0.5	0.5	0.25	0.25	0.25
<b>Minimum interpolator cycle clock</b>	ms	0.5	0.5	0.5	0.25	0.25	0.25
<b>Servo / IPO clock cycle, remark</b>		–	–	–	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO <sub>FAST</sub> and IPO <sub>FAST</sub>	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO <sub>FAST</sub> and IPO <sub>FAST</sub>	0.5 ms in conjunction with integrated SINAMICS S120 drives (SINAMICS Integrated); 0.25 ms in conjunction with SERVO <sub>FAST</sub> and IPO <sub>FAST</sub>
<b>Integrated drive control</b>							
<b>Maximum number of axes for integrated drive control</b>							
• servo		6	6	6	6	6	6
• vector		6	6	6	6	6	6
• V/f		12	12	12	12	12	12
• remark		Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x
<b>Memory</b>							
<b>RAM (work memory)</b>	MB	48	48	64	64	128	256
<b>Additional RAM work memory for Java applications</b>	MB	20	20	20	20	20	20
<b>RAM disk (load memory)</b>	MB	31	31	41	41	56	76
<b>Retentive memory</b>	KB	364	364	364	364	512	512
<b>Persistent memory (user data on CF)</b>	MB	300	300	300	300	300	300

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.	6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>	D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>Communication</b>						
<b>DRIVE-CLiQ interfaces</b>	4	4	6	6	6	6
<b>USB interfaces</b>	2	2	2	2	2	2
<b>Industrial Ethernet interfaces</b>	3	2	3	2	2	2
<b>PROFIBUS interfaces</b>	2	2	2	2	2	2
• remark	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave	Equidistant and isochronous; Can be configured as master or slave
<b>PROFINET interfaces</b>	0	1	0	1	1	1
• remark	–	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	–	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)	1 interface with 3 ports onboard; 1 interface with 4 ports optional via CBE30-2; functionality: supports PROFINET IO with IRT and RT; configurable as PROFINET IO controller and/or device; supports media redundancy (MRP and MRPD)
<b>General technical data</b>						
<b>Fan</b>	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery	Double fan/ battery module included in scope of delivery
<b>DC supply voltage</b>						
• rated value	V	24	24	24	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption, typ.</b>	mA	700	1 000	700	1 000	1 900
• remark		Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ and PROFIBUS interface
<b>Making current, typ.</b>	A	5	5	5	5	5
<b>Power loss, typ.</b>	W	17	24	17	24	46
<b>Ambient temperature</b>						
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
- remark		Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 m (6562 ft), the maximum ambient temperature decreases by 7 °C (44.6 °F) per 1000 m (3281 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>General technical data (continued)</b>							
<b>Relative humidity without condensation during operating phase</b>	%	5 ... 95	5 ... 95	5 ... 95	5 ... 95	5 ... 95	5 ... 95
<b>Air pressure</b>	hPa	620 ... 1 060	620 ... 1 060	620 ... 1 060	620 ... 1 060	620 ... 1 060	620 ... 1 060
<b>Protection class IP</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Height</b>	mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
<b>Width</b>	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)
<b>Depth</b>	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
• remark		When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep	When the spacer is removed 230 mm (9.05 in) deep
<b>Net weight</b>	g (lb)	3600 (7.94)	3600 (7.94)	3600 (7.94)	3600 (7.94)	4400 (9.70)	4400 (9.70)
<b>Digital inputs</b>							
<b>Number of digital inputs</b>		12	12	12	12	12	12
<b>DC input voltage</b>							
• rated value	V	24	24	24	24	24	24
• for signal "1"	V	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5
<b>Electrical isolation</b>		Yes	Yes	Yes	Yes	Yes	Yes
• remark		In groups of 6	In groups of 6	In groups of 6	In groups of 6	In groups of 6	In groups of 6
<b>Current consumption for "1" signal level, typ.</b>	mA	9	9	9	9	9	9
<b>Input delay for</b>							
• signal "0" → "1", typ.	µs	50	50	50	50	50	50
• signal "1" → "0", typ.	µs	150	150	150	150	150	150
<b>Digital inputs/outputs</b>							
<b>Number of digital inputs/outputs</b>		16	16	16	16	16	16
<b>Parameterization possibility of the digital inputs/outputs</b>		Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)	Can be parameterized as DI, as DO, as measuring input (max. 16), as output cam (max. 8)
<b>If used as an input</b>							
<b>DC input voltage</b>							
• rated value	V	24	24	24	24	24	24
• for signal "1"	V	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30	15 ... 30
• for signal "0"	V	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5	-3 ... +5
<b>Electrical isolation</b>		No	No	No	No	No	No
<b>Current consumption for "1" signal level, typ.</b>	mA	9	9	9	9	9	9
<b>Input delay for</b>							
• signal "0" → "1", typ.	µs	5	5	5	5	5	5
• signal "1" → "0", typ.	µs	50	50	50	50	50	50

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.		6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>		SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>		D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>If used as an input (continued)</b>							
<b>Measuring input, reproducibility</b>	μs	5	5	5	5	5	5
<b>Measuring input, resolution</b>	μs	1	1	1	1	1	1
<b>If used as an output</b>							
<b>Load voltage</b>							
• rated value	V	24	24	24	24	24	24
• permissible range	V	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8	20.4 ... 28.8
<b>Electrical isolation</b>		No	No	No	No	No	No
<b>Current carrying capacity for each output, max.</b>	mA	500	500	500	500	500	500
<b>Leakage current, max.</b>	mA	2	2	2	2	2	2
<b>Output delay for</b>							
• signal "0" → "1", typ.	μs	150	150	150	150	150	150
• signal "0" → "1", max.	μs	400	400	400	400	400	400
• signal "1" → "0", typ.	μs	75	75	75	75	75	75
• signal "1" → "0", max.	μs	150	150	150	150	150	150
- remark		Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut
<b>Output cam, reproducibility</b>	μs	10	10	10	10	10	10
<b>Output cam, resolution</b>	μs	1	1	1	1	1	1
<b>Switching frequency of the outputs for</b>							
• ohmic load, max.	Hz	100	100	100	100	100	100
• inductive load, max.	Hz	2	2	2	2	2	2
• lamp load, max.	Hz	11	11	11	11	11	11
<b>Short-circuit protection</b>		Yes	Yes	Yes	Yes	Yes	Yes

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Technical specifications (continued)

Order No.	6AU1425-2AA00-0AA0	6AU1425-2AD00-0AA0	6AU1435-2AA00-0AA0	6AU1435-2AD00-0AA0	6AU1445-2AD00-0AA0	6AU1455-2AD00-0AA0
<b>Product brand name</b>	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION	SIMOTION
<b>Product-type designation</b>	D425-2 DP	D425-2 DP/PN	D435-2 DP	D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
<b>Additional technical data</b>						
<b>Backup of non-volatile data</b>						
• Backup of retentive data	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration	Unlimited buffer duration
• Buffer time real-time clock	4 days min.	4 days min.	4 days min.	4 days min.	4 days min.	4 days min.
• remark	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module	Longer buffer duration of the real time clock using a battery which is inserted in double fan/ battery module
<b>Approvals</b>						
• USA	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04
• Canada	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04	UL 61010-1, 2nd Ed. CAN/ CSA-C22.2 NO. 61010-1-04
• Australia	C-Tick	C-Tick	C-Tick	C-Tick	C-Tick	C-Tick

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Selection and ordering data

Description	Order No.
<b>SIMOTION D425-2 DP Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1425-2AA00-0AA0</b>
<b>SIMOTION D425-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1425-2AD00-0AA0</b>
<b>SIMOTION D435-2 DP Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1435-2AA00-0AA0</b>
<b>SIMOTION D435-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.3 SP1 or higher)	<b>6AU1435-2AD00-0AA0</b>
<b>SIMOTION D445-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.2 SP1 or higher)	<b>6AU1445-2AD00-0AA0</b>
<b>SIMOTION D455-2 DP/PN Control Unit</b> incl. double fan/battery module and battery (SIMOTION V4.2 SP1 or higher)	<b>6AU1455-2AD00-0AA0</b>
<b>CompactFlash card (CF) 1 GB for SIMOTION D4x5-2</b> with the current SIMOTION Kernel and SINAMICS S120 drive software V4.x <i>Pre-installed license can be obtained using additional order codes <sup>1)</sup></i> Note: A separate CompactFlash card is available for the SIMOTION D410-2 Control Units (6AU1400-1PA22-0AA0).	<b>6AU1400-2PA22-0AA0</b>
<b>MultiAxes Package license for SIMOTION D425-x</b> • As Z option • As Z option incl. Safety Extended Functions • As single license • As single license incl. Safety Extended Functions	<b>M42</b> <b>S42</b> <b>6AU1820-0AA42-0AB0</b> <b>6AU1820-0AS42-0AB0</b>
<b>MultiAxes Package license for SIMOTION D435-x</b> • As Z option • As Z option incl. Safety Extended Functions • As single license • As single license incl. Safety Extended Functions	<b>M43</b> <b>S43</b> <b>6AU1820-0AA43-0AB0</b> <b>6AU1820-0AS43-0AB0</b>

Description	Order No.
<b>MultiAxes Package license for SIMOTION D445-x/D455-x</b> • As Z option • As Z option incl. Safety Extended Functions • As single license • As single license incl. Safety Extended Functions	<b>M44</b> <b>S44</b> <b>6AU1820-0AA44-0AB0</b> <b>6AU1820-0AS44-0AB0</b>

#### Note:

MultiAxes bundles are no longer available for the SIMOTION D4x5-2 (packages comprising Control Unit, CompactFlash card + MultiAxes Package license).

You can instead order the Control Unit and CompactFlash card with MultiAxes Package license individually:

Example for SIMOTION D445-2 DP/PN:

- Control Unit: 6AU1445-2AD00-0AA0
- CompactFlash card with MultiAxes Package license: 6AU1400-2PA22-0AA0 -Z M44

#### MultiAxes Packages

The MultiAxes Packages support particularly simple licensing. They contain the license for unlimited use of the POS/GEAR/CAM technology functions on the SIMOTION D Control Unit.

#### MultiAxes and Safety Packages

In addition to unlimited use of the axes licenses, the MultiAxes and Safety Packages also contain the licenses of the Safety Integrated Extended functions for all integrated SINAMICS drives (SIMOTION D and Controller Extensions CX32-2).

<sup>1)</sup> Note about licenses for runtime software:  
Runtime software licenses can either be pre-installed on a CompactFlash card (CF) or ordered separately.  
[See Ordering of licenses for runtime software on page 9/63.](#)

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### Accessories

Description	Order No.
<b>Accessories for SIMOTION D4x5-2</b>	
<b>Double fan/battery module</b> incl. battery Spare part for SIMOTION D4x5-2	<b>6FC5348-0AA02-0AA0</b>
<b>Battery</b> Spare part for fan/battery module	<b>6FC5247-0AA18-0AA0</b>
<b>Seal for external air cooling</b> (1 pack = 10 units) With external air cooling, the cooling fins of the Control Unit are outside of the control cabinet. A seal is required so that the D445-2/D455-2 can be hermetically mounted in the rear cabinet panel.	<b>6FC5348-0AA07-0AA0</b>
<b>Accessories for PROFIBUS</b>	
<b>PROFIBUS RS485 bus connector with angular cable outlet (35°) and screw-type terminals</b> Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7972-0BA42-0XA0</b>
• With PG interface	<b>6ES7972-0BB42-0XA0</b>
<b>PROFIBUS Fast Connect RS485 bus connector with angular cable outlet (35°) and insulation displacement terminals</b> Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7972-0BA60-0XA0</b>
• With PG interface	<b>6ES7972-0BB60-0XA0</b>
<b>PROFIBUS adapter plug</b> for raising the PROFIBUS connector to create more wiring space	<b>6FX2003-0BB00</b>
<b>Accessories for PROFINET (interface X150)</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 145° cable outlet (10/100 Mbit/s)	
• 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
• 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
• 1 pack = 50 units	<b>6GK1901-1BB30-0AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC standard cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC flexible cable GP 2x2	<b>6XV1870-2B</b>
• IE FC trailing cable GP 2x2	<b>6XV1870-2D</b>
• IE FC trailing cable 2x2	<b>6XV1840-3AH10</b>
• IE FC marine cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

Description	Order No.
<b>Accessory for Industrial Ethernet (interface X120, X127, X130)</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 180° cable outlet (10/100/1000 Mbit/s)	
• 1 pack = 1 unit	<b>6GK1901-1BB11-2AA0</b>
• 1 pack = 10 units	<b>6GK1901-1BB11-2AB0</b>
• 1 pack = 50 units	<b>6GK1901-1BB11-2AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC Standard Cable GP 4x2	<b>6XV1878-2A</b>
• IE FC Flexible Cable GP 4x2	<b>6XV1878-2B</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>
<b>Other accessories</b>	
<b>Dust-proof blanking plugs</b> (50 units) for sealing unused DRIVE-CLiQ, Ethernet and PROFINET ports	<b>6SL3066-4CA00-0AA0</b>

#### More information

##### More information

- about PROFIBUS DP/MPI cables and MOTION-CONNECT can be found in chapter MOTION-CONNECT connection systems.
- about PROFIBUS DP, Industrial Ethernet and PROFINET can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication as well as the chapter Communication.
- about the ordering data for other SINAMICS drive components such as Line Modules, Motor Modules, DRIVE-CLiQ cables, etc. can be found in chapter SINAMICS S120 drive system and the Industry Mall under Drive Technology/Converters/...

##### Integrated drive control

The drive control integrated in the SIMOTION D4x5-2 Control Units is based on the drive control of a SINAMICS S120 CU320-2 Control Unit (firmware version V4.x), whereby there are minor functional differences. For example, the integrated drive control does not have a basic positioner function (EPos), since this is already covered by SIMOTION technology functions.

For more information, refer to chapter System description – Dimensioning and the documentation for SIMOTION and SINAMICS.

##### SIZER for Siemens Drives engineering tool

With the SIZER for Siemens Drives engineering tool, you can easily configure the SINAMICS S110/S120 drive families including SIMOTION. It provides you with support for selecting and dimensioning the components for a Motion Control task. You can also determine the possible number of axes and the resulting utilization with SIZER for Siemens Drives in accordance with your performance requirements.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### SIMOTION D4x5-2 Control Units

#### More information (continued)

##### *Connectors and cables*

The adapter plug (Order No. 6FX2003-0BB00) is required for D4x5-2 when the bus cable has to be looped through the left-hand PROFIBUS interface (X126; 2 PROFIBUS cables wired to the plug) and also

- Ethernet interface X120, in the case of D4x5-2 DP or
- Port 3 of the PROFINET interface X150 in the case of D4x5-2 DP/PN

has to be wired to a FastConnect plug. With the adapter plug fitted, the PROFIBUS connector is higher which creates extra wiring space.

Ethernet interfaces X120, X127 and X130 support 10, 100 and 1000 Mbit/s. For 1000 Mbit/s, 8-core cables (4x2) must be used as well as the 1000 Mbit version of the 180° FastConnect plug.

The 145° FastConnect plugs cannot be used for Ethernet interface X130 (cable outlet downwards). They also only support a maximum of 100 Mbit/s.



# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components

#### SIMOTION CX32-2 Controller Extension

### Overview



The SIMOTION CX32-2 Controller Extension is a module in SINAMICS S120 booksize format. It enables the extension of the drive-side computing performance of the SIMOTION D4x5-2 Control Units.

The integrated drive computing performance enables the SIMOTION D4x5-2 Control Units to operate up to 6 servo, 6 vector or 12  $V/f$  axes.

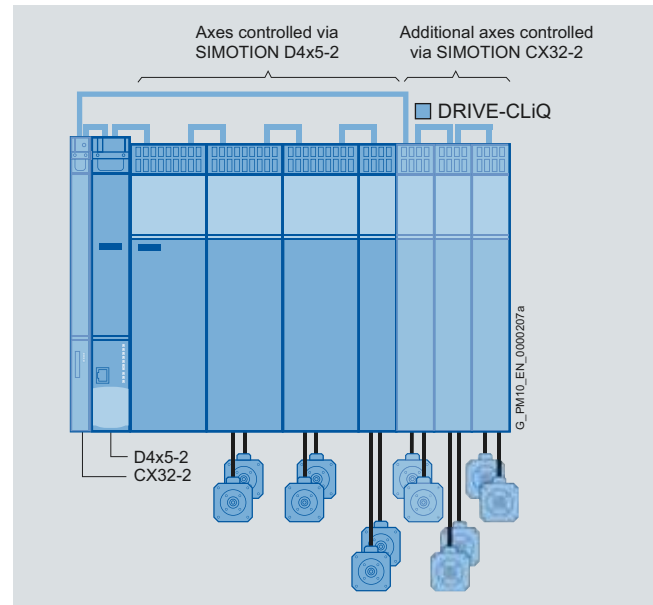
The SIMOTION CX32-2 Controller Extension extends the drive computing performance by up to 6 additional servo, 6 vector or 12  $V/f$  axes. This allows the number of axes of a multi-axis system to be increased according to the requirements of the application.

If required, several CX32-2 Controller Extensions can be operated on one SIMOTION D4x5-2 Control Unit.

### Benefits

- With a width of 25 mm (0.98 in), the CX32-2 Controller Extension requires very little space and is therefore well-suited for use in compact machines.
- The CX32-2 Controller Extension is connected to the SIMOTION D4x5-2 via DRIVE-CLiQ, so high-performance, isochronous closed-loop control of the drives is possible without the need for additional modules. The communication interfaces on the SIMOTION D4x5-2 remain available for other connections.
- The addressing of the Controller Extension is independent of the addressing on PROFIBUS/PROFINET. This is advantageous for modular machine concepts.
- Simple cabling and configuration
- The "Control operation" signal from an infeed connected to the SIMOTION D4x5-2 is particularly easy to interconnect to the drives of the CX32-2 Controller Extension.
- The CX32-2 Controller Extension does not require its own CompactFlash card. Data is managed centrally on the CompactFlash card of the SIMOTION D4x5-2 Control Unit. This has the following advantages:
  - Simple module replacement (no operator action required on the CX32-2, such as memory card replacement)
  - During firmware upgrades, the CX32-2 Controller Extension is automatically upgraded with the integrated drive of the SIMOTION D4x5-2 Control Unit
  - Central license handling via the SIMOTION D4x5-2

### Design



Example: Axis grouping for 12 axes with SIMOTION D4x5-2 and SIMOTION CX32-2 Controller Extension

The SIMOTION CX32-2 Controller Extension is connected to the SIMOTION D4x5-2 via DRIVE-CLiQ.

In this way, a very compact axis grouping can be implemented, for example, with 12 servo axes.

If required, several SIMOTION CX32-2 Controller Extensions can be operated on one SIMOTION D4x5-2 Control Unit.

- Max. 3 CX32-2 units on one SIMOTION D425-2
- Max. 5 CX32-2 units on one SIMOTION D435-2, D445-2 or D455-2

In principle, a 4th or 6th CX32-2 Controller Extension can also be connected. In this case, no drives / drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the connected Controller Extensions. This can be useful, for example, when implementing distributed, modular machine concepts.

Additional drive controls can be implemented with SINAMICS S110/S120 Control Units via PROFIBUS or PROFINET.

#### Note

The SIMOTION CX32-2 Controller Extension can only be used with SIMOTION D4x5-2 Control Units. Operation with SIMOTION D4x5 Control Units is not possible.

The SIMOTION CX32 Controller Extension should be used for the SIMOTION D435 and D445-1 Control Units (Order No. 6SL3040-ONA00-0AA0).

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components SIMOTION CX32-2 Controller Extension

#### Technical specifications

<b>Order No.</b>	<b>6AU1432-2AA00-0AA0</b>	
<b>Product brand name</b>	SIMOTION	
<b>Product-type designation</b>	CX32-2	
<b>Version of the motion control system</b>	Controller Extension	
<b>Integrated drive control</b>		
<b>Maximum number of axes for integrated drive control</b>		
• servo	6	
• vector	6	
• V/f	12	
• remark	Alternative control modes; drive control based on SINAMICS S120 CU320-2, firmware version V4.x	
<b>Communication</b>		
<b>DRIVE-CLiQ interfaces</b>	4	
<b>General technical data</b>		
<b>Fan</b>	No fan	
<b>DC supply voltage</b>		
• rated value	V	24
• permissible range	V	20.4 ... 28.8
<b>Current consumption, typ.</b>		
• remark	Without load at the inputs/outputs, without 24 V supply via DRIVE-CLiQ interface	
<b>Making current, typ.</b>	A	1.6
<b>Power loss, typ.</b>	W	7
<b>Ambient temperature</b>		
• during long-term storage	°C (°F)	-25 ... +55 (-13 ... +131)
• during transport	°C (°F)	-40 ... +70 (-40 ... +158)
• during operating	°C (°F)	0 ... +55 (+32 ... +131)
- remark	Maximum installation altitude 4000 m (13124 ft) above sea level. Above an altitude of 2000 (6562 ft), the maximum ambient temperature decreases by 7° C (44.6 °F) per 1000 m (3281 ft).	
<b>Relative humidity without condensation during operating phase</b>	%	5 ... 95
<b>Air pressure</b>	hPa	620 ... 1 060
<b>Protection class IP</b>	IP20	
<b>Height</b>	mm (in)	380 (14.96)
<b>Width</b>	mm (in)	25 (0.98)
<b>Depth</b>	mm (in)	270 (10.63)
• remark	When the spacer is removed 230 mm (9.05 in) deep	
<b>Net weight</b>	g (lb)	2600 (5.73)
<b>Digital inputs</b>		
<b>Number of digital inputs</b>	6	
<b>DC input voltage</b>		
• rated value	V	24
• for signal "1"	V	15 ... 30
• for signal "0"	V	-3 ... +5

<b>Order No.</b>	<b>6AU1432-2AA00-0AA0</b>	
<b>Product brand name</b>	SIMOTION	
<b>Product-type designation</b>	CX32-2	
<b>Digital inputs (continued)</b>		
<b>Electrical isolation</b>		
• remark	Yes in groups of 6	
<b>Current consumption for "1" signal level, typ.</b>	mA	9
<b>Input delay for</b>		
• signal "0" → "1", typ.	µs	50
• signal "1" → "0", typ.	µs	150
<b>Digital inputs/outputs</b>		
<b>Number of digital inputs/outputs</b>	4	
<b>Parameterization possibility of the digital inputs/outputs</b>	Parameterizable as DI, as DO, as measuring input (max. 4)	
<b>If used as an input</b>		
<b>DC input voltage</b>		
• rated value	V	24
• for signal "1"	V	15 ... 30
• for signal "0"	V	-3 ... +5
<b>Electrical isolation</b>		
No		
<b>Current consumption for "1" signal level, typ.</b>	mA	9
<b>Input delay for</b>		
• signal "0" → "1", typ.	µs	5
• signal "1" → "0", typ.	µs	50
<b>Measuring input, reproducibility</b>	µs	5
<b>Measuring input, resolution</b>	µs	1
<b>If used as an output</b>		
<b>Load voltage</b>		
• rated value	V	24
• permissible range	V	20.4 ... 28.8
<b>Electrical isolation</b>		
No		
<b>Current carrying capacity for each output, max.</b>	mA	500
<b>Leakage current, max.</b>	mA	2
<b>Output delay for</b>		
• signal "0" → "1", typ.	µs	150
• signal "0" → "1", max.	µs	400
• signal "1" → "0", typ.	µs	75
• signal "1" → "0", max.	µs	100
- remark	Data for Vcc = 24 V; load 48 Ohm; "1" = 90 % VOut, "0" = 10 % VOut	

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components SIMOTION CX32-2 Controller Extension

#### Technical specifications (continued)

<b>Order No.</b>	<b>6AU1432-2AA00-0AA0</b>	
<b>Product brand name</b>	SIMOTION	
<b>Product-type designation</b>	CX32-2	
<b>If used as an output (continued)</b>		
<b>Switching frequency of the outputs for</b>		
• ohmic load, max.	Hz	100
• inductive load, max.	Hz	2
• lamp load, max.	Hz	11
<b>Short-circuit protection</b>	Yes	
<b>Additional technical data</b>		
<b>Backup of non-volatile data</b>		
• Backup of retentive data	Unlimited buffer duration	
<b>Approvals</b>		
• USA	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	
• Canada	UL 61010-1, 2nd Ed. CAN/CSA-C22.2 NO. 61010-1-04	
• Australia	C-Tick	

#### Selection and ordering data

Description	Order No.
<b>SIMOTION CX32-2 Controller Extension for SIMOTION D4x5-2</b>	<b>6AU1432-2AA00-0AA0</b>

# SIMOTION Motion Control System

## SIMOTION D – Drive-based

### Supplementary components CBE30-2 Communication Board

#### Overview



The CBE30-2 Communication Board can be used to provide the SIMOTION D4x5-2 DP/PN with a second PROFINET interface.

#### Application

Applications for a second PROFINET interface are as follows:

- 2 separate networks (e.g. one local and one higher-level network)
- Address space can be doubled to 2 × 4 KB
- Maximum number of connectable devices can be doubled to 2 × 64
- Separation into a high-speed and a slow bus system/execution system in order to make efficient use of the controller's capacity (applies only to SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN)

#### Function

The CBE30-2 Communication Board provides the following functions:

- PROFINET IO controller, I-Device (also controller and device simultaneously)
- 100 Mbit/s full-duplex/autocrossing
- Supports real-time classes of PROFINET IO:
  - RT (Real-Time)
  - IRT (Isochronous Real Time)
- Integration of distributed I/O as PROFINET IO devices
- Integration of drives as PROFINET IO devices through PROFIdrive according to the V4 specification
- Support for standard Ethernet communication, e.g.
  - for interfacing with SIMOTION SCOUT
  - for the connection of HMI systems
  - for communication with any other devices over TCP/IP or UDP communication
- Integrated 4-port switch with four RJ45 sockets. The optimum topology (line, star, tree) can therefore be configured without additional external switches.
- Support of media redundancy (MRP/MRPD).

#### Integration

The CBE30-2 Communication Board is plugged into the option slot on the SIMOTION D4x5-2 DP/PN.

#### Note

The CBE30-2 Communication Board can only be used with the SIMOTION D4x5-2 DP/PN Control Units.

It is not compatible with SIMOTION D425, D435, D445-1 and D4x5-2 DP.

#### Technical specifications

CBE30-2 Communication Board	
<b>Current requirement at 24 V DC</b>	0.25 A
<b>Permissible ambient temperature</b>	
• Storage and transport	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... 55 °C (32 ... 131 °F)
<b>Weight, approx.</b>	100 g (0.22 lb)
<b>Dimensions (W × H × D)</b>	25 × 95 × 143 mm (0.98 × 3.74 × 5.63 in)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>CBE30-2 Communication Board</b> For SIMOTION D4x5-2 DP/PN (SIMOTION V4.3 SP1 or higher)	<b>6FC5312-0FA00-2AA0</b>

#### Accessories

Description	Order No.
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b>	
• 145° cable outlet (10/100 Mbit/s)	
- 1 pack = 1 unit	<b>6GK1901-1BB30-0AA0</b>
- 1 pack = 10 units	<b>6GK1901-1BB30-0AB0</b>
- 1 pack = 50 units	<b>6GK1901-1BB30-0AE0</b>
<b>FastConnect cables for Industrial Ethernet/PROFINET <sup>1)</sup></b>	
• IE FC Standard Cable GP 2x2	<b>6XV1840-2AH10</b>
• IE FC Flexible Cable GP 2x2	<b>6XV1870-2B</b>
• IE FC Trailing Cable GP 2x2	<b>6XV1870-2D</b>
• IE FC Trailing Cable 2x2	<b>6XV1840-3AH10</b>
• IE FC Marine Cable 2x2	<b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b>	
• IE FC stripping tool	<b>6GK1901-1GA00</b>

#### More information

More information about FastConnect cables can be found in Catalog IK PI (Industrial Communication) and the Industry Mall under Automation Technology/Industrial Communication/Industrial Ethernet/Cabling technology/...

<sup>1)</sup> Sold by the meter; max. length 1000 m (3281 ft); minimum order 20 m (65.62 ft).

#### Overview

##### **SIMOTION – The scalable system platform for Motion Control applications**

The SIMOTION system has created a scalable system platform for automation tasks, particularly Motion Control applications.

The scalability of the system allows you to implement tailor-made and economic applications.

The modular SIMOTION software is perfectly integrated and offers easy-to-use functions for all phases of the automation process.

##### **SIMOTION – Software for runtime, engineering and commissioning**

The software for SIMOTION is divided into the following categories:

###### Runtime software

SIMOTION Kernel – Basic functionality

The SIMOTION Kernel provides the basic functionality and is a component of all SIMOTION devices.

SIMOTION technology packages

The SIMOTION technology packages support modular expansion of the functionality.

SIMOTION IT – Service and diagnostics functions

Supports simple diagnostics, service or HMI applications without SIMOTION SCOUT.

###### Engineering software

- SIMOTION SCOUT engineering software (with integrated STARTER commissioning tool)
- Optional CamTool package (cam editor)
- Optional Drive Control Chart (DCC) package

The SCOUT engineering system provides high-performance tools that provide simple, optimal support for all engineering steps required in the context of machine automation.

The SIMOTION CamTool is available as an optional package which permits simple creation of cams.

The optional Drive Control Chart package is available for easy graphical configuration of technology functions using pre-defined function blocks (Drive Control Blocks DCB).

The SCOUT engineering system can be used in SIMATIC STEP 7, either with integrated data management and configuration, or as a stand-alone engineering tool.

##### **Supplementary software**

In addition to the SIMOTION software, other standard software products are available, for example, for easy programming of HMIs on Operator, Touch or Multi Panels, as well as Panel PCs or PC systems.

###### SIMATIC HMI software

Optional software packages are:

- WinCC flexible for easy configuration of HMIs on Operator, Touch or Multi Panels, as well as Panel PCs or PC systems (integration of WinCC flexible is possible in SCOUT)
- SCADA system WinCC: PC-based operator control and monitoring system for visualizing and operating production processes.
- SIMATIC NET for implementing HMI over OPC in Windows environments.

###### Further optional SIMATIC software

- SIMATIC Logon for user administration in projects with specific support for validation processes, for example, in the pharmaceutical industry.
- SIMATIC Version Trail for the easy versioning of projects (SIMATIC Logon is required).

###### SIMOTION Utilities & Applications

The SIMOTION Utilities & Applications DVD, which is available free of charge, supplements the SIMOTION software with a wide range of valuable information and tools for SIMOTION applications as well as SIMOTION easyProject.

The project generator SIMOTION easyProject enables basic and modular machine functions to be integrated into SCOUT engineering projects.

#### More information

##### **Security note**

In the case of software for remote maintenance or connection to higher-level networks, suitable protection measures must be taken (including IT security, e.g. network segmentation) to guarantee safe operation of the system. You can find more information on Industrial Security on the Internet at:

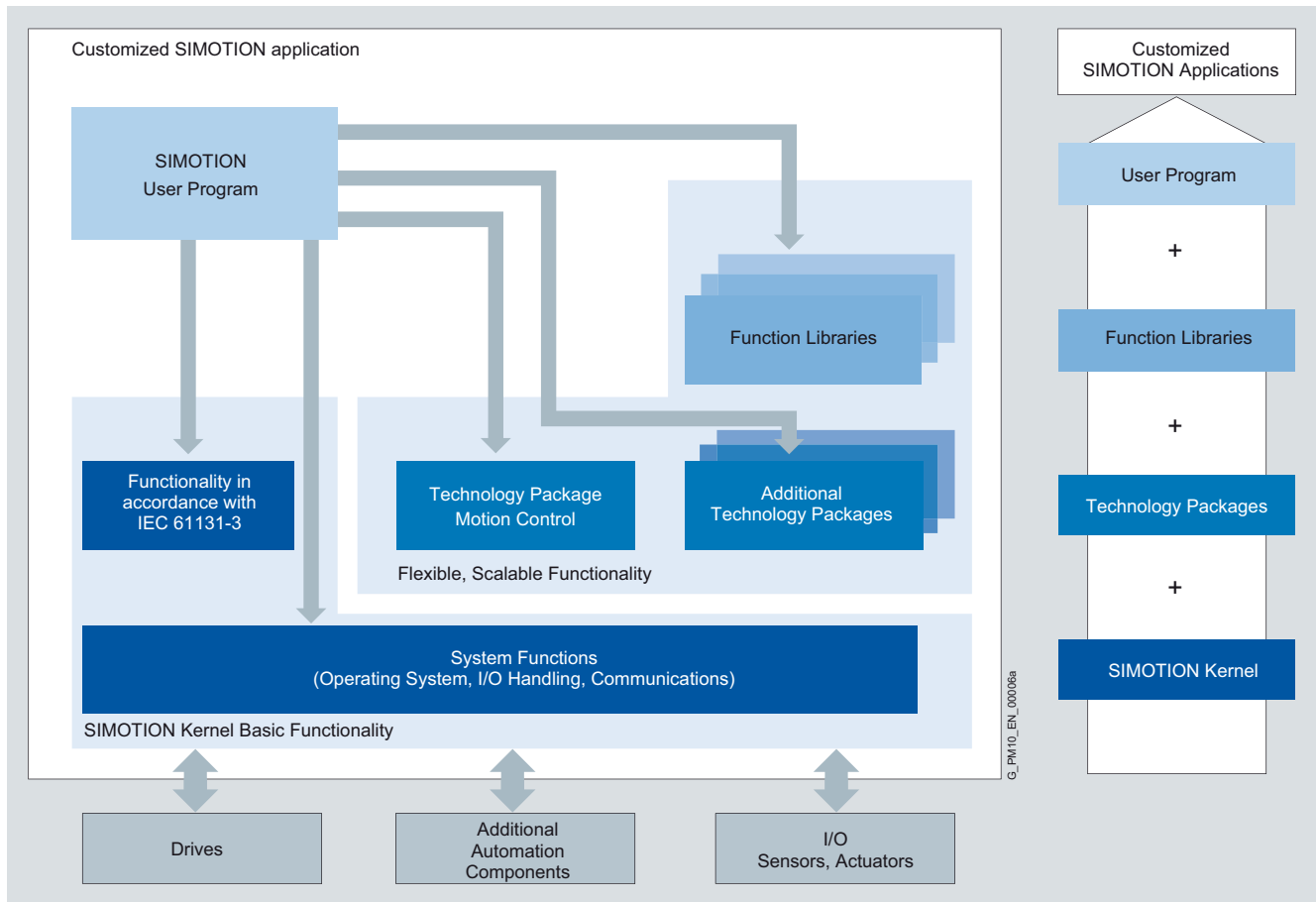
[www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity)

# SIMOTION Motion Control System

## SIMOTION runtime software

### Overview of runtime software

#### Overview



Software structure of a SIMOTION application

#### **SIMOTION Kernel – Basic functionality**

The basic functionalities of the SIMOTION devices are combined within the SIMOTION Kernel.

The SIMOTION Kernel provides, among other features, high-performance functions for

- PLC functionality (according to IEC 61131-3)
- Program control
- Timers, counters
- I/O operation
- Communication

It also provides a powerful runtime system with

- Cyclical (synchronized and cyclic) tasks
- Sequential tasks
- Time-driven tasks
- Event-driven tasks

The scope of the language conforms to the IEC 61131-3 standard and contains all PLC commands required for I/O management, process and machine control. LAD (Ladder Diagram), FBD (Function Block Diagram), ST (Structured Text), MCC (Motion Control Chart) and Drive Control Chart (DCC) are used for programming.

The SIMOTION Kernel basic functionality can be expanded by loading SIMOTION technology packages.

#### **SIMOTION technology packages**

SIMOTION technology packages combine software functions which are required for automation in mechanical engineering in a very wide variety of sectors. They are loaded into the controller during configuration and expand the basic functionality through additional system functions. The functions of the technology packages can be accessed in the SCOUT command library during engineering.

The technology packages enable the generation of technological objects, e.g. technology object "positioning axis", which are all set up, configured and parameterized by the same method.

#### Overview (continued)

##### Motion Control technology package

The comprehensive motion control functions in this technology package offer very open and flexible ways of programming applications and provide users with the assurance that they can implement even complex motion control applications.

The SIMOTION Motion Control technology package contains the following functions:

- Motion Control Basic
- POS – Positioning
- GEAR – Synchronous operation/electronic
- CAM – Cam
- PATH – Path interpolation
- Supplementary technology functions

The technology object functions in the technology package are accessed via additional language commands and system variables, as well as with function blocks in accordance with PLCopen. Programming of motion sequences is therefore simple and integrated.

##### Technology package for temperature control (TControl)

The SIMOTION technology package for temperature control provides temperature channels with extensive functions. These functions are also accessed via additional language commands and system variables.

##### Technology package for Drive Control Chart (DCC)

The SIMOTION technology package for Drive Control Chart (DCC) provides a library of "Drive Control Blocks" (DCBs). These blocks can be used to graphically configure open and closed-loop control functions using an optional DCC editor that can be integrated into SCOUT.

##### Technology package Multipurpose Information Interface (MIIF)

The SIMOTION technology package MIIF functions as a server to permit symbolic access to SIMOTION data and makes them available to clients (e.g. operator panel) via Ethernet.

##### SIMOTION function libraries for I/O interfacing

These function libraries contain standard functions for integrating intelligent I/O and communication modules. They are a component part of the SCOUT command library and make it extremely easy to integrate modules such as FM 350-1/-2, FM 352, CP 340/341, SIWAREX FTA or identification systems into the SIMOTION user program. Programming examples and standard applications are also available in the SIMOTION Utilities & Applications. The SIMOTION Utilities & Applications are supplied free of charge with SCOUT.

##### SIMOTION user program

In the SIMOTION user program, the functions of the technology packages, function libraries and functions of the SIMOTION Kernel are accessed in a uniform manner by means of language commands.

The structure of the SIMOTION application program therefore supports merging of PLC functions with motion control functions and technology functions. This simplifies the optimization of motion sequences (no PLC/Motion interface), reducing engineering costs and increases both product quality and machine productivity (machine cycle and output) by eliminating interfaces and dead times.

A SIMOTION application can be programmed in different ways:

- The graphical programming languages LAD (Ladder Diagram), FBD (Function Block Diagram) and MCC (Motion Control Chart) make graphical programming user-friendly.
- Programming can also be performed textually, using Structured Text (ST).
- Using the optional technology package for Drive Control Chart (DCC), drive-based open and closed-loop control functions can be easily configured graphically.

Direct access to the drive allows:

- Increased uniformity and integration depth as far as the drive (access to control/status words and drive data, flexible torque limits, additive torque setpoint)
- Highly-dynamic applications with servo drives thanks to DSC (Dynamic Servo Control) allows position control cycles of 125 µs
- Highly dynamic applications with hydraulic drives with position control cycles and pressure/force control cycles of 250 µs
- Synchronization with drives and modular open-loop controls

Apart from electrical drives, hydraulic drives within a controller or distributed over several controllers can be synchronized with each other. This supports the implementation of integrated automation solutions such as conveyor systems and press lines in the automotive industry, in which both electrical drives (winders, cross cutters, roller feeds) and hydraulic drives (e.g. deep-drawing presses) are implemented in the same system.

##### SIMOTION isochronous mode

In the SIMOTION system, all the components (one or more control units, drives, isochronous I/Os) are synchronized to the communication cycle of the machine, the PROFIBUS DP/PROFINET cycle. The application is also synchronized with this cycle through synchronous application tasks (in the servo and interpolator cycle). Isochronous mode therefore permeates the whole machine application (also in the case of distributed systems) and this provides considerable advantages:

- Short response times from terminal to terminal and terminal to axis
- High machine cycle times
- Programming of synchronous closed-loop control tasks
- High product quality thanks to a deterministic and reproducible machine response

# SIMOTION Motion Control System

## SIMOTION runtime software

### Overview of runtime software

#### Overview (continued)

##### **Modular concepts – Modular machines**

SIMOTION supports modular machine concepts and thus reduces engineering and commissioning costs through:

- Modular software development with libraries and reusable code
- Division into individual machine modules, which are linked, for example, through distributed synchronous operation (over PROFIBUS DP or PROFINET IO with IRT). Based on a maximum project, the project can be reconfigured, for example, using HMI
- Activation/deactivation of DP slaves/PROFINET IO devices (I/O components) and technology objects (drives, axes, external encoders, and cams) during engineering and at runtime
- Easy, modular configuration of projects using the project generator SIMOTION easyProject

The modular machine concept means scalable solutions and large axis line-ups to be achieved. Standardized modules can be easily adapted to special requirements and separately tested. These modules are then easily combined to form individual machine variants.

##### **Communication via PROFIBUS**

The communication functions are available via PROFIBUS on all platforms:

- I/O communication between SIMOTION and/or SIMATIC controllers
- Communication with programming devices (programming device functions)
- Communication with WinCC flexible
- Communication with PCs on which SIMATIC NET OPC is installed.  
A prerequisite on the PC side is the SIMATIC NET SOFTNET S7 software.

##### **Communication using Ethernet/PROFINET**

The communication functions below are available via Ethernet on all platforms:

- I/O communication between SIMOTION and/or SIMATIC controllers
- Communication with SIMOTION devices, SIMATIC CPUs and non-Siemens devices via UDP and TCP/IP
- Communication with programming devices (programming device functions)
- Communication with WinCC flexible
- Communication through the SCADA system WinCC.
- Communication with PCs on which SIMATIC NET OPC is installed.  
A prerequisite on the PC side is the SIMATIC NET SOFTNET S7 software.

##### **SIMOTION IT**

SIMOTION IT enables additional communication functions via Industrial Ethernet (HTML over standard Internet browser):

- Diagnostics functions via SIMOTION IT DIAG
- Communication via SIMOTION IT OPC XML-DA
- SIMOTION IT Virtual Machine: Creation of Java applications for SIMOTION.



#### Overview

##### *The basic concept: "pay only for what you need"*

The functionally scalable licenses for SIMOTION runtime software and axis-specific licensing result in a simple pricing structure, allowing you to only pay for what you really need.

Runtime licenses are not bound to specific versions and are therefore valid for all firmware versions. In case of a firmware update the runtime licenses remain valid. The license key generated from the runtime licenses and the serial number of the memory card or SIMOTION P is stored on the memory card or on SIMOTION P.

##### *How can licenses be obtained for runtime software?*

Licenses for SIMOTION runtime software can be obtained as follows:

- Pre-installed licenses can be ordered when purchasing a SIMOTION memory card (SIMOTION C, D) or for SIMOTION P. The order number is expanded with one or more additional order codes (Z options) that specify the required licenses. Alternatively, pre-installed runtime licenses can be ordered using the configurator for SIMOTION runtime licenses in the Industry Mall.  
Homepage: [www.siemens.com/industrymall](http://www.siemens.com/industrymall)
- Licenses can be ordered separately, independently of purchase of a SIMOTION controller or a SIMOTION memory card. The required software options are assigned to hardware (memory cards or SIMOTION P) by generating a license key over the Internet at:  
Homepage: [www.siemens.com/automation/license](http://www.siemens.com/automation/license)

##### *When do licenses need to be obtained for runtime software?*

When configuring using SIMOTION SCOUT, the required licenses are displayed.

A license is required for the runtime software:

- When it is used in a machine or a machine component before it is supplied by the manufacturer
- When it is used by the customer on completion of initial commissioning
- When it is retrofitted following completion of initial commissioning
- In large-scale plants that are installed directly at the production site without previous initial commissioning by the manufacturer, on completion of initial commissioning before test operation commences.

##### *Unlicensed basic functions*

The rights of use for these software components are included when the basic unit is purchased:

- SIMOTION Kernel runtime software  
The SIMOTION Kernel is already installed on the device.
- Motion Control Basic technology functions  
Use of technology functions for speed-controlled axes, single output cams and cam tracks, measuring inputs and external encoders.
- Technology functions for Drive Control Chart  
By installing the optional SCOUT package Drive Control Chart, the technology functions of Drive Control Chart are made available to the SIMOTION runtime system.
- Supplementary technology functions  
Use of supplementary technology functions, such as adders, formula objects and fixed gears.
- Function libraries for I/O interfacing
- Communication functions  
This covers SIMATIC S7 communication functions on the SIMOTION side (PG/OP communication to programming devices, for engineering and communication to TPs/OPs/MPs and PCs with SIMATIC HMI, e.g. WinCC flexible, SIMATIC NET OPC, SIMOTION IT DIAG and SIMOTION IT OPC XML-DA), as well as UDP and TCP/IP communication.

##### *Motion Control technology functions under license*

The Motion Control Basic technology functions can be used without a license. When other technology functions of the Motion Control technology package are used, a license is required for each axis used. Licenses are only necessary for real axes; virtual axes and speed-controlled axes are not subject to license. A license is obtained for the different axis types using a separate order number for each.

##### POS, GEAR, CAM axis licenses

Three different axis licenses are available:

- POS – Use of the positioning technology function for a created positioning axis
- GEAR – Use of the positioning and synchronous operation technology functions for a created synchronous axis as well as additional path interpolation for a created path axis
- CAM – Use of the positioning, synchronous operation, path interpolation and cam technology functions for a created synchronous axis with cam

##### MultiAxes Packages

The platform-independent MultiAxes Package supports particularly simple licensing. It contains the license for unlimited use of the POS/GEAR/CAM technology functions on one SIMOTION Controller. Variably priced, platform-specific packages for C2xx, P320-3, P350-3 or D410-2, D425-x, D435-x and D445-x/D455-x are offered in addition to the platform-independent MultiAxes Package.

# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Overview of the licensing concept

#### Overview (continued)

##### **Other technology functions which are subject to a license**

###### TControl technology functions

The functions of the TControl technology package must be licensed for specific channels in packages, each package containing 8 temperature channels.

###### Multipurpose Information Interface (MIIF) technology functions

To use the functions of the MIIF technology package, a separate license must be obtained for each SIMOTION Controller.

###### SIMOTION IT communication functions

For version V4.2 and higher of SIMOTION Kernel, a license need be purchased only to cover the use of SIMOTION IT Virtual Machine. The licenses for SIMOTION IT DIAG and SIMOTION IT OPC XML-DA are no longer required.

The license SIMOTION IT Virtual Machine can continue to be used as a combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine in the case of version V4.2 and lower of SIMOTION Kernel.

##### **Safety Integrated functions for SINAMICS S120 which are subject to license**

SINAMICS S120 drives with safety functions can be integrated into a SIMOTION D application.

The following must be noted with regard to use of Safety Integrated functions:

- The Safety Integrated basic functions are unlicensed.
- A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions.
- MultiAxes and Safety Packages are available for SIMOTION D4x5-x that, in addition to unlimited use of the axes licenses, also contain the licenses of the Safety Integrated Extended functions for all integrated SINAMICS drives (SIMOTION D and Controller Extensions CX32-2).

##### **Note regarding SIMOTION D410-2**

SIMOTION D410-2 has an integrated drive control for either a servo, a vector or a V/f axis and is therefore ideal for single-axis applications.

One real axis can be used without license on the Control Unit. Speed-controlled axes and virtual axes never require a license.

SIMOTION D410-2 can be extended with additional SINAMICS S110/S120 Control Units (e.g. CU305) and so can also be used for smaller multi-axis applications (e.g. with 2 to 3 axes). A license is required for any additional axes. Where a license is required for a POS axis, the POS single-axis license is the ideal solution; it is better to use the MultiAxes Package D410-2 in the case of GEAR/CAM or more than one POS license.

The axis license with the highest functionality is covered by the inclusive license (a real axis).

The functionality has the following granularity:  
CAM > GEAR > POS.

###### Example:

Application with 2 real axes: 1 POS, 1 CAM.  
Only a POS license needs to be purchased because the higher-order CAM license is already included.

Licenses are also required for runtime functions subject to licensing, such as SIMOTION IT Virtual Machine. These can be pre-installed on the CompactFlash card (CF card) or ordered separately.

#### Overview

##### Runtime licenses for SIMOTION C and D

For SIMOTION C and D, licenses for runtime software can be ordered individually or as pre-installed software (by order code/Z option) on memory card.

In both cases, the license certificate is enclosed.

##### Runtime licenses for SIMOTION P

For SIMOTION P, licenses for runtime software can be ordered individually or by means of order code (Z option).

When ordered by means of order code (Z option), the runtime licenses are not pre-installed, the license certificate is enclosed.

##### Ordering individual licenses

The order numbers can be found in column "Single-user license" in the ordering data table.

If several licenses of the same type are needed, e.g. 3 x POS license, the order number must be repeated for each license.

##### Example:

A 1 GB CompactFlash card for SIMOTION D4x5-2 has been purchased, but without pre-installed runtime licenses. During the configuring process with SIMOTION SCOUT, a message is displayed to indicate that the following runtime licenses are needed: 1 x POS axis license, 1 x TControl license.

The ordering data table specifies the following:

- POS axis license: 6AU1820-1AA20-0AB0
- TControl license: 6AU1820-2AA20-0AB0

##### Ordering pre-installed licenses

To order pre-installed licenses on memory card, the type and number of required licenses must be specified in the order using order codes (Z options). These order codes are added to the order number for the SIMOTION memory card.

Step 1: The order number of the SIMOTION memory card must be stated first:

- Memory card for SIMOTION C:  
Micro Memory Card 64 MB: 6AU1720-1KA00-0AA0
- Memory card for SIMOTION D410-2:  
CompactFlash card 1 GB: 6AU1400-1PA22-0AA0
- Memory card for SIMOTION D4x5-2:  
CompactFlash card 1 GB: 6AU1400-2PA22-0AA0

Step 2: The following order codes must be stated in order to specify the type and quantity of required runtime licenses:

Each order code begins with the characters "-Z" and is listed in the column headed "Order codes for pre-installed licenses" in the ordering data table.

##### Example 1:

64 MB Micro Memory Card for SIMOTION C240 with

- MultiAxes Package license for SIMOTION C2xx:

Order No.: 6AU1720-1KA00-0AA0 **-Z M24**

##### Example 2:

1 GB CompactFlash card for SIMOTION D4x5-2 with

- 3 POS licenses
- 2 CAM licenses
- 1 TControl license and
- 1 SINAMICS Safety Integrated Extended Functions license:

Order No.: 6AU1400-2PA22-0AA0 **-Z P03 C02 T01 F01**

##### Configurator for runtime licenses

An electronic ordering configurator is available in the Industry Mall for ordering SIMOTION hardware with corresponding runtime licenses.

Homepage: [www.siemens.com/industrymall](http://www.siemens.com/industrymall)

This will guide you step by step through the process of selecting and ordering SIMOTION hardware with pre-installed runtime licenses.

# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Ordering of licenses for runtime software

#### Selection and ordering data

License type	Single-user license Order No.	Order codes for pre-installed licenses on SIMOTION memory cards	Licensed functions	License object	Notes
<b>Axis licenses</b>					
• POS axis license	<b>6AU1820-1AA20-0AB0</b>	<b>Pxx</b> – POS license and quantity (e.g. P02 = 2 POS licenses)	Positioning	Per axis	In the case of D410-2, required only for 2 axes or more
• GEAR axis license	<b>6AU1820-1AB20-0AB0</b>	<b>Gxx</b> – GEAR license and quantity (e.g. G03 = 3 GEAR licenses)	Positioning, synchronous operation, path interpolation		
• CAM axis license	<b>6AU1820-1AC20-0AB0</b>	<b>Cxx</b> – CAM license and quantity (e.g. C01 = 1 CAM license)	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package)		
<b>MultiAxes packages</b>					
• Platform-independent	<b>6AU1820-0AA20-0AB0</b>	<b>M00</b> – MultiAxes Package license (platform-independent)	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package)	Unlimited axes on one controller	
• For C2xx	<b>6AU1820-0AA24-0AB0</b>	<b>M24</b> – MultiAxes Package license for C2xx			
• For P320-3	<b>6AU1820-0AA32-0AB0</b>	<b>M32</b> – MultiAxes Package license for P320-3			
• For P350-3	<b>6AU1820-0AA35-0AB0</b>	<b>M35</b> – MultiAxes Package license for P350-3			
• For D410-2	<b>6AU1820-0AA41-0AB0</b>	<b>M41</b> – MultiAxes Package license for D410-2			
• For D425-x	<b>6AU1820-0AA42-0AB0</b>	<b>M42</b> – MultiAxes Package license for D425-x			
• For D435-x (incl. D425-x)	<b>6AU1820-0AA43-0AB0</b>	<b>M43</b> – MultiAxes Package license for D435-x			
• For D445-x/D455-x (incl. D435-x and D425-x)	<b>6AU1820-0AA44-0AB0</b>	<b>M44</b> – MultiAxes Package license for D445-x/D455-x			
<b>MultiAxes and Safety Package</b>					
• For D425-x	<b>6AU1820-0AS42-0AB0</b>	<b>S42</b> – MultiAxes license and Safety Package for D425-x	Positioning, synchronous operation, path interpolation, cam (all functions of the Motion Control technology package) plus SINAMICS Safety Integrated Extended Functions for SIMOTION D	Unlimited axes (incl. SINAMICS Safety Integrated Extended Functions) on one controller	SINAMICS Safety Integrated Extended Functions for integrated SINAMICS drives with SIMOTION D and CX32-2 Controller Extension
• For D435-x (incl. D425-x)	<b>6AU1820-0AS43-0AB0</b>	<b>S43</b> – MultiAxes license and Safety Package for D435-x			
• For D445-x/D455-x (incl. D435-x and D425-x)	<b>6AU1820-0AS44-0AB0</b>	<b>S44</b> – MultiAxes license and Safety Package for D445-x/D455-x			
<b>Licenses for other technology packages / technology functions</b>					
• TControl	<b>6AU1820-2AA20-0AB0</b>	<b>Txx</b> – TControl license and quantity (e.g. T03 = 3 TControl licenses)	Temperature control	8 temperature channels per license	
• MIIF (Multipurpose Information Interface)	<b>6AU1820-3DA20-0AB0</b>	<b>B02</b> – MIIF license	Multipurpose Information Interface	Per controller	On one C2xx, P3xx or D4xx-2
• Safety Integrated	<b>6AU1820-2AF20-0AB0</b>	<b>Fxx</b> – Safety license and quantity (e.g. F02 = 2 Safety Integrated Extended Functions licenses)	SINAMICS Safety Integrated Extended Functions for SIMOTION D	Per safety axis with Safety Integrated Extended Functions	For integrated SINAMICS drives with SIMOTION D and CX32-2 Controller Extension

# SIMOTION Motion Control System

## SIMOTION runtime software

### Runtime software licensing Ordering of licenses for runtime software

#### Selection and ordering data (continued)

License type	Single-user license Order No.	Order codes for pre-installed licenses on SIMOTION memory cards	Licensed functions	License object	Notes
<b>Licenses for SIMOTION IT communication functions</b>					
• SIMOTION IT DIAG <sup>1)</sup>	<b>6AU1820-8BA20-0AB0</b>	<b>D00</b> – IT DIAG license	Integrated web server	Per controller	On platforms with Ethernet and/or PROFINET interface
• SIMOTION IT OPC XML-DA <sup>1)</sup>	<b>6AU1820-8BB20-0AB0</b>	<b>X00</b> – IT OPC XML-DA license	Communication via OPC XML-DA	Per controller	
• SIMOTION IT Virtual Machine	<b>6AU1820-8BD20-0AB0</b>	<b>J00</b> – SIMOTION IT Virtual Machine license	For SIMOTION Kernel versions earlier than V4.2, usable as combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.	Per controller	
<b>License for SIMATIC NET OPC server on SIMOTION P</b>					
• License for SIMATIC NET OPC server on SIMOTION P	<b>6AU1380-0AA20-0YB0</b>	<b>K00</b> – OPC server license, on SIMOTION P, XP variant			

<sup>1)</sup> Subject to license for SIMOTION Kernel versions earlier than V4.2

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION Kernel

#### Function

The SIMOTION Motion Control system uses high-performance CPUs on which a real-time operating system suitable for fast control processes is implemented.

This real-time operating system organizes an execution system comprising different execution levels.

#### Execution system

The SIMOTION execution system makes a distinction between system execution levels and user execution levels (tasks):

System tasks process operations that are necessary for general operation of the system. With technology objects, closed loop position control and characteristic variable calculation is performed in the SERVO, IPO and IPO2 system tasks.

System tasks are regularly executed by the system. The system cycle clock can be specified.

Execution levels with different execution characteristics are available for task-related user programming (user program tasks).

The execution levels define the chronological sequence of programs in the execution system. Each execution level contains one or more tasks. The individual user programs are assigned to these tasks.

All programs – and thus also tasks – can execute PLC, technology and motion control tasks.

Task types for task-related execution are:

- Synchronous tasks
- Cyclic tasks
- Sequential tasks
- Time-triggered tasks, and
- Interrupt-driven tasks

Synchronous tasks are synchronized with the system tasks and the control cycle of the drives or the isochronous PROFIBUS/PROFINET.

With the help of these synchronous tasks, the whole application is in isochronous mode (Application program ↔ Drives ↔ I/O). This results in short response times and the application is easily reproducible.

The following execution levels are available to the application:

#### StartupTask

The StartupTask is executed once at the operating mode transition from STOP to RUN; it controls the system start-up.

#### BackgroundTask

The BackgroundTask is executed cyclically and is used for general PLC tasks. Cycle time monitoring checks the maximum processing time of the BackgroundTask. The BackgroundTask can be compared with the OB1 of a SIMATIC controller.

#### MotionTasks

MotionTasks are used for motion sequences.

Command sequences in the same Motion Task are usually executed sequentially, for example, the next motion command is only started when the previous command has been completed.

The MotionTasks do not require any CPU time during these waiting times, but respond immediately on receipt of the wait event.

#### SynchronousTasks

In servo-synchronous user tasks, time-critical terminal-to-terminal responses for I/O or fast influencing of setpoints can be implemented on the servo level (synchronous to the system cycle SERVO of the technology objects, e.g. position controllers).

The IPO synchronous user tasks are started synchronously immediately before the interpolator cycle IPO or the slower IPO2.

Fast Motion Control reactions can be implemented here, as well as closed-loop control tasks in which the acquisition of actual values and output of setpoints must be synchronized.

The characteristic variables for the technology objects are calculated in system cycles IPO and IPO2.

The user program is therefore synchronized with the control cycle of the drives and with I/O processing. Synchronization ensures short response times and, above all, deterministic and reproducible machine behavior.

#### DCC tasks

Drive Control Chart (option) uses the above-mentioned SynchronousTasks. In addition, further synchronous execution levels (special tasks for DCC) can be assigned to the blocks.

#### TimerInterruptTasks

Several time-triggered tasks are available. The call cycles can be parameterized. Periodically repeated tasks are normally placed here.

#### InterruptTasks

InterruptTasks are used for a fast response to internal events that are signaled using interrupts. InterruptTasks can be activated by system interrupts, such as alarms and timeouts, or by user interrupts.

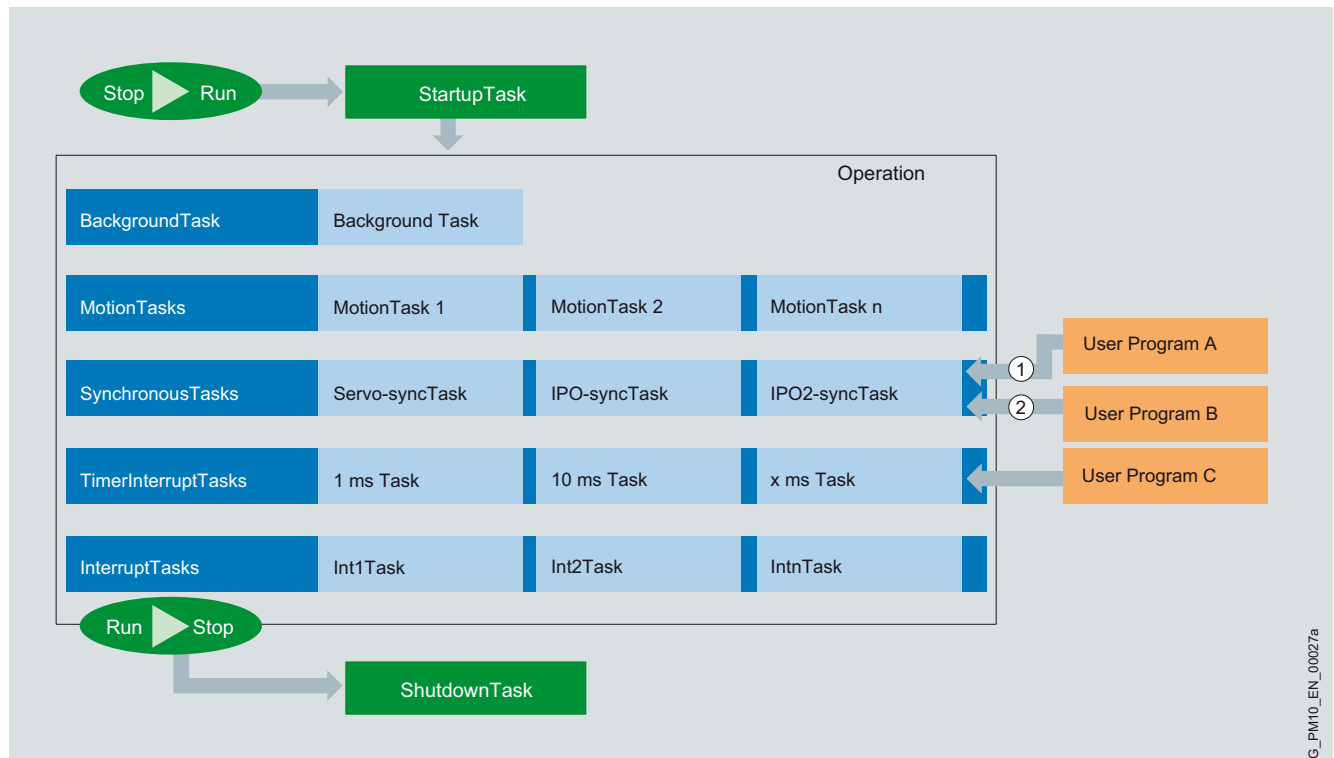
#### ShutdownTask

The ShutdownTask is called when there is a transition to STOP mode. The specific behavior for the transition into this system state can be defined here.

The complete instruction set is available for all user tasks. This allows the current positioning command to be superimposed with an additional movement from a MotionTask which was triggered by a UserInterruptTask, for example.

### Function (continued)

#### Task structure of a SIMOTION application



Task structure of a SIMOTION application

#### Runtime levels of the technology packages

The execution cycle can be set object-specifically for Motion Control technology objects.

Technology objects are executed in the execution levels SERVO cycle and IPO cycle or IPO2 cycle that are synchronized with the PROFIBUS or PROFINET cycle.

- Command evaluation and motion control in the IPO/IPO2 cycle
- Position and setpoint control in the SERVO cycle

The SIMOTION D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN Control Units have an additional runtime level (SERVO<sub>Fast</sub>, IPO<sub>Fast</sub>).

This additional runtime level enables the performance of the controller to be utilized more efficiently. Electrical and/or hydraulic axes can be distributed over one slow and one fast bus system, in accordance with the dynamics required.

Electrical positioning drives, for example, can be controlled with cycle times in the millisecond range requiring fewer resources and at the same time the pressure-controlled axes of an hydraulic press can be controlled with a high dynamic response and short cycle times.

The runtime level (SERVO<sub>Fast</sub>, IPO<sub>Fast</sub>) also enables a particularly fast I/O processing in conjunction with, for example, high-speed PROFINET I/O modules.

#### Further characteristics of the execution system

- Operating states – Run, Stop, StopU (Stop User Program for test and commissioning functions)
- Process images for inputs/outputs, is separate for BackgroundTask, SynchronousTasks and TimerInterruptTasks
- Debug functions such as
  - Controlling and monitoring of variables
  - Display of the program status
  - Breakpoints and single step
  - Trace functions
- Kernel updates can be implemented with new SCOUT versions.

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION technology packages

#### Overview

##### Scalable functionality through technology packages

The SIMOTION technology packages expand the basic functionality of the SIMOTION devices with additional language commands, which makes adaptation to the respective automation task easy.

The loadable technology packages support the creation of technology objects (e.g. positioning and synchronous axis, cam paths, external encoders, ...) which can be accessed over system functions and system variables for use in every SIMOTION programming language.

#### Function

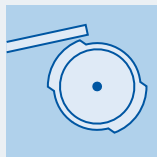
##### SIMOTION Motion Control technology package

The Motion Control Basic technology functions can be used without a license. Use of the extended functions of the Motion Control technology package is subject to a license.

The comprehensive functions of the Motion Control technology package offer very open and flexible ways of influencing application programming and ensure that you can also implement future motion control applications.

Using the motion control functions in conjunction with the powerful PLC functionality results in high machine cycles thanks to short response times as well as high product quality thanks to reproducible machine behavior.

##### Technology functions for Motion Control Basic



##### The "speed-controlled axis" technology object

- Speed setpoints are defined in the program (for servo and vector drives)
- In addition, additional torque setpoints and torque limits can be defined, for example, for controlling a winder drive with tension control
- Access to status and control words of the drive  
Release sequence of the PROFIdrive units can be specifically controlled (e.g. for braking signal)
- Reading and writing of drive parameters
- Support for SINAMICS drives which can perform safety-related monitoring functions (SOS=Safe Operating Stop, SLS=Safely Limited Speed, SSM=Safe Speed Monitor, SDI=Safe Direction) or stop reactions (STO=Safe Torque Off, SS1=Safe Stop 1, SS2=Safe Stop 2).

The purpose of this support is to prevent stop reactions by the drive, where SIMOTION uses the application to regulate, e.g. within permissible velocity limits (with SLS) or stop (with SOS) the drive.

Activation and deactivation of SINAMICS Safety Integrated Extended Functions SS1, SS2, SOS, SLS, SSM, SDI as well as their status are indicated on the axis with specific technology alarms and system variables.

*Further information about SINAMICS Safety Integrated can be found in chapter Safety Integrated.*

##### "External encoder" technology object

External encoders can be used to detect actual position values of axes (on PROFIBUS/PROFINET, onboard for C240 and as a second encoder on the drive).

##### "Cam and cam track" technology object

- Generates position-dependent switching signals
- Number of cams and cam tracks depend on available system resources
- Each cam track can have up to 32 cams on one output

The following cam types are available:

- Trip cams
- Position-position cams
- Position-time cams
- Position-time-based cams with maximum ON length
- Counter cams
- Exact time setting of an output, exact time output cams

The cam statuses can be output with:

- Internal variables
- Standard digital outputs (SIMATIC S7-300, SIMATIC ET 200, ...)
- Onboard outputs of SIMOTION C, D and TM15 / TM17 High Feature (for high accuracy requirements in the  $\mu$ s range)
- The output can be inverted

The following can be used as reference points for the switching edges of the cams:

- Setpoints for real and virtual axes
- Actual values of real axes and external encoders

The following functions are available:

- Parameterizable hysteresis and effective direction
- Activation and deactivation times can be specified separately (dead time compensation)
- One-time and cyclic output of cam paths
- Parameterizable start/stop mode for cam paths (immediately, with next path cycle, etc.)
- Edge-triggered enable of cam paths in conjunction with TM17 High Feature terminal module
- The status of each individual cam (activated/deactivated) can be read
- Single output cams on a cam track can also be directly defined as valid/invalid

##### "Sensor" technology object

Sensors can be assigned to positioning and synchronous axes, external encoders or virtual axes and supply the axis position at the time of measuring.

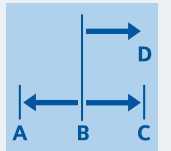
The following functions are available:

- One-time measurement
- Cyclic measurement (2 edges per servo/IPO cycle in conjunction with TM17 High Feature or SIMOTION C240, D4x5-2)
- Measuring on virtual axes (in conjunction with TM15, TM17 High Feature, D4xx-2, CX32-2, CUxx or C240)
- Several active measuring inputs on one axis or one measuring input for several axes (in conjunction with TM15, TM17 High Feature, D4xx-2, CX32-2, CUxx or C240)
- Parameterizable edge evaluation (rising, falling, both edges)
- Dynamic resolution range



### Function (continued)

#### POS – Positioning technology functions



#### The positioning axis technology object

- Contains the functions of the speed-controlled axis technology object
- Supported axis types:
  - Linear axis, rotary axis
  - Modulo axis for linear and rotary axes
  - Real and virtual axis
  - Simulation axis
- Position control for:
  - Electrical drives
    - Position control with digital setpoint output
    - The following PROFIBUS DP/PROFINET protocol is used for this purpose: Profile drive technology, PROFIdrive, Version 4 (isochronous mode), use of Dynamic Servo Control (DSC) is possible with position control in the drive in, for example, 125 µs
    - Position control with analog setpoint output (onboard I/Os for C240, ADI 4, IM 174)
  - Hydraulic drives
    - Position control with analog setpoint output (onboard I/Os for C240, ADI 4, IM 174, analog outputs in the I/O range, e.g. in combination with ET 200S High Speed I/Os)
    - The characteristics of the hydraulic valves are specified with cams
  - Stepper motors
    - Position control with pulse direction output for stepper drives (onboard I/Os for C240, IM 174)
    - Alternatively, stepper drives with a PROFIBUS interface can be connected, provided that they support the PROFIdrive profile. Stepper drives can be operated without an encoder or be position-controlled with an encoder.
- Position-controlled positioning:
  - Axes can be manipulated individually without interpolation context by specifying, for example:
    - Axis name
    - Position
    - Velocity
    - Acceleration/delay, jerk
    - Transition behavior to next motion
- Speed-controlled operation of positioning axes
- Monitoring and limiting (standstill, positioning, dynamic following error, standstill signal, controlled variables, hardware/software end positions, encoder limit frequency, velocity error, measuring system difference/slip, limits for the dynamic response)
- Reversing block (prevents the output of setpoints which would cause a reversing motion)
- Movement profiles on axis defined over cams:
  - Path over time
  - Velocity over time
  - Velocity over path
- Force and pressure control of an axis:
  - Direct switchover from position to pressure-controlled operation and vice versa
  - Several pressure sensors possible
  - Pressure difference measurement
- Force and pressure limitation of an axis
- Force and pressure profiles specifiable over cams:
  - For closed-loop control and limitation
  - Force/pressure over time
  - Force/pressure over path
- Traveling to a fixed stop point
  - Stop on reaching a following error limit
  - Stop on reaching a torque limit
  - Stop with defined torque
- Traversing with additive torque, adjustable torque limiting and flexible torque limits B+/B-
- Transition behavior of successive motions:
  - attach, i.e. each motion is completed and the axis stops between motions (exact stop)
  - continuous move, i.e. the transition to the next motion begins when braking starts.
  - replace, i.e. the programmed motion is performed immediately. The active command is aborted.
- An additional motion can be performed during an active motion, for example, an active positioning motion can be performed simultaneously to a compensation motion.
- Concurrent start of positioning axes
- Homing:
  - The following homing types are currently supported:
    - Active homing (reference point approach)/passive homing (homing on-the-fly)
      - o With reference cam and encoder zero mark
      - o With external zero mark only
      - o With encoder zero mark only
      - o BERO proximity switch and hardware limit switch as reversing cam
      - o Hardware limit switch as reference cam
    - Direct homing / setting the home position
    - Relative direct homing (shift by specified offset)
    - Absolute encoder homing / absolute encoder calibration
- Compensations and reference points:
  - Reference point offset
  - Backlash on reversal compensation
  - Static friction compensation
  - Sliding friction compensation for hydraulics
  - Drift compensation for analog drives
- Pressure mark correction
- Encoder switchover:
  - Up to 8 encoders can be specified for an axis:
    - For the position control, only one encoder is active at any one time:
      - The switchover between encoders can be performed on-the-fly (with a change-over smoothing filter).
      - The actual value for the non-active encoder can be read with the application program and used for specific monitoring, for example.
- Override:
  - Factors can be superimposed online on the current traverse velocity and acceleration/deceleration.

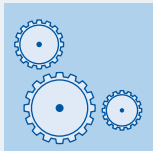
# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION technology packages

#### Function (continued)

##### GEAR – Synchronous operation/electronic gear technological functions

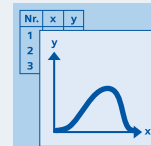


##### Synchronized axis technology object

- Contains the functions of the positioning axis technology object
- Synchronized speed for position-controlled axes
- Angular synchronization, electronic gear:  
Stable, long-time angular synchronization over several axes is ensured. The gear ratio can be adjusted in small steps.
- Absolute and relative gearbox synchronism
- Offset of the following axis
- Leading axis:  
The master value can be changed immediately between master value sources (transition dynamics must be specified). The following can be used as a leading axis or master value sources for the following axes:
  - Virtual axis:  
The virtual axis only exists in the control and therefore does not have a real drive, motor or encoder. A virtual axis can be controlled with commands in the same way as a real axis. The motion control calculates the setpoints with the interpolator which can be used as a master value for synchronous operation, for example.
  - Real axis:  
The real axis is a leading axis which is part of the SIMOTION system and can be coupled over a setpoint and actual value.
  - External encoder:  
The actual value is detected with an external encoder and supplied as a master value after conditioning.
- Setpoint value linkage as well as actual-value linkage with compensation of dead times.
- Angular position and electronic gear ratio for axes can also be changed during operation.
- Engaging/disengaging:  
Following axes can be stopped for one cycle or moved for only one cycle to remove a faulty component, for example. This can be flexibly implemented with the programmable synchronism functionality.
- Synchronization and desynchronization:
  - Following axes can be synchronized and desynchronized while the leading axis is in motion or standing still.
  - The angular position to the leading position can be specified.
- Different synchronization modes are available:
  - Synchronization via a specifiable master value distance
  - Synchronization based on specifiable dynamic response parameters (jerk-limited)
  - Synchronizing position for synchronization and desynchronization at a precision position
  - Position of synchronizing range (before, after and symmetrically with synchronizing position)

- Terminating synchronized operation of/to positioning
- Comprehensive synchronized operation monitoring functions
- External synchronization:  
By flying measurement of, for example, a print-mark and a superimposed positioning function, a material slip can be corrected.
- Simultaneous motion during synchronized operation:  
A positioning motion or other synchronized operation can be performed during synchronized operation.
- Distributed synchronous operation and the option to implement synchronous operation beyond device limits.
  - PROFIBUS: Leading axis to PROFIBUS master, following axes to PROFIBUS slaves.
  - PROFINET: Changeover between leading axes to different SIMOTION controllers possible. Cascading of the synchronous operation over several SIMOTION controllers.
  - Dead times are compensated automatically.
  - Also possible across different projects (independent projects)

##### CAM – Cam technology functions

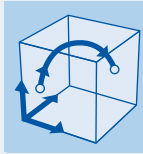


##### Cam technology object

- Contains the functions of the synchronous axis technology object
- The number of cams depends on the available system resources
- The number of support points or segments per cam depends on the available system resources
- Cam functions:
  - Definition over table support point or polynomials up to 6th degree with trigonometrical functions
  - Motion rules implementable to VDI 2143
  - Transition between support points/polynomials:  
Linear, continuous, spline
- Scalability, cam functions can be offset and switched even during operation:
  - The leading and following axis positions of the cam functions can be scaled and offset during operation.
  - The active cam function can be defined and switched during operation.
- Non-cyclic and cyclic editing of cams
- Absolute and relative curve synchronization
- Absolute and relative master value referencing
- Synchronization and desynchronization (see [synchronous operation technology object](#))
- Overriding of 2 synchronized cams
- Cams can be defined and modified with the SCOUT engineering system or with an application program during runtime.

### Function (continued)

#### **PATH –** Path interpolation technology functions



#### Path interpolation technology object

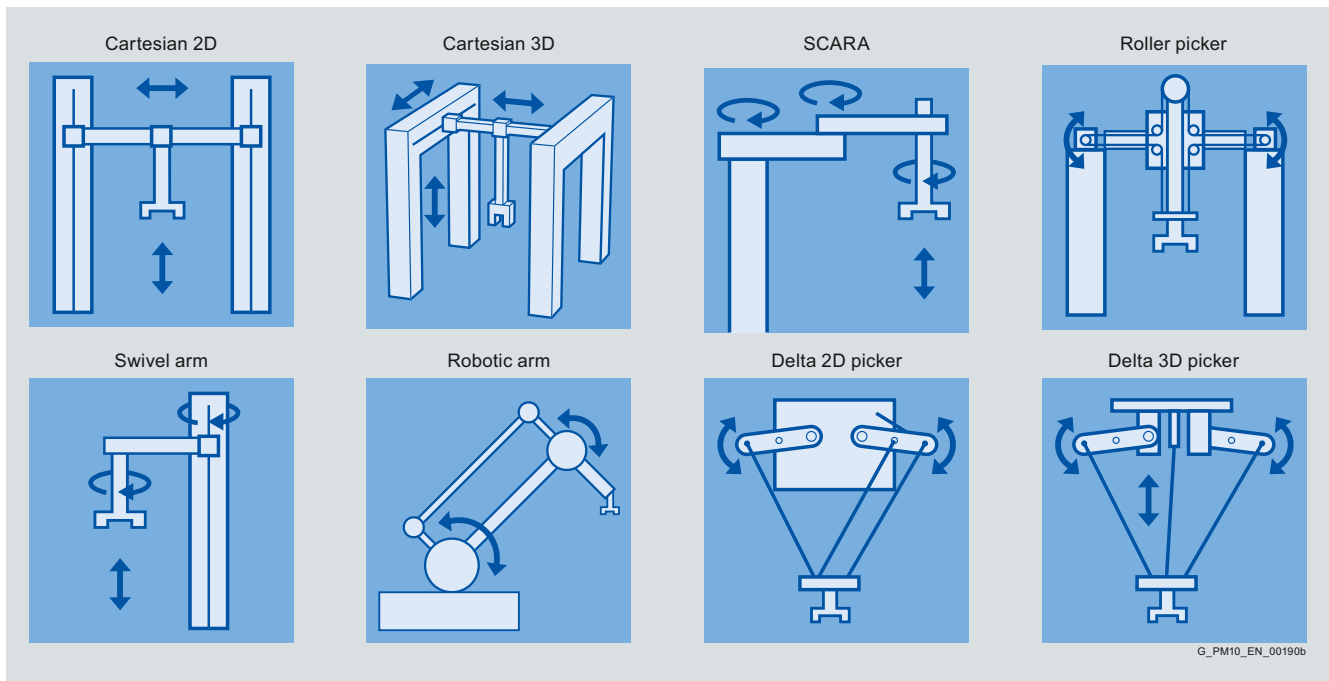
The path interpolation technology object is primarily intended for the automation of handling robots. Interpolation in machines for material machining is covered by the SINUMERIK machine tool controllers. (Further information about SINUMERIK control systems can be found in Catalogs NC 60 and NC 61.)

- The number of path objects is dependent on the performance of the hardware platform used.
- Interpolation types:
  - Linear interpolation in 2D and 3D
  - Circle interpolation in 2D and 3D
  - Polynomial interpolation in 2D and 3D
- Interconnection of a path object is possible with:
  - Up to 3 interpolating path axes
  - One positioning axis for path-synchronized motion (axis moves in synchronism with motion)
  - One cam for specifying velocity profiles along the path
- Connection of path-based cams, cam tracks and measuring inputs over the positioning axis for path-synchronized motion

- Interconnection of the Cartesian path coordinates with positioning axes is possible. Cams, cam tracks and measuring inputs can also be implemented on the path
- The path dynamics (acceleration, jerk) are specified on the path, axis limits are generally applicable regardless of the limits along the path
- Dynamic planning via 3 traversing blocks
- Continuous geometric movement between 2 traversing blocks
- Kinematic transformations for:
  - Cartesian gantry
  - SCARA
  - Robotic arm (toploader)
  - Roller picker
  - Delta 2D and Delta 3D picker
  - Swivel arm
- Synchronization with conveyor belts (conveyor tracking). This facilitates the handling of products which are continuously fed or continuously removed.
- Programming in ST and MCC

A pre-configured sample application can be used for easy implementation of handling robots, which allows both jog mode and the creation of motion programs (see [SIMOTION Utilities & Applications](#) which is supplied with SIMOTION SCOUT).

*More information about handling applications can be found in chapter Sector-specific solutions.*



Kinematics in the Motion Control technology package

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION technology packages

#### Function (continued)

##### Supplementary technology functions

###### "Fixed gear" technology object

You can use the "Fixed gear" technology object to implement a fixed synchronous operation (without synchronization/desynchronization) using a specified gear ratio. Fixed gearing converts an input variable to an output variable with a configured transmission ratio (gear ratio).

A Fixed Gear technology object can be used as follows, for example:

- To make allowance for diameters in a master variable
- To implement a fixed gear ratio without coupling
- For speed synchronization on speed-controlled axes
- As a motion-coupled gear on master value, following axes are engaged or disengaged. In this way, the gear is always synchronized with the master value. Example: A paper web runs synchronously with the master.

###### "Summator" technology object

The summator object can be used to add up to four input vectors (motion vectors) with one output vector. An addition object can be used as follows, for example:

- To add up superimpositions/offsets in the main signal path, e.g. color register, cut-off register on the paper web

###### "Formula" technology object

Formula object for scalable variables and motion vectors. A formula object can be used between interconnected objects to modify scalar variables in the main signal path, e.g.:

- Superimposition of torque
- Superimposition of master velocity
- Modification of torque variables B+, B-
- Enabling of torque limitations
- Enabling of torque

###### "Sensor" technology object

The sensor object can be used to acquire scalar measuring values. A sensor object reads out a value from the I/O and supplies an actual value as an output signal in standardized formats.

###### "Controller" technology object

The controller object can be used to prepare and control scalar variables.

A controller object can be used as a universal PIDT1 controller for scalar control variables as well as a PI and P controller.

###### Interconnection of technology objects

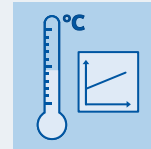
The individual technology objects can be interconnected. The supplementary technology functions, for example, can be used to implement additional winder applications directly on the system level.

###### Note:

No license is necessary for using the supplementary technology functions.

##### SIMOTION TControl technology package

###### TControl – Temperature controller technology functions



###### Temperature Channel technology object

The controller core of the temperature technology package has a DPID structure. Pure heating controllers and cooling controllers as well as combined heating/cooling controllers can be configured and parameterized.

User-assignable functions are available for each temperature channel:

- Each temperature channel can either be configured as a heating or cooling section or as a combined heating/cooling section.
- The controllers either use a PID or DPID control algorithm or use the optional control zone functionality.
- In manual output mode, a replacement value can be output.
- You can select the operating mode for each controller channel separately. In this way, you can switch the output to a fixed value.
  - The following operating modes are available:
    - Closed-loop control for operating setpoint
    - Actual value acquisition and output of the manual manipulated variable value
    - Actual value acquisition and output of 0
    - Self tuning
- Actual value acquisition and processing
  - Plausibility check for each new actual value and correction before corresponding filter measures
  - Filtering (by PT1 element)
- Actuating signal preparation and output
  - Digital, pulse-length modulated actuating signal
  - Prevention of minimal pulse durations for I/O cycles by integration of lost pulses
  - Manual actuating value (for manual output mode)
  - Output value limitation
  - Replacement value (calculated dynamically)
- Self-tuning for heating controllers
  - This ensures fast startup without overshooting and maintains the setpoint value without lasting system deviations.
  - Self-tuning can be used in parallel for all desired channels to ensure optimal parameter acquisition even for strongly coupled temperature sections.
- Monitoring and alarm functions
  - Actual value monitoring by definition of tolerance bands. The inner and outer tolerance bands can be defined independently as absolute or relative tolerance bands.
  - Measuring circuit monitoring for increased operational safety of a plant
  - Plausibility check
  - Alarm functions

The use of the TControl technology package is clarified by an application example. The application example provides functional expansions, function interfaces to the application and data interfaces to the HMI. It is contained in the Utilities & Applications which are supplied with SIMOTION SCOUT.

### Function (continued)

#### SIMOTION technology package for Drive Control Chart (DCC)

##### Technology functions for Drive Control Chart

With Drive Control Chart (DCC), open-loop and closed-loop control functions can be easily configured graphically. Multi-instance function blocks are selected from a block library using drag & drop, graphically interconnected and parameterized. The control structures are presented clearly.

The block library comprises a large selection of

- control,
- arithmetic and
- logic blocks as well as
- comprehensive open-loop and closed-loop control functions.

Further functions:

- For linking, evaluating and acquiring binary signals, all the commonly available logic functions are available, for example, AND, XOR, On/Off delays, RS flip-flops or counters.
- For monitoring and evaluating numerical values, numerous arithmetic functions are available, such as:
  - Summation
  - Divider
  - Minimum/maximum evaluation
- Apart from the automatic speed control, winders, PI controls, ramp-function generators and wobble generators can easily be configured.

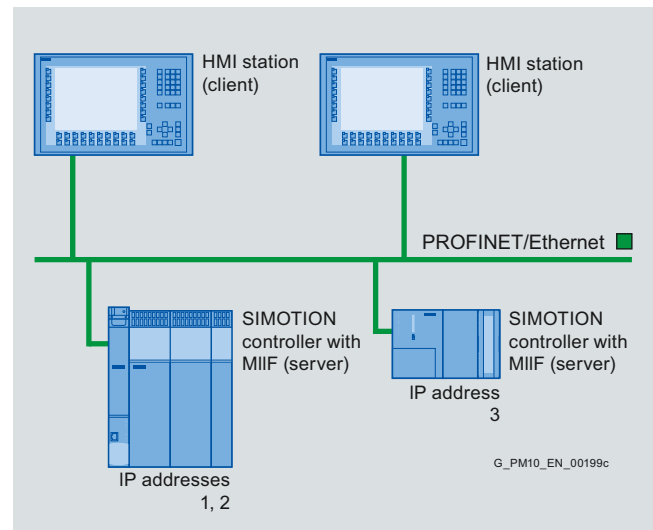
*More information about Drive Control Chart (DCC) can be found in section Optional packages for SIMOTION SCOUT.*

#### SIMOTION technology package Multipurpose Information Interface (MIIF)

The SIMOTION technology package MIIF (Multipurpose Information Interface) functions as a server to permit symbolic access to SIMOTION data and makes them available to clients (e.g. operator panel) via Ethernet.

Access to SIMOTION variables is purely symbolic. The client application is not in any way dependent on the SIMOTION application. The communication is TCP/IP-based. Several controllers and HMI stations can be operated on an Ethernet line.

The server is active after being loaded to the controller. The server does not need to be configured in the application.



#### Symbolic access to SIMOTION data with MIIF

The server allows variables to be read and written within SIMOTION RT. System variables of the device, system variables of technology objects and UNIT global variables are supported here. Global device variables and I/O variables are not supported in the OAMIIF V1.0. If these are displayed/changed, they need to be copied by the application.

The server works at round robin level. This means that response times are longer on a system working at full capacity. Deterministic behavior is not guaranteed.

The technology package MIIF (Multipurpose Information Interface) is compatible with the following SIMOTION controllers:

- SIMOTION C240/C240 PN
- SIMOTION P320-3/P350-3
- SIMOTION D410-2/D4x5-2

Runtime software V4.1 SP4 or higher must be installed on the SIMOTION controller.

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION PLCopen blocks

#### Overview



#### **Block library containing certified function blocks in accordance with PLCopen**

PLCopen is an association of leading PLC manufacturers that was formed for the purpose of defining international standards in the field of PLC programming and promoting their use.

The PLCopen function blocks integrated into the Motion Control technology package are designed for use in cyclic programs/tasks; they enable motion control programming in a PLC environment. The function blocks can be selected from the SCOUT command library and can therefore be easily used in all SIMOTION programming languages. They should preferably be used in LAD/FBD.

The following certified single-axis and multi-axis PLCopen blocks as well as extended functions are available:

#### Single-axis function blocks

- `_MC_Power` (axis enable)
- `_MC_Stop` (stop axis)
- `_MC_Reset` (reset axis)
- `_MC_Home` (reference point approach for axes)
- `_MC_MoveAbsolute` (absolute positioning of axes)
- `_MC_MoveRelative` (relative positioning of axes)
- `_MC_MoveVelocity` (traversing axes at a specified velocity)
- `_MC_MoveAdditive` (relative traversing of axes by a defined path additively to the remaining path)
- `_MC_MoveSuperimposed` (relative superimposition of a new motion in addition to existing motion)
- `_MC_PositionProfile` (traversing axis by a predefined and specified position/time profile)
- `_MC_VelocityProfile` (traversing axis by a predefined and specified velocity/time profile)
- `_MC_ReadActualPosition` (read actual position of axis)
- `_MC_ReadStatus` (read status of an axis)
- `_MC_ReadAxisError` (read error of an axis)
- `_MC_ReadParameter` (read axis parameter, LREAL data type)
- `_MC_ReadBoolParameter` (read axis parameter, BOOL data type)
- `_MC_WriteParameter` (write axis parameter, LREAL data type)
- `_MC_WriteBoolParameter` (write axis parameter, BOOL data type)

#### Multi-axis function blocks

- `_MC_CamIn` (enable cam with synchronization) contains implicit `_MC_CamTableSelect` (selection of cam)
- `_MC_CamOut` (disengage cam with desynchronization length)
- `_MC_GearIn` (synchronize)
- `_MC_GearOut` (desynchronize)
- `_MC_Phasing` (apply phase shift)

Apart from the standard PLCopen functions, the following additional standard axis function is included:

- `_MC_Jog` (continuous or incremental jogging)

### Overview



OPC (Open Process Communication) is used by the Windows 7 and Windows XP operating systems as a communications interface.

The basic principle of OPC is that OPC client applications can communicate with the OPC server over a standardized, open and multi-vendor interface. COM (Component Object Model) and DCOM (Distributed COM) are applied as basic procedures.

Pre-existing COM-capable Windows applications (MS Office or HMI systems) can be linked.

As a basic rule, however, software for communication via OPC must be installed on all systems.

The OPC servers fulfill the following specifications of the OPC Foundation:

- Data Access Automation Interface
- Data Access Custom Interface
- Alarm and Events Custom Interface

#### **OPC on PC and PG**

The SIMATIC SOFTNET S7 communication software for PC/PG is available for PROFIBUS DP and PROFINET/Industrial Ethernet and includes software for S7 communication, S5-compatible communication and communication with SIMOTION.

#### **OPC on SIMOTION**

The SIMATIC NET OPC server is pre-installed on SIMOTION P350-3, but its use is subject to a license. See selection and ordering data.

Communication can thus take place internally on SIMOTION P350-3 from Windows level to SIMOTION runtime level by means of OPC mechanisms and functions.

### Benefits

- Standardized access to SIMATIC S7 and SIMOTION for OPC-capable applications under Windows XP and Windows 7
- Integration of automation products of different manufacturers
- The same, easy-to-use user interface for different components
- Can be accessed from every computer in the LAN
- High-performance data access over the "Custom Interface" (C++)
- Easy to use with the "Automation Interface" (VB) or the supplied OCX data control

### Function

#### **Programming**

- Synchronous and asynchronous reading and writing of variables
- Monitoring of variables using the OPC server with a signal to the client when a change occurs
- Transmission of alarms and events to client
- Use of batch operations, so a large volume of data can be processed in a short time

#### **Interfaces**

- Custom Interface (C++) for high OPC performance
- Automation Interface (VB, Excel, Access, Delphi, etc.) for ease-of-use
- Graphics with OCX for configuring instead of programming

#### **Bus systems**

- Communication over OPC for PROFIBUS and Industrial Ethernet is supported.

#### **Operating systems**

- Windows XP Professional
- For 32 bit: Windows 7 Professional/Ultimate
- For 64 bit: Windows 7 Professional/Ultimate

# SIMOTION Motion Control System

## SIMOTION runtime software

### OPC server

#### Integration

A variety of different requirements must be fulfilled in order to set up a communication link from a PC/PG to SIMOTION via OPC:

##### Requirements for communication via PROFIBUS

- PC/PG with CP 5621 PCI card and SOFTNET S7 communication software for PROFIBUS DP, or
- PG/Notebook with CP 5512 PCMCIA card and SOFTNET S7 communication software for PROFIBUS DP

##### Requirements for communication via Industrial Ethernet

- PC/PG with standard Ethernet interface and SOFTNET S7 communication software for Industrial Ethernet or SOFTNET S7/LEAN for Industrial Ethernet (only 8 connections)

#### Selection and ordering data

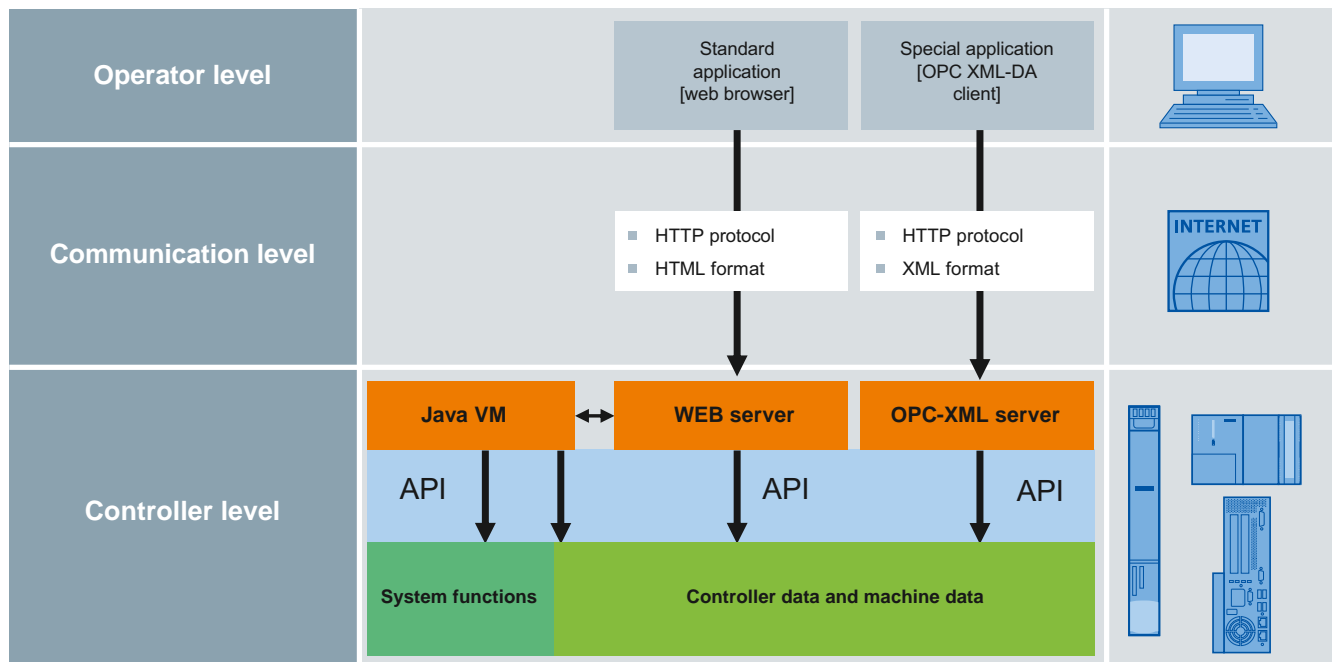
Description	Order No.
<b>SOFTNET S7 communication software for PROFIBUS DP</b> Software for S7 communication incl. FDL and S7 OPC server, with electronic manual on CD-ROM, for use with CP 5512 and CP 5621 modules	<b>6GK1704-5CW80-3AA0</b>
<b>CP 5512 communications processor</b> PCMCIA card for connecting a PG or notebook computer to PROFIBUS DP and MPI	<b>6GK1551-2AA00</b>
<b>CP 5621 communications processor</b> PCI card for connecting a PG or AT-PC to PROFIBUS DP or MPI	<b>6GK1562-1AA00</b>
<b>SOFTNET S7 communication software for Industrial Ethernet</b> Software for S7 communication, S5-compatible communication (SEND/RECEIVE), incl. OPC, PG/PC communication, incl. S7 OPC server, with electronic manual	<b>6GK1704-1PW08-1AA0</b>
<b>SOFTNET S7 LEAN communication software for Industrial Ethernet</b> Software for S7/S5-compatible communication, incl. OPC, PG/OP communication and NCM PC, up to 8 connections	<b>6GK1704-1LW08-1AA0</b>
<b>SIMATIC NET OPC server on SIMOTION P</b> License for pre-installed communication software on the SIMOTION P Motion Controller	<b>6AU1380-0AA20-0YB0</b>

#### More information

More information about the SIMATIC NET software package with OPC server can be found in Catalog IK PI and the Industry Mall under Automation Technology/Industrial Communication.



### Overview



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SIMOTION IT: Three different technologies for easy access to control and machine data

#### **SIMOTION IT: Service and diagnostics via the Internet**

The SIMOTION controllers support communication with the outside world through the integrated Ethernet or PROFINET interface using standard IT protocols such as HTTP. Using the web functions integrated in SIMOTION IT, machine manufacturers and users can perform commissioning, diagnostic and service procedures on production machines easily and without additional engineering tools.

The web pages provided by SIMOTION IT supply comprehensive information about the current condition of a SIMOTION controller. This information can be accessed with a standard PC and commercially available Internet browser. Extensive protection has been provided to ensure security against unauthorized access by third parties. The integrated web pages provide users with commissioning and service support, e.g. helping them to detect the causes of faults, and with upgrading the software on the SIMOTION controller.

#### **SIMOTION IT offers three varying technologies**

SIMOTION IT DIAG and SIMOTION IT OPC XML-DA each provide a communications server on the SIMOTION controller. Via Industrial Ethernet/PROFINET, a client PC can then access data in the SIMOTION controller for diagnostic or service purposes or for visualization.

SIMOTION IT Virtual Machine provides a Java runtime environment on the SIMOTION controller. This means that Java applications can be executed on the SIMOTION controller. This allows you to create your own programs for commissioning, service and preventive maintenance.

#### **Licensing of SIMOTION IT**

With SIMOTION Kernel version V4.2 and higher, only a license for SIMOTION IT Virtual Machine is required. Here, the SIMOTION IT functions IT DIAG and OPC XML-DA are part of the standard firmware of the SIMOTION controller and do not require a license.

#### Note:

A license with SIMOTION Kernel < V4.2 is still required for using the functions SIMOTION IT DIAG and OPC XML-DA. These must be licensed using the respective software options. The SIMOTION IT Virtual Machine license can still be used for SIMOTION Kernel < V4.2 as a combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.

# SIMOTION Motion Control System

## SIMOTION runtime software

### SIMOTION IT

#### Function

##### **SIMOTION IT DIAG**

SIMOTION controllers have a web server integrated into their runtime systems. For implementing applications with SIMOTION IT DIAG, a series of predefined web pages are stored in the SIMOTION controller that offer the following information and functions:

- **Device information**  
Detailed information about the firmware versions, hardware components and technology objects of the device
- **Diagnostics**  
Information about device resources such as: CPU load, memory usage, task duration times and operating state, diagnostic buffer, extended diagnostic buffer and technology object alarms, axis overview, watch tables and runtime trace  
The diagnostic pages for SIMOTION D also display drive alarms, drive diagnostic buffer and parameters of the integrated SINAMICS drive.
- **Runtime trace**  
Recorded data are loaded to the PC with a mouse click. The Web Trace Viewer for Windows XP offers a wide scope of options for evaluating recorded data: Graphical, with zoom and dual measuring cursor.  
SIMOTION D offers the Web Trace Viewer as a direct download.
- **System trace**  
As with SCOUT, a trace can be initiated over different controllers.
- **Access to the device file system**  
An Internet browser can be used to store and access any number of files in the file system of the SIMOTION controller. In this way, documentation and service instructions can be stored directly in the controller, for example.
- **Project update and firmware update**  
A special web page can be used to update the SIMOTION project and also the firmware of the SIMOTION controller.
- **Access protection**  
The web pages are protected with a user name and password. Different user groups can be defined for different pages.
- **User-specific web pages**  
The user can create web pages and save them on the SIMOTION controller. "Server side includes" are used to access SIMOTION variables in these web pages. This is a special HTML syntax extension which allows the values of the selected variable to be inserted on a web page.

Read and write access to the SIMOTION variables is possible. Java scripts or applets can be used to implement active operation and display functions in the web pages that can be executed on a client PC with an Internet browser.

The standard pages of SIMOTION IT DIAG have the same design as the pages on a SIMATIC controller. The service overview and watch table can also be opened in parallel in separate windows.

A horizontal navigation can be created very easily for user-defined pages. No additional software is required.

##### **SIMOTION IT OPC XML-DA**

SIMOTION controllers have an OPC XML-DA server integrated in their runtime system. OPC XML-DA is an interface specified by the OPC Foundation and is based on the standard IT protocol HTTP. The data requests of a client are coded in XML symbolically and transmitted to SIMOTION using the HTTP protocol. These are evaluated by the integrated OPC XML DA server and the response is then sent back to the client over the same path.

It is therefore possible, for example, to create HMI applications in different programming languages (C#, Visual Basic, Java) on any client systems independently of the operating system.

The application works with the symbolic names of the SIMOTION variables and has thus only a loose, symbolic dependence on the SIMOTION SCOUT database. A symbol export, similar to the Windows-based process on the SIMATIC NET OPC DA server, is not required. This ensures that consistency problems between the version of the client application and the project version in SIMOTION are avoided.

The OPC XML-DA server offers the following functions for access to the data of the SIMOTION controller:

- Read and write access to the SIMOTION variables
- Access to diagnostic buffer, extended diagnostic buffer and technology alarm objects
- Symbolic browsing function via the SIMOTION variables
- Cyclical reading of variables using "subscriptions"
- Access protection (password-based) can be configured, if required.

SIMOTION IT OPC XML DA is integrated directly in the SIMOTION Kernel. The functionality responds in accordance with the specification of the OPC Foundation "OPC XML-DA Specification Version 1.01".

##### Note:

SIMOTION offers two different access possibilities over OPC. The method already described over OPC XML-DA and the method over OPC DA. OPC DA requires that the SIMATIC NET package is installed on the client PC and it is described in the "OPC server" section.

[More information about OPC can be found on the Internet at www.opcfoundation.org](http://www.opcfoundation.org)

### Function (continued)

#### **SIMOTION IT Virtual Machine**

SIMOTION controllers have an integrated Java runtime environment (Virtual Machine) in their runtime system. Use of this function is licensed by the "SIMOTION IT Virtual Machine" license.

Java applications can be executed on a SIMOTION controller with SIMOTION IT Virtual Machine. This allows you to develop your own programs and concepts for commissioning, service and preventive maintenance.

The programs can be created with standard development tools that are available on the market, such as Eclipse or Borland JBuilder. When they have been created, the programs can be downloaded into the SIMOTION controller online. There is no dependency on SIMOTION SCOUT.

All Java applications on the SIMOTION controller are executed in asynchronous tasks in the SIMOTION task system, not in real-time tasks.

The Java environment provides an interface (API) to the SIMOTION runtime system over special system functions. The following functions are available:

- Read and write access to the SIMOTION variables
- Read and write access to the non-volatile memory (NVRAM)
- Use of system functions (functions of the technology objects)
- Use of standard Java classes in the device (file access, network functions, string functions, ...)
- Creation of servlets, for the purpose of enhancing menu interfaces in web pages, in particular.

### Selection and ordering data

Description	Order No.
<p>As of SIMOTION Kernel V4.2, the SIMOTION IT functions IT DIAG and OPC XML-DA are included in the standard firmware of the SIMOTION controllers and do not require a license. Use of the function SIMOTION IT Virtual Machine must be licensed through the following software option:</p> <p><b>SIMOTION IT Virtual Machine</b> License for SIMOTION IT Virtual Machine on one controller</p> <p><b>Note</b> It can be used as a combined license for SIMOTION Kernel &lt; V4.2 for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.</p> <p>The functions SIMOTION IT DIAG and OPC XML-DA remain subject to licensing with SIMOTION Kernel &lt; V4.2. They must be licensed using the following software options:</p>	<b>6AU1820-8BD20-0AB0</b>
<p><b>SIMOTION IT DIAG</b> License for SIMOTION IT DIAG on SIMOTION Kernel &lt; V4.2</p>	<b>6AU1820-8BA20-0AB0</b>
<p><b>SIMOTION IT OPC XML-DA</b> License for SIMOTION IT OPC XML-DA on SIMOTION Kernel &lt; V4.2</p>	<b>6AU1820-8BB20-0AB0</b>

#### Note

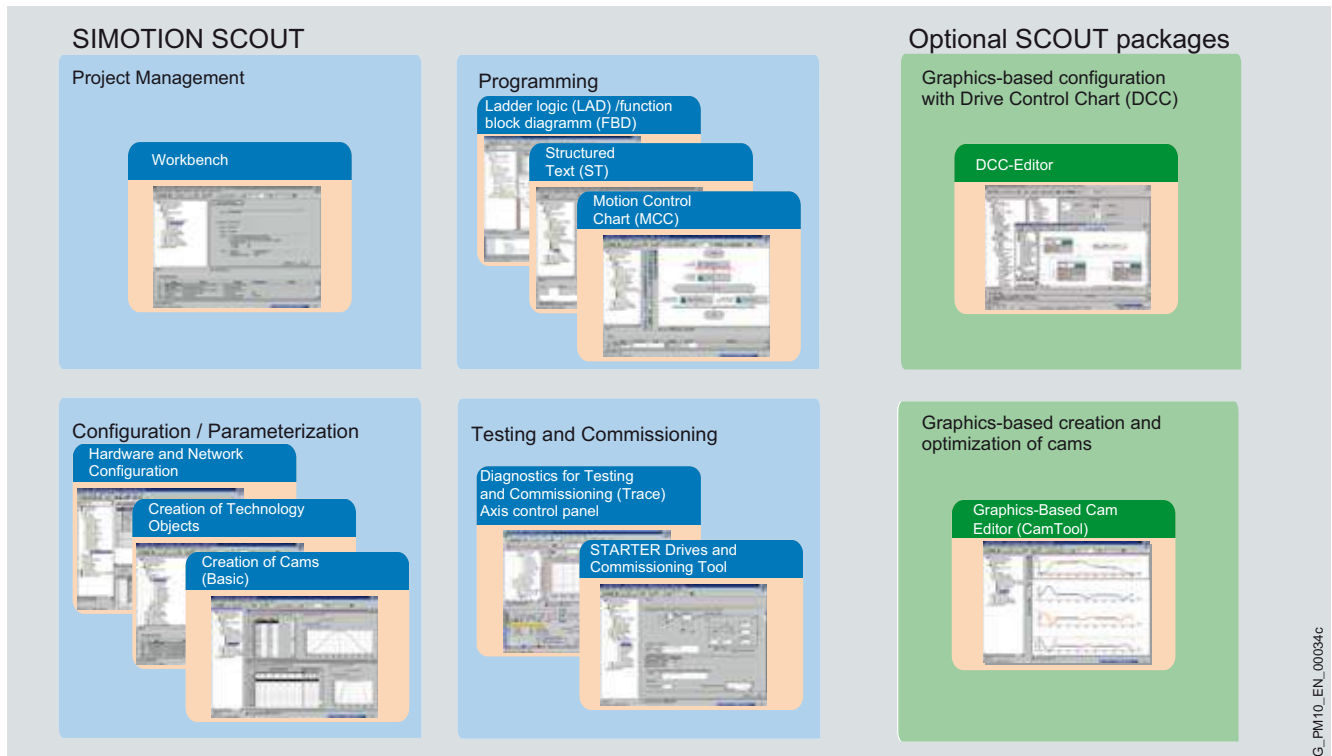
SIMOTION IT is available only on SIMOTION controllers with Ethernet or PROFINET interface.

# SIMOTION Motion Control System

## SIMOTION engineering software

### Overview of engineering software

#### Overview



SIMOTION SCOUT: a uniform view of your automation task

#### **SIMOTION SCOUT – The holistic engineering system for your motion control applications**

The SIMOTION Motion Control system provides a wide variety of preprogrammed functions and you can assign parameters and program it for customized use.

For practical implementation of your automation tasks, you therefore require a tool that will support all the necessary engineering steps in a user-friendly manner: SIMOTION SCOUT

SCOUT is the environment for uniform automation in mechanical engineering. It supports simple engineering of complex production machines with demanding PLC and Motion Control functions.

SCOUT is integrated in STEP 7 and is therefore also integrated into the SIMATIC landscape to ensure Totally Integrated Automation (TIA).

SCOUT provides

- an integrated, function-oriented view of your automation task, combined with
- a high level of user friendliness.

The possible SIMOTION applications range from a simple, parameterizable, speed-controlled single axis through to complex, mechatronically-coupled and programmable multi-axis machines.

Therefore, SCOUT provides views adapted to the task and can be expanded with additional tools (e.g. tool for the graphic creation of cams).

#### **SIMOTION SCOUT – A tool for engineering, testing and diagnostics**

SCOUT supports all the steps required for creating a Motion Control application: configuration, parameterization, programming, testing and diagnostics. The integrated test and diagnostics functions are useful when commissioning and servicing.

The graphical menu system of SCOUT supports the user with important tasks, such as:

- Creation of the hardware and network configuration
- Creation, configuration and parameterization of technology objects such as axes, measuring inputs, output cams, cam tracks and cams.

#### **SIMOTION SCOUT – Support for text-based and graphical programming**

With SCOUT the following programming languages are available for programming a SIMOTION application:

- Structured Text in accordance with IEC 61131
- LAD (Ladder Diagram) and FBD (Function Block Diagram)
- MCC (Motion Control Chart): the graphical "flow diagram language" for easily describing and programming motion sequences for production machines
- DCC (Drive Control Chart): graphical configuration of open and closed-loop control functions

#### **Optional CamTool package (cam editor)**

The optional CamTool package expands SCOUT with a powerful graphical tool for creation and optimization of cams. Simple editors for creating cams are already integrated in SCOUT as standard.

#### **Optional Drive Control Chart (DCC) package**

With Drive Control Chart (DCC), drive-based open and closed-loop control functions can be easily configured graphically. Multi-instance function blocks are selected from a standard function block library, and then graphically linked by means of drag & drop and parameterized. The control structures are presented clearly in SCOUT.

The optional CamTool and Drive Control Chart packages are completely integrated in the SCOUT environment.

### Overview

The SIMOTION SCOUT software package is the basis for implementation of the SIMOTION Motion Control System.

It essentially contains the SIMOTION SCOUT engineering system including the integrated STARTER commissioning tool and the runtime software for all SIMOTION platforms.

SIMOTION SCOUT is available as an optional STEP 7 package or as SIMOTION SCOUT stand-alone.

SCOUT also supports the engineering of SIMOTION platforms with older runtime versions.

### SIMOTION SCOUT

The SIMOTION SCOUT engineering system provides important new features in version V4.2 and higher. The focus is on an improved connection of the SINAMICS S120 drive system, the completion of the comparison functionality and many usability improvements.

#### Improved connection to SINAMICS S120

The most important innovation in the SIMOTION SCOUT engineering system is the significantly simplified connection to the SINAMICS S120 drive system. Drives and their components are integrated automatically to the greatest possible extent. The connections to the drive objects are simply interconnected, whereby the required message frame generation is performed automatically by the engineering system.

#### Project comparison now also in LAD/FBD and MCC

The detail comparison option available when using Structured Text (ST) is now also available in the graphical programming languages LAD/FBD and MCC (Motion Control Chart). This enables the graphical comparison of programs, where the different structures and commands can be recognized through colored highlighting. The comparison function is available for offline-offline and also for offline-online comparison.

#### Uniform display of lists

The display of all lists in the system has now been simplified and adapted to the well-known look and feel of Office applications. The highest possible data security was observed during the implementation. If there are any operation faults (e.g. faulty copy and paste), the system restores the data. In this way, even beginners can become familiar with the engineering software, intuitively, quickly and safely.

#### System trace across several motion controllers

The so-called system trace feature is available for analysis or system optimization. This enables up to 128 signals from SIMOTION controllers networked via PROFINET to be recorded synchronously.

#### Trace for technology objects

With the new TO trace, all events affecting a technology object can be recorded in real-time and displayed in detail in a chronological sequence in the engineering system.

#### New watch tables

The new watch tables provide extended functions and diagnostic options. They allow different variables of the project (also different devices) to be collected. The watch tables can be clearly displayed and controlled with current values. Stored control value tables can also be used to perform comprehensive test sequences quickly and easily.

#### Improved diagnostics and troubleshooting

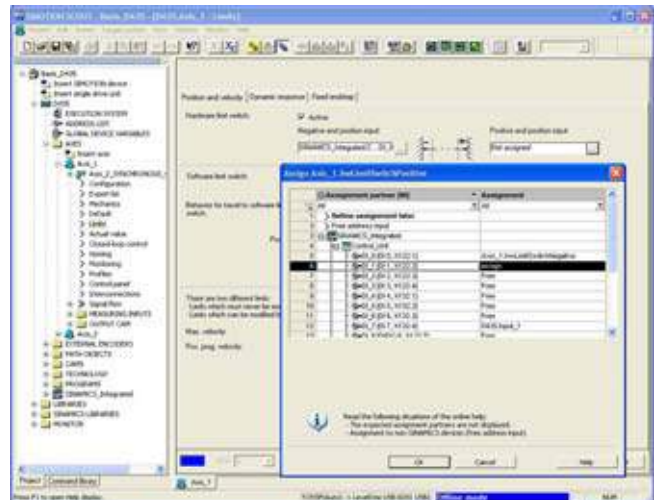
New features such as the "Trace" in the MCC editor, which make the program sequence visible and understandable even with rapid command transitions, provide greater clarity in diagnostics and troubleshooting. Or "talking" icons in the tabs of the opened programs that refer to active status or debug functions.

#### Easier to use during programming

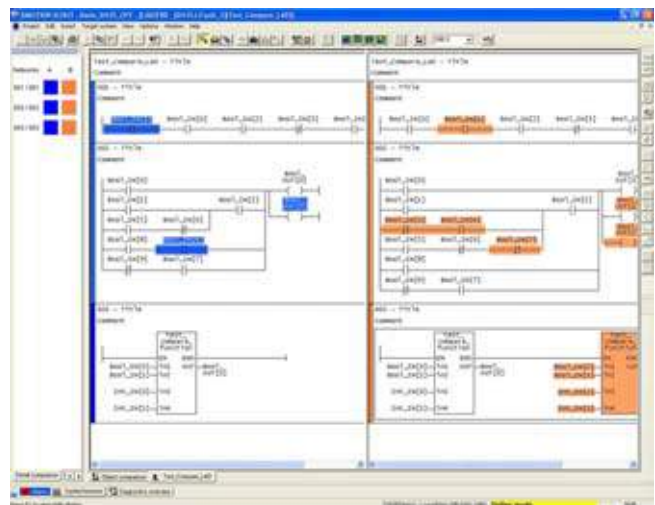
Greater clarity is provided in the general programming through small additions such as the display of the variable type, display of the current value when there is an online connection and language-dependent comments which appear when the cursor is moved over the code ("tooltips").

Rollout tips provide the user with information on input errors or system information that is still missing when working in tables or entry fields.

The system-wide effective automatic completion of user entries ("Auto-Complete") with automatic correction of upper/lower case makes the editing process more efficient and provides an easily readable program code.



Simple interconnection of the drive I/Os



Detail comparison with ladder logic (LAD)

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Overview (continued)

##### Scope of supply

###### SIMOTION SCOUT engineering software

- SCOUT with corresponding license
- License key for SCOUT
- Integrated STARTER commissioning tool

###### Optional packages for SIMOTION SCOUT

- Optional CamTool package without license  
The license must be ordered separately.
- Optional Drive Control Chart (DCC) package without license  
The license must be ordered separately.

###### Documentation

- Complete SIMOTION documentation on DVD

###### Other software

- SIMOTION – Utilities & Applications  
Free utilities (e.g. calculation tools, optimization tools, etc.) and application examples (ready-to-apply solutions such as winders, cross cutters or handling) as well as the project generator SIMOTION easyProject
- SIMATIC NET without license
- SIMATIC software:  
With SCOUT stand-alone, the necessary components of STEP 7.

##### System requirements for V4.3

###### Software

- Windows XP SP3 or Windows 7 Professional or Ultimate (32/64-bit)
- SIMATIC STEP 7 V5.5 SP2 (not required for SCOUT stand-alone)

###### Hardware

Minimum system requirements PG/PC for SCOUT:

- As of Pentium IV 2.5 GHz, 1 GB RAM (2 GB recommended)
- At least 1024 MB main memory for PG/PC and SIMOTION P; 2 GB main memory is recommended
- Screen resolution: 1024 x 768 pixels, 16-bit color depth
- Free hard disk memory: 3 GB

With additional installation of WinCC flexible ES in Scout:

- Pentium IV 2.5 GHz, 4 GB RAM

##### Integrated STARTER commissioning tool

The STARTER commissioning tool is directly integrated in SCOUT. It supports the simple and rapid commissioning, optimization and diagnostics of all new-generation Siemens drives with only one tool.

STARTER supports the drives:

- SINAMICS
- MICROMASTER 420/430/440
- MICROMASTER 411/COMBIMASTER 411
- COMBIMASTER

##### SIMOTION SCOUT stand-alone software package

If STEP 7 is not installed, the SIMOTION SCOUT stand-alone software package can be used. It also contains the components of STEP 7 that are required for SIMOTION SCOUT as well as the license key for SCOUT stand-alone.

It is not possible to operate the SCOUT and SCOUT stand-alone software packages on the same machine.

##### SIMOTION Kernel updates

SIMOTION Kernel updates for all SIMOTION platforms are supplied on DVD and can then be copied from the PG/PC to the SIMOTION Micro Memory Card (C2xx) or SIMOTION CompactFlash card (SIMOTION D) or installed on the P350-3.

A PC card adapter is needed to write to the SIMOTION MMC (Micro Memory Card) or the SIMOTION CF (CompactFlash Card). Adapters can usually be found in PC shops and at electronics shops.

With the device update tool, SIMOTION offers a user-friendly solution to update SIMOTION devices. SIMOTION D4x5-2 can also be updated using a USB stick.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Selection and ordering data

Description	Order No.
<b>SIMOTION SCOUT software package</b>	
<b>SIMOTION SCOUT V4.3 SP1</b> On DVD, including STARTER, runtime software and documentation Languages: English, French, German, Italian <ul style="list-style-type: none"> <li>• Single license</li> <li>• Upgrade</li> </ul>	   <b>6AU1810-1BA43-1XA0</b> <b>6AU1810-1BA43-1XE0</b>
<b>SIMOTION SCOUT V4.3 SP1 stand-alone</b> On DVD, including STARTER, runtime software and documentation Languages: English, French, German, Italian <ul style="list-style-type: none"> <li>• Single license</li> <li>• Upgrade</li> </ul>	   <b>6AU1810-1CA43-1XA0</b> <b>6AU1810-1CA43-1XE0</b>
<b>Software update service</b> The latest software version is necessary <ul style="list-style-type: none"> <li>• for SIMOTION SCOUT</li> <li>• for SIMOTION SCOUT stand-alone</li> </ul>	   <b>6AU1810-0BA00-0XL0</b> <b>6AU1810-0CA00-0XL0</b>

Description	Order No.
<b>Optional packages for SIMOTION SCOUT</b>	
<b>SIMOTION CamTool V3.0 SP2</b> High-performance graphical cam editor Languages: English, German <ul style="list-style-type: none"> <li>• Single license, with data carrier</li> <li>• Upgrade, with data carrier</li> </ul>	   <b>6AU1810-0FA30-2XA0</b> <b>6AU1810-0FA30-2XE0</b>
<b>DCC SIMOTION/SINAMICS V2.2 SP1 for SCOUT V4.3 SP1 / STARTER V4.3 SP1</b> Graphic programming with Drive Control Chart DCC editor + DCB libraries for use on SIMOTION and SINAMICS S120 <ul style="list-style-type: none"> <li>• Single engineering license, with data carrier</li> <li>• Upgrade, with data carrier</li> </ul>	   <b>6AU1810-1JA22-1XA0</b> <b>6AU1810-1JA22-1XE0</b>
<b>DCC-SINAMICS V2.2 SP1 for STARTER V4.3 SP1</b> Graphic programming with Drive Control Chart DCC editor + DCB libraries for use on SINAMICS S120 <ul style="list-style-type: none"> <li>• Single engineering license, with data carrier</li> <li>• Upgrade, with data carrier</li> </ul>	   <b>6AU1810-1HA22-1XA0</b> <b>6AU1810-1HA22-1XE0</b>

#### More information

A number of additional software products can be used in conjunction with SIMOTION SCOUT. It must be ensured that the corresponding versions of these software products are compatible. Please consult the "Compatibility table of the software products in the SIMOTION environment".

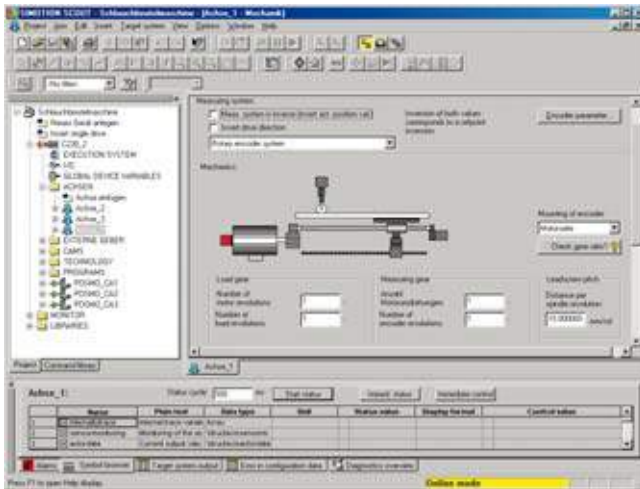
More information can be found on the Internet at <http://support.automation.siemens.com/WW/view/en/18857317>

# SIMOTION Motion Control System

## SIMOTION engineering software

SIMOTION SCOUT software package  
SCOUT Workbench

### Overview



The SCOUT Workbench is the common frame for all tools of the engineering system. The Workbench is thus the central navigation point for the individual engineering steps. It is used for the creation and management of SIMOTION projects and provides a uniform and integrated view of all devices, data and programs.

#### The SCOUT Workbench: Project navigator – Work area – Information area

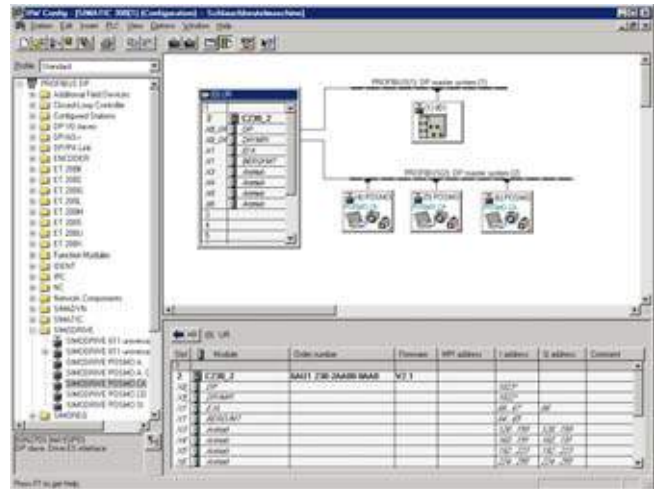
- Project navigator (left): The project navigator displays the technological tree structure of the project. All devices (controller, drives, etc.), all technological objects (axes, cam tracks, cams, etc.) and user programs are displayed in filterable hierarchical views. From here, new objects/programs can be created or existing ones called for modification.
- Work area (right): All editing tools of the engineering system (parameterization dialogs, program editors, etc.) can be integrated (SNAP IN) in this work area. This provides you with an individual view adapted to the situation in a fixed outer frame for each engineering task. If more than one window is open at the same time, they can be arranged as required or you can toggle between them by selecting the tabs.
- Detail area (bottom): The situation-dependent views for data and messages provided by the detailed display can be activated and deactivated. The data involve system variables provided by the devices and the technological objects, the peripheral data (inputs/outputs) and the user variables that you have defined. Their current states for an online connection with the SIMOTION device can be visualized. The message view refers both to the messages and alarms reported online from the SIMOTION devices and to warnings and faults created during the program creation.

### Benefits

- Integrated, function-oriented view optimized for ease-of-use
- Integrated intuitive engineering system
- Central data and program management, even for distributed systems
- Function-oriented, technological project structure with filterable views
- Fast access to individual engineering tools, e. g. configuration, programming, and commissioning

SIMOTION SCOUT software package  
Hardware and network configuration

### Overview



One of the first engineering steps to define the automation topology and assign parameters to the components and networks is to create:

- Hardware configuration
- Network configuration

To do so, SCOUT uses the STEP 7 tools HW-Config and NetPro.

You make selections from a hardware catalog to combine all required hardware components graphically in the work area, assign parameters to the components, and create bus connections between the individual components. You are warned immediately of any illegal inputs, so that only plausible configurations can be generated.

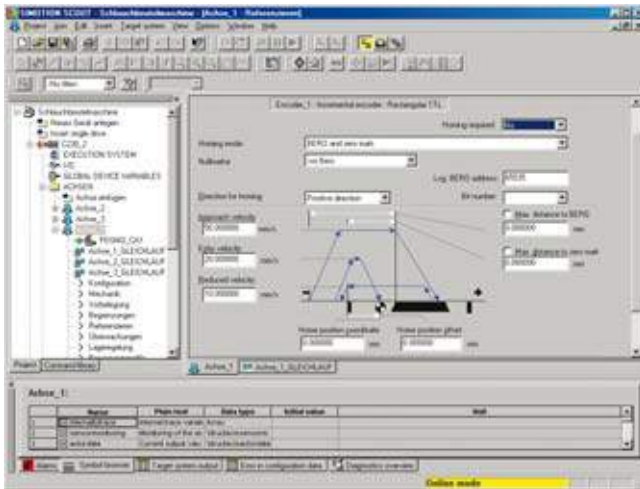


# SIMOTION Motion Control System

## SIMOTION engineering software

**SIMOTION SCOUT software package**  
Creation of technology objects

### Overview



All SIMOTION controllers feature basic functions which are predefined by the SIMOTION Kernel. The scope of the language is compatible with the IEC 61131-3 standard and contains all of the necessary PLC commands for I/O management, process or machine control.

Additional functions such as positioning, synchronous operation, cams and temperature channels are available with loadable technology packages.

These technology packages permit the generation of technology objects which provide you with a very simple and uniform view of the functions of the technology packages.

There are many technology objects, but all are generated, configured and parameterized in the same way.

In addition, the technology objects have programming interfaces through which you can use the functionality from application programs.

### Working with technology objects

A brief description of the individual engineering steps will be given using the example of the technology object "Axis".

#### Generating

A new axis object is generated by double-clicking the "Insert New Axis" tab.

#### Configuration

A wizard helps to specify object properties such as:

- Name of the axis
- Functionality (e.g. positioning axis or synchronized axis)
- Connection to the drive (e.g. SINAMICS S120 over PROFIBUS DP or PROFINET IO or an analog drive on SIMOTION C240)

After the axis has been generated or configured, it is displayed in the project tree along with additional tabs for parameterizing the axis and an option for generating other technological objects associated with the axis (e.g. cam paths, measuring inputs).

#### Assigning parameters

By double-clicking the "Referencing" tab, for example, all parameters for referencing can be set.

The "axis" object generated in this way also has a specified number of system variables which can be displayed in the detailed view when the axis is selected in the project tree.

The system variables are mainly used to visualize axis states such as:

- Display of the following error
- Target position to be reached
- Motion status (axis is accelerating, braking, motionless, etc.)

These system variables can also be used for:

- Online diagnostics
- Display on HMI
- Logging with the SIMOTION trace functionality
- Application programming through querying/comparing these system variables

Application programs access the axis functionality with system functions (selected from the command library), which are part of the "axis" object when it is generated.

The command `_pos(axis:=Axis1, position:=100, velocity:=123)` would cause axis "Axis 1" to move to position 100 with velocity 123 (example for system function in Structured Text).

### Benefits

- Easy generation of the technology object for determining the quantity structure
  - Axes
  - Output cams and cam tracks
  - Measuring inputs
  - Cams, etc.
- Menu-guided parameterization, graphically supported for easy understanding
- Easy visualization and access to functions through system variables and system functions of the technology objects
- User-friendly diagnostic information for function optimization of the technology objects
- Meaningful alarms in the form of numbers and plain text in the event of errors

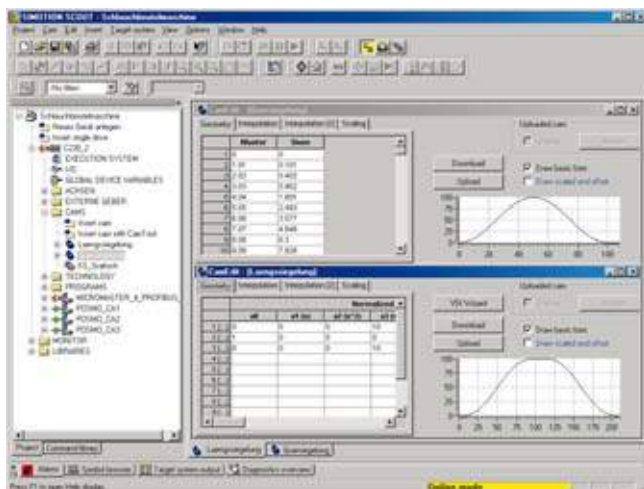
# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Creation of cams (basic)

#### Overview



A cam generally specifies the motion relationship between a leading axis (master axis) and a following axis (slave axis). Cams can also mirror velocity profiles, pressure characteristics or valve characteristic compensation for hydraulic axes. The cam technology object can process cams which are defined as interpolation point tables or polynomial descriptions.

The basic scope of SCOUT contains editors to create simple cams in the form of text in a table or using polynomials (VDI wizard) in the form of graphics symbols with configuration support.

#### Creation of cams

When the technological object "Cam" is generated, the type "Interpolation point table" or "Polynomial" is defined.

- Interpolation point table:  
With this type, the master and slave positions are entered in a two-column table. It is also possible to use external interpolation point tables (ASCII file, Excel table).
- Polynomials:  
Polynomials describe motion rules in accordance with VDI 2143. SIMOTION supports polynomials up to the 6th degree. In polynomial mode, the cam is described by a number of consecutive polynomials. Polynomials are entered in the form of a polynomial table. Users can use a polynomial description dialog and/or VDI wizard.

The result of the input is displayed in the right-hand side of the window in the form of a curve in the coordinate system.

In addition, other parameters such as the interpolation type between the curve support points or the scale of the cam can be specified. The SIMOTION CamTool option package can be used to display and optimize cams graphically.

#### Benefits

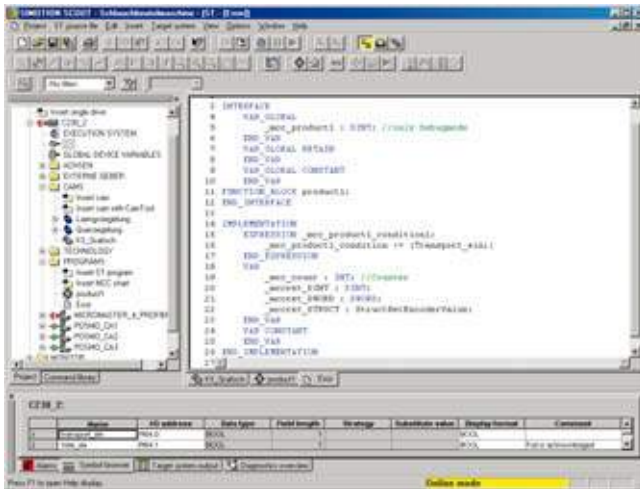
- Editors for simple cams are included in the basic scope of functions of SCOUT
- Graphic visualization of the cam so that input errors can be quickly identified
- Representation as interpolation point table with options to transfer data from external sources (ASCII, Excel)
- Alternative: Representation by polynomials up to the 6th degree with inputs supported by polynomial description dialog and VDI wizard

# SIMOTION Motion Control System

## SIMOTION engineering software

SIMOTION SCOUT software package  
Structured Text (ST)

### Overview



The high-level language ST (Structured Text) provides all language elements as text commands. This enables well-structured applications to be created.

The basic scope of commands includes:

- Commands for data management
- Arithmetic functions
- Control structures
- Commands for accessing I/O and
- Communication functions

The addition of technology packages for Motion Control adds powerful, extremely flexible Motion Control commands to the mix (e.g.: `_pos(...)` for position-controlled positioning axes). The system functions can be selected from a clearly arranged library and can be used in the ST source by means of drag & drop.

An ST source file basically consists of continuous text. This text can be structured by dividing it into sections. These sections represent logical units of an ST source.

These sections can be:

- A program that is assigned to a runtime level
- A function block with its own memory
- A function without its own memory

Function blocks and functions are not allocated to a runtime level, but are instead called in programs and supplied with parameters.

### Benefits

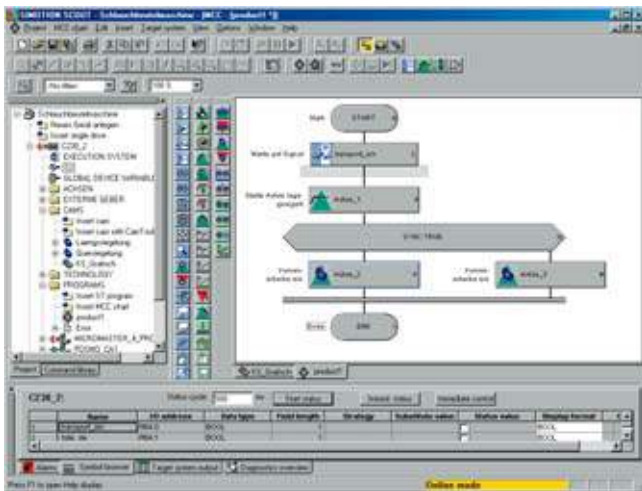
- Motion Control, PLC, and technology functions in one language
- Well-structured programs with comment capability
- Powerful editing functions, such as syntax coloring and automatic indenting
- Easy-to-use debug functions for online testing and diagnostics: e. g. display of actual variable content of the code sequence and break points selected in the editor.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package Motion Control Chart (MCC)

#### Overview



MCC (Motion Control Chart) is a "flow diagram language" that can be used to graphically formulate the process procedures of production in a simple manner. The result is one or more flow diagrams, comprising of MCC blocks that describe the time sequence of the individual machine actions. Due to its special means of expression, MCC (Motion Control Chart) is ideally suited to programming sequential processes.

Motion Control Chart supports the simple description of the motion sequences of machines with the help of powerful Motion Control commands, such as reference axis, position axis, synchronize or desynchronize cam, and many more.

Various MCC blocks are available for controlling the machine, for example, if conditions must be fulfilled, I/O signals can be read or set, calculations can be formulated and different control structures such as condition (IF), cases (CASE) and loops (WHILE, REPEAT UNTIL) can be programmed.

Several MCC programs may be created to describe different process situations. For example, you can create one MCC program to bring the machine to a defined initial state when it is switched on, a second MCC program for the normal production sequence, and a third MCC program to specify what the machine is to do in the event of a fault.

All MCC blocks – a selection of the most important SIMOTION functions – are available in toolbars. They are grouped according to function and are automatically inserted in the flow diagram at the point marked with a click. By clicking on different elements, individual dialog boxes are opened for further parameterization. Of course, it is also possible to include individual comments to document the process sequence. Functions from the SIMOTION command library that are not individually offered as MCC blocks can be used in an MCC program by means of a special command.

#### Benefits

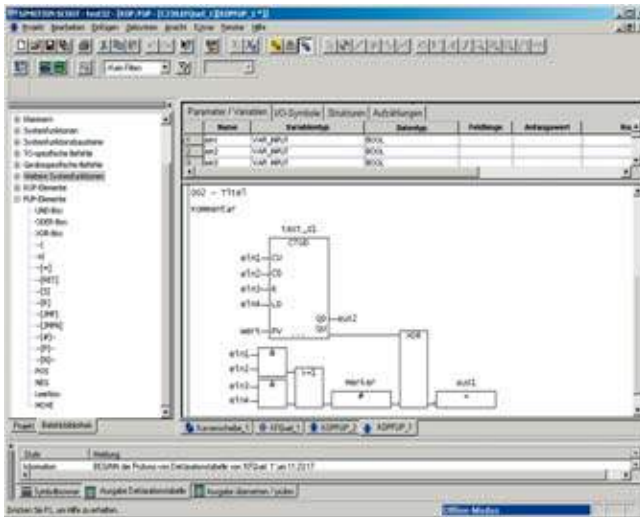
- Representation as graphical flowcharts make programming especially easy
- Hierarchical command library for Motion Control, PLC, and technology functions
- Control structures (IF, WHILE, CASE, etc.)
- Zoom-in functions for LAD, FBD and ST
- Subroutine calls (FB/FC)
- Structuring based on module creation, i.e. combination of command sequences to form a module command. Clicking on the module command invokes the corresponding command sequence.
- Powerful test functions for ONLINE connection with the SIMOTION controller such as graphical step tracing, single-step mode and breakpoints.

# SIMOTION Motion Control System

## SIMOTION engineering software

**SIMOTION SCOUT software package - Ladder Diagram/Function Block Diagram (LAD/FBD)**

### Overview



A powerful editor for LAD/FBD programming is available for ladder diagrams (LAD) or function block diagrams (FBD).

LAD/FBD also include commands for SIMOTION control using standard logic functions. It is recommended that motion control tasks are programmed with PLCopen blocks. Also, blocks which have been programmed in other SIMOTION languages can be called from LAD/FBD. User-friendly functions such as "on the fly" variable declarations or automatic syntax checks are available when programming in LAD or FBD. It is possible to switch over between LAD and FBD in the editor at any time. Any program can be viewed and processed in either LAD or FBD.

### Benefits

- The LAD/FBD blocks are stored in the SIMOTION project
- Existing PLCopen, ST, LAD/FBD or MCC blocks can be called from within the LAD/FBD program.
- Network titles and comments are available.
- Special functions such as automatic syntax checking or "on the fly" variable declaration can be activated.
- The commands are loaded from a library

For startup and troubleshooting purposes, the status of the LAD/FBD program is displayed while in monitoring mode. In addition, break points can also be defined in LAD/FBD programs.

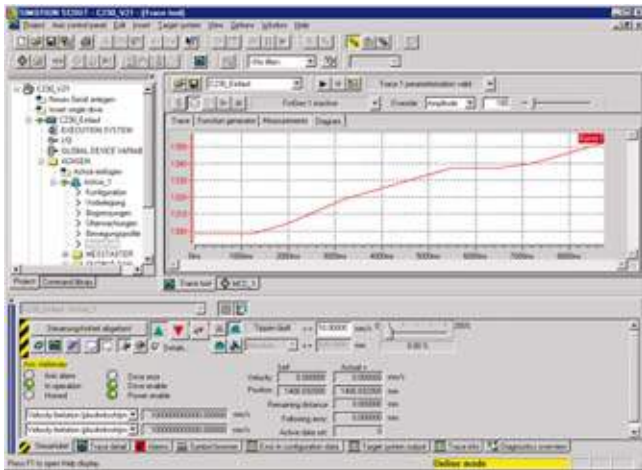
# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package

#### Diagnostics for testing and commissioning

#### Overview



SCOUT includes a number of diagnostic tools to make testing and startup of SIMOTION applications as simple as possible:

- Device diagnostics can be used to display program execution status, system load and memory usage.
- The diagnostic buffer is used to log the fault history. The following events are logged in the diagnostic buffer of the SIMOTION device:
  - All system status changes (RUN, STOP, etc.)
  - System interrupts with date and time.
- All error messages related to technology objects, e.g. axis errors, are displayed in the Alarms window of SCOUT with the fault number and description.
- All SIMOTION system and application variables can be dynamically updated, monitored and controlled while online with the SIMOTION controller.
- All programming errors are displayed with the location and cause during compilation.
- The status display for programs with possible break points (LAD/FBD, MCC, ST) and additional step-by-step tracing (MCC) helps the user to troubleshoot and optimize their code. During program execution, the values of the variables are displayed as they arise, not only at the end of the cycle when the sum of all changes has been implemented.
- Watch tables can be used to combine important variables of different objects in the project to monitor them, even those of different SIMOTION devices.

#### Axis control panel

The axis control panel can be used to commission the axes with SIMOTION SCOUT. The axes can also be traversed and optimized without any user programs.

#### Trace function

The most powerful tool for testing and commissioning is the trace function integrated in SCOUT.

In this manner, a selection of any of the data in the system (user variables, I/O variables, data of the technology objects such as actual position of an axis) can be recorded and traced, real-time. Up to 32 signals are possible in test mode.

Each SIMOTION device has a trace buffer which can be configured with the trace functionality of SCOUT. When the trace is started, the configured data is logged in the SIMOTION device. On completion of the trace, the contents of the trace buffer is read by SCOUT and displayed graphically.

#### Configuring the trace function

The trace function can be configured using the following parameters:

- Trigger condition (e.g. rising edge of a definable signal) and pre-trigger
- Time Limit Recording (a multiple of the basic cycle of the SIMOTION device)
- Continuous Recording (or endless trace with ring buffer)
- System variables to be logged (system, I/O and user variables)

#### Evaluating the trace data

The logged data is displayed in the form of graphs over time for evaluation. The following functions are offered here:

- Different colors can be selected for the curves. Curves can be switched off and on again.
- The zoom function can be used to show details.
- Rulers support the measuring of, for example, signal level and duration.
- Possible changes can be viewed by superimposing measuring curves from different trace logs.

Apart from recording, the trace function also offers a "function generator" and mathematical functions.

The traced curves can be stored or exported to Microsoft Excel as a table for further evaluation. Of course, the plots can also be stored for documentation purposes, inserted in documents or printed out.

#### Automatic optimization of the control loops

Automatic optimization of the control loops makes commissioning of the axes and drives particularly easy. For SINAMICS S120 drives, the parameters for the speed controller and the position controller are automatically determined (with DSC).

#### Integrated measuring functions

The integrated measuring functions support the recording of, for example, step responses for optimization as well as the detection of electromagnetic weak points or resonant frequencies (using, for example, bode diagrams and FFT analysis). Electronic filters can be optimally placed at these resonant frequencies to achieve higher dynamics.

# SIMOTION Motion Control System

## SIMOTION engineering software

### SIMOTION SCOUT software package Diagnostics for testing and commissioning

### Optional packages for SIMOTION SCOUT Optional CamTool package (graphical cam editor)

#### Overview (continued)

##### Comparison function for projects

With SCOUT V4.1 SP2 and higher, it is possible to compare and, if necessary, merge the components of different projects.

It is therefore possible to perform a CPU-based comparison between the objects of a project.

An overview of the differences between objects is displayed. Objects with differences can be merged.

If necessary, to a highly detailed degree: Objects can be merged right down to data level also for individual data.

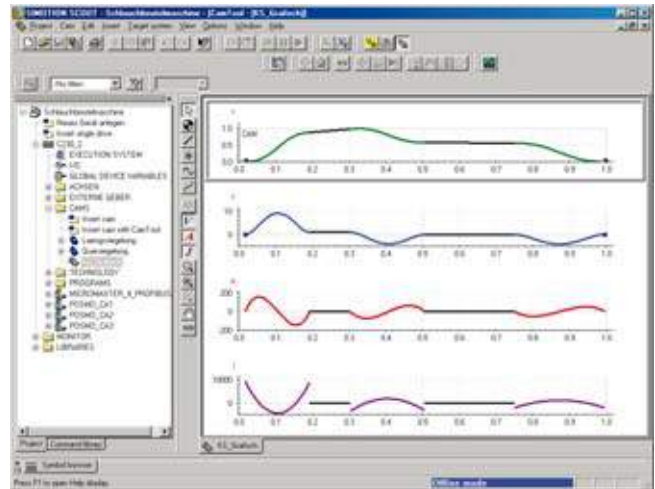
##### Advantages for practical working with SIMOTION:

- Online/offline comparisons allow the target device and project to be merged
- Offline/offline comparisons make it possible to merge programs
- Detailed differences between data can be identified in the detailed comparison
- Data missing from the engineering project are easy to restore if the source data are stored in the target system.

#### Benefits

- Numerous easy-to-use and expressive diagnostic tools are fully integrated in SCOUT
- Extremely useful support with optimizing and troubleshooting
- All information can be printed in the form displayed on the screen for documentation purposes
- Axis control panel for commissioning and optimizing the axes without the need for an application program
- Automatic controller optimization for fast commissioning
- Comprehensive, integrated comparison functions for the ST, MCC and LAD/FBD languages enable differences to be identified between projects or between the current project and the device.

#### Overview



SIMOTION CamTool is a powerful, graphical editor for creating and optimizing cams.

SIMOTION CamTool can be used as an expansion package for SIMOTION SCOUT and is completely integrated in the SCOUT environment.

#### Benefits

- Precise, graphic display of the CAM profile
- Entries can be made quickly and easily by inserting curve elements with drag & drop operation
- Fast and easy optimization of the curve by means of "dragging the profile"
- Simultaneous display of position, speed, acceleration, and jerk characteristics immediately indicates the effect on the maximum speed, the required motor torque, and the mechanical load
- Curve can also be optimized in relation to speed, acceleration, or jerk
- Basic principles of motion correspond to VDI 2143

#### Function

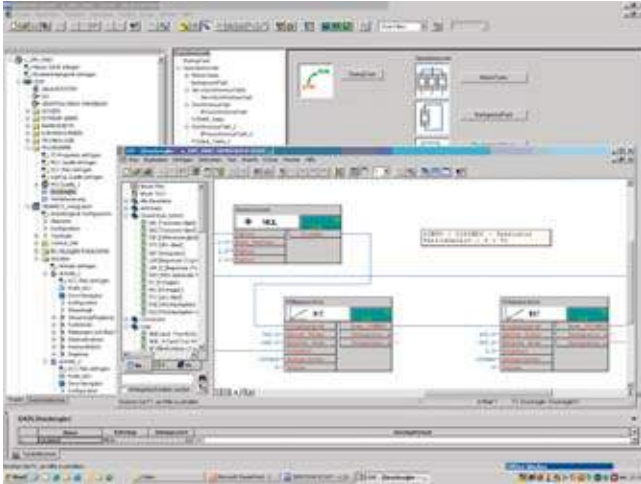
- The curve is displayed graphically in an x-y-diagram (positions of master and following axes). The curve profile is first roughly entered here with individual elements such as fixed points, lines and support points. Lines can be entered as straight lines, sine curves or arc sine curves.
- SIMOTION CamTool then connects these individual elements automatically to form a continuous curve. The transitions between the individual curve sections are automatically shaped as smooth as possible.
- You can optimize the curve by simply moving the specified curve sections with the mouse. The curve profile immediately adapts to your changes.
- In addition, SIMOTION CamTool can display the effects on the velocity, acceleration and jerk of the following axis over the motion of the leading axis.
- SCOUT can be used to convert cams created with CamEdit to the format used by CamTool or vice versa.

# SIMOTION Motion Control System

## SIMOTION engineering software

### Optional packages for SIMOTION SCOUT Optional Drive Control Chart (DCC) package

#### Overview



The Drive Control Chart (DCC) option packages for SIMOTION and SINAMICS extend the possibilities of SIMOTION SCOUT and the STARTER commissioning tool to graphically configure technology functions using predefined function blocks.

Multi-instance function blocks are selected from a library and are graphically interconnected using drag & drop capability. The function block library comprises of a large number of control, calculation and logic blocks as well as extensive open-loop and closed-loop control functions. Numerous calculation functions, such as summation, division and minimum/maximum evaluation are available for monitoring and evaluating numeric variables.

Drive Control Chart (DCC) does not limit the number of functions that can be used.

#### Benefits

- Clear visualization of technical control structures
- High degree of reusability of previously created plans
- Graphical editor for configuring open-loop and closed-loop control functions which can be operated without any programming know-how
- With Drive Control Chart for SIMOTION, closed-loop control structures can be programmed almost without constraints. These can then be combined with other programs to form complete program functionality.
- Drive Control Chart for SINAMICS S120 provides a convenient basis for implementing drive tasks directly in the converter.



# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION easyProject project generator

### Overview

You can achieve greater efficiency in the development and commissioning of your machines by using the project generator SIMOTION easyProject.

SIMOTION easyProject is included on the SIMOTION Utilities & Applications DVD that is supplied free of charge with SIMOTION SCOUT.

In recent years, a wide variety of applications have been realized in different sectors using the SIMOTION Motion Control system, and various basic, technology and application modules have been developed and optimized for this purpose. These well-proven software modules that have become quasi standard can now be integrated into a new or existing engineering project in an extremely easy manner with the project generator. This is done by first selecting the SIMOTION components and then the required modules in simple selection screens. Their integral or predefined functions are then configured with a mouse click and, finally, the project as a whole is generated. This saves a lot of programming time and at the same time creates the preconditions for a uniform and therefore standardized project structure.

The basic functions that can be used in practically every SIMOTION application and which are provided by the project generator include:

- **Message handling:**  
Centralized error message handling for all components including archiving and display on a visualization system (HMI)
- **Startup check:**  
A startup check for all connected components (provides information on the status of the configured devices connected to the various field buses or internal connections)
- **OMAC:**  
Operating mode management
- **Ethernet communication:**  
Machine-to-machine coupling via Ethernet communication over TCP/IP
- **Axis function block:**  
Easy activation of basic Motion Control functions (as far as cam synchronization) via a central (generic) axis function block
- **Interpreter:**  
A sequence interpreter for easy configuration of machine sequences using tables

These basic functions alone remove most of the manual programming and configuration work that would normally be necessary and consequently minimize the associated working time and possibilities for error.



### Automatic generation of the project

When the project is generated, all the necessary technology objects (TOs) are created and connected, libraries and program modules (only the currently selected modules) are automatically linked into the project and the programs are assigned to the respective execution levels. This results in a loadable and executable SIMOTION SCOUT project comprising the required machine functions without having to write a single line of code. You can concentrate fully on the special functions of your machine (sequence, signal connections, special functions, etc.) saving a considerable amount of work so that you achieve your objective much more quickly.

SIMOTION easyProject is also designed so that it can integrate its own blocks in this generic workflow of the automatic application creation.

The uniform structure also makes a project generated in this manner extremely easy to maintain. The generated program modules can be edited and modified by the user. If standard modules of the project have been changed centrally or if new standard modules need to be linked into the project, this can be done simply by running the project generator again. During the generator run, the originally used and, where applicable, updated modules and libraries will be recognized and displayed. These can then also be updated in the project automatically.

# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION easyProject project generator

### Overview (continued)



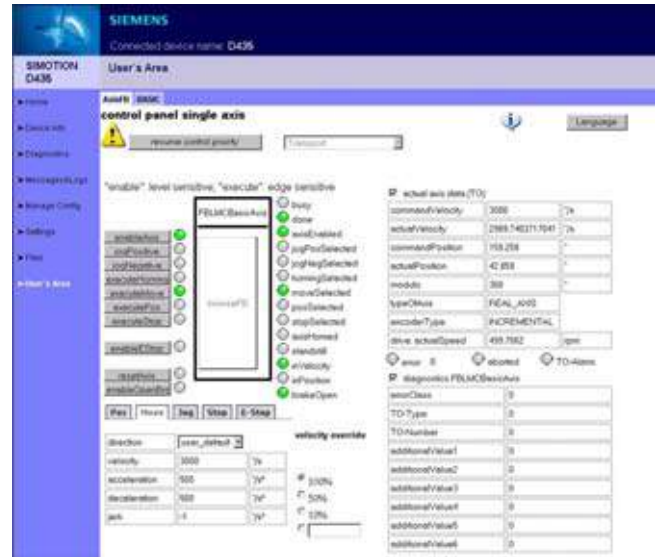
### Web-based diagnostics

The project generator also creates specific web pages for the separate modules. These can be loaded into the SIMOTION controller, if required, to offer additional customized diagnostic functions to those provided by every device via the integrated web server and the standard diagnostic pages of SIMOTION IT. This means that commissioning or specific service tasks can also be performed using a standard web browser – without the need for an engineering system. It is of no consequence here whether you connect to the controller via a network cable or via a secure connection over the Internet (e.g. through a VPN tunnel).

### Standard blocks – two examples:

#### 1. Axis function block:

The standard axis function block covers a range of requirements that concern the activation of axis technology objects and simplifies programming, commissioning and testing of each axis object due to its central interface. The integrated HTML control panel enables the axes controlled by the axis function block to be tested easily – without any HMI or engineering system.



#### 2. Message handling

The core tasks of the generic basic module "Message handling" include the chronological collection of system, TO, drive, I/O and user messages and their conditioning for display on the operator panel – or their direct display via a web browser.

The specific diagnostic pages are a huge advantage during initial commissioning, but particularly in the event of a fault or during servicing, because fault states can be diagnosed without the need for an engineering system and standstill times can be minimized.

### Modular machine functions

The project generator also supports the modularization of machine functions in accordance with the specification of international standard ISA-88. The module structure is precisely defined in ISA-88. This ensures a simple and uniform structure for machines. Basic, technology and application modules are combined to implement clearly comprehensible modularization for machines using functional units. You can find details about this in chapter Sector-specific solutions.

# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION Utilities & Applications

### Overview

The SIMOTION Utilities & Applications DVD, which is available free of charge, provides you with a wide range of valuable information and tools for SIMOTION:

- SIMOTION easyProject project generator
- Applications
- SIMOTION IT
- FAQs
- Examples
- Tools and documentation
- Scripts for SIMOTION

SIMOTION Utilities & Applications are part of the scope of delivery of SIMOTION SCOUT.

#### **SIMOTION easyProject project generator**

See "SIMOTION easyProject project generator" for further details.

#### **Applications for sector-specific solutions**

So that you don't have to reinvent the wheel every time, we have developed a range of applications for SIMOTION that are available as well-documented master solutions and that can be easily adapted to your specific projects with minimal engineering outlay.

Simple faceplates are also included for the visualization system WinCC flexible that have been adapted to the application. The diagram of industrial sector solutions shown below provides an overview of the applications that are currently available.

#### **SIMOTION IT**

Diagnostics, maintenance and operation can be performed locally or remotely using a PC with standard browser installed thanks to the web servers available on all SIMOTION devices. You will find helpful examples and tools here for creating your own HTML pages.



#### **FAQs (Frequently Asked Questions)**

We provide answers to the questions most frequently asked about SIMOTION.

#### **Examples**

Based on comprehensively documented examples, we make it easy to get started with SIMOTION and show how even complex applications can be easily implemented.

#### **Tools and documentation**

You will find easy-to-use tools for many tasks, as well as detailed documentation.

#### **Scripts for SIMOTION**

Numerous engineering tasks can be automated with the SIMOTION scripting function. The selection of documents and scripts provided here show how you can use scripts in your projects.

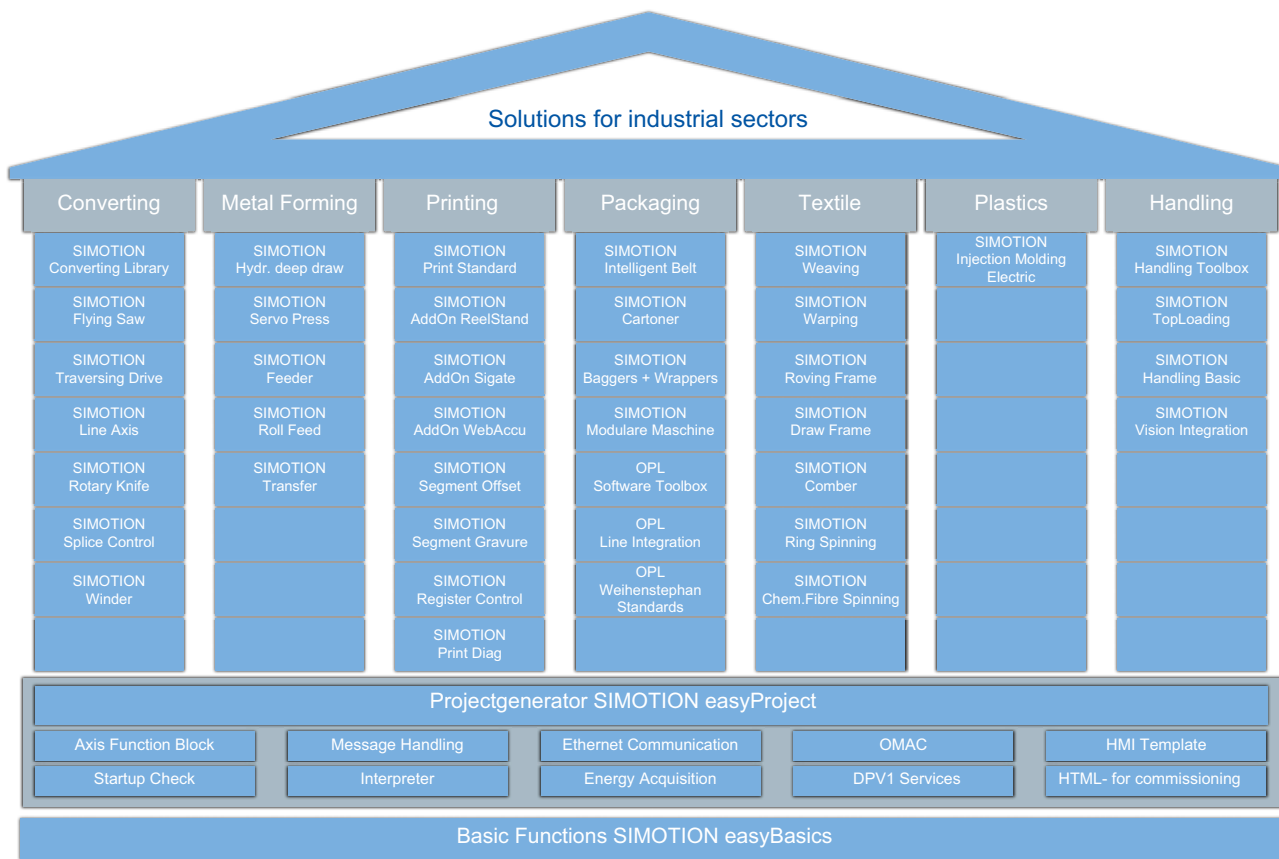
A number of example scripts that you can implement directly will make working with SIMOTION even easier.

# SIMOTION Motion Control System

## SIMOTION engineering software

Free extras for SIMOTION SCOUT  
SIMOTION Utilities & Applications

**Overview** (continued)



G\_PM10\_EN\_00218

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>System cycles</b>					
<b>PROFIBUS cycle</b>	SIMOTION D: For integrated drives and drives on connected CX32-2: 0.5 ... 8 ms	C240/C240 PN: 1 ... 8 ms  (in 0.25 ms steps)	P350-3 DP: 1 ... 8 ms  (in 0.125 ms steps)	1 ... 8 ms  (in 0.125 ms steps)	1 ... 8 ms  (in 0.125 ms steps)
<b>PROFINET cycle</b>		C240 PN: 0.5 ... 4 ms  (in 0.25 ms steps)	P320-3, P350-3 PN: 0.25 ... 4 ms  (in 0.125 ms steps)	D410-2 DP/PN: 0.25 ... 4 ms  (in 0.125 ms steps)	D4x5-2 DP/PN: 0.25 ... 4 ms  (in 0.125 ms steps)
<b>Position control and interpolation cycle</b>					
<ul style="list-style-type: none"> <li>• Minimum position control cycle</li> </ul>	The position control cycle (SERVO) includes the position controller, the actual-value and setpoint system and the axis monitoring functions.	0.5 ms	0.25 ms	1/0.5 ms <sup>3)</sup>	0.5/0.25 ms <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Position control cycle to PROFIBUS cycle</li> </ul>		1:1, 2:1	1:1, 2:1	1:1 ... 8:1	1:1 ... 8:1
<ul style="list-style-type: none"> <li>• Position control cycle to PROFINET cycle</li> </ul>		1:1 ... 16:1	1:1 ... 16:1	1:1 ... 16:1	1:1 ... 16:1 (1:1) <sup>2)</sup>
<ul style="list-style-type: none"> <li>• Interpolation cycle 1 (IPO) to position control cycle</li> </ul>	The axis motion control functions are performed in the interpolation cycle. The position control cycle and the interpolation cycle are a multiple of the PROFIBUS/PROFINET cycle. The transformation ratios are adjustable.	1:1 ... 6:1	1:1 ... 6:1	1:1 ... 6:1	1:1 ... 6:1 (1:1 ... 4:1) <sup>2)</sup>
<ul style="list-style-type: none"> <li>• Interpolation cycle 2 (IPO2) to interpolation cycle 1 (IPO1)</li> </ul>		2:1 ... 64:1	2:1 ... 64:1	2:1 ... 64:1	2:1 ... 64:1
<ul style="list-style-type: none"> <li>• Fast position control cycle (SERVO<sub>Fast</sub>) to PROFIBUS cycle</li> </ul>	Values with SERVO <sub>Fast</sub> and IPO <sub>Fast</sub> activated for D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN (for details, see SIMOTION D4x5-2 manuals)	–	–	–	1:1
<ul style="list-style-type: none"> <li>• Fast interpolation cycle (IPO<sub>Fast</sub>) to fast position control cycle (SERVO<sub>Fast</sub>)</li> </ul>		–	–	–	1:1 ... 4:1

Notes:**Communication via PROFIBUS and PROFINET**

The availability of a PROFIBUS or PROFINET interface depends on the controller variant implemented.

The SIMOTION controllers are equipped with PROFIBUS and/or PROFINET as standard.

For SIMOTION P350-3 DP, PROFINET can be retrofitted with an optional communication module.

This must be taken into account with regard to the connection possibilities and functions over PROFIBUS and PROFINET.

**SIZER for Siemens Drives engineering tool**

The performance requirements for a SIMOTION application can be estimated using the engineering tool SIZER for Siemens Drives.

For more information about SIZER for Siemens Drives, refer to chapter System description – Dimensioning.

<sup>1)</sup> 0.5 ms in combination with integrated SINAMICS S120 drives, 0.25 ms in combination with the runtime levels SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> (D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN only).

<sup>2)</sup> Values in brackets with SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> activated (for details, see SIMOTION D4x5-2 manuals)

<sup>3)</sup> 1 ms when using the TO axis and the integrated drive control

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Dynamic Servo Control (DSC)</b>					
<ul style="list-style-type: none"> <li>● With Dynamic Servo Control (DSC), the control loop of the position controller is located in the drive (with cycles of 125 µs or higher).</li> </ul>	With SINAMICS S120 and SIMODRIVE drives	●	●	●	●
<b>Memory for system data</b>					
<ul style="list-style-type: none"> <li>● Memory media</li> </ul>	MMC: Micro Memory Card CF: CompactFlash card HDD: Hard Disk Drive	MMC 64 MB	P320-3: CF 4 GB P350-3: HDD 40 GB	CF 1 GB	CF 1 GB
<ul style="list-style-type: none"> <li>● Retentive memory (for retained user data/retain variables)</li> </ul>	SIMOTION P: with UPS up to 256 KB	107 KB	15 KB	108 KB	D425-2/ D435-2: 364 KB D445-2/ D455-2: 512 KB
<ul style="list-style-type: none"> <li>● Permanent memory (for user data/data storage on exchangeable memory medium)</li> </ul>		50 MB	Any, dependent on memory configuration	300 MB	300 MB
<ul style="list-style-type: none"> <li>● RAM disk (load memory for user data/ for downloading the configuration and programs)</li> </ul>	Memory sizes can be configured with SIMOTION P	29 MB	18 MB	31 MB	D425-2: 31 MB D435-2: 41 MB D445-2: 56 MB D455-2: 76 MB
<ul style="list-style-type: none"> <li>● RAM (user memory for code and data)</li> </ul>	D410-2 and D4x5-2: additional 20 MB for Java applications	50 MB	37 MB Adjustable to a maximum of 200 MB	48 MB	D425-2: 48 MB D435-2: 64 MB D445-2: 128 MB D455-2: 256 MB
<b>Address ranges</b>					
<ul style="list-style-type: none"> <li>● Logical I/O address space in KB</li> </ul>		4	4	8	16
<ul style="list-style-type: none"> <li>● Physical I/O address space in KB</li> <li>- PROFIBUS: max. per ext. subnet each for inputs and outputs</li> <li>- PROFINET: max. for inputs and outputs (each)</li> </ul>	When PROFIBUS and PROFINET are used, the total address space applies	1	1	1	1
	D4x5-2 DP/PN: If CBE30-2 is used as a second PROFINET interface, 2 × 4 KB physical address space is available.	4	4	4	4
<ul style="list-style-type: none"> <li>● Permanent process image for background task (I/O variables) in bytes</li> </ul>		64	64	64	64
<ul style="list-style-type: none"> <li>● Additional configurable process image for each cyclic task (I/O variables)</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>● Address space per PROFIBUS DP station in bytes</li> </ul>		244	244	244	244
<ul style="list-style-type: none"> <li>● Address space per PROFINET device in bytes</li> </ul>		1400	1400	1400	1400

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Drives on SIMOTION</b>					
<b>Maximum number of axes</b>	Higher number of axes possible using multiple synchronized devices	32 axes	128 axes	8 axes (typ. 2 to 3 axes)	D425-2: 16 axes D435-2: 32 axes D445-2: 64 axes D455-2: 128 axes
<b>Integrated drive control</b> The drive control integrated in SIMOTION D is based on SINAMICS S120 Control Units: <ul style="list-style-type: none"> <li>● With SIMOTION D410-2 on the CU310-2 Control Unit, firmware version V4.x</li> <li>● With SIMOTION D4x5-2/CX32-2 on the CU320-2 Control Unit, firmware version V4.x</li> </ul> The BOP20 Basic Operator Panel and the basic positioner EPos are not supported by the integrated drive control.	SIMOTION D4x5-2: CX32-2 Controller Extension can be used to provide additional drive controls: D425-2: max. 3 CX32-2 <sup>1)</sup> D435-2: max. 5 CX32-2 <sup>1)</sup> D445-2: max. 5 CX32-2 <sup>1)</sup> D455-2: max. 5 CX32-2 <sup>1)</sup>  Per CX32-2: Servo: 1..6 Vector: 1..6 V/f: 1..12 (alternatively)	–	–	Servo: 1 Vector: 1 V/f: 1 (alternatively)	Servo: 1..6 Vector: 1..6 V/f: 1..12 (alternatively)
<b>Speed-controlled axis over PROFIBUS DP</b> <ul style="list-style-type: none"> <li>● SINAMICS S/SINAMICS G (servo, vector control)</li> <li>● SIMODRIVE 611 universal</li> <li>● MICROMASTER/MICROMASTER Vector</li> <li>● Drives with speed profile in accordance with standard message frames (PROFdrive profile 1-6)</li> </ul>	SIMOTION D: SINAMICS as the standard drive technology	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Intelligent positioning motor over PROFIBUS DP</b> <ul style="list-style-type: none"> <li>● SIMODRIVE POSMO A</li> </ul>	Standard functions available in SCOUT command library	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●

<sup>1)</sup> In principle, a fourth or sixth CX32-2 Controller Extension can also be connected, e.g. for implementing modular machine concepts. In this case, no drives/drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the Controller Extensions.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2			
<b>Drives on SIMOTION (continued)</b>								
<b>Position-controlled axis over PROFIBUS DP with PROFdrive</b> <ul style="list-style-type: none"> <li>● SINAMICS S110 (blocksize format)               <ul style="list-style-type: none"> <li>- Servo control</li> </ul> </li> <li>● SINAMICS S120 (blocksize, booksize and chassis formats)               <ul style="list-style-type: none"> <li>- Servo control</li> <li>- Vector control</li> </ul> </li> <li>● SIMODRIVE 611 universal</li> <li>● MICROMASTER MM4</li> <li>● Certified servo/vector/stepper drives in acc. with standard message frames (PROFdrive profile 1-6)</li> </ul>	SIMOTION D: SINAMICS as the standard drive technology	<ul style="list-style-type: none"> <li>● (C240)</li> <li>● (C240 PN)</li> </ul>	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●	●			
	Also linear motor <sup>1)</sup>							
	With external encoder (limited dynamic response)							
	Also linear motor <sup>1)</sup>							
<b>Speed and position-controlled axis over PROFINET IO with IRT (PROFdrive)</b> <ul style="list-style-type: none"> <li>● SINAMICS S110 (blocksize format)               <ul style="list-style-type: none"> <li>- Servo control</li> </ul> </li> <li>● SINAMICS S120 (blocksize, booksize and chassis formats)               <ul style="list-style-type: none"> <li>- Servo control</li> <li>- Vector control</li> </ul> </li> <li>● Certified servo/vector/stepper drives in acc. with standard message frames (PROFdrive profile 1-6)</li> </ul>	With external encoder (limited dynamic response)	<ul style="list-style-type: none"> <li>– (C240)</li> <li>● (C240 PN)</li> </ul>	<ul style="list-style-type: none"> <li>● (P320-3)</li> <li>○ (P350-3 DP)</li> <li>● (P350-3 PN)</li> </ul>	<ul style="list-style-type: none"> <li>– D410-2 DP</li> <li>● D410-2 DP/PN</li> </ul>	<ul style="list-style-type: none"> <li>– D4x5-2 DP</li> <li>● D4x5-2 DP/PN</li> </ul>			
	Also linear motor <sup>1)</sup>							
	With external encoder (limited dynamic response)							
<b>Analog interface with ±10 V setpoint interface</b> <ul style="list-style-type: none"> <li>● Via onboard drive interface</li> <li>● Via ADI 4 (Analog Drive Interface for 4 axes)</li> <li>● Via IM 174 (Interface Module for 4 axes)</li> </ul>	Configuration either as analog or stepper drive	<ul style="list-style-type: none"> <li>4 (C240)</li> <li>– (C240 PN)</li> </ul>	–	–	–			
	See chapter SIMOTION I/O components.					●	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●
						●	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●
<b>Hydraulic drives over ±10 V setpoint interface</b> <ul style="list-style-type: none"> <li>● Via onboard drive interface</li> <li>● Via ADI 4 (Analog Drive Interface for 4 axes)</li> <li>● Via IM 174 (Interface Module for 4 axes)</li> <li>● Analog outputs through I/O</li> <li>● Encoders through I/O</li> </ul>		<ul style="list-style-type: none"> <li>4 (C240)</li> <li>– (C240 PN)</li> </ul>	–	–	–			
						●	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●
						●	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●
						●	●	●
						●	●	●

<sup>1)</sup> See chapter SIMOTICS linear and torque motors.



# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Drives on SIMOTION (continued)</b>					
<b>Stepper drives</b>					
<ul style="list-style-type: none"> <li>● Onboard pulse direction interface for stepper drives</li> <li>● Via IM 174 (Interface Module for 4 axes)</li> </ul>	Configuration either as analog or stepper drive	4 (C240) – (C240 PN)	–	–	–
		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Encoders on SIMOTION</b>					
<b>Measuring systems that can be connected over the integrated interface</b>					
<ul style="list-style-type: none"> <li>● Quantity</li> </ul>	See chapter <a href="#">Measuring systems.</a>				
	SIMOTION D/CX32-2: Encoder connection via DRIVE-CLiQ	4 (C240) – (C240 PN)	–	1	–
<ul style="list-style-type: none"> <li>● Absolute encoder with SSI interface</li> </ul>		● (C240) – (C240 PN)	–	●	–
<ul style="list-style-type: none"> <li>● Incremental measuring systems</li> </ul>	C240: TTL D410-2: TTL/HTL	● (C240) – (C240 PN)	–	●	–
<b>Measuring systems that can be connected over the bus</b>					
<ul style="list-style-type: none"> <li>● Resolver, absolute encoder (SSI and EnDat), incremental encoder (TTL and sin/cos)</li> </ul>	Connected through drive or ADI 4/IM 174 (ADI 4/IM 174 for SSI absolute encoder and TTL incremental encoder)	●	●	●	●
<b>Connection options for 2nd encoder (external encoder)</b>					
<ul style="list-style-type: none"> <li>● Via onboard interfaces</li> </ul>		● (C240) – (C240 PN)	–	●	–
<ul style="list-style-type: none"> <li>● Via SINAMICS S110/S120</li> </ul>	SIMOTION D/CX32-2: Encoder connection via DRIVE-CLiQ	●	●	●	●
<ul style="list-style-type: none"> <li>● SIMODRIVE 611 universal over 2nd axis control (2-axis module)</li> </ul>	Option for SIMODRIVE 611 universal	●	●	●	●
<ul style="list-style-type: none"> <li>● Isochronous PROFIBUS encoder</li> </ul>	See chapter <a href="#">Measuring systems.</a>	●	●	●	●
<ul style="list-style-type: none"> <li>● PROFINET encoder with IRT</li> </ul>	See chapter <a href="#">Measuring systems.</a>	– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
<ul style="list-style-type: none"> <li>● Encoder on ADI 4 (Analog Drive Interface for 4 axes)</li> </ul>	At least one electric or hydraulic axis must be configured on ADI 4/IM 174.	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<ul style="list-style-type: none"> <li>● Encoder on IM 174 (Interface Module for 4 Axes)</li> </ul>		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Measuring inputs</b>					
<b>On-board measuring inputs</b>					
• Quantity		C240: 2+4 C240 PN:4	–	8	16
• Reproducibility		6 μs	–	Typ. 5 μs	5 μs
<b>Measuring inputs on the drives</b>					
• SIMODRIVE 611 universal		1/axis	1/axis	1/axis	1/axis
• SINAMICS S110 (CU305)		2/closed-loop control	2/closed-loop control	2/closed-loop control	2/closed-loop control
• SINAMICS S120 (CU310-2)		8/closed-loop control	8/closed-loop control	8/closed-loop control	8/closed-loop control
• SINAMICS S120 (CU320-2)		8/closed-loop control	8/closed-loop control	8/closed-loop control	8/closed-loop control
• SIMOTION CX32-2	D425-2: max. 3 CX32-2 <sup>1)</sup> D435-2: max. 5 CX32-2 <sup>1)</sup> D445-2: max. 5 CX32-2 <sup>1)</sup> D455-2: max. 5 CX32-2 <sup>1)</sup>	–	–	–	4/closed-loop control
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32-2	See chapter SIMOTION I/O components.	24	24	24	24
- Number of measuring inputs per Terminal Module, max.		125 μs	125 μs	125 μs	125 μs
- Reproducibility					
• Over TM17 Terminal Module High Feature on SINAMICS S120 or SIMOTION D/CX32-2		16	16	16	16
- Number of measuring inputs per Terminal Module, max.		≤ 1 μs	≤ 1 μs	≤ 1 μs	≤ 1 μs
- Reproducibility					
<b>Output cams</b>					
<b>High-speed output cams</b> (hardware-supported output cams with higher resolution)					
• On-board output cams		●	–	●	●
- Reproducibility		70 μs	–	Typ. 125 μs	10 μs
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32-2	See chapter SIMOTION I/O components.	125 μs	125 μs	125 μs	125 μs
- Reproducibility					
• Over TM17 Terminal Module High Feature on SINAMICS S120 or SIMOTION D/CX32-2			≤ 10 μs	≤ 10 μs	≤ 10 μs
- Reproducibility					

<sup>1)</sup> In principle, a fourth or sixth CX32-2 Controller Extension can also be connected, e.g. for implementing modular machine concepts. In this case, no drives/drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the Controller Extensions.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Output cams (continued)</b>					
<b>Standard output cams</b> (update in position controller or IPO cycle, reproducibility of the output cam depends on the implemented I/O)					
<ul style="list-style-type: none"> <li>● On-board output cams</li> </ul>		●	–	●	●
<ul style="list-style-type: none"> <li>● Over TM15/TM17 Terminal Module High Feature on SINAMICS S120 or SIMOTION D/CX32-2</li> </ul>	See chapter <a href="#">SIMOTION I/O components</a> .	●	●	●	●
<ul style="list-style-type: none"> <li>● Over S7-300 backplane bus of SIMOTION C</li> </ul>		●	–	–	–
<ul style="list-style-type: none"> <li>● Over PROFIBUS DP</li> </ul>		●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<ul style="list-style-type: none"> <li>● Over PROFINET IO</li> </ul>		– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
<ul style="list-style-type: none"> <li>● Output to internal system variable</li> </ul>		●	●	●	●
<b>Integrated I/O interfaces</b>					
<b>Programmable digital inputs/ outputs</b> (can be parameterized individually as either input or output) <ul style="list-style-type: none"> <li>● of which for output cam, max.</li> <li>● of which as measuring inputs, max.</li> </ul>	Further inputs/outputs can be implemented for output cam or measuring inputs via the TM15 or TM17 High Feature Terminal Modules.	–	–	8	16
		–	–	8	8
		–	–	8	16
<b>Digital inputs</b> (fixed inputs, cannot be parameterized) <ul style="list-style-type: none"> <li>● of which inputs with specific functions <ul style="list-style-type: none"> <li>- Measuring inputs, max.</li> <li>- External zero mark signal for referencing, max.</li> <li>- Fail-safe digital inputs (F-DI)</li> </ul> </li> </ul>	D410-2: The 3 F-DI can also be used as 6 DI.	18	–	5 + 6 (3 F-DI)	12
		2+4 (C240) 4 (C240 PN)	–	–	–
		4 (C240)	–	–	–
		–	–	3	–
<b>Digital outputs</b> (fixed outputs, cannot be parameterized) <ul style="list-style-type: none"> <li>● of which for outputs with specific functions <ul style="list-style-type: none"> <li>- High-speed outputs of output cams, max.</li> <li>- Fail-safe digital outputs (F-DO)</li> </ul> </li> </ul>	D410-2: The F-DO can also used as DO.	8	–	1 (1 F-DO)	–
		8	–	–	–
		–	–	1	–
<b>Relay outputs with specific functions</b> <ul style="list-style-type: none"> <li>● Controller enable</li> <li>● Ready</li> </ul>		4 (C240)	–	–	–
		1	–	–	–
<b>Analog inputs</b> SIMOTION D: D410-2: Also over TM31 D4x5-2: Over TM31 or TB30	See chapter <a href="#">SIMOTION I/O components</a> .	–	–	1 (on-board) ○ (TM31)	○

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Integrated I/O interfaces (continued)</b>					
<b>Analog outputs</b> SIMOTION C240: Can be used as drive interface or standard analog outputs. SIMOTION D: D410-2: Over TM31 D4x5-2: Over TM31 or TB30	See chapter <a href="#">SIMOTION I/O components</a> .	4 (C240)	–	○	○
<b>Pulse direction interface for stepper drives</b>	SIMOTION C240: Configuration either as analog or stepper drive.	4 (C240)	–	–	–
<b>SIMOTION C centralized I/O modules</b>					
<ul style="list-style-type: none"> <li>• Centralized I/O modules per system, max.</li> </ul>		16	–	–	–
<ul style="list-style-type: none"> <li>• Central/expansion rack, max.</li> </ul>	SIMOTION C: max. two-tier configuration with IM 365 interface module	○	–	–	–
<ul style="list-style-type: none"> <li>• Connectable central SIMATIC S7-300 I/Os</li> </ul>	For suitable modules see chapter <a href="#">SIMOTION I/O components</a> .	●	–	–	–
<b>Connectable distributed I/O modules</b>					
<b>Distributed I/O (over PROFIBUS DP)</b>  <ul style="list-style-type: none"> <li>• SIMATIC ET 200S</li> <li>• SIMATIC ET 200pro</li> <li>• SIMATIC ET 200M</li> <li>• SIMATIC ET 200eco</li> <li>• ADI 4 (Analog Drive Interface for 4 Axes)</li> <li>• IM 174 (Interface Module for 4 Axes)</li> <li>• All certified standard slaves (DP-V0, DP-V1, DP-V2)</li> </ul>	For suitable modules see chapter <a href="#">SIMOTION I/O components</a> .  Isochronous: SIMATIC ET 200S SIMATIC ET 200M ADI 4 IM 174	●	– (P320-3) ● (P350-3 DP) ○ (P350-3 PN)	●	●
<b>Distributed I/O (over PROFINET IO)</b>  <ul style="list-style-type: none"> <li>• TMC</li> <li>• SIMATIC ET 200S, ET 200SP</li> <li>• SIMATIC ET 200M</li> <li>• SIMATIC ET 200pro</li> <li>• SIMATIC ET 200eco PN</li> <li>• All certified PROFINET devices</li> </ul>	Isochronous: SIMATIC ET 200S SIMATIC ET 200SP (available soon) TMC	– (C240) ● (C240 PN)	● (P320-3) ○ (P350-3 DP) ● (P350-3 PN)	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
<b>SINAMICS drive I/O (over DRIVE-CLiQ)</b>  <ul style="list-style-type: none"> <li>• Via Terminal Modules TM15, TM17 High Feature, TM31, TM41, TM54F</li> <li>• Via TB30 Terminal Board</li> </ul>	For connection to SIMOTION C and P over SINAMICS S120  Plug-in card for SIMOTION D4x5-2 and SINAMICS CU320-2	●	●	●	●
		●	●	–	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>SIMOTION HMI devices</b>					
<b>Connection over PROFIBUS DP (configured using WinCC flexible)</b> <ul style="list-style-type: none"> <li>● SIMATIC MP 177 DP Mobile Panel</li> <li>● SIMATIC MP 277 Mobile Panel</li> <li>● SIMATIC TP 177B and TP 277 Touch Panel</li> <li>● SIMATIC OP 177B and OP 277 Operator Panel</li> <li>● SIMATIC MP 277 and MP 377 Multi Panel</li> <li>● SIMATIC Panel PC 477, PC 677, PC 877</li> </ul>		●	<ul style="list-style-type: none"> <li>– (P320-3)</li> <li>● (P350-3 DP)</li> <li>○ (P350-3 PN)</li> </ul>	●	●
<b>Connection over Ethernet/PROFINET (when configured using WinCC flexible)</b> <ul style="list-style-type: none"> <li>● SIMATIC MP 177 PN Mobile Panel <sup>1)</sup></li> <li>● SIMATIC MP 277 Mobile Panel <sup>1)</sup></li> <li>● SIMATIC TP 277 Touch Panel <sup>1)</sup></li> <li>● SIMATIC TP 177B Touch Panel Color <sup>1)</sup></li> <li>● SIMATIC OP 177B Operator Panel Color <sup>1)</sup></li> <li>● SIMATIC MP 177</li> <li>● SIMATIC OP 277 Operator Panel <sup>1)</sup></li> <li>● SIMATIC MP 277 <sup>1)</sup> and MP 377 Multi Panel <sup>1)</sup></li> <li>● SIMATIC Panel PC 277, PC 477, PC 577, PC 677, PC 877</li> </ul>		●	●	●	●
<b>HMI software for SIMOTION</b>					
<ul style="list-style-type: none"> <li>● WinCC flexible</li> <li>● WinCC (SCADA system, Version V7.0 and higher)</li> </ul>		○	○	○	○
<b>Software for extended communication with SIMOTION</b>					
<ul style="list-style-type: none"> <li>● SIMATIC NET OPC server</li> <li>● SIMOTION IT OPC XML-DA (over Ethernet) <ul style="list-style-type: none"> <li>- Open communication over TCP/IP and SOAP standard protocols</li> <li>- Clients on any hardware with various operating systems (Windows, Linux, etc.)</li> <li>- According to OPC Foundation standard OPC XML-DA V1.01</li> </ul> </li> </ul>	<a href="#">See section SIMOTION runtime software.</a>	○	● <sup>2)</sup>	○	○
		● <sup>3)</sup>	● <sup>3)</sup>	●	●

<sup>1)</sup> PROFINET IO-capable.

<sup>2)</sup> Subject to license.

<sup>3)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Software for extended communication with SIMOTION (continued)</b>					
<ul style="list-style-type: none"> <li>● SIMOTION MIIF: Multipurpose Information Interface               <ul style="list-style-type: none"> <li>- Symbolic access to SIMOTION data via Ethernet</li> <li>- SIMOTION as server, e.g. operator panels as clients</li> </ul> </li> </ul>		○	○	○	○
<b>Communication</b>					
<b>Ethernet interfaces</b>					
<ul style="list-style-type: none"> <li>● Number and transmission rates</li> </ul>		1 × 10/100 Mbit/s	P320-3: 1 × 10/100/1000 Mbit/s P350-3: 2 × 10/100 Mbit/s	1 × 10/100 Mbit/s	D4x5-2 DP: 3 × 10/100/1000 Mbit/s D4x5-2 DP/PN: 2 × 10/100/1000 Mbit/s
<b>PROFIBUS DP interfaces</b>					
<ul style="list-style-type: none"> <li>● On-board/support isochronous communication</li> </ul>	One interface can be used as an MPI. SIMOTION P350-3: The PROFIBUS version can be optionally retrofitted with PROFINET.	2/2	P320-3: –/– P350-3 DP: 2/2 P350-3 PN: –/–	D410-2 DP: 2/2 D410-2 DP/PN: 1/1	2/2
<ul style="list-style-type: none"> <li>● On-board CP5621</li> </ul>	For PG/PC and HMI	–	P350-3: 1	–	–
<ul style="list-style-type: none"> <li>● Transmission rates in Mbit/s</li> </ul>		1.5 / 3 / 6 /12	1.5 / 3 / 6 /12	1.5 / 3 / 6 /12	1.5 / 3 / 6 /12
<ul style="list-style-type: none"> <li>● Number of PROFIBUS DP slaves</li> </ul>	Per PROFIBUS DP subnet	64	64	64	64
<b>PROFINET interfaces</b>					
<ul style="list-style-type: none"> <li>● On-board ports</li> </ul>	SIMOTION P350-3 DP: PROFINET can be optionally retrofitted by means of MCI-PN Communication Board	C240: – C240 PN: 3	P320-3: 3 P350-3 DP: 4, ○ P350-3 PN: 4	D410-2 DP: – D410-2 DP/PN: 2	D4x5-2 DP: – D4x5-2 DP/PN: 3
<ul style="list-style-type: none"> <li>● Number of PROFINET devices (provided that PROFINET interface is onboard or optionally retrofitted)</li> </ul>	D4x5-2: CBE30-2 can be implemented as second PROFINET interface for D4x5-2 DP/PN. Per PROFINET interface	64	64	64	64
<ul style="list-style-type: none"> <li>● Media redundancy (MRP and MRPD)</li> </ul>		●	P320-3: ● P350-3: –	–	●
<b>Further communication interfaces</b>					
<ul style="list-style-type: none"> <li>● Serial interfaces</li> </ul>		–	1	–	–
<ul style="list-style-type: none"> <li>● USB interfaces</li> </ul>	D4x5-2: for upgrading from D4x5-2 Control Units using a USB memory stick	–	P320-3: 4 × USB 2.0 P350-3: 4 × USB 2.0	–	2
<ul style="list-style-type: none"> <li>● DRIVE-CLiQ interfaces</li> </ul>		–	–	1	D425-2: 4 D435-2: 6 D445-2: 6 D455-2: 6

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Communication (continued)</b>					
<b>Connections over PROFIBUS DP and Ethernet/PROFINET</b> <ul style="list-style-type: none"> <li>● PROFIBUS DP</li> <li>● Ethernet/PROFINET</li> </ul>	SIMOTION C: PROFINET with C240 PN only  The connection resources can be assigned as required, over PROFIBUS DP or Ethernet.	C240: ● C240 PN: ●	P320-3: – P350-3 DP: ● P350-3 PN: –	●	●
		C240: ●/– C240 PN: ●/●	P320-3: ●/● P350-3 DP: ●/○ P350-3 PN: ●/●	D410-2 DP: ●/– D410-2 DP/PN: ●/●	D4x5-2 DP: ●/– D4x5-2 DP/PN: ●/●
<b>Online connections, max.</b>		16	16	16	16
<ul style="list-style-type: none"> <li>● SIMOTION SCOUT engineering system (SCOUT occupies up to 3 online connections)</li> </ul>		2	2	2	2
<ul style="list-style-type: none"> <li>● HMI</li> </ul>		5	5	5	5
<ul style="list-style-type: none"> <li>● OPC</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>● Basic communication Xsend / Xreceive (not via Ethernet)</li> </ul>		5	5	5	5
<ul style="list-style-type: none"> <li>● Standard TCP/IP connections</li> </ul>		45	75	45	75
<ul style="list-style-type: none"> <li>● SIMOTION IT</li> </ul>		●	●	●	●
<b>Communication functions over PROFIBUS between:</b> <ul style="list-style-type: none"> <li>● SIMOTION – SIMATIC HMI/WinCC flexible               <ul style="list-style-type: none"> <li>- HMI data exchange: Support from the SIMOTION operating system</li> <li>- Plant-wide access to process data and displays</li> <li>- Interrupt mechanism: Alarms are event-driven</li> </ul> </li> <li>● SIMOTION – SIMOTION               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables (symbolic)</li> <li>- XSND/XRCV, max. 200 bytes</li> </ul> </li> <li>● SIMOTION – SIMATIC S7               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables</li> <li>- XSND/XRCV, max. 76 bytes</li> </ul> </li> <li>● SIMOTION – SIMATIC NET OPC</li> <li>● SIMOTION – PG/PCs with STEP 7 and SCOUT</li> <li>● PROFIBUS DP slave-to-slave communication</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2	
<b>Communication (continued)</b>						
<b>Communication functions over PROFINET IO between:</b> <ul style="list-style-type: none"> <li>● SIMOTION – SIMOTION               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms</li> <li>Process image, e.g. (% I1.3)</li> <li>I/O variables (symbolic)</li> </ul> </li> <li>● SIMOTION – SIMATIC S7               <ul style="list-style-type: none"> <li>- Distributed I/O mechanisms</li> <li>Process image, e.g. (% I1.3)</li> <li>I/O variables                   <ul style="list-style-type: none"> <li>- For SIMATIC – SIMOTION: SIMOTION as I-Device</li> <li>- For SIMOTION – SIMATIC: over SIMATIC CP</li> </ul> </li> </ul> </li> <li>● Slave-to-slave communication between SIMOTION controllers</li> </ul>		Basic version with regard to SIMOTION PROFINET standard feature on C240 PN, P320-3, P350-3 PN, D410-2 DP/PN and D4x5-2 DP/PN On P350-3 DP optionally by means of PROFINET board.	●	●	●	●
<b>Communication functions over Ethernet/PROFINET between:</b> <ul style="list-style-type: none"> <li>● SIMOTION – SIMATIC HMI/WinCC flexible               <ul style="list-style-type: none"> <li>- HMI data exchange: Support from the SIMOTION operating system</li> <li>- Plant-wide access to process data and displays</li> <li>- Interrupt mechanism: Alarms are event-driven</li> </ul> </li> <li>● SIMOTION – SIMATIC NET OPC</li> <li>● SIMOTION IT OPC XML-DA (over Ethernet)               <ul style="list-style-type: none"> <li>- Open communication over TCP/IP and SOAP standard protocols</li> <li>- Clients on any hardware with various operating systems (Windows, Linux, etc.)</li> <li>- According to OPC Foundation standard OPC XML-DA V1.01</li> </ul> </li> <li>○ SIMOTION MIIF: Multipurpose Information Interface               <ul style="list-style-type: none"> <li>- Symbolic access to SIMOTION data via Ethernet</li> <li>- SIMOTION as server, e.g. operator panels as clients</li> </ul> </li> <li>● SIMOTION – PG/PCs with STEP 7 and SCOUT</li> <li>● S7 routing Ethernet/PROFIBUS DP</li> </ul>			●	●	●	●
<ul style="list-style-type: none"> <li>● SIMOTION – SIMATIC NET OPC</li> <li>● SIMOTION IT OPC XML-DA (over Ethernet)</li> </ul>			● <sup>1)</sup>	● <sup>1)</sup>	●	●
<ul style="list-style-type: none"> <li>○ SIMOTION MIIF: Multipurpose Information Interface</li> </ul>			○	○	○	○

<sup>1)</sup> Subject to license for SIMOTION Kernel < V4.2.



# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Communication (continued)</b>					
<b>UDP and TCP/IP communication functions over Ethernet/PROFINET between:</b> <ul style="list-style-type: none"> <li>• SIMOTION – SIMOTION</li> <li>• SIMOTION – SIMATIC</li> <li>• SIMOTION – PC</li> </ul>		●	●	●	●
<b>Serial communication via a point-to-point connection</b> <ul style="list-style-type: none"> <li>• CP 340 and CP 341 communication modules</li> <li>• 1SI communication module (connected over ET 200S)</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●
<b>Communication via AS-Interface</b> <ul style="list-style-type: none"> <li>• CP 343-2 P communication module</li> <li>• DP/AS-Interface Link 20E/ Link Advanced</li> <li>• IE/AS-Interface link PN IO</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●
<b>Connectable network couplers</b> <ul style="list-style-type: none"> <li>• DP/DP coupler for connecting two PROFIBUS DP networks</li> <li>• PN/PN coupler for connecting two PROFINET IO networks</li> </ul>	Basic version with regard to SIMOTION	●	●	●	●
<b>PROFIsafe drives on SIMOTION</b>					
<b>Max. number of PROFIsafe drives on SIMOTION with SINAMICS S120 drive system:</b> <ul style="list-style-type: none"> <li>• via PROFIBUS with PROFIsafe <ul style="list-style-type: none"> <li>- with 1 × PROFIBUS interface</li> <li>- with 2 × PROFIBUS interface</li> </ul> </li> <li>• via PROFINET with PROFIsafe</li> </ul>	SIMOTION as I-Slave on SIMATIC F-CPU over PROFIBUS  SIMOTION as I-Device on SIMATIC F-CPU over PROFINET Configuration: A higher-level SIMATIC F-CPU controls the safety functions of the SINAMICS S120 drives that are assigned to SIMOTION via the I-Slave/ I-Device interface of the SIMOTION controller. SIMOTION routes the safety telegrams through to the drives.	16	P320-3: – P350-3 DP: 16 P350-3 PN: –	8	16
		32	P320-3: – P350-3 DP: 32 P350-3 PN: –	8	32
		32	P320-3: 64 P350-3 DP: – P350-3 PN: 64	D410-2 DP: – D410-2: DP/PN: 8	64

# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<b>SIMOTION Kernel</b>					
<b>Execution system</b>					
<ul style="list-style-type: none"> <li>● System tasks for motion control               <ul style="list-style-type: none"> <li>- SERVO (position control cycle)</li> <li>- IPO (interpolation cycle)</li> <li>- SERVO<sub>Fast</sub></li> <li>- IPO<sub>Fast</sub></li> </ul> </li> </ul>	SERVO <sub>Fast</sub> and IPO <sub>Fast</sub> allow axes with differing dynamic responses to be assigned to a slow bus system and a fast bus system, as well as especially fast I/O processing. High-speed PROFINET I/O modules are used for this purpose.	●	●	●	●
<ul style="list-style-type: none"> <li>- MotionTasks (sequential)</li> <li>- ServoSynchronousTask (cyclic, synchronous with the position control cycle)</li> </ul>		20	32	32	32
<ul style="list-style-type: none"> <li>- Task structure/program execution               <ul style="list-style-type: none"> <li>- BackgroundTask (cyclic)</li> <li>- TimerInterruptTasks (time-controlled down to 1 ms)</li> <li>- IPOSynchronousTask (cyclic, synchronous with the interpolation cycle)</li> <li>- InterruptTasks (for user) (event-driven)</li> <li>- TControlTasks (temperature control)</li> <li>- StartupTask (for transition from STOP to RUN)</li> <li>- ShutdownTask (for transition from RUN to STOP)</li> </ul> </li> </ul>	Adjustable monitoring time	1	1	1	1
<ul style="list-style-type: none"> <li>- Task structure / error processing (SystemInterruptTasks)               <ul style="list-style-type: none"> <li>- ExecutionFaultTask (starts in the event of an error when executing a program)</li> <li>- TechnologicalFaultTask (starts in the event of an error on a technology object)</li> <li>- PeripheralFaultTask (starts in the event of an error on the I/O)</li> <li>- TimeFaultTask (starts in the event of a TimerInterruptTask timeout)</li> <li>- TimeFaultBackgroundTask (starts in the event of a BackgroundTask timeout)</li> </ul> </li> </ul>	Central troubleshooting is possible	1	1	1	1
		5	5	5	5
		2	2	2	2 (3) <sup>1)</sup>
		2	2	2	2
		5	5	5	5
		1	1	1	1
		1	1	1	1
		1	1	1	1
		1	1	1	1
		1	1	1	1

<sup>1)</sup> Values in brackets with SERVO<sub>Fast</sub> and IPO<sub>Fast</sub> activated for D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>SIMOTION Kernel (continued)</b>					
<b>Execution system (continued)</b>					
<ul style="list-style-type: none"> <li>● Program organization               <ul style="list-style-type: none"> <li>- Units (source program)</li> <li>- Programs</li> <li>- Function blocks (FBs)</li> <li>- Functions (FCs)</li> <li>- System functions (SFs)</li> <li>- Libraries</li> </ul> </li> </ul>		●	●	●	●
<b>PLC command set</b> (according to IEC 61131-3; optionally expandable by technology functions)					
System functions, e.g. for		●	●	●	●
<ul style="list-style-type: none"> <li>● Interrupt and error handling</li> <li>● Copying data</li> <li>● Clock functions</li> <li>● Diagnostic functions</li> <li>● Module parameterization</li> <li>● Operating mode transitions, Run/Stop</li> <li>● Reading and writing of data blocks from the user program to an exchangeable memory medium</li> <li>● DPV1 communication to DP slaves</li> <li>● Read/write drive parameters</li> <li>● DP slaves/PROFINET devices can be connected to and disconnected from application</li> <li>● DP slave and IP address can be set in user program</li> <li>● DP station diagnostics</li> <li>● Activate/deactivate technology objects</li> <li>● Counter (IEC commands)</li> <li>● Timer (IEC commands)</li> <li>● Real-time clock, format [DATE_AND_TIME]</li> </ul>					

# SIMOTION Motion Control System

## Overview of SIMOTION functions

<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<b>Motion Control technology package</b>					
<b>Technology functions</b>					
<ul style="list-style-type: none"> <li>• Motion Control Basic</li> <li>• POS – Positioning</li> <li>• GEAR – Synchronous operation</li> <li>• CAM – Cam</li> <li>• PATH – Path interpolation</li> </ul> <p>The technology package functions are accessed via language commands, system variables and through function blocks in accordance with PLCopen.</p>	No license required	●	●	●	●
	Use of the functions during runtime is subject to license. SIMOTION D410-2 already contains the technology functions for precisely one axis. (D410-2 no PATH)	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
		● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
		● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
		● <sup>1)</sup>	● <sup>1)</sup>	–	● <sup>1)</sup>
<b>Axis types</b>					
<ul style="list-style-type: none"> <li>• Electrical/hydraulic/stepper motor axes</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• Speed-controlled axis</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• Positioning axes               <ul style="list-style-type: none"> <li>- Rotary axis</li> <li>- Linear axis</li> <li>- Modulo for linear and rotary axes</li> <li>- Force/pressure-controlled axis</li> <li>- Force/pressure-limited axis</li> </ul> </li> </ul>	Included with POS license or higher	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Synchronous axis</li> </ul>	Included with GEAR license or higher	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Path axis</li> </ul>	Included with GEAR license or higher	● <sup>1)</sup>	● <sup>1)</sup>	–	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Cam axis</li> </ul>	Included with CAM license or higher	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<ul style="list-style-type: none"> <li>• Virtual axis</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• Simulation axis</li> </ul>		●	●	●	●
<b>Systems of units</b>					
<ul style="list-style-type: none"> <li>• Metric (mm, m, Nm, Pa, ...)</li> </ul>		●	●	●	●
<ul style="list-style-type: none"> <li>• US (inch, feet, PSI, lb, ...)</li> </ul>		●	●	●	●
<b>Axis monitoring functions</b>					
<p>The activated monitoring functions are executed cyclically.</p> <ul style="list-style-type: none"> <li>• Watchdog</li> <li>• Hardware and software limit switches</li> <li>• Position/zero-speed monitoring</li> <li>• Dynamic following error monitoring</li> <li>• Encoder monitoring, cable break</li> <li>• Force/pressure monitoring</li> <li>• Setpoint</li> <li>• Plausibility in data exchange</li> </ul>		●	●	●	●

<sup>1)</sup> Use of the functions during runtime is subject to license. Exception: SIMOTION D410-2 already contains the Motion Control technology functions for just one axis.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Other technology packages</b>					
<b>TControl technology package</b> <ul style="list-style-type: none"> <li>• With technology functions for temperature control</li> </ul>	Technology package integrated in SCOUT	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>	● <sup>1)</sup>
<b>Technology package Drive Control Chart (DCC)</b> <ul style="list-style-type: none"> <li>• With technology functions for Drive Control Chart</li> </ul>	Technology package integrated in SCOUT	●	●	●	●
<b>Technology package Multipurpose Information Interface (MIIF)</b> <ul style="list-style-type: none"> <li>• With multi-functional communication functions</li> </ul>	Technology package can be purchased via your Siemens contact	○ <sup>1)</sup>	○ <sup>1)</sup>	○ <sup>1)</sup>	○ <sup>1)</sup>
<b>SIMOTION IT</b>					
<b>SIMOTION IT DIAG</b> Integrated web server on the SIMOTION controller <ul style="list-style-type: none"> <li>• Service and diagnostic functions provided via Internet browser with extensive information functions (hardware/software version display, process utilization, memory usage, diagnostic buffer, task runtimes, user logbook, operating state, time of day, etc.)</li> <li>• Access to all variables on the control system using variable browser functions</li> <li>• Watch tables (control variable diagnostics in status and control tables that can be permanently saved)</li> <li>• Trace (control variable tracing for one controller or several synchronously)</li> <li>• Generation of diagnostic data (diagnostic buffer, alarms, states of variables, ...)</li> <li>• Project update</li> <li>• Firmware update</li> <li>• Password-protected access</li> <li>• Remote access to SIMOTION file system</li> <li>• User-defined service and diagnostic pages</li> </ul>		● <sup>2)</sup>	● <sup>2)</sup>	●	●

<sup>1)</sup> Use of the functions during runtime is subject to license.

<sup>2)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>SIMOTION IT (continued)</b>					
<b>SIMOTION IT OPC XML-DA</b> Integrated OPC XML-DA server on the SIMOTION controller <ul style="list-style-type: none"> <li>● Read/write variables</li> <li>● Browse variables</li> <li>● Trace interface via SOAP</li> <li>● Password-protected access</li> </ul>		● <sup>1)</sup>	● <sup>1)</sup>	●	●
<b>SIMOTION IT Virtual Machine</b> (integrated Java runtime environment on the SIMOTION controller) <ul style="list-style-type: none"> <li>● Read and write access to the SIMOTION variables</li> <li>● Read and write access to the non-volatile memory (NVRAM)</li> <li>● Use of system functions (functions of the technology objects)</li> <li>● Use of standard Java classes in the device (file access, network functions, string functions, etc.)</li> <li>● Creation of servlets, for the purpose of enhancing the display of menu interfaces in HTML pages</li> </ul>	Licensing through SIMOTION IT Virtual Machine  Note: For SIMOTION Kernel < V4.2, can be used as combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.	●	●	●	●
<b>SIMOTION SCOUT engineering system</b>					
<b>SIMOTION SCOUT basic functions</b> <ul style="list-style-type: none"> <li>● SCOUT Workbench</li> <li>● STARTER Drive commissioning/parameterization</li> <li>● Hardware and network configuration</li> <li>● Diagnostics for testing and commissioning</li> <li>● Axis control panel</li> <li>● Program editors/programming languages (command set in accordance with IEC 61131-3)               <ul style="list-style-type: none"> <li>- Structured Text (ST)</li> <li>- Ladder Logic (LAD)</li> <li>- Function Block Diagram (FBD)</li> <li>- Motion Control Chart (MCC)</li> </ul> </li> <li>● Creation of cams (basic)</li> <li>● Creation of technology objects</li> <li>● Technology tools (function generator)</li> <li>● Operator interface, online help and documentation in English, French, German and Italian</li> </ul>		●	●	●	●
<b>SIMOTION SCOUT optional packages</b> <ul style="list-style-type: none"> <li>● CamTool (graphical cam editor)</li> <li>● DCC editor (graphical editor for Drive Control Chart)</li> </ul>		○	○	○	○

<sup>1)</sup> Subject to license for SIMOTION Kernel < V4.2.

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Testing and diagnostics with SIMOTION SCOUT</b>					
<b>Information functions</b>					
<ul style="list-style-type: none"> <li>• Hardware/software version</li> <li>• Processor utilization</li> <li>• Memory utilization</li> <li>• Diagnostic buffer</li> <li>• Task runtimes</li> <li>• User logbook</li> <li>• Operating status</li> <li>• Time</li> </ul>		●	●	●	●
<b>Comparison functions for projects</b>					
<ul style="list-style-type: none"> <li>• Comparison of objects in projects: <ul style="list-style-type: none"> <li>- between offline projects</li> <li>- between online and offline projects</li> </ul> </li> <li>• Detailed comparison: Shows differences between objects in detail</li> <li>• Matching: Projects and objects can be merged</li> </ul>		●	●	●	●
<b>Program test functions</b>					
<ul style="list-style-type: none"> <li>• Control/status variables</li> <li>• Watch tables</li> <li>• Status program/FB/FC (with specification of the call point)</li> <li>• Single-step MCC</li> <li>• Breakpoints in all languages (ST, MCC, LAD/FBD)</li> <li>• Tracer for MCC (for fast program sequences)</li> <li>• Trace technology object (recording of all technology object commands)</li> </ul>		●	●	●	●
<b>Trace</b>					
<ul style="list-style-type: none"> <li>• Recording of I/O, system and program variables (on one controller as well as over several synchronously)</li> <li>• Recording from position control cycle onwards (<math>n \times</math> position control cycle)</li> <li>• Trigger: Instantaneous, rising/falling edge, at code point system variable</li> <li>• Measuring functions for optimizing the speed/position controller (step response, ramp, frequency curve)</li> <li>• Automatic setting of the speed controller/position controller</li> <li>• Bode diagram, FFT analysis, function generator, mathematical functions</li> <li>• Endless trace</li> <li>• Recording over defined measuring period</li> </ul>		●	●	●	●

# SIMOTION Motion Control System

## Overview of SIMOTION functions

	Notes	SIMOTION C240/C240 PN	SIMOTION P320-3/P350-3	SIMOTION D410-2	SIMOTION D4x5-2
<ul style="list-style-type: none"> <li>● Basic version (function or license is purchased with the device or SCOUT)</li> <li>○ Option (must be acquired as software/hardware)</li> <li>– Not possible</li> </ul>					
<b>Testing and diagnostics with SIMOTION SCOUT (continued)</b>					
<b>Further diagnostic functions</b>					
<ul style="list-style-type: none"> <li>● Module diagnostics               <ul style="list-style-type: none"> <li>- Centralized</li> <li>- Distributed (e.g. ET 200M)</li> </ul> </li> <li>● PROFIBUS DP station diagnostics</li> <li>● PROFINET station diagnostics</li> </ul>		●	●	●	●
	PROFINET standard feature on C240 PN, P320-3, P350-3 PN, D410-2 DP/PN and D4x5-2 DP/PN. Optional on P350-3 DP by means of PROFINET board.	●	●	●	●
<ul style="list-style-type: none"> <li>● Diagnostic buffer               <ul style="list-style-type: none"> <li>- No. of entries, max.</li> </ul> </li> <li>● Process fault diagnostics (Alarm_S)               <ul style="list-style-type: none"> <li>- Messages from user program</li> <li>- No. of entries, max.</li> </ul> </li> </ul>	On SIMOTION D, one diagnostic buffer is provided for SIMOTION and another for the integrated SINAMICS drive.	200	200	2 × 100	2 × 200
		●	●	●	●
		40	40	40	40
<b>Engineering drives</b>					
<b>STARTER (integrated in SCOUT)</b>					
Drive/commissioning software for:					
<ul style="list-style-type: none"> <li>● SINAMICS S / SINAMICS G</li> <li>● MICROMASTER 410/420/430/440</li> </ul>		●	●	●	●
<b>Drive ES BASIC</b>					
Engineering tools and integrated data storage in SIMATIC S7/SIMOTION projects for:					
<ul style="list-style-type: none"> <li>● SINAMICS S/SINAMICS G (STARTER)</li> <li>● MICROMASTER 410/420/430/440 (STARTER)</li> <li>● SIMODRIVE (SimoCom U/SimoCom A)</li> </ul>	Drive ES BASIC is included complete with license in the SIMOTION SCOUT software package.	●	●	●	●



# SIMOTION I/O components



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# SIMOTION I/O components

## Overview

	Designation	Description	Page
<b>Compact I/O</b>			
	SIMOTION TMC	SIMOTION TMC – compact I/O modules with high channel densities, designed for SINAMICS S120 booksize compact	<b>10/3</b>
			<b>10/3</b>
<b>Power supplies</b>			
	Power supplies for SIMOTION C/SIMATIC ET 200M	Power supplies for snapping onto the SIMATIC S7-300 routing rail	<b>10/9</b>
	Universal SITOP power supplies	Power supplies for snapping onto 35 mm (1.38 in) standard rails (EN 50022)	<b>10/10</b>
	Uninterruptible SITOP power supplies with battery module	Power supplies for completely bridging power failures or fluctuations	<b>10/11</b>
	Uninterruptible SITOP power supply with capacitor module		<b>10/12</b>
<b>SIMATIC S7-300 I/O</b>			
	Digital Modules	For the connection of digital sensors and actuators	<b>10/14</b>
	Analog Modules	For the connection of analog sensors and actuators	<b>10/15</b>
	FM 350-1, FM 350-2 Counter Modules	For simple and universal counting and measuring tasks	<b>10/16</b>
	FM 352 Cam controller	High-speed, electronic cam controller	<b>10/17</b>
	FM 352-5 High Speed Boolean Processor	For applications with an extremely short response time	<b>10/17</b>
	CP 340, CP 341 Communication Modules	For a point-to-point connection	<b>10/18</b>
	SM 374 Simulator Module	For program testing during commissioning and operation	<b>10/19</b>
	DM 370 Dummy Module	For reserving slots for unconfigured Signal Modules	<b>10/19</b>
	Accessories		<b>10/20</b>
	<b>Distributed I/O</b>		
	SIMATIC ET 200SP	Extremely flexible and modular distributed I/O system	<b>10/21</b>
	SIMATIC ET 200M	With high channel densities	<b>10/22</b>
	SIMATIC ET 200S	Multi-talent with comprehensive function range	<b>10/23</b>
	SIMATIC ET 200eco	Digital block I/O	<b>10/24</b>
	SIMATIC ET 200eco PN	Digital block I/O with PROFINET connection	<b>10/35</b>
	SIMATIC ET 200pro	Modular and multi-functional	<b>10/36</b>
	SINUMERIK Analog Drive Interface for 4 Axes ADI 4	For the connection of drives with analog $\pm 10$ V interface and stepper drives	<b>10/37</b>
	SIMATIC Interface Module IM 174	For the connection of drives with analog $\pm 10$ V interface and stepper drives	<b>10/38</b>
	AS-Interface	Modules and accessories for gateway to AS-Interface	<b>10/38</b>
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<b>SINAMICS drive I/O</b>			
	TM15 and TM17 High Feature Terminal Modules	For digital inputs and outputs with short signal delay times	<b>10/44</b>
			<b>10/47</b>
<b>Other I/O modules</b>			
	SIPLUS extreme	For extremely harsh industrial environmental conditions	<b>10/50</b>
	SIMATIC RFID systems	For controlling and optimizing the material flow and logistics	<b>10/50</b>
	SIMATIC Machine Vision	For the visual inspection and recognition of products	<b>10/51</b>
	SIWAREX Weighing systems	For weighing and filling systems	<b>10/51</b>
	Other I/O modules/Notes on use	For the connection of standard components	<b>10/52</b>
	Function blocks for I/O modules	For the transfer into the application program	<b>10/52</b>

# SIMOTION I/O components

## Compact I/O modules

SIMOTION TMC

### Overview



Left: SIMOTION TMC1080 PN  
Right: SIMOTION TMC2040 PN

SIMOTION TMC compact I/O is available in two function variants and two wiring variants:

	TMC1080 PN	TMC1180 PN	TMC2040 PN <sup>1)</sup>	TMC2140 PN <sup>1)</sup>
Number of I/Os	80	80	40	40
DI, DO	✓	✓	✓	✓
High speed DI, DO	–	–	✓ (16)	✓ (16)
Technology Measuring Input, Output Cam <sup>2)</sup>	–	–	✓	✓
Module width	75 mm (2.95 in)	75 mm (2.95 in)	50 mm (1.97 in)	50 mm (1.97 in)
I/O wired to the module directly via terminal blocks	✓	–	✓	–
I/O wired indirectly through wiring modules	–	✓	–	✓

✓ Available

– Not available

### Features

The function variant TMC1x80 PN has 80 channels with

- 32 digital inputs,
- 32 digital inputs/outputs and
- 16 digital outputs.

The function variant TMC2x40 PN <sup>1)</sup> has 40 channels with

- 16 high speed digital inputs/outputs with technology (Output Cam, Measuring Input) and push-pull drivers,
- 16 digital inputs/outputs with technology (Output Cam, Measuring Input) and
- 8 digital inputs/outputs.

16 outputs of the TMC2x40 have special push-pull output drivers. The push-pull technology ensures that extremely steep input and output edges are achieved. This offers the advantages of extremely short OFF delay times and maximum repeat accuracy. This is particularly useful when signals have to be switched position-specifically with a high degree of accuracy, e.g. for accurate positioning of a drop of glue when the web of material is passing through at high speed.

The push-pull technology ensures that especially short terminal-to-terminal response times are achieved.

SIMOTION TMC are compact I/O modules with high channel densities designed for SINAMICS S120 Booksize Compact.

The modules have two PROFINET IO connections with real-time functionality (IRT) for connecting to the SIMOTION controller or for networking with other PROFINET components.

The performance of the digital inputs and outputs whose functions can be parameterized has been optimized for Motion Control applications – with regard to a strict real-time response, shortest possible signal runtimes and the most stringent requirements for reproducibility of signal acquisition and signal output.

### Benefits

The compact digital I/O SIMOTION TMC is a perfectly integrated part of the high-performance control and drive concept of SIMOTION/SINAMICS thanks to its format, high density of channels and excellent performance.

- The high channel density saves space in the control cabinet
- Easy configuration and integration due to connection over PROFINET IO
- Optimized for Motion Control applications with SIMOTION and SINAMICS
- High performance and high precision
- I/O functionality parameterizable per channel
- Flexible wiring through wiring variants
- Adjustable input filters for particularly short delay times or maximum suppression of noise pulses

<sup>1)</sup> Available soon.

<sup>2)</sup> Only in combination with the SIMOTION Motion Control system .

# SIMOTION I/O components

## Compact I/O modules

### SIMOTION TMC

#### Application

SIMOTION TMC is predestined for applications in which a high channel density of digital inputs/outputs is required in accordance with the SINAMICS S120 Booksize Compact format.

With the TMC2x40 PN technology module, applications can also be implemented that require fast and highly accurate acquisition or output of signals.

Examples for precise sensing of signals:

- Edge detection
- Quality monitoring (e.g. product is good/bad)
- Product tracing (e.g. product is available/not available)
- Print-mark detection
- Tool monitoring (e.g. presses)
- Machine status monitoring (e.g. plastic injection molding machines)
- Weft thread break monitoring (e.g. textile machines)

Examples for precise output of signals:

- Position-dependent switching of actuators
  - Camera trigger signal (quality assurance)
  - Control of an air nozzle for blowing away cut-offs
  - Controlling nozzles for applying glue
- Product extraction from production line
- Implementation of line Motion Control systems

#### Design

In addition to the 2 function variants TMC1x80/2x40 PN, the modules are also available in 2 wiring variants – so there are 4 variants in total.

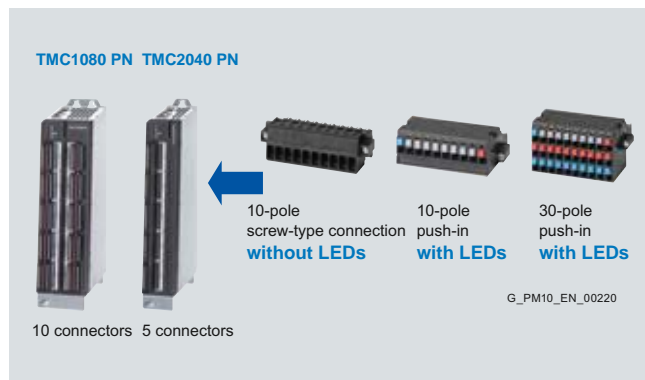
#### I/O wired directly to TMC

With TMC1080 PN and TMC2040 PN, the I/O is wired up to the module directly at terminal blocks. The terminal blocks are available in 3 designs:

- 10-pole screw-type connection without LEDs
- 10-pole push-in with 9 LEDs
- 30-pole push-in with 9 LEDs

The 30-pole terminal block supports wiring in a 3-wire system, i.e. one ground and one 24 V terminal are available for each DI or DO.

The LEDs of the terminal blocks indicate channel status as well as the presence of the load current supply.



#### Indirectly wired I/O

With TMC1180 PN and TMC2140 PN, the I/O is wired through separate wiring modules. The wiring modules, connecting cables and the 10-pole connector for the load current supply must be ordered separately.



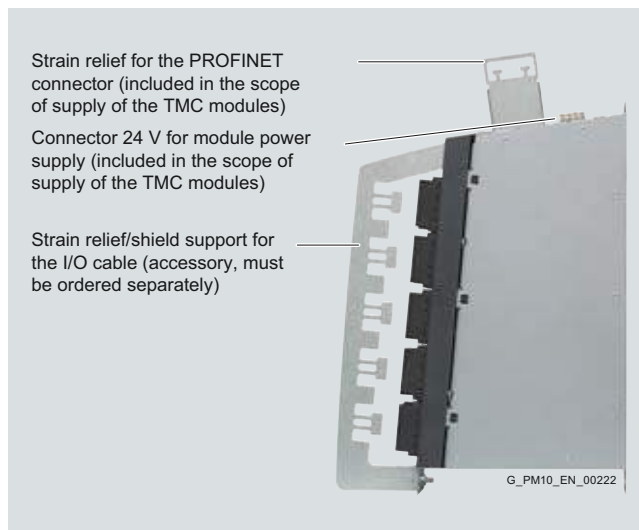
#### Strain relief/shield support

The 24 V connector for the module power supply as well as the strain relief for the PROFINET connectors are included in the scope of supply of the TMC modules.

The strain relief/shield support for the I/O wiring is available as an optional accessory and is required in the following cases:

- When digital inputs are operated with short filter times, a shield support is required.
- Strain relief is necessary due to the local conditions.

Alternatively, the shield may also be attached to a shield busbar in the control cabinet.



### Function

#### Functionality of the digital inputs/outputs

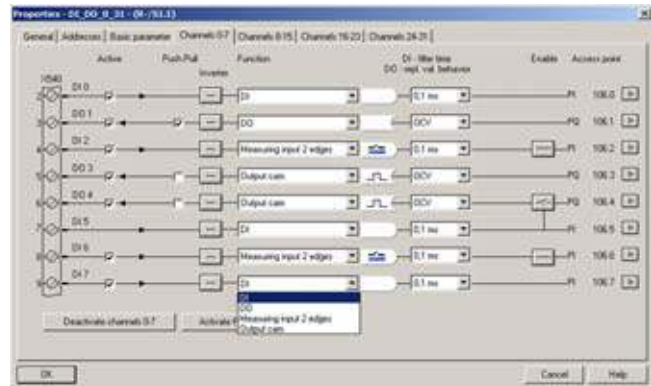
The TMC compact I/O is configured using the SIMOTION SCOUT engineering system. The digital inputs/outputs are galvanically isolated in groups of 8. The functionality of each I/O channel can be individually parameterized and therefore optimized to the specific requirements.

- The DI/DO channels of TMC1x80 PN can be parameterized as DI or DO as required.
- With TMC2x40 PN:
  - 8 DI/DO channels can be parameterized as DI or DO as required,
  - 32 DI/DO channels can be parameterized as DI, DO, measuring input or output cam as required and
  - channels can be parameterized as enable inputs.
- Adjustable filter time for digital inputs (from 1 µs to 3.2 ms in steps of 5)
- Adjustable substitute value response for digital outputs
- Signals can be inverted

Parameterized enable inputs can enable measuring inputs and output cams (gate function).

For measuring inputs and output cams, TMC2x40 PN supports up to 2 edges of each servo/interpolator cycle of the SIMOTION controller.

The measuring input and cam functionality is supported by the SIMOTION technology objects Measuring Input, Cam and Cam Track.



#### Status indications

The status of the TMC compact I/O is indicated via four two-color LEDs on the module front.

- SF, group fault
- BF, bus fault
- SY/MT status "SY" (SYNC) and "MT" (maintenance)
- ON – Power on

The LINK and ACTIVITY status are also signaled on the two PROFINET ports.

On TMC1080 PN and TMC2040 PN, the channel status and the presence of the load current supply are indicated via green LEDs on the terminal block, depending on the terminal block used.

### Technical specifications

	TMC1x80 PN		TMC2x40 PN <sup>1)</sup>
<b>PROFINET interface</b>			
<b>Number of ports</b>		2	2
<b>Functionality</b>		PROFINET IO with IRT and RT	PROFINET IO with IRT and RT
• Note			IRT is required for Output Cam/Measuring Input
<b>Minimum PROFINET transmission cycle</b>	µs	250	250
<b>Module power supply</b>			
<b>DC supply voltage</b>			
• Nominal value	V	24	24
• Permitted range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption, typ.</b>			
• Note	A	0.1 Without digital inputs/outputs	0.2 Without digital inputs/outputs
<b>Power loss, max.</b>	W	3	5
<b>I/O</b>			
<b>Quantity structure</b>			
		32 DI, 32 DI/DO, 16 DO	16 high speed DI/DO with technology and push-pull drivers, 16 DI/DO with technology, 8 DI/DO
• Note		DI/DO parameterizable as DI or DO	8 DI/DO parameterizable as DI or DO; 32 DI/DO parameterizable as DI, DO, measuring input or output cam
<b>Isolation</b>			
• Note		Yes In groups of 8	Yes In groups of 8
<b>Max. cable length</b>	m (ft)	30 (98.4)	30 (98.4)

<sup>1)</sup> Technical data subject to change without notice.  
For up-to-date information, see Industry Mall.

# SIMOTION I/O components

## Compact I/O modules

### SIMOTION TMC

#### Technical specifications (continued)

	TMC1x80 PN		TMC2x40 PN <sup>1)</sup>
<b>Digital inputs</b>			
<b>DC load voltage supply</b>			
• Nominal value	V	24	24
• Permitted range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Current consumption at 24 V DC</b>			
• DI	mA	15	15
• High speed DI	mA	–	0
• Note		Current consumption from load supply per group	Current consumption from load supply per group
<b>DC input voltage at digital input</b>			
• Permitted range	V	-3 ... 30	-3 ... 30
• For "0" signal	V	-3 ... 5	-3 ... 5
• For "1" signal	V	15 ... 30	15 ... 30
• Note		An unconnected digital input is interpreted as "Low"	An unconnected digital input is interpreted as "Low"
<b>Current consumption per channel</b>			
• DI	mA	2.5	2.5
• High speed DI	mA	–	5.3
• Note		IEC 61131-2 Type 1	IEC 61131-2 Type 1
<b>Input impedance</b>			
• DI	kΩ	8.8	8.8
• High speed DI	kΩ	–	4.5
<b>Input delay time, typ.</b>			
• DI	μs	15	15
• High speed DI	μs	–	1
<b>Input delay time, max.</b>			
• DI	μs	20	20
• High speed DI	μs	–	1
<b>Adjustable filter times</b>			
		1 μs/0.1 ms/0.4 ms/1.6 ms/3.2 ms	1 μs/0.1 ms/0.4 ms/1.6 ms/3.2 ms
<b>Measuring input, resolution</b>			
	μs	–	1
<b>Reproducibility of signal acquisition</b>			
• DI	μs	15	15
• High speed DI	μs	–	1
• Note		Data is based on filter time of 1 μs	Data is based on filter time of 1 μs
<b>Digital outputs</b>			
<b>DC load current supply</b>			
• Nominal value	V	24	24
• Permitted range	V	20.4 ... 28.8	20.4 ... 28.8
<b>Load current per channel</b>			
	A	0.5	0.5
<b>Lamp load, max.</b>			
	W	5	2
<b>Extinguishing power, max.</b>			
• DO	J	0.5	0.5
• High speed DO (push-pull)	J	–	0.2
• Note		Per channel, one-off pulse	Per channel, one-off pulse
<b>Output delay time</b>			
• Signal "0" -> "1", max.	μs	120	120
• Signal "1" -> "0", max.	μs	170	170
• Note		Resistive load, R <sub>L</sub> = 47 Ω	Resistive load, R <sub>L</sub> = 47 Ω
<b>Output delay time (high speed DO, push-pull)</b>			
• Signal "0" -> "1", max.	μs	–	1
• Signal "1" -> "0", max.	μs	–	1
• Note		–	Resistive load, R <sub>L</sub> = 47 Ω
<b>Output cam, resolution</b>			
	μs	–	1
<b>Reproducibility of signal output</b>			
• DO	μs	40	40
• High speed DO (push-pull)	μs	–	1

<sup>1)</sup> Technical data subject to change without notice.  
For up-to-date information, see Industry Mall.

### Technical specifications (continued)

	TMC1x80 PN		TMC2x40 PN <sup>1)</sup>
<b>Digital outputs (continued)</b>			
<b>Switching frequency, max.</b>			
• Resistive load	kHz	2	2
• Inductive load	kHz	0.002	0.002
<b>Switching frequency, max. (high speed DO, push-pull)</b>			
• Resistive load	kHz	–	64
• Inductive load	kHz	–	0.002
<b>Leakage current in switched off state, max.</b>	µA	50	50
• Note		Per channel	Per channel
<b>Voltage drop at output</b>			
• DO	V	0.7	0.7
• High speed DO (push-pull)	V	–	0.6
• Note		Load current supply to output	Load current supply to output
<b>Total current of outputs, max.</b>			
• Up to 40 °C (104 °F)	A	4	4
• Up to 55 °C (131° F) (derating)	A	2	2
• Note		Current per group of 8	Current per group of 8
<b>Outputs protected against continuous short-circuit, overload and reverse-polarity</b>	V	36	36
<b>Other technical specifications</b>			
<b>Ambient temperature up to an altitude of 2000 m</b>			
• Without derating	°C (°F)	0 ... +40 (+32 ... +104)	0 ... +40 (+32 ... +104)
• With derating	°C (°F)	0 ... +55 (+32 ... +131)	0 ... +55 (+32 ... +131)
<b>Storage Temperature</b>	°C (°F)	-40 ... +85 (-40 ... +185)	-40 ... +85 (-40 ... +185)
<b>Relative humidity</b>	%	5 ... 95	5 ... 95
• Note		No condensation	No condensation
<b>Degree of protection</b>		IP 20	IP 20
<b>Weight</b>	kg (lb)	1.5 (3.31)	1.3 (2.86)
<b>Height</b>	mm (in)	286 (11.26)	286 (11.26)
<b>Width</b>	mm (in)	75 (2.95)	50 (1.97)
<b>Depth</b>	mm (in)	165 (6.50)	165 (6.50)
• Note		Dimensions without connector, strain relief/shield support	Dimensions without connector, strain relief/shield support
<b>Approvals</b>			
<b>USA</b>		UL 508c	UL 508c
<b>Canada</b>		–	–

<sup>1)</sup> Technical data subject to change without notice.  
For up-to-date information, see Industry Mall.

# SIMOTION I/O components

## Compact I/O modules

### SIMOTION TMC

#### Selection and ordering data

Description	Order No.
<b>TMC1080 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for direct wiring to terminal blocks, 32 DI, 32 DI/DO, 16 DO <i>Requires SIMOTION SCOUT V4.3 SP1 HF3</i>	<b>6AU1101-0AB00-0AA0</b>
<b>TMC1180 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for indirect wiring through wiring modules, 32 DI, 32 DI/DO, 16 DO <i>Requires SIMOTION SCOUT V4.3 SP1 HF3</i>	<b>6AU1101-1AB00-0AA0</b>
<b>TMC2040 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for direct wiring to terminal blocks, 16 high speed DI/DO with technology drivers and push-pull drivers, 16 DI/DO with technology, 8 DI/DO <i>Requires SIMOTION SCOUT V4.3.x<sup>1)</sup></i>	<b>6AU1102-0AB00-0AA0<sup>2)</sup></b>
<b>TMC2140 PN</b> Compact I/O designed in SINAMICS S120 Booksize Compact format, for PROFINET IO, for indirect wiring through wiring modules, 16 high speed DI/DO with technology drivers and push-pull drivers, 16 DI/DO with technology, 8 DI/DO <i>Requires SIMOTION SCOUT V4.3.x<sup>1)</sup></i>	<b>6AU1102-1AB00-0AA0<sup>2)</sup></b>

#### Accessories

Description	Order No.
<b>Accessories for TMC1x80 PN and TMC2x40 PN</b>	
<b>Connector set, screw-type 1-wire system, without LEDs</b> 5 terminal blocks (10-pole)	<b>6AU1100-0AA00-0AA0</b>
<b>Connector set, push-in 1-wire system, with LEDs</b> 5 terminal blocks (10-pole)	<b>6AU1100-0AB00-0AA0</b>
<b>Connector set, push-in 3-wire system, with LEDs</b> 5 terminal blocks (30-pole)	<b>6AU1100-0AC00-0AA0</b>
<b>Strain relief/shield support</b> For I/O cable, for commercially available clamps up to 12 mm (0.47 in)	<b>6AU1100-1AB00-0AA0</b>
<b>Accessories for PROFINET</b>	
<b>RJ45 FastConnect connector for Industrial Ethernet/PROFINET</b> 180° cable outlet • 1 pack = 1 unit • 1 pack = 10 units • 1 pack = 50 units	<b>6GK1901-1BB10-2AA0</b> <b>6GK1901-1BB10-2AB0</b> <b>6GK1901-1BB10-2AE0</b>

Description	Order No.
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#### Accessories for PROFINET (continued)

<b>FastConnect cables for Industrial Ethernet/PROFINET<sup>3)</sup></b> • IE FC Standard Cable GP 2x2 • IE FC Flexible Cable GP 2x2 • IE FC Trailing Cable GP 2x2 • IE FC Trailing Cable 2x2 • IE FC Marine Cable 2x2	<b>6XV1840-2AH10</b> <b>6XV1870-2B</b> <b>6XV1870-2D</b> <b>6XV1840-3AH10</b> <b>6XV1840-4AH10</b>
<b>Stripping tool for Industrial Ethernet/PROFINET FastConnect cables</b> IE FC stripping tool	<b>6GK1901-1GA00</b>

Description	Type/Item No.
	Available from: Phoenix Contact <a href="https://catalog.phoenixcontact.net">https://catalog.phoenixcontact.net</a>

#### Accessories for SIMOTION TMC1180 PN and TMC2140 PN

<b>Wiring module</b> 50-pole without LEDs (VARIOFACE module with tension clamp spring connection)	Type: UM 45-FLK50/ZFKDS Item No.: 293585
<b>Wiring module</b> 50-pole with LEDs (VARIOFACE module with screw-type connection)	Type: VIP-3/SC/FLK50/LED Item No.: 2322113
<b>Connecting cable</b> For connecting the separate wiring modules to the TMC compact I/O (pre-assembled round cable with two 50-pole spring-loaded terminal strips)	Type: FLK50/EZ-DR/100/KONFEK/S (example for 1 m (3.28 ft) cable length)
<b>Connecting cable</b> For connecting the separate wiring modules to the TMC compact I/O (pre-assembled round cable with two overmolded 50-pole spring-loaded terminal strips)	Type: VIP-CAB-FLK50/0.14/3.0M (example for 3 m (9.84 ft) cable length)

#### Note on connector sets

Two connector sets (2 × 5 connectors) are required for TMC1080 PN. One connector set is sufficient for TMC2040 PN. Connectors from the different sets can be used together on the same module (e.g. when only a subset of the I/O channels is required in a 3-wire system).

Two 10-pole terminal blocks are required for the load current supply of the digital inputs and outputs with TMC1180 PN and one 10-pole terminal block is required with TMC2140.

#### Note on wiring modules

With TMC1180 PN, two wiring modules and two connecting cables are required. One wiring module and one connecting cable are sufficient for TMC2140 PN.

One (TMC2140 PN) or two (TMC1180 PN) 10-pole terminal blocks are also required alternatively with or without LEDs for load current supply of the I/O channels.

#### More information

You will find information about integrating TMC compact I/O into automation solutions that do not use SIMOTION controllers on the Internet at:

<http://support.automation.siemens.com/WW/view/en/59886631>

<sup>1)</sup> For the applicable SCOUT version, see the delivery release announcement at:  
<http://support.automation.siemens.com/WW/view/en/10805436/133400>

<sup>2)</sup> Available soon.

<sup>3)</sup> Sold by the meter. Max. delivery unit 1000 m (3281 ft), minimum order quantity 20 m (65.62 ft).



# SIMOTION I/O components

## Power supplies

Power supplies for  
SIMOTION C / SIMATIC ET 200M

### Overview



PS307 power supply, 5 A

The PS305/PS307 power supplies convert the line voltage (120 V/230 V AC, 24 V to 110 V DC) into the 24 V DC operating voltage and are directly snapped onto the SIMATIC S7-300 mounting rail.

The following versions are available for the output currents:

- 2 A
- 5 A
- 10 A

The required summation current should be taken into account when sizing in the power supply (e.g. current draw of SIMOTION C, supply for the digital outputs).

### Application

Controlled 24 V DC power supply for:

- SIMOTION C
- Distributed I/O (e.g. SIMATIC ET 200M)
- Sensors
- Actuators

### Design

The power supplies are snapped onto the SIMATIC S7-300 mounting rail to the left of the SIMOTION C Motion Controller or SIMATIC ET 200M interface (IM 153).

The front of the module contains:

- An LED (signals that the 24 V DC output voltage is ON)
- Supply voltage selector switch with protective cap for selecting the input voltage of 120 V AC or 230 V AC
- ON/OFF switch for 24 V DC output voltage
- Terminals for input voltage, output voltage and ground, covered by the front door

The power supplies can also be mounted onto a 35 mm DIN rail (EN 50022). Mounting adapters are required for this purpose:

- 1 adapter for PS307, 24 V DC/2 A, 24 V DC/5 A
- 2 adapters for PS307, 24 V DC/10 A

### Selection and ordering data

Description	Order No.
<b>SIMATIC S7-300, controlled power supply, 1-phase</b>	
• 120/230 V AC; 24 V DC/2 A	<b>6ES7307-1BA01-0AA0</b>
• 24 V ... 110 V DC; 24 V DC/2 A (extended temperature range)	<b>6ES7305-1BA80-0AA0</b>
• 120/230 V AC; 24 V DC/5 A	<b>6ES7307-1EA01-0AA0</b>
• 120/230 V AC; 24 V DC/5 A (extended temperature range)	<b>6ES7307-1EA80-0AA0</b>
• 120/230 V AC; 24 V DC/10 A	<b>6ES7307-1KA02-0AA0</b>
<b>Mounting adapter</b> for snapping the PS307 onto 35 mm (1.38 in) standard rails (EN 50022)	<b>6ES7390-6BA00-0AA0</b>

### More information

For further information, see [Catalog ST 70](#) and the [Industry Mall](#) under [Automation technology/Automation systems/SIMATIC Industrial automation systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Power supplies](#).

# SIMOTION I/O components

## Power supplies

### Universal SITOP power supplies

#### Overview



Power supplies (one, two or three-phase)

The controlled SITOP power supplies are snapped onto a 35 mm (1.38 in) standard mounting rail (EN 50022). They cannot be snapped onto the SIMATIC S7-300 mounting rail.

#### SITOP modular

The SITOP modular power supply comprises of standard devices with 5 A, 10 A, 20 A and 40 A options which can be expanded with additional modules. The modularity offers advantages with respect to flexibility and simple handling. The wide-range input, Class B radio interference category according to EN 55022 and limitation of input current harmonics to EN 61000-3-2 make these power supplies suitable for use in many different application areas.

#### Basic units/features

- 5 A and 10 A basic units with 120/230 to 500 V AC wide-range input for operation on 1-phase network as well as 2-phase operation on 3-phase network (connection to two phases of a 3-phase supply network)
- 20 A and 40 A basic units with 120/230 V AC input voltage for 1-phase operation or with 400 to 500 V 3 AC wide-range input for 3-phase operation
- Extremely small width of the 3-phase 20 A basic unit (70 mm (2.76 in) wide)
- Selectable "constant current" or "stored tripping" short-circuit behavior
- 3 LEDs for signaling "24 V OK", "Overload" and "Stored tripping"
- Adjustable output voltage up to 28.8 V to compensate for voltage drops
- Power boost supports up to three times the rated current

#### Supplementary modules for function expansions

Buffer module for extending the network failure buffering time to 100 ms for 40 A load currents and up to 800 ms for 5 A load currents

Signaling module for providing signals about the operating status of the power supply ("DC Voltage OK", "Ready") as well as for remote activation/deactivation of the power supply

Redundancy module for decoupling two power supplies during parallel operation (continued)

#### SITOP select diagnostics module

The SITOP select diagnostics module is used for dividing the load current into four current paths for monitoring the individual subcurrents.

#### SITOP smart

The 1-phase power supply for universal applications with a narrow construction; 150 % extra power and 120 % rated power up to 45 °C (113 °F). Without limitation of the line harmonics according to EN 61000-3-2 with the industrial version (-2AA01 types).

#### SITOP power in flat design

SITOP power in flat design is preferred where only small mounting depths are available, for example, when distributed I/O is used, in machines or recesses.

#### Selection and ordering data

Description	Order No.
<b>SITOP modular power supply</b>	
• 1-phase/2-phase	
- 120/230 ... 500 V AC; 24 V DC/5 A	<b>6EP1333-3BA00</b>
- 120/230 ... 500 V AC; 24 V DC/10 A	<b>6EP1334-3BA00</b>
- 120/230 V AC; 24 V DC/20 A	<b>6EP1336-3BA00</b>
- 120/230 V AC; 24 V DC/40 A	<b>6EP1337-3BA00</b>
• 3-phase	
- 400 ... 500 V AC; 24 V DC/20 A	<b>6EP1436-3BA10</b>
- 400 ... 500 V AC; 24 V DC/40 A	<b>6EP1437-3BA00</b>
<b>Add-on modules for SITOP modular</b>	
• Buffer module	<b>6EP1961-3BA01</b>
• Signaling module	<b>6EP1961-3BA10</b>
• Redundancy module	<b>6EP1961-3BA21</b>
<b>SITOP select diagnostics module, 4 channels</b>	<b>6EP1961-2BA00</b>
<b>SITOP smart power supply, 1-phase</b>	
• 120/230 V AC; 24 V DC/2.5 A	<b>6EP1332-2BA10</b>
• 120/230 V AC; 24 V DC/5 A	<b>6EP1333-2BA01</b>
• 120/230 V AC; 24 V DC/5 A (industrial version)	<b>6EP1333-2AA01</b>
• 120/230 V AC; 24 V DC/10 A	<b>6EP1334-2BA01</b>
• 120/230 V AC; 24 V DC/10 A (industrial version)	<b>6EP1334-2AA01</b>
<b>Power supply SITOP power, slimline design, 1-phase</b>	
• 120/230 V AC; 24 V DC/5 A	<b>6EP1333-1AL12</b>
• 120/230 V AC; 24 V DC/10 A	<b>6EP1334-1AL12</b>

#### More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/SITOP Power Supplies.

# SIMOTION I/O components

## Power supplies

### Uninterruptible SITOP power supplies with battery module

#### Overview



DC UPS module with battery module

By combining a DC UPS module with at least one 24 V battery module and one SITOP power supply, longer power failures can be completely bridged.

This combination can be used e.g. in

- mechanical engineering
- textile industry
- all types of production lines and filling systems

This prevents the negative effects which often result due to power failures.

Siemens offers the uninterruptible power supplies DC UPS 6 A, DC UPS 15 A and DC UPS 40 A as well as the battery modules 1.2 Ah, 2.5 Ah, 3.2 Ah, 7 Ah and 12 Ah for "NONSTOP" applications.

#### Benefits

DC UPS modules for complete uninterruptible bridging of power failures including exhaustive discharge protection, battery life time monitoring and ON/OFF control current circuit.

- 24 V DC input voltage (supply through SITOP power supply from 5 A rated current)
- Rated output power 144 W (DC UPS 6 A) and 360 W (DC UPS 15 A)
- Rated output power 480 W or 960 W (DC UPS 40 A with one or two battery modules)
- High efficiency of approx. 95 to 97 %
- Power ON threshold adjustable through DIP switch between 22 V and 25.5 V
- Bridging time adjustable with DIP switch in the range between 5 and 635 s or until switched off automatically due to complete discharge
- Option: Signals can be output via serial interface or USB interface, automatic reset of industrial PCs supported through selectable shut-down behavior

#### Function

The rechargeable battery is connected to the system as soon as the load voltage or the voltage between the connections L+/M of the DC UPS module falls below the set value of the 22 to 25.5 V threshold.

After a power failure the battery module is disconnected automatically from the loads by electronic means and immediately recharged with a 0.2/0.4 A (DC UPS module 6 A), 0.35/0.7 A (DC UPS module 15 A) or 1/2 A (DC UPS module 40 A) constant current (U/I characteristic with 26.3 to 29.3 V end-of-charge voltage).

For increased load current demands (e.g., when incandescent lamps, power contactors with DC auto-connected windings, DC motors, DC/DC converters, electronic modules with high input capacity are connected to the system), electronically limited peak currents are supplied automatically.

The operating state (mains/battery operation, battery level > 85 % as well as buffer ready/alarm) is signaled with LEDs and isolated relay contacts.

For SIMOTION P350 and SIMOTION P320 applications, the UPS module can be used with a serial interface or USB interface. The operating state is indicated on an SP\_SITOP application that is already installed on SIMOTION P350 and SIMOTION P320. An action can be defined for each status change of the UPS during configuration of the application. The operating status of the UPS is also available to the user program via a system variable.

#### Selection and ordering data

Description	Order No.
<b>SITOP DC UPS module</b>	
• 24 V / 6 A	<b>6EP1931-2DC21</b>
• 24 V / 6 A, with serial interface	<b>6EP1931-2DC31</b>
• 24 V / 6 A, with USB interface	<b>6EP1931-2DC42</b>
• 24 V / 15 A	<b>6EP1931-2EC21</b>
• 24 V / 15 A, with serial interface	<b>6EP1931-2EC31</b>
• 24 V / 15 A, with USB interface	<b>6EP1931-2EC42</b>
• 24 V / 40 A	<b>6EP1931-2FC21</b>
• 24 V / 40 A, with USB interface	<b>6EP1931-2FC42</b>
<b>SITOP battery module</b>	
• 24 V / 1.2 Ah for DC UPS module, 6 A	<b>6EP1935-6MC01</b>
• 24 V / 2.5 Ah for DC UPS module, 6 A and 15 A	<b>6EP1935-6MD31</b>
• 24 V / 3.2 Ah for DC UPS module, 6 A and 15 A	<b>6EP1935-6MD11</b>
• 24 V / 7 Ah for DC UPS module, 6 A, 15 A and 40 A	<b>6EP1935-6ME21</b>
• 24 V / 12 Ah for DC UPS module, 6 A, 15 A and 40 A	<b>6EP1935-6MF01</b>

#### More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/SITOP Power Supplies/24 V DC uninterruptible power supplies.

# SIMOTION I/O components

## Power supplies

### Uninterruptible power supplies with capacitor module

#### Overview



DC UPS with capacitor module

Uninterruptible power supplies normally store the electrical energy in lead-acid batteries. The temperatures that prevail inside the cabinet, however, shorten the service life of the batteries considerably and require regular replacement, e.g. annually at ambient temperatures of 40 °C (104 °F). The innovative SITOP UPS500 is, however, based on completely maintenance-free capacitors with a long service life. Even at temperatures of 50 °C (122 °F) they still have more than 80 % of their capacity after 8 years, so there is no need to replace the energy stores. Because the capacitors do not emit any gas, the control cabinet does not have to be ventilated. Another advantage are the significantly shorter charging times of the double-layer capacitors which ensure that the buffer is ready very quickly after loss of power.

#### Benefits

##### Basic device 15 A, SITOP UPS500S

- Compact design, degree of protection IP20
- Integrated energy storage: 2.5 kW or 5 kW
- Easily expanded with the 5 kW expansion module (up to 3 expansion modules can be connected)
- Signaling of the operating states and capacitor discharge > 85 %
- Support for automatic reset of industrial PCs through selectable shutdown characteristics
- USB interface

##### Basic device 7 A, SITOP UPS500P

- Compact design, degree of protection IP65
- For distributed applications without control cabinet
- Integrated energy storage: 5 kW or 10 kW
- High efficiency of approx. 96.6 %
- Low power losses of approx. 6 W at 7 A load current
- Signaling of the operating states and capacitor discharge > 85 %
- USB interface

#### Function

Communication with the control can be implemented via the USB interface. In the case of the UPS500S, also via relay contacts.

The backup time is shorter than with lead-acid battery solutions, but in many cases it suffices in order to back up data and shut down the machine in a controlled manner.

#### Selection and ordering data

Description	Order No.
<b>SITOP UPS500S with capacitor</b>	
• 24 V / 15 A, with USB interface and 2.5 kW	<b>6EP1933-2EC41</b>
• 24 V / 15 A, with USB interface and 5 kW	<b>6EP1933-2EC51</b>
<b>SITOP UPS500P with capacitor</b>	
• 24 V / 7 A, with USB interface and 5 kW	<b>6EP1933-2NC01</b>
• 24 V / 7 A, with USB interface and 10 kW	<b>6EP1933-2NC11</b>
<b>Accessories</b>	
SITOP UPS501S expansion module For extension of the buffering time for connection to a SITOP UPS500S	
• 24 V / 15 A and 5 kW	<b>6EP1935-5PG01</b>
Connector set for UPS500P Input/output connector, USB signal cable 2 m (6.56 ft)	<b>6EP1975-2ES00</b>

#### More information

For further information, see Catalog KT 10.1 and the Industry Mall under Automation technology/Power supplies/SITOP Power Supplies/24 V DC uninterruptible power supplies.

### Overview



SIMATIC S7-300 I/O Modules

The following SIMATIC S7-300 I/O modules can be used as:

- Central I/O within SIMOTION C240.  
The I/O configuration comprises two tiers for central I/O with up to 8 I/O Modules per tier, of which up to 4 can be Analog Modules. The second tier is connected over the IM 365 interface module.
- Distributed I/O in the modular I/O system SIMATIC ET 200M with the IM 153 Head Module (up to 8 or 12 I/O Modules per SIMATIC ET 200M, depending on the Head Module)

I/O modules transform the levels of the external digital and analog process signals into the internal signal levels for SIMOTION and vice versa. In addition, signal-preprocessing Function Modules and Communication Modules are available.

### Benefits

#### User benefits through use of SIMATIC S7-300 I/O modules

- Optimal adaptation  
The number of inputs/outputs can be adapted to the corresponding task with the help of modules which can be combined as required. Unnecessary investments can be avoided.
- Flexible process connection  
SIMOTION can be connected to the process over different digital and analog actuators and sensors.
- Powerful analog technology  
Various input/output ranges and high resolution allows for the connection of many different analog sensors and actuators.
- Intelligent function modules  
Function Modules (FM) relieve the CPU from time-intensive tasks such as counting and output cams.
- Communication modules  
Communication modules (CP) implement serial data exchange over point-to-point connections and connection of AS-Interface slaves.

### Design

SIMATIC S7-300 I/O Modules for digital and analog inputs/outputs have the following mechanical characteristics:

- Compact design  
The rugged plastic casing contains:
  - Green LEDs for indicating the signal states on the inputs/outputs
  - Red LED to indicate that a diagnosis is being performed (for modules capable of diagnostics)
  - Sockets for front connectors, protected behind front door
  - Labeling area on front door
- Simple assembly  
The modules are mounted one after the other on the mounting rail from the left to the right and connected to neighboring modules with bus connectors. There are no slot rules.
- User-friendly wiring  
The modules are wired with front connectors. When the module is connected for the first time, a coding latches in the connector so that the connector now only fits onto modules of the same type. When a module is replaced, the front connector can be plugged onto the new module of the same type with the complete wiring. The front connectors are available with screw-type or spring-loaded terminals or with the FastConnect connection system.

### Integration

#### Connectable devices

The following can be connected to SIMOTION over I/O Modules:

- Digital and analog sensors/actuators
- Switches
- Encoders
- Printers, barcode readers, ...
- AS-Interface slaves
- Identification systems
- Weighing systems
- ...

### More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F.

The I/O Modules which can be used with SIMOTION are listed in a compatibility list which can be found at:

<http://support.automation.siemens.com/WW/view/en/11886029>

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### Digital Modules

#### Selection and ordering data

Description	Order No.
<b>Digital Input Modules SM 321 <sup>1)</sup>, isolated</b>	
• <b>16 DI</b> , 24 V DC	
- Standard	<b>6ES7321-1BH02-0AA0</b>
- Isochronous, High Speed	<b>6ES7321-1BH10-0AA0</b>
- Active low input	<b>6ES7321-1BH50-0AA0</b>
• <b>32 DI</b> , 24 V DC, 40-pole	<b>6ES7321-1BL00-0AA0</b>
• <b>64 DI</b> , 24 V DC, active high/low (parameterizable)	<b>6ES7321-1BP00-0AA0</b>
• <b>8 DI</b> , 120/230 V AC	
- Standard, 20-pole	<b>6ES7321-1FF01-0AA0</b>
- With single-root, 40-pole	<b>6ES7321-1FF10-0AA0</b>
• <b>16 DI</b> , 24 ... 48 V AC/DC with single root, 40-pole	<b>6ES7321-1CH00-0AA0</b>
• <b>16 DI</b> , 48 ... 125 V DC, 20-pole	<b>6ES7321-1CH20-0AA0</b>
• <b>16 DI</b> , 120/230 V AC, 20-pole	<b>6ES7321-1FH00-0AA0</b>
• <b>32 DI</b> , 120 V AC, 40-pole	<b>6ES7321-1EL00-0AA0</b>
• <b>16 DI</b> , 24 V DC, 20-pole Process alarm, diagnostics, parameterizable input delay, isochronous	<b>6ES7321-7BH01-0AB0</b>
<b>Digital Output Modules SM 322 <sup>1)</sup>, isolated</b>	
• <b>8 DO</b> , 24 V DC, 2 A, 20-pole	<b>6ES7322-1BF01-0AA0</b>
• <b>8 DO</b> , 48 ... 125 V DC, 1.5 A, 20-pole	<b>6ES7322-1CF00-0AA0</b>
• <b>16 DO</b> , 24 V DC, 0.5 A, 20-pole	
- Standard	<b>6ES7322-1BH01-0AA0</b>
- Isochronous, High Speed	<b>6ES7322-1BH10-0AA0</b>
• <b>32 DO</b> , 24 V DC, 0.5 A, 40-pole	<b>6ES7322-1BL00-0AA0</b>
• <b>64 DO</b> , 24 V DC, 0.3 A	
- Current sourcing	<b>6ES7322-1BP00-0AA0</b>
- Current sinking	<b>6ES7322-1BP50-0AA0</b>

Description	Order No.
<b>Digital Output Modules SM 322 <sup>1)</sup>, isolated</b>	
• <b>8 DO</b> , 120/230 V AC, 1 A, 20-pole	<b>6ES7322-1FF01-0AA0</b>
• <b>8 DO</b> , 120/230 V AC, 2 A, 40-pole with single root and selectable failure mode	<b>6ES7322-5FF00-0AB0</b>
• <b>16 DO</b> , 120/230 V AC, 1 A, 20-pole	<b>6ES7322-1FH00-0AA0</b>
• <b>32 DO</b> , 120/230 V AC, 1 A, double-width, 2 × 20-pole	<b>6ES7322-1FL00-0AA0</b>
• <b>8 DO</b> (relay), 24 V DC, 2 A or 230 V AC, 2 A, 20-pole	<b>6ES7322-1HF01-0AA0</b>
• <b>8 DO</b> (relay), 120 V DC, 5 A or 230 V AC, 5 A, 40-pole, connector with spring-loaded terminal, can be used for 6ES7392-1BM01-0AA0 and higher	<b>6ES7322-1HF10-0AA0</b>
• <b>8 DO</b> (relay), 24 V DC, 120 ... 230 V AC, 5 A, 40-pole with RC filter overvoltage protection	<b>6ES7322-5HF00-0AB0</b>
• <b>16 DO</b> , solid state relay, 24 ... 48 V AC/DC, 0.5 A, 40-pole with single root	<b>6ES7322-5GH00-0AB0</b>
• <b>16 DO</b> (relay), 24 ... 120 V DC, 2 A or 48 ... 230 V AC, 2 A, 20-pole	<b>6ES7322-1HH01-0AA0</b>
• <b>8 DO</b> , 24 V DC, 0.5 A, 20-pole Short-circuit protection, diagnostics	<b>6ES7322-8BF00-0AB0</b>
<b>SM323 / SM327 Digital Input/Output Modules <sup>1)</sup>, isolated</b>	
• <b>8 DI</b> , 8 DO, 24 V DC, 0.5 A, 20-pole	<b>6ES7323-1BH01-0AA0</b>
• <b>16 DI</b> , 16 DO, 24 V DC, 0.5 A, 40-pole	<b>6ES7323-1BL00-0AA0</b>
• <b>8 DI</b> , 8 DX, 24 V DC, 0.5 A, 20-pole, 8 DX per single channel parameterizable as DI or DO	<b>6ES7327-1BH00-0AB0</b>

#### More information

For further information, see [Catalog ST 70](#) and the [Industry Mall](#) under [Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Signal modules/Digital modules](#).

<sup>1)</sup> Incl. labeling strips and bus connectors, front connector required (if not specified otherwise).  
64-channel modules require special terminal blocks and connecting cables, see Accessories and spare parts.

### Selection and ordering data

Description	Order No.
<b>Analog Input Modules SM 331<sup>1)</sup>, isolated</b>	
<ul style="list-style-type: none"> <li>• <b>2 AI</b>, 20-pole (1 AI for resistance-based sensor), U/I/thermoelement/resistor/ Pt 100/Ni 100, alarm, diagnostics, resolution 9/12/14 bit (+ sign)</li> </ul>	<b>6ES7331-7KB02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 20-pole (4 AI for resistance-based sensor), U/I/thermoelement/resistor/ Pt 100/Ni 100, alarm, diagnostics, resolution 9/12/14 bit (+ sign)</li> </ul>	<b>6ES7331-7KF02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole U/I/resistor/Pt 100/Ni 100/Ni 1000/LG-Ni 1000 (standard, air-conditioned), resolution 12 bit + sign/13 bit</li> </ul>	<b>6ES7331-1KF02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole U/I, alarm and diagnostics, resolution 13 bit + sign/14 bit, isochronous, High Speed</li> </ul>	<b>6ES7331-7HF01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole U/I, alarm and diagnostics, resolution 15 bit (+ sign)</li> </ul>	
- 2 channels with limit value monitoring, isolation between channels and backplane bus	<b>6ES7331-7NF00-0AB0</b>
- Fast measured value update, 8 channels with limit value monitoring, isolation between channels and backplane bus as well as between channels in groups of 2	<b>6ES7331-7NF10-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole 2/3/4-wire, resistor, Pt 100/200/500/1000, Ni 100/120/200/500/1000, Cu 10, characteristics acc. to GOST, 16 bit (24 bit internally)</li> </ul>	<b>6ES7331-7PF01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>8 AI</b>, 40-pole thermoelements Types B, E, J, K, L, N, R, S, T, U, TXK/TXK(L) according to GOST, 16 bit (24 bit internally)</li> </ul>	<b>6ES7331-7PF11-0AB0</b>
<b>Analog Output Modules SM 332<sup>1)</sup>, isolated</b>	
<ul style="list-style-type: none"> <li>• <b>AO</b>, 0 ... 10 V, ± 10 V, 1 ... 5 V, 0/4 ... 20 mA, ± 20 mA 11 bit + sign/12 bit</li> </ul>	
- 2 AO, 20-pole	<b>6ES7332-5HB01-0AB0</b>
- 4 AO, 20-pole	<b>6ES7332-5HD01-0AB0</b>
- 8 AO, 40-pole	<b>6ES7332-5HF00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>4 AO</b>, 20-pole 0 ... 10 V, ± 10 V, 1 ... 5 V, 0/4 ... 20 mA, ± 20 mA 14 bit + sign/15 bit + sign, isochronous, High Speed</li> </ul>	<b>6ES7332-7ND02-0AB0</b>

Description	Order No.
<b>Fast analog Input/Output Modules SM 334<sup>1)</sup></b>	
<ul style="list-style-type: none"> <li>• <b>4 AI, 2 AO</b>, 20-pole non-isolated, 0 to 10 V, 0 ... 20 mA, 8 bit</li> </ul>	<b>6ES7334-0CE01-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>4 AI, 2 AO</b>, 20-pole (2 AI under power), isolated, 12 bit, Input: 0 ... 10 V, Pt 100 (climatic range only), resistance measurement 10 kΩ, Output: 0 ... 10 V</li> </ul>	<b>6ES7334-0KE00-0AB0</b>
<b>Fast analog Input/Output Modules SM 335<sup>1)</sup></b>	
4 fast analog inputs (basic conversion time for 4 channels, max. 1 ms), 4 fast analog outputs (conversion time per channel, max. 0.8 ms), encoders supplied with 10 V/25 mA, 1 counter input (24 V/500 Hz), special operating modes: "Measuring only" and "Comparator"	
<ul style="list-style-type: none"> <li>• <b>4 AI, 4 AO</b>, 20-pole isolated, alarm and diagnostics, Input: ±1 V, ±2.5 V, ±10 V, 0 ... 2 V, 0 ... 10 V, ±10 mA, 0/4 ... 20 mA, 13 bit + sign, 14 bit; (up to 2 channels parameterizable) Output: ±10 V, 0 ... 10 V, 11 bit + sign, 12 bit</li> </ul>	<b>6ES7335-7HG02-0AB0</b>
<b>Accessories</b>	<a href="#">See Accessories and spare parts</a>

### More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F/Signal modules/Analog modules.

<sup>1)</sup> Incl. labeling strips and bus connectors, front connector required (if not specified otherwise).

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### FM 350-1 Counter Module

#### Overview



- Single-channel, intelligent Counter Module for simple counting tasks
- For direct connection of 24 V incremental encoders
- Compare function with two definable comparison values
- Integrated digital outputs for response output when the comparison value is reached
- Operating modes:
  - Continuous counting
  - One-time counting
  - Periodic counting
- Special functions:
  - Set counter
  - Latch counter
  - Start/stop counter via gate function
- Plug-in option for 20-pole front connector

#### Integration

The single-channel FM 350-1 Counter Module can be operated as follows:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 350-1 Counter Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>FM 350-1 Counter Module</b> max. 500 kHz, 1 channel, incl. SIMATIC configuration package on CD-ROM	<b>6ES7350-1AH03-0AE0</b>

### FM 350-2 Counter Module

#### Overview



- 8-channel intelligent Counter Module for universal counting and measuring tasks
- For direct connection of 24 V incremental encoders, direction encoders, initiators, or NAMUR encoders
- Compare function with definable comparison values (number depends on operating mode)
- Integrated digital outputs for response output when the comparison value is reached
- Operating modes:
  - Continuous/one-time/periodic counting
  - Frequency/speed measurement
  - Period measurement
  - Dosing
- Plug-in option for 40-pole front connector

#### Integration

The 8-channel FM 350-2 Counter Module can be operated as follows:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 350-2 Counter Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>FM 350-2 Counter Module</b> max. 20 kHz, 8 channels, incl. SIMATIC configuration package on CD-ROM	<b>6ES7350-2AH01-0AE0</b>



### FM 352 Electronic cam controller

#### Overview



- High-speed electronic cam controller
- Economical alternative to mechanical cam controllers
- 32 cam tracks, 13 onboard digital outputs for the direct output of actions
- Position sensing by means of incremental encoder or absolute encoder with synchronous serial transmission (SSI)
- Plug-in option for 20-pole front connector

#### Integration

The FM 352 Electronic cam controller can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the FM 352 cam controller in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>FM 352 Electronic cam controller</b> Incl. SIMATIC configuration package on CD-ROM	<b>6ES7352-1AH02-0AE0</b>
<b>Sub-D connector</b> 15-pole, pins; for encoder cable	<b>6ES5750-2AA21</b>

### FM 352-5 High-speed Boolean processor

#### Overview



- High-speed processor for Boolean operations (LAD, FBD); processes them at a fixed cycle time of 1  $\mu$ s.
- Designed for applications that require an extremely fast response time
- 12 integrated digital inputs
- 8 integrated digital outputs
- 1 channel for connection of a 24 V incremental encoder, a 5 V incremental encoder (RS 422) or an SSI absolute encoder
- The application program is written with the STEP 7 program editor and stored on the Micro Memory Card (MMC) in compiled form after successful simulation
- Plug-in option for 40-pole front connector

#### Integration

The FM 352-5 High-speed Boolean processor can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

#### Selection and ordering data

Description	Order No.
<b>FM 352-5 High-speed Boolean processor</b>	
• With current sinking digital outputs	<b>6ES7352-5AH01-0AE0</b>
• With current sourcing digital outputs	<b>6ES7352-5AH11-0AE0</b>
<b>Micro Memory Card</b>	
• 128 KB	<b>6ES7953-8LG20-0AA0</b>
• 512 KB	<b>6ES7953-8LJ30-0AA0</b>

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### CP 340 Communication Module

#### Overview



- The cost-effective, complete solution for serial communication over a point-to-point connection
- 3 versions with various physical transmission characteristics:
  - RS 232 C (V.24),
  - 20 mA (TTY),
  - RS 422/RS 485 (X.27)
- Implemented protocols: ASCII, 3964 (R) and printer driver (3964; not for RS 485)
- Simple configuration over SCOUT with integrated parameterization tool

#### Integration

The CP 340 Communication Module can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The standard functions required to use the CP 340 Communication Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>CP 340 Communication Module</b> Incl. SIMATIC configuration package on CD-ROM with: <ul style="list-style-type: none"> <li>• 1 RS 232 C interface (V.24)</li> <li>• 1 20 mA interface (TTY)</li> <li>• 1 RS 422/485 (X.27) interface</li> </ul>	<b>6ES7340-1AH02-0AE0</b> <b>6ES7340-1BH02-0AE0</b> <b>6ES7340-1CH02-0AE0</b>
<b>RS 232 C signal cable</b> each 9-pole Sub-D socket <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6ES7902-1AB00-0AA0</b> <b>6ES7902-1AC00-0AA0</b> <b>6ES7902-1AD00-0AA0</b>
<b>20 mA (TTY) signal cable</b> each 9-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-2AB00-0AA0</b> <b>6ES7902-2AC00-0AA0</b> <b>6ES7902-2AG00-0AA0</b>
<b>RS 422/485 signal cable</b> each 15-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-3AB00-0AA0</b> <b>6ES7902-3AC00-0AA0</b> <b>6ES7902-3AG00-0AA0</b>

### CP 341 Communication Module

#### Overview



- The fast and powerful serial data exchange over a point-to-point connection
- 3 versions with various physical transmission characteristics:
  - RS 232 C (V.24),
  - 20 mA (TTY),
  - RS 422/RS 485 (X.27)
- Implemented protocols: ASCII, 3964 (R), RK 512
- Simple configuration over SCOUT with integrated parameterization tool

#### Integration

The CP 341 Communication Module can be operated:

- Centrally on SIMOTION C
- Distributed (via SIMATIC ET 200M) on SIMOTION C, SIMOTION P and SIMOTION D

The loadable special drivers of the CP 341 Communication Module are not supported by SIMOTION.

The standard functions required to use the CP 341 Communication Module in combination with SIMOTION are part of the SCOUT command library.

#### Selection and ordering data

Description	Order No.
<b>CP 341 Communication Module</b> Incl. SIMATIC configuration package on CD-ROM with: <ul style="list-style-type: none"> <li>• 1 RS 232 C interface (V.24)</li> <li>• 1 20 mA interface (TTY)</li> <li>• 1 RS 422/485 (X.27) interface</li> </ul>	<b>6ES7341-1AH02-0AE0</b> <b>6ES7341-1BH02-0AE0</b> <b>6ES7341-1CH02-0AE0</b>
<b>RS 232 C signal cable</b> each 9-pole Sub-D socket <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6ES7902-1AB00-0AA0</b> <b>6ES7902-1AC00-0AA0</b> <b>6ES7902-1AD00-0AA0</b>
<b>20 mA (TTY) signal cable</b> each 9-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-2AB00-0AA0</b> <b>6ES7902-2AC00-0AA0</b> <b>6ES7902-2AG00-0AA0</b>
<b>RS 422/485 signal cable</b> each 15-pole Sub-D connector <ul style="list-style-type: none"> <li>• 5 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 50 m (164 ft)</li> </ul>	<b>6ES7902-3AB00-0AA0</b> <b>6ES7902-3AC00-0AA0</b> <b>6ES7902-3AG00-0AA0</b>

### SM 374 Simulator Module

### DM 370 Dummy Module

#### Overview



- Simulator Module for program testing during commissioning and operation
- Simulation of sensor signals over switches
- Display of signal states on outputs with LEDs

#### Design

The front panel is equipped with:

- 16 switches for the simulation of input signals
- 16 LEDs for displaying the signal state at outputs
- Mode selector  
With the aid of a screwdriver, you can set three operating modes:
  - 16 inputs (input simulation only)
  - 16 outputs (output simulation only)
  - 8 inputs and 8 outputs (input and output simulation)

#### Function

The SM 374 Simulator Module is mounted onto the SIMATIC S7-300 mounting rail instead of a Digital Input or Output Module.

The CPU reads the set input signal states of the Simulator Module and processes these in the user program. The output signal states are sent to the module as a result and are indicated with LEDs.

#### Selection and ordering data

Description	Order No.
<b>SM 374 Simulator Module</b> For simulating 16 inputs or 16 outputs or 8 inputs and 8 outputs (16 switches, 16 LEDs)	<b>6ES7374-2XH01-0AA0</b>

#### Overview



- Dummy Module for reserving slots for unconfigured Signal Modules
- When replaced with a Signal Module (SM), configuration and address assignment remain unchanged

#### Application

The DM 370 Dummy Module reserves a slot for an unconfigured Signal Module.

When replaced with a Signal Module, the mechanical configuration and address assignment of the overall configuration remain unchanged.

#### Selection and ordering data

Description	Order No.
<b>DM 370 Dummy Module</b> Incl. bus connector, labeling strips	<b>6ES7370-0AA01-0AA0</b>

# SIMOTION I/O components

## SIMATIC S7-300 I/O

### Accessories and spare parts

#### Selection and ordering data

Description	Order No.
<b>Bus connector</b>	<b>6ES7390-0AA00-0AA0</b>
<b>Slot label</b> Labeling sheet, DIN A4, film, perforated, for printing with laser printer; 10 sheets	<b>6ES7912-0AA00-0AA0</b>
For signal modules (16 channels)	
• petrol	<b>6ES7392-2AX00-0AA0</b>
• light-beige	<b>6ES7392-2BX00-0AA0</b>
• yellow	<b>6ES7392-2CX00-0AA0</b>
• red	<b>6ES7392-2DX00-0AA0</b>
For signal modules (32 channels)	
• petrol	<b>6ES7392-2AX10-0AA0</b>
• light-beige	<b>6ES7392-2BX10-0AA0</b>
• yellow	<b>6ES7392-2CX10-0AA0</b>
• red	<b>6ES7392-2DX10-0AA0</b>
<b>Labeling strips</b> 10 units	
• For modules with 20-pole front connector	<b>6ES7392-2XX00-0AA0</b>
• For modules with 40-pole front connector	<b>6ES7392-2XX10-0AA0</b>
<b>Cover foil for labeling strips</b> 10 units (spare part)	
• For modules with 20-pole front connector	<b>6ES7392-2XY00-0AA0</b>
• For modules with 40-pole front connector	<b>6ES7392-2XY10-0AA0</b>
<b>Shield connection element</b> 80 mm (3.15 in) wide, with 2 rows for 4 shield terminal elements each	<b>6ES7390-5AA00-0AA0</b>
<b>Shield terminal element</b> 2 units per packaging unit	
• For 2 cables with 2 ... 6 mm (0.08 ... 0.24 in) Ø	<b>6ES7390-5AB00-0AA0</b>
• For 1 cable with 3 ... 8 mm (0.12 ... 0.31 in) Ø	<b>6ES7390-5BA00-0AA0</b>
• For 1 cable with 4 ... 13 mm (0.16 ... 0.51 in) Ø	<b>6ES7390-5CA00-0AA0</b>
<b>Front door</b> Raised design 5 units per packaging unit	<b>6ES7328-0AA00-7AA0</b>

Description	Order No.
<b>Front connector</b> with screw-type terminals	
• 20-pole, 1 unit	<b>6ES7392-1AJ00-0AA0</b>
• 20-pole, 100 units	<b>6ES7392-1AJ00-1AB0</b>
• 40-pole, 1 unit	<b>6ES7392-1AM00-0AA0</b>
• 40-pole, 100 units	<b>6ES7392-1AM00-1AB0</b>
<b>Front connector</b> with spring-loaded terminals	
• 20-pole, 1 unit	<b>6ES7392-1BJ00-0AA0</b>
• 20-pole, 100 units	<b>6ES7392-1BJ00-1AB0</b>
• 40-pole, 1 unit	<b>6ES7392-1BM01-0AA0</b>
• 40-pole, 100 units	<b>6ES7392-1BM01-1AB0</b>
<b>Front connector</b> with FastConnect terminals	
• 20-pole, 1 unit	<b>6ES7392-1CJ00-0AA0</b>
• 40-pole, 1 unit	<b>6ES7392-1CM00-0AA0</b>
<b>Terminal block and signal cable for 64-channel modules</b> 2 terminal blocks and 2 connecting cables are required per module	
• Length 1 m (3.28 ft), 2 units	<b>6ES7392-4BB00-0AA0</b>
• Length 2.5 m (8.20 ft), 2 units	<b>6ES7392-4BC50-0AA0</b>
• Length 5 m (16.41 ft), 2 units	<b>6ES7392-4BF00-0AA0</b>
• Terminal block with screw-type terminals, 2 units	<b>6ES7392-1AN00-0AA0</b>
• Terminal block with spring-loaded terminals, 2 units	<b>6ES7392-1BN00-0AA0</b>
<b>Effective Range Modules for analog inputs</b> 2 units	<b>6ES7974-0AA00-0AA0</b>
<b>Fuse set</b> 10 fuses 8 A, quick-response, 2 fuse holders	<b>6ES7973-1HD00-0AA0</b>
<b>Sub-D connector</b>	
• 9-pole, pins	<b>6ES5750-2AA11</b>
• 9-pole, socket	<b>6ES5750-2AB11</b>
• 15-pole, pins	<b>6ES5750-2AA21</b>
<b>Mounting rail, SIMATIC S7-300</b>	
• Length 160 mm (6.30 in)	<b>6ES7390-1AB60-0AA0</b>
• Length 480 mm (18.90 in)	<b>6ES7390-1AE80-0AA0</b>
• Length 530 mm (20.87 in)	<b>6ES7390-1AF30-0AA0</b>
• Length 830 mm (32.68 in)	<b>6ES7390-1AJ30-0AA0</b>
• Length 2000 mm (78.74 in)	<b>6ES7390-1BC00-0AA0</b>
<b>SIMATIC Manual Collection</b> Electronic manuals on DVD, multilingual	<b>6ES7998-8XC01-8YE0</b>
<b>SIMATIC Manual Collection Update service for 1 year</b> Current manual collection DVD as well as the three subsequent updates	<b>6ES7998-8XC01-8YE2</b>

#### More information

For further information, see Catalog ST 70 and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/Controllers/SIMATIC S7 modular controllers/S7-300/S7-300F.

### Overview



SIMATIC ET 200 variants

#### Perfect communication on all levels

Distributed machine and plant configurations have now become common practice in automation technology. This reduces the wiring layout and significantly increases flexibility and reliability.

PROFINET and PROFIBUS DP are available for connecting distributed I/O. And the AS-Interface handles communication on the actuator/sensor level. This allows problem-free data exchange throughout the whole automation world.

#### PROFIBUS DP

PROFIBUS DP is a fast, standardized bus system for the field level.

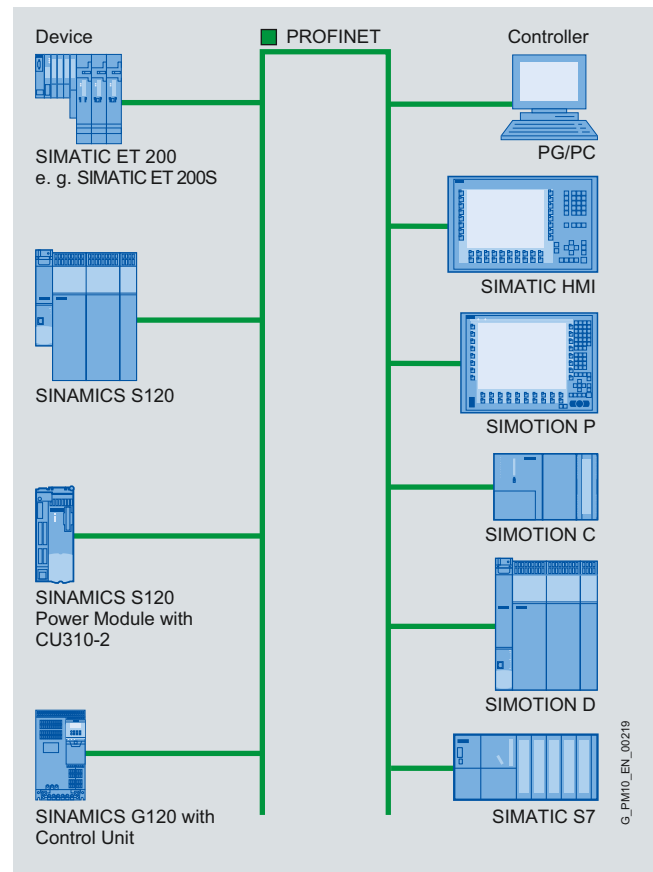
With the distributed SIMATIC ET 200 I/O system, digital and analog inputs and outputs can be connected to SIMOTION. Intelligent I/O modules can also be used distributedly with SIMATIC ET 200.

The isochronous mode functionality also allows PROFIBUS DP to be used for high-speed, deterministic I/O processing as well as for integrating drives.

#### PROFINET

PROFINET is the innovative and open Industrial Ethernet standard (IEC 61158) for industrial automation. With PROFINET, devices can be linked up from the field level through to the management level. PROFINET is supported by the SINAMICS drive system and the SIMATIC ET 200S, SIMATIC ET 200M, SIMATIC ET 200pro and SIMATIC ET 200eco PN distributed I/O systems.

With Isochronous Real-Time (IRT) and the new SIMATIC ET 200S High Speed I/O, cycle times of 250 µs are achieved on the basis of PROFINET.



Controller device configuration on PROFINET

#### AS-Interface

With AS-Interface, actuators and sensors on the field level can be connected with a simple two-wire line. In addition to communication, this two-wire line is also used to supply the individual stations with power.

# SIMOTION I/O components

## Distributed I/O

### Summary

#### Overview (continued)

##### *SIMATIC ET 200 distributed I/O*

The distributed SIMATIC ET 200 I/O provide I/O systems for many different applications:

- SIMATIC ET 200M: The modular I/O system for control cabinet installation and high channel densities
- SIMATIC ET 200S: The finely scalable I/O system for control cabinet installation and time-critical applications in particular; including motor starters, safety technology and individual grouping of load groups
- SIMATIC ET 200pro: The modular I/O system with IP65/67 degree of protection for cabinet-free use close to the machine; with features such as small frame size, integrated PROFIsafe safety technology, PROFINET connection and hot swapping of modules
- SIMATIC ET 200eco: The compact, economical I/O system with IP65/67 degree of protection for local use without a control cabinet with flexible and fast ECOFAST or M12 connection system over PROFIBUS DP
- SIMATIC ET 200eco PN: The compact, economical I/O system with IP65/67 degree of protection for local use without a control cabinet with flexible and fast M12 connection system over PROFIBUS IO

- SIMATIC ET 200SP: The SIMATIC ET 200SP distributed I/O system is a scalable and extremely flexible distributed I/O system for interfacing the process signals to a central control system via PROFINET. The distributed I/O system is particularly easy to use and, with its compact design, offers maximum economy in the control cabinet. High speed and transmission rates provide significantly stronger performance than conventional systems. SIMATIC ET 200SP I/O is not integrated in STEP 7 HW Config as standard and is supported for SIMOTION only via the GSDML (device description file) in SCOUT.

#### *Complete list of I/O that can be used*

A list of all the I/O modules that can currently be used with SIMOTION is available under the following link:

<http://support.automation.siemens.com/WW/view/en/11886029>

#### More information

For further information, see [Catalog IK PI and the Industry Mall under Automation technology/Automation Systems/SIMATIC Industrial Automation Systems/SIMATIC ET 200 Distributed I/O](#) or at [www.siemens.com/et200](http://www.siemens.com/et200)

### Overview



SIMATIC ET 200M with power supply

SIMATIC ET 200M is a modular I/O system with IP20 degree of protection.

It can be expanded with Signal Modules, Communication Modules and Function Modules of the SIMATIC S7-300 automation system.

Due to the wide range of modules available, the SIMATIC ET 200M I/O system is especially well-suited for complex automation tasks with a high channel density.

For SIMATIC ET 200M, interface modules are available with PROFIBUS DP or PROFINET interfaces.

Signal states can be detected and output synchronously and at specified times via the isochronous PROFIBUS DP in combination with the IM 153-2 High Feature interface module. Isochronous mode is supported by selected I/O modules (see [SIMATIC S7-300 I/O or SIMATIC ET 200M manual](#)). It is possible to combine isochronous and non-isochronous modules in a single station.

### Design

The SIMATIC ET 200M modular distributed I/O system consists of

- one IM 153 interface module,
- depending on the IM 153 interface module, 8 or 12 I/O modules of the SIMATIC S7-300 automation system and
- a PS307 power supply, if required.

The I/O modules can be combined as required and therefore optimally adapted to requirements.

The SIMATIC ET 200M I/O system is connected to PROFIBUS DP or PROFINET over an IM 153 interface module.

It can be connected to PROFIBUS DP with fiber-optic cables through integrated interfaces on the IM 153-2 FO or through additional OLMs (Optical Link Modules) or OBTs (Optical Bus Terminals).

#### Connection with bus connectors

The simple design with bus connectors of the SIMATIC S7-300 series makes SIMATIC ET 200M flexible and service-friendly:

- Module installation  
The modules are simply hooked onto the rail, swung into place and screwed tight.
- Integral backplane bus  
The backplane bus is integrated in the modules. Module interfacing takes place by means of bus connectors inserted into back of the housing.

### Function

The user program in the SIMOTION Motion Control System can access the inputs and outputs of the SIMATIC ET 200M modular I/O system in the same manner as central inputs and outputs.

Communication over the bus system is handled completely by the SIMOTION Master and the IM 153 interface module. The diagnostics function is used to check that the SIMATIC ET 200M is operating correctly.

The SIMATIC ET 200M I/O system diagnoses the following:

- Module faults
- Short-circuits (outputs)
- Bus faults, i.e. faulty data transfer
- 24 V DC load voltage supply

### Selection and ordering data

Ordering data	Order No.
<b>IM 153-1 Interface Module</b> For connecting to PROFIBUS DP, with RS 485 interface, for max. 8 SIMATIC S7-300 modules	<b>6ES7153-1AA03-0XB0</b>
<b>IM 153-2 High Feature Interface Module</b> For connecting to PROFIBUS DP, with RS 485 interface, for max. 12 SIMATIC S7-300 modules, isochronous	<b>6ES7153-2BA02-0XB0</b>
<b>IM 153-4 PN Interface Module</b> For connecting to PROFINET, for max. 12 SIMATIC S7-300 modules	<b>6ES7153-4AA01-0XB0</b>
<b>IM 153-4 PN High Feature Interface Module</b> For connecting to PROFINET, for max. 12 SIMATIC S7-300 modules with integrated switch	<b>6ES7153-4BA00-0XB0</b>

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Overview



#### **SIMATIC ET 200S Compact**

- Extended block I/O with IP20 degree of protection and 32 integrated channels, comprising of terminal block and electronic block
- 2 variants: 32 DI or 16 DI/16 DO
- Finely scalable expansion to a maximum of 128 channels or 12 modules
- The complete SIMATIC ET 200S module spectrum can be used (with the exception of PROFI-safe modules and reserve modules)
- Minimal width supports installation in particularly small, compact terminal boxes
- Separation of connections and electronics with permanent wiring
- Screw-type and spring-loaded terminal connections
- Standard terminal block with 2-wire connection system; 3-wire and 4-wire systems available using optional add-on terminals
- Installation on a DIN rail
- Hot swapping of expansion modules
- Communication via PROFIBUS
- Up to 100 bytes inputs and outputs (address space)
- The system characteristics meet high machine and plant availability requirements.
- SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S Compact and creating order lists



#### **SIMATIC ET 200S**

- Distributed I/O system with IP20 degree of protection with minimal wiring
- Can be used with integrated SIMATIC S7-CPU as mini PLC:
  - also available as a fail-safe PROFI-safe version
  - with optional lower-level PROFIBUS DP
- Finely modular design for adaptation to the automation task at hand.
- Interface modules available with PROFIBUS DP or PROFINET interfaces
- PROFINET modules with integrated 2-port switch for a line topology
- The optimum solution for extremely time-critical tasks
  - Cycle times down to 250 µs based on PROFINET IO with Isochronous Real-Time (IRT)
  - Short terminal-to-terminal times through High Speed analog modules with conversion times of ≤ 20 µs per channel
- Combine digital and analog input or output modules, technology modules, motor starters and frequency converters
- Modules can be replaced during operation (hot swapping)
- Channel-specific diagnostics for high availability
- Can be supplied with integrated fiber optic interface if required
- Transfer rate up to 12 Mbit/s (PROFIBUS) or 100 Mbit/s (PROFINET)
- Flexible connection method (2/3/4-wire connections as screwtype and spring-loaded terminals and FastConnect which requires no insulation stripping)
- Variable potential groups through power modules
- Option handling with or without reserve modules
- SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S and creating order lists



### Application

The comprehensive module range with uniform handling for configuration, assembly and programming allows the SIMATIC ET 200S to be used as a universal I/O system.

The finely scalable design permits fast and optimal adaptation to the requirements of the automation task:

- No reserves
- No unnecessary channels

Even if requirements change frequently, setup times can be reduced significantly by replacing or combining different I/O modules.

The transmission rate of up to 12 Mbit/s with PROFIBUS DP and 100 Mbit/s with PROFINET IO as well as the powerful internal data transmission makes the SIMATIC ET 200S also perfectly suited for extremely time-critical applications such as highly dynamic hydraulic applications with position and pressure control.

In combination with the interface module

- IM 151-1 High Feature (PROFIBUS) or
- IM 151-3 PN High Speed (PROFINET)

signal states can be synchronously acquired or output over the isochronous PROFIBUS DP or over PROFINET IO with IRT at precisely defined points in time. Isochronous mode is supported by selected I/O modules ([see SIMATIC S7-300 I/O or SIMATIC ET 200S manual](#)). It is possible to combine isochronous and non-isochronous modules in a single station.

In addition to Interface Modules for connecting the SIMATIC ET 200S to PROFIBUS DP or PROFINET IO (either electrical or optical interface) for distributed automation tasks, an Interface Module with an integrated CPU is also available. The maintenance free CPU (without battery) integrated in the Interface Module is based on the SIMATIC S7-300 CPU 314 and is programmed with STEP 7. The CPU permits distributed on-site preprocessing of process data and communicates with the high-level motion control system as a PROFIBUS DP slave or PROFINET IO Device.

Two different variants are available for integrating safety technology with SIMATIC ET 200S:

- Over local safety components in motor starter applications
- Over PROFIsafe components that replace the wiring-based safety logic with a freely programmable controller (up to SIL 3 according to IEC 61508 and Category 4 according to EN 954-1).

The construction of the SIMATIC ET 200S allows it to be used under increased mechanical load. The system features support high machine availability requirements.

### Design

The SIMATIC ET 200S distributed I/O system consists of:

- IM 151 Interface Module
- Digital and Analog Electronic Modules
- Technology modules, e. g., for counter/position detection tasks
- Motor starters and frequency converters
- Terminating module (part of the scope of supply of the IM 151)
- Power modules

One SIMATIC ET 200S station comprises of up to 63 I/O modules. The I/O modules can be combined as required.

The SIMATIC ET 200S is installed with permanent wiring:

All modules are plugged onto purely mechanical Terminal Modules. These Terminal Modules contain the complete wiring and can be mounted on standard 35 × 15 mm (1.38 × 0.59 in) or 35 × 7.5 mm (1.38 × 0.30 in) mounting rails.

This results in the following advantages:

- Simple implementation of the wiring without additional electronics components
- Fast and safe testing of wiring even under power
- Tool-free replacement of Electronics Modules
- Automatic coding of Electronics Modules for safe replacement (protected against polarity reversal)

The SIMATIC ET 200 Configurator software for designing the SIMATIC ET 200S and creating order lists is available for download:

[www.siemens.com/ET200](http://www.siemens.com/ET200)

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Function

##### **IM 151-3 PN High Speed Interface Module:** **Ideal for fast I/O processing with SIMATIC ET 200S and PROFINET**

The IM 151-3 PN High Speed Interface Module supports the following on a PROFINET IO basis with Isochronous Real-Time (IRT):

- Isochronous acquisition/output of signal states, synchronized with the user program
- Implementation of fast cycle times of 250 µs.

In comparison to PROFIBUS applications, much shorter terminal-to-terminal times can be implemented on the basis of PROFINET.

- The high data transmission rate of 100 Mbit/s and full-duplex mode (simultaneous transmitting and receiving) enable larger I/O volumes to be transmitted with the same bus cycle time as compared to PROFIBUS (125 bytes are transferred in approximately 10 µs).
- This communication performance is available on every PROFINET port of the controller – i.e. 3 ports on the SIMOTION D4x5-2 DP/PN, C240 PN and P320-3 or 4 ports on the SIMOTION P350-3 with MCI-PN Communication Board.
- The IM 151-3 PN High Speed Interface Module as well as the associated I/O modules have extremely short signal processing times (e.g. conversion time of  $\leq 20$  µs per channel for Analog Modules) so that even during the same bus cycle significantly shorter terminal-to-terminal times can be achieved with PROFINET than with a comparable PROFIBUS cycle. The big advantage: the terminal-to-terminal times are reduced without reducing the computing time available to the application.
- Apart from Isochronous Real-Time (IRT) communication, Real-Time (RT) communication and standard TCP/IP communication can also be executed without losing the deterministic response of the IRT message frames due to the bandwidth reserved for IRT.

The minimum cycle times are usually dependent on the application to be implemented (computing load) and the performance capability of the controller used, for example:

- SIMOTION P320-3/SIMOTION P350-3: Minimum 250 µs.
- SIMOTION D435-2/SIMOTION D445-2/SIMOTION D455-2: Minimum 250 µs.

SIMATIC ET 200S is the optimum I/O system for closed-loop control and motion control applications in which short cycle times, isochronous/equidistant signal acquisition and signal output are required.

SIMATIC ET 200S also supports the accurate and high-speed acquisition of digital inputs as well as time or position-based switching of digital outputs. For position-based switching of digital outputs, the SIMATIC ET 200S output is assigned to the SIMOTION technology object "TO Output Cam" or "TO Cam Track".

#### Applications with high-speed isochronous I/O devices

##### Closed-loop control/Motion control

- Hydraulic applications
  - with closed-loop position control (e.g. folding, pipe bending)
  - with closed-loop position and pressure control (e.g. hydraulic universal, IHU and powder metal presses as well as bed cushions)
- Speed and position detection
- Dancer control

##### Acquisition of signals

- Time/position-based acquisition of binary signals
  - Quality control
  - Product tracking
  - Tool monitoring
  - Monitoring of machine states

##### Output of signals

- Time/position-based setting of binary signals
  - Time/position-based switching of actuators
  - Product rejection
  - Trigger signal for measuring systems

Isochronous and equidistant acquisition/output of signals with short terminal-to-terminal times by means of:

- High-speed peripheral modules
- Synchronization of control system, bus and I/O
- Short cycle times in the controller

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**The modules listed below support isochronous operation with bus cycle times of 250µs minimum:**

Description	
Interface Modules	IM 151-3 PN High Speed
Power Modules	PM-E 24 V DC Standard PM-E 24 ... 48 V DC
Digital Electronic Modules	4 DI 24 V DC, High Feature 4 DO 24 V DC/0.5 A Standard 4 DO 24 V DC/2 A Standard
Analog Electronic Modules	2 AI, U, High Speed 2 AI, I, 2-wire High Speed 2 AI, I, 4-wire High Speed 2 AO, U, High Speed 2 AO, I, High Speed
Technology Modules	SSI module, 1 channel Counter module 1 COUNT, 24 V/100 kHz, 1 channel Counter module 1 COUNT, 5 V/500 kHz, 1 channel

## Selection and ordering data

Description	Order No.
<b>IM 151-1 Compact Interface Module for PROFIBUS DP</b> Transmission rate up to 12 Mbit/s; for connecting to PROFIBUS DP, with RS 485 interface; expandable with up to 12 power, electronic and motor starter modules (except F and reserve modules); including termination module	
<ul style="list-style-type: none"> <li>• <b>32 DI, 24 V DC</b> 32 digital inputs</li> </ul>	<b>6ES7151-1CA00-1BL0</b>
<ul style="list-style-type: none"> <li>• <b>16 DI, 24 V DC; 16 DO, 24 V DC/0.5 A</b> 16 digital inputs and 16 digital outputs</li> </ul>	<b>6ES7151-1CA00-3BL0</b>
<b>Terminal Modules for SIMATIC ET 200S Compact</b>	
<ul style="list-style-type: none"> <li>• <b>TM-C120S Compact</b> With screw terminals</li> </ul>	<b>6ES7193-4DL10-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>TM-C120C Compact</b> With spring-loaded terminals</li> </ul>	<b>6ES7193-4DL00-0AA0</b>
<b>Add-on terminals for Terminal Modules for SIMATIC ET 200S Compact</b>	
<ul style="list-style-type: none"> <li>• SIMATIC DP, add-on terminals for SIMATIC ET 200S and SIMATIC ET 200S Compact, screw-type</li> </ul>	<b>6ES7193-4FL10-0AA0</b>
<ul style="list-style-type: none"> <li>• SIMATIC DP, add-on terminals for SIMATIC ET 200S and SIMATIC ET 200S Compact, spring-loaded</li> </ul>	<b>6ES7193-4FL00-0AA0</b>
Please order two units for 4-wire connection.  The add-on terminals can also be attached to TM-E/TM-P Terminal Modules, provided at least 120 mm (4.72 in) of the construction width attains the same overall height as the Terminal Module.	
<b>Interface Modules for PROFIBUS DP</b> Transmission rate up to 12 Mbit/s; incl. termination module	
<ul style="list-style-type: none"> <li>• <b>IM 151-1 Basic</b> Data volume 88 bytes each for inputs and outputs; up to 12 power, electronic and motor starter modules can be connected (except F modules), with RS 485 interface</li> </ul>	<b>6ES7151-1CA00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-1 Standard</b> Data volume 244 bytes each for inputs and outputs; up to 63 I/O modules can be connected, with RS 485 interface</li> </ul>	<b>6ES7151-1AA05-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-1 High Feature</b> As IM 151-1 Standard, but also for use with isochronous I/O and F modules</li> </ul>	<b>6ES7151-1BA02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-1 FO</b> As IM 151-1 Standard, but with 128 byte data volume each for inputs and outputs; with fiber-optic interface</li> </ul>	<b>6ES7151-1AB05-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-7 CPU</b> With integrated PROFIBUS DP interface (RS 485 interface); 96 Kbyte work memory</li> </ul>	<b>6ES7151-7AA21-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-7 CPU FO</b> As IM 151-7 CPU, but with fiber-optic interface, 48 Kbyte work memory</li> </ul>	<b>6ES7151-7AB00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-7 F-CPU</b> Integrated, fail-safe CPU</li> </ul>	<b>6ES7151-7FA21-0AB0</b>

Description	Order No.
<b>Master interface module</b> Expands the IM 151-7 CPU/IM 151-7 F-CPU/IM 151-8 PN DP CPU interface module with a DP master interface; up to one module per CPU	<b>6ES7138-4HA00-0AB0</b>
<b>Interface Modules for PROFINET</b> Transmission rate up to 100 Mbit/s, 2 x bus connection via RJ45, incl. termination module	
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN Standard</b> Max. 63 I/O modules can be connected (except F modules; reserve modules)</li> </ul>	<b>6ES7151-3AA23-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN High Feature</b> As IM 151-3 PN Standard, but F modules can be used</li> </ul>	<b>6ES7151-3BA23-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN FO</b> As IM 151-3 PN High Feature, but with 2 PROFINET fiber-optic interfaces</li> </ul>	<b>6ES7151-3BB23-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-3 PN High Speed</b> Max. 32 power modules and electronic modules can be connected; for the use of isochronous I/O with cycle times of 250 µs minimum; only for use with selected I/O modules <a href="#">For further details, see Functions</a></li> </ul>	<b>6ES7151-3BA60-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-8 PN/DP CPU</b> With integrated PROFINET IO interface (3 RJ45 ports) 128 Kbyte work memory</li> </ul>	<b>6ES7151-8AB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>IM 151-8F PN/DP F-CPU</b> With integrated PROFINET IO interface (3 RJ45 ports) 128 Kbyte work memory</li> </ul>	<b>6ES7151-8FB01-0AB0</b>
<b>Micro Memory Card (MMC)</b>	
<ul style="list-style-type: none"> <li>• With IM 151-7 CPU, essential for program back-up</li> <li>• With IM 151-3 PN essential for saving the device name (64 KB)</li> <li>• Required for firmware updates (more than 2 MB)               <ul style="list-style-type: none"> <li>- 64 KB</li> <li>- 128 KB</li> <li>- 512 KB</li> <li>- 4 MB</li> <li>- 8 MB</li> </ul> </li> </ul>	<b>6ES7953-8LF20-0AA0</b> <b>6ES7953-8LG20-0AA0</b> <b>6ES7953-8LJ30-0AA0</b> <b>6ES7953-8LM20-0AA0</b> <b>6ES7953-8LP20-0AA0</b>
<b>External EPROM programming device</b> For programming Micro Memory Cards (MMC); connectable via USB interface	<b>6ES7792-0AA00-0XA0</b>

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.
<b>Power Modules</b> 1 unit, Width 15 mm (0.59 in)	
<ul style="list-style-type: none"> <li>• <b>PM-E 24 V DC Standard</b> For electronic modules, with diagnostics</li> </ul>	<b>6ES7138-4CA01-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>PM-E 24 V DC High Feature <sup>1)</sup></b> For electronic modules, with diagnostics</li> </ul>	<b>6ES7138-4CA60-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>PM-E 24 ... 48 V DC</b> For electronic modules, with diagnostics</li> </ul>	<b>6ES7138-4CA50-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>PM-E 24 ... 48 V DC, 24 ... 230 V AC</b> For electronic modules, with diagnostics and fuse</li> </ul>	<b>6ES7138-4CB11-0AB0</b>
<b>Potential Distributor Module for SIMATIC ET 200S</b> For preparing the load voltage on additional terminals, 1 unit, width 15 mm (0.59 in)	<b>6ES7138-4FD00-0AA0</b>
<b>TM-P Terminal Modules for Power Modules <sup>2)</sup></b> 1 unit, Width 15 mm (0.59 in)	
<ul style="list-style-type: none"> <li>• <b>2 x 3 terminals</b> <b>With terminal access to AUX1, AUX1 connected through to the left</b> <ul style="list-style-type: none"> <li>- TM-P15S23-A1, screw-type terminal</li> </ul> </li> </ul>	<b>6ES7193-4CC20-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15C23-A1, spring-loaded terminals</li> </ul>	<b>6ES7193-4CC30-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15N23-A1, FastConnect</li> </ul>	<b>6ES7193-4CC70-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>2 x 3 terminals</b> <b>With terminal access to AUX1, AUX1 interrupted to the left</b> <ul style="list-style-type: none"> <li>- TM-P15S23-A0, screw-type terminal</li> </ul> </li> </ul>	<b>6ES7193-4CD20-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15C23-A0, spring-loaded terminals</li> </ul>	<b>6ES7193-4CD30-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15N23-A0, FastConnect</li> </ul>	<b>6ES7193-4CD70-0AA0</b>
<ul style="list-style-type: none"> <li>• <b>2 x 2 terminals</b> <b>Without terminal access to AUX1, AUX1 connected through to the left</b> <ul style="list-style-type: none"> <li>- TM-P15S22-01, screw-type terminal</li> </ul> </li> </ul>	<b>6ES7193-4CE00-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15C22-01, spring-loaded terminals</li> </ul>	<b>6ES7193-4CE10-0AA0</b>
<ul style="list-style-type: none"> <li>- TM-P15N22-01, FastConnect</li> </ul>	<b>6ES7193-4CE60-0AA0</b>

Description	Order No.
<b>Digital Electronic Modules</b> 5 units, (unless specified otherwise) Width 15 mm (0.59 in)	
<ul style="list-style-type: none"> <li>• 2 DI, 24 V DC, Standard</li> </ul>	<b>6ES7131-4BB01-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DI, 24 V DC, Standard</li> </ul>	<b>6ES7131-4BD01-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DI, 24 V DC, Standard (1 unit)</li> </ul>	<b>6ES7131-4BF00-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DI, 24 V DC, SOURCE INPUT, active low inputs</li> </ul>	<b>6ES7131-4BD51-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DI, 24 V DC, SOURCE INPUT, active low inputs (1 unit)</li> </ul>	<b>6ES7131-4BF50-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DI, 24 V DC, NAMUR (1 unit)</li> </ul>	<b>6ES7131-4RD02-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DI, 120 V AC</li> </ul>	<b>6ES7131-4EB00-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DI, 230 V AC</li> </ul>	<b>6ES7131-4FB00-0AB0</b>
<ul style="list-style-type: none"> <li>• With parameterizable input delay and diagnostics               <ul style="list-style-type: none"> <li>- 2 DI, 24 V DC, High Feature <sup>3)</sup></li> <li>- 4 DI, 24 V DC, High Feature <sup>3)</sup></li> <li>- 4 DI, 24 ... 48 V DC <sup>1)</sup></li> </ul> </li> </ul>	<b>6ES7131-4BB01-0AB0</b> <b>6ES7131-4BD01-0AB0</b> <b>6ES7131-4CD02-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC/0.5 A, Standard</li> </ul>	<b>6ES7132-4BB01-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/0.5 A, Standard <sup>3)</sup></li> </ul>	<b>6ES7132-4BD02-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DO, 24 V DC/0.5 A, Standard <sup>3)</sup> (1 unit)</li> </ul>	<b>6ES7132-4BF00-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/0.5 A, current sinking <sup>3)</sup></li> </ul>	<b>6ES7132-4BD50-0AA0</b>
<ul style="list-style-type: none"> <li>• 8 DO, 24 V DC/0.5 A, current sinking <sup>3)</sup> (1 unit)</li> </ul>	<b>6ES7132-4BF50-0AA0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC/2 A, Standard</li> </ul>	<b>6ES7132-4BB31-0AA0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/2 A, Standard <sup>3)</sup></li> </ul>	<b>6ES7132-4BD32-0AA0</b>
<ul style="list-style-type: none"> <li>• With diagnostics for short-circuit and wire break, output of replacement value               <ul style="list-style-type: none"> <li>- 2 DO, 24 V DC/0.5 A, High Feature <sup>1)</sup></li> <li>- 2 DO, 24 V DC/2 A, High Feature <sup>1)</sup></li> </ul> </li> </ul>	<b>6ES7132-4BB01-0AB0</b> <b>6ES7132-4BB31-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 ... 230 V AC/1 A, output of substitute value</li> </ul>	<b>6ES7132-4FB01-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC ... 230 V AC/5 A, relay, NO contact, output of substitute value</li> </ul>	<b>6ES7132-4HB01-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V DC ... 230 V AC/5 A, relay, changeover contact, output of substitute value</li> </ul>	<b>6ES7132-4HB12-0AB0</b>
<ul style="list-style-type: none"> <li>• 2 DO, 24 V ... 48 V DC/5A 24 V ... 230 V DC/5 A, relay, changeover contact, output of substitute value, with manual operation (1 unit)</li> </ul>	<b>6ES7132-4HB50-0AB0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/0.5A, High Feature <sup>3)</sup></li> </ul>	<b>6ES7132-4BD00-0AB0</b>
<ul style="list-style-type: none"> <li>• 4 DO, 24 V DC/2A, High Feature <sup>3)</sup></li> </ul>	<b>6ES7132-4BD30-0AB0</b>
<ul style="list-style-type: none"> <li>• 8 DO, 24 V DC/0.5A, High Feature <sup>3)</sup></li> </ul>	<b>6ES7132-4BF00-0AB0</b>

<sup>1)</sup> Can be used for all electronic and technology modules except 2 DI 120 V AC / 2 DI 230 V AC / 2 DO 120/230 V AC.

<sup>2)</sup> Consult corresponding TM-P/TM-E manual or SIMATIC ET 200 Configurator software for selection.

<sup>3)</sup> Can be used as isochronous I/O.

### Selection and ordering data (continued)

Description	Order No.	Description	Order No.
<b>Analog Electronic Modules</b> Width 15 mm (0.59 in)			
<ul style="list-style-type: none"> <li>• <b>2 AI, U, Standard,</b> Cycle time 65 ms per channel, <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 1 ... 5 V, 13 bit (+ sign)</li> </ul>	<b>6ES7134-4FB01-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AI, TC, High Feature,</b> With internal temperature compensation, Cycle time 80 ms per channel, characteristic linearization for thermoelements of types: B, C, E, J, K, L, N, R, S, T, voltage measuring: <math>\pm 80\text{ mV}</math>, 15 bit (+ sign) (special TM required)</li> </ul>	<b>6ES7134-4NB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, U, High Feature <sup>1)</sup>,</b> Process and diagnostic alarm, cycle time 0.5 ms (both channels), <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 1 ... 5 V, 15 bit (+ sign), basic error limit <math>\pm 0.1\%</math></li> </ul>	<b>6ES7134-4LB02-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AI, RTD, Standard,</b> Cycle time 130 ms per channel, Pt 100, Ni 100, (standard, air-conditioned) Resistance: 150 <math>\Omega</math>, 300 <math>\Omega</math> and 600 <math>\Omega</math>, 14 ... 15 bit (+ sign)</li> </ul>	<b>6ES7134-4JB51-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, U, High Speed <sup>1)</sup>,</b> Process and diagnostic alarm, cycle time 100 <math>\mu\text{s}</math> (both channels), <math>\pm 2.5\text{ V}</math>, <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 1 ... 5 V, 15 bit (+ sign)</li> </ul>	<b>6ES7134-4FB52-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AI, RTD, High Feature</b> As RTD standard, but with additional functions such as higher accuracy, additional measuring ranges, internal compensation of cable resistances</li> </ul>	<b>6ES7134-4NB51-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 2-wire, Standard,</b> Cycle time 65 ms per channel, 4 ... 20 mA, 13 bit</li> </ul>	<b>6ES7134-4GB01-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, U, Standard,</b> Cycle time &lt; 1.5 ms (both channels), <math>\pm 10\text{ V}</math>, 13 bit (+ sign), 1 ... 5 V, 12 bit</li> </ul>	<b>6ES7135-4FB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>4 AI, I, 2-wire, Standard,</b> Cycle time 40 ms (both channels), 4 ... 20 mA, 13 bit</li> </ul>	<b>6ES7134-4GD00-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, U, High Feature <sup>1)</sup>,</b> Cycle time &lt; 0.5 ms (both channels), <math>\pm 5\text{ V}</math>, <math>\pm 10\text{ V}</math>, 15 bit + sign, 1 ... 5 V, 15 bit, basic error limit <math>\pm 0.05\%</math></li> </ul>	<b>6ES7135-4LB02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 4-wire, standard,</b> Cycle time 65 ms per channel, 4 ... 20 mA, <math>\pm 20\text{ mA}</math>, 13 bit (+ sign)</li> </ul>	<b>6ES7134-4GB11-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, U, High Speed <sup>1)</sup>,</b> Cycle time 100 <math>\mu\text{s}</math> (both channels), <math>\pm 5\text{ V}</math>, 14 bit + sign, <math>\pm 10\text{ V}</math>, 15 bit + sign, 1 ... 5 V, 14 bit</li> </ul>	<b>6ES7135-4FB52-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 2/4-wire, High Feature <sup>1)</sup>,</b> Cycle time 0.5 ms (both channels), 4 ... 20 mA, <math>\pm 20\text{ mA}</math>, 15 bit (+ sign), basic error limit <math>\pm 0.05\%</math></li> </ul>	<b>6ES7134-4MB02-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, I, Standard,</b> Cycle time &lt; 1.5 ms (both channels), <math>\pm 20\text{ mA}</math>, 13 bit (+ sign), 4 ... 20 mA, 13 bit</li> </ul>	<b>6ES7135-4GB01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 2-wire, High Speed <sup>1)</sup>,</b> Process and diagnostic alarm, cycle time 100 <math>\mu\text{s}</math> (both channels), 0/4 ... 20 mA, 15 bit</li> </ul>	<b>6ES7134-4GB52-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, I, High Feature <sup>1)</sup>,</b> Cycle time &lt; 0.5 ms (both channels), <math>\pm 20\text{ mA}</math>, 15 bit + sign, 4 ... 20 mA, 15 bit, basic error limit <math>\pm 0.05\%</math></li> </ul>	<b>6ES7135-4MB02-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, I, 4-wire, High Speed <sup>1)</sup>,</b> Process and diagnostic alarm, cycle time 100 <math>\mu\text{s}</math> (both channels), 0/4 ... 20 mA, <math>\pm 20\text{ mA}</math>, 15 bit (+ sign)</li> </ul>	<b>6ES7134-4GB62-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>2 AO, I, High Speed <sup>1)</sup>,</b> Cycle time 100 <math>\mu\text{s}</math> (both channels), <math>\pm 20\text{ mA}</math>, 15 bit (+ sign), 4 ... 20 mA, 15 bit</li> </ul>	<b>6ES7135-4GB52-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>2 AI, TC, Standard,</b> Cycle time 65 ms per channel, characteristic linearization for thermoelements of types: B, E, J, K, L, N, R, S, T, voltage measuring: <math>\pm 80\text{ mV}</math>, 15 bit (+ sign)</li> </ul>	<b>6ES7134-4JB01-0AB0</b>		

<sup>1)</sup> Can be used as isochronous I/O.

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.	Description	Order No.
<b>Technology modules</b>			
<ul style="list-style-type: none"> <li>• <b>SSI module, 1 channel</b><sup>1)</sup> For connecting SSI absolute encoders, with latch input and comparison value, width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DB03-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>1 SI interface module</b> Serial interface (1 channel): RS 232C, RS 422, RS 485, protocols: ASCII, 3964 (R), width 15 mm (0.59 in) <i>The standard functions required to use the module in connection with SIMOTION are included in the SCOUT Function Library.</i></li> </ul>	<b>6ES7138-4DF01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Pulse generator 2 PULSES, 2 channels</b> Pulse generator and Timer Module for controlling actuators, valves, heating elements, etc., optionally over PWM modulation, pulse trains or time-limited permanent signals at the 24 V output, width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DD01-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>1 STEP stepper module, 1 channel</b> For controlled positioning of stepper motor axes, interface to RS 422 and 2 DI, width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DC01-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Counter module 1 COUNT, 24 V/100 kHz, 1 channel</b><sup>1)</sup> Connection of incremental encoders, direction encoders and initiators; with DI, DO and comparison value; operating modes: counting, measuring, position detection; width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4DA04-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>IO-Link module</b> 4SI IO-Link, 4 point-to-point interfaces, IO-Link master width 15 mm (0.59 in)</li> </ul>	<b>6ES7138-4GA50-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Counter module 1 COUNT, 5 V/500 kHz, 1 channel</b><sup>1)</sup> Connection of RS 422 incremental encoders; with DI, DO and comparison value; operating modes: counting, measuring, position detection; width 30 mm (1.18 in)</li> </ul>	<b>6ES7138-4DE02-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>1 POS U Positioning module, 1 channel</b> For controlled positioning with digital outputs for 5 V/24 V incremental encoder, SSI encoder, width 30 mm (1.18 in)</li> </ul>	<b>6ES7138-4DL00-0AB0</b>
<ul style="list-style-type: none"> <li>• <b>Sensor module 4 IQ-Sense</b> For connecting up to 4 IQ-Sense sensors, with SF-LED, width 15 mm (0.59 in), 5 units</li> </ul>	<b>6ES7138-4GA00-0AB0</b>	<ul style="list-style-type: none"> <li>• <b>SIWAREX CS</b> Electronic weighing system for scales in SIMATIC ET 200S for applications with and without verified calibration, with EU type approval 2000 d, width 30 mm (1.18 in)</li> </ul>	<b>7MH4910-0AA01</b>
		<ul style="list-style-type: none"> <li>• <b>SIWAREX CF</b> Transmitter for connecting DMS sensors, e.g. for force and torque measurement, width 30 mm (1.18 in)</li> </ul>	<b>7MH4920-0AA01</b>
		<p>You can find more information on SIWAREX weighing systems at: <a href="http://www.siemens.com/siwarex">www.siemens.com/siwarex</a></p>	

<sup>1)</sup> Can be used as isochronous I/O.

### Selection and ordering data (continued)

Description	Order No.
<b>Reserve Module for reserving space in unused slots</b> <ul style="list-style-type: none"> <li>• Width 15 mm (0.59 in), 5 units</li> <li>• Width 30 mm (0.59 in), 1 unit</li> </ul>	<b>6ES7138-4AA01-0AA0</b> <b>6ES7138-4AA11-0AA0</b>
<b>TM-E Terminal Modules for Electronic Modules<sup>1)</sup></b> Width 30 mm (1.18 in) for 1 COUNT 5 V/500 kHz, 1 POS U and SIWAREX CS/CF <ul style="list-style-type: none"> <li>• <b>4 × 4 terminals</b>                Without terminal access to AUX1, AUX1 connected through to the left               <ul style="list-style-type: none"> <li>- TM-E30S44-01, screw-type terminals</li> <li>- TM-E30C44-01, spring-loaded terminals</li> </ul> </li> <li>• <b>4 × 6 terminals</b>                With terminal access to AUX1, AUX1 connected through to the left               <ul style="list-style-type: none"> <li>- TM-E30S46-A1, screw-type terminals</li> <li>- TM-E30C46-A1, spring-loaded terminals</li> </ul> </li> </ul>	<b>6ES7193-4CG20-0AA0</b> <b>6ES7193-4CG30-0AA0</b> <b>6ES7193-4CF40-0AA0</b> <b>6ES7193-4CF50-0AA0</b>
<b>TM-E Terminal Modules for Electronic Modules<sup>1)</sup></b> 1 unit, width 15 mm (0.59 in), for 2 AI TC High Feature <ul style="list-style-type: none"> <li>• <b>Terminal Modules for internal temperature compensation for 2 AI TC High Feature</b> <ul style="list-style-type: none"> <li>- TM-E15S24-AT, screw-type terminals</li> <li>- TM-E15C24-AT, spring-loaded terminals</li> </ul> </li> </ul>	<b>6ES7193-4CL20-0AA0</b> <b>6ES7193-4CL30-0AA0</b>

Description	Order No.
<b>TM-E Terminal Modules for Electronic Modules<sup>1)</sup></b> Width 15 mm (0.59 mm), 5 units <ul style="list-style-type: none"> <li>• <b>2 × 4 terminals</b>                With terminal access to AUX1, AUX1 connected through to the left               <ul style="list-style-type: none"> <li>- TM-E15S24-A1, screw-type terminals</li> <li>- TM-E15C24-A1, spring-loaded terminals</li> <li>- TM-E15N24-A1, FastConnect</li> </ul> </li> <li>• <b>2 × 6 terminals</b>                With terminal access to AUX1, AUX1 connected through to the left               <ul style="list-style-type: none"> <li>- TM-E15S26-A1, screw-type terminals</li> <li>- TM-E15C26-A1, spring-loaded terminals</li> <li>- TM-E15N26-A1, FastConnect</li> </ul> </li> <li>• <b>2 × 3 terminals</b>                Without terminal access to AUX1, AUX1 connected through to the left               <ul style="list-style-type: none"> <li>- TM-E15S23-01, screw-type terminals</li> <li>- TM-E15C23-01, spring-loaded terminals</li> <li>- TM-E15N23-01, FastConnect</li> </ul> </li> <li>• <b>2 × 4 terminals</b>                Without terminal access to AUX1, AUX1 connected through to the left               <ul style="list-style-type: none"> <li>- TM-E15S24-01, screw-type terminals</li> <li>- TM-E15C24-01, spring-loaded terminals</li> <li>- TM-E15N24-01, FastConnect</li> </ul> </li> </ul>	<b>6ES7193-4CA20-0AA0</b> <b>6ES7193-4CA30-0AA0</b> <b>6ES7193-4CA70-0AA0</b> <b>6ES7193-4CA40-0AA0</b> <b>6ES7193-4CA50-0AA0</b> <b>6ES7193-4CA80-0AA0</b> <b>6ES7193-4CB00-0AA0</b> <b>6ES7193-4CB10-0AA0</b> <b>6ES7193-4CB60-0AA0</b> <b>6ES7193-4CB20-0AA0</b> <b>6ES7193-4CB30-0AA0</b> <b>6ES7193-4CB70-0AA0</b>

<sup>1)</sup> Consult corresponding TM-P/TM-E manual or SIMATIC ET 200 Configurator software for selection.

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.
<b>Standard motor starter</b> With diagnostics, electromechanical, fuseless, expandable with Brake Control Module	
• <b>DS1-x direct-on-line starters</b>	<b>3RK1301- ■ ■ B00-0AA2</b>
• <b>RS1-x reversing starters</b>	<b>3RK1301- ■ ■ B00-1AA2</b>
< 0.06 kW <sup>1)</sup> ; 0.14 ... 0.20 A <sup>2)</sup>	<b>0 B</b>
0.06 kW <sup>1)</sup> ; 0.18 ... 0.25 A <sup>2)</sup>	<b>0 C</b>
0.09 kW <sup>1)</sup> ; 0.22 ... 0.32 A <sup>2)</sup>	<b>0 D</b>
0.10 kW <sup>1)</sup> ; 0.28 ... 0.40 A <sup>2)</sup>	<b>0 E</b>
0.12 kW <sup>1)</sup> ; 0.35 ... 0.50 A <sup>2)</sup>	<b>0 F</b>
0.18 kW <sup>1)</sup> ; 0.45 ... 0.63 A <sup>2)</sup>	<b>0 G</b>
0.21 kW <sup>1)</sup> ; 0.55 ... 0.80 A <sup>2)</sup>	<b>0 H</b>
0.25 kW <sup>1)</sup> ; 0.70 ... 1.0 A <sup>2)</sup>	<b>0 J</b>
0.37 kW <sup>1)</sup> ; 0.9 ... 1.25 A <sup>2)</sup>	<b>0 K</b>
0.55 kW <sup>1)</sup> ; 1.1 ... 1.6 A <sup>2)</sup>	<b>1 A</b>
0.75 kW <sup>1)</sup> ; 1.4 ... 2.0 A <sup>2)</sup>	<b>1 B</b>
0.90 kW <sup>1)</sup> ; 1.8 ... 2.5 A <sup>2)</sup>	<b>1 C</b>
1.1 kW <sup>1)</sup> ; 2.2 ... 3.2 A <sup>2)</sup>	<b>1 D</b>
1.5 kW <sup>1)</sup> ; 2.8 ... 4.0 A <sup>2)</sup>	<b>1 E</b>
1.9 kW <sup>1)</sup> ; 3.5 ... 5.0 A <sup>2)</sup>	<b>1 F</b>
2.2 kW <sup>1)</sup> ; 4.5 ... 6.3 A <sup>2)</sup>	<b>1 G</b>
3.0 kW <sup>1)</sup> ; 5.5 ... 8.0 A <sup>2)</sup>	<b>1 H</b>
4.0 kW <sup>1)</sup> ; 7.0 ... 10 A <sup>2)</sup>	<b>1 J</b>
5.5 kW <sup>1)</sup> ; 9.0 ... 12 A <sup>2)</sup>	<b>1 K</b>
<b>High Feature motor starters</b> With diagnostics, fuseless, expandable with Brake Control Module	
• <b>DS1e-x direct-on-line starters</b>	<b>3RK1301- ■ ■ B10-0AB4</b>
• <b>RS1e-x reversing starters</b>	<b>3RK1301- ■ ■ B10-1AB4</b>
• <b>DSS1e-x soft starters</b>	<b>3RK1301- ■ ■ B20-0AB4</b>
0.3 ... 3.0 A <sup>2)</sup>	<b>0 A</b>
2.4 ... 8.0 A <sup>2)</sup>	<b>0 B</b>
2.4 ... 16.0 A <sup>2)</sup>	<b>0 C</b>

Description	Order No.
<b>Power Module for motor starter</b>	
• <b>PM-D Power Module</b> for 24 V DC with diagnostics	<b>3RK1903-0BA00</b>
• <b>Terminal Module for</b> motor starter power module PM-D TM-P15-S27-01	<b>3RK1903-0AA00</b>
<b>Accessories for standard motor starters</b>	
<b>Control kit</b>	
• For manually operating the contacts during start-up and servicing (one set contains five control kits)	<b>3RK1903-0CA00</b>
• For direct control of contactor (manual control) 24 V DC	<b>3RK1903-0CG00</b>
<b>Terminal Modules for direct-on-line starter</b>	
• <b>TM-DS45-S32</b> With supply cable connection for power bus; incl. three caps for terminating the power bus	<b>3RK1903-0AB00</b>
• <b>TM-DS45-S31</b> Without supply cable connection for power bus	<b>3RK1903-0AB10</b>
<b>Terminal Modules for reversing starter</b>	
• <b>TM-RS90-S32</b> With supply cable connection for power bus; incl. three caps for terminating the power bus	<b>3RK1903-0AC00</b>
• <b>TM-RS90-S31</b> Without supply cable connection for power bus	<b>3RK1903-0AC10</b>
<b>Accessories for DS1-x, RS1-x motor starters</b>	
<b>DM-V15 Distance Module</b>	<b>3RK1903-0CD00</b>
• For direct-on-line starters with high temperature and current load; width 15 mm (0.59 in)	
<b>Terminal block PE/N</b>	
• <b>M45-PEN-F</b> , width 45 mm (1.77 in), incl. 2 caps; in combination with TM-DS45-S32 or TM-RS90-S32	<b>3RK1903-2AA00</b>
• <b>M45-PEN-S</b> , width 45 mm (1.77 in), in combination with TM-DS45-S31 or TM-RS90-S31	<b>3RK1903-2AA10</b>

<sup>1)</sup> Motor output for three-phase standard motor at 400 V.

<sup>2)</sup> Setting range of the overcurrent release.



### Selection and ordering data (continued)

Description	Order No.	Description	Order No.
<b>Accessories for standard and High Feature motor starters</b>		<b>Accessories for High Feature motor starters</b>	
<b>Jumper module</b> <ul style="list-style-type: none"> <li>M30-PEN, 30 mm (1.18 in) wide; for bridging a 30 mm (1.18 in) module</li> <li>M15-PEN, 15 mm (0.59 in) wide; for bridging a 15 mm (0.59 in) module</li> <li>M30-L123, 30 mm (1.18 in) wide; jumper module; for bridging a 30 mm (1.18 in) module</li> <li>M15-L123, 15 mm (0.59 in) wide; bridge module; for bridging a 15 mm (0.59 in) module</li> </ul>	<b>3RK1903-0AJ00</b>  <b>3RK1903-0AH00</b>  <b>3RK1903-0AF00</b>  <b>3RK1903-0AE00</b>	<b>Control Module 2DI, 24 V DC COM</b> Digital input module with two inputs <ul style="list-style-type: none"> <li>For local motor start functions for mounting to the front of a motor starter</li> <li>For local motor start functions or manual operation for mounting to the front of a motor starter</li> </ul>	<b>3RK1903-0CH10</b>  <b>3RK1903-0CH20</b>
<b>Brake Control Module</b> For motors with a mechanical brake <ul style="list-style-type: none"> <li>xB1 24 V DC/4 A</li> <li>xB2 500 V DC/0.7 A</li> <li>xB3 24 V DC/4 A, 2 DI 24 V DC Local control with diagnostics: with 2 inputs with quick-stop function</li> <li>xB4 500 V DC/0.7 A, 2 DI 24 V DC Local control with diagnostics: with 2 inputs with quick-stop function</li> </ul>	<b>3RK1903-0CB00</b>  <b>3RK1903-0CC00</b>  <b>3RK1903-0CE00</b>  <b>3RK1903-0CF00</b>	<b>LOGO! PC signal cable</b> For connecting the High Feature motor starter with Switch ES interface to a PC	<b>6ED1057-1AA00-0BA0</b>
<b>Terminal Modules</b> <ul style="list-style-type: none"> <li>TM-xB15 S24-01 for xB1 or xB2</li> <li>TM-xB215 S24-01 for xB3 ... xB4</li> </ul>	<b>3RK1903-0AG00</b>  <b>3RK1903-0AG01</b>	<b>Terminal Modules</b> <ul style="list-style-type: none"> <li><b>TM-DS65-S32</b> For direct-on-line starters DS1e-x, DSS1e-x, with supply cable connection for power bus; incl. three caps for terminating the power bus</li> <li><b>TM-DS65-S31</b> For direct-on-line DS1e-x, DSS1e-x, without supply cable connection for power bus</li> <li><b>TM-RS130-S32</b> For RS1e-x reversing starter, with supply cable connection for power bus; incl. three caps for terminating power bus</li> <li><b>TM-RS130-S31</b> For RS1e-x reversing starter, without supply cable connection for power bus</li> </ul>	<b>3RK1903-0AK00</b>  <b>3RK1903-0AK10</b>  <b>3RK1903-0AL00</b>  <b>3RK1903-0AL10</b>
		<b>M65-PEN-F Infeed Module</b> 65 mm (2.56 in) wide, incl. two caps, in combination with TM-DS65-S32/ TM-RS130-S32	<b>3RK1903-2AC00</b>
		<b>M65-PEN-S Connection Module</b> 65 mm (2.56 in) wide, in combination with TM-DS65-S31/TM-RS130-S31	<b>3RK1903-2AC10</b>

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200S

#### Selection and ordering data (continued)

Description	Order No.
<b>Local Safety Modules</b>	
<b>• Safety Modules</b>	
- PM-D F1, with diagnostics, for EMERGENCY-STOP applications, monitored startup	<b>3RK1903-1BA00</b>
- PM-D F2, with diagnostics, for protective door monitoring, automatic startup	<b>3RK1903-1BB00</b>
- PM-D F3, with diagnostics, for expansion of PM-D F1/2 for an additional voltage group, time-delayed 0 ... 15 s	<b>3RK1903-1BD00</b>
- PM-D F4, with diagnostics, for expansion of PM-D F1 to F4 with an additional voltage group	<b>3RK1 903-1BC00</b>
- PM-D F5 with diagnostics for expansion of PM-D F1 to F4 with four isolated enabling circuits, contact multiplier	<b>3RK1 903-1BE00</b>
- PM-X, with diagnostics; connection module for connecting a safety group and an external incoming supply contactor or external safety circuit	<b>3RK1903-1CB00</b>
<b>• Terminal Modules for Safety Modules</b>	
- TM-PF30 S47-B1, for PM-D F1/2 with incoming supply U1/U2 and sensor connection	<b>3RK1903-1AA00</b>
- TM-PF30 S47-B0, for PM-D F1/2 with sensor connection	<b>3RK1903-1AA10</b>
- TM-PF30 S47-C1, for PM-D F 3/4 with incoming supply U1/U2 and IN+/IN- control input	<b>3RK1903-1AC00</b>
- TM-PF30 S47-C0, for PM-D F3/4 with incoming supply U2	<b>3RK1903-1AC10</b>
- TM-PF30 S47-D0, for PM-D F5	<b>3RK1903-1AD10</b>
<b>• TM-X15 S27-01</b> for connection module PM-X	<b>3RK1903-1AB00</b>
<b>• F kit 1</b> Failsafe equipment for DS1-x standard motor starter <sup>1)</sup>	<b>3RK1903-1CA00</b>
<b>• F kit 2</b> Failsafe equipment for RS1-x standard motor starter <sup>1)</sup>	<b>3RK1903-1CA01</b>

Description	Order No.
<b>SIMATIC ET 200S accessories</b>	
<b>Shield connection element</b> Pluggable on TM-E and TM-P, 5 units	<b>6ES7193-4GA00-0AA0</b>
<b>Shield terminal</b> for 3 × 10 mm (0.39 in) busbar, 5 units	<b>6ES7193-4GB00-0AA0</b>
<b>Grounding terminal</b> for cable cross-sections up to 25 mm <sup>2</sup> , 1 unit	<b>8WA2 868</b>
<b>Busbar 3 × 10 mm × 1000 mm</b>	<b>8WA2 842</b>
<b>SIMATIC, DIN rail</b>	
• 35 mm (1.38 in), length 483 mm (19.02 in) for 19" cabinets	<b>6ES5710-8MA11</b>
• 35 mm (1.38 in), length 530 mm (20.87 in) for 600 mm (23.62 in) cabinets	<b>6ES5710-8MA21</b>
• 35 mm (1.38 in), length 830 mm (32.68 in) for 900 mm (35.43 in) cabinets	<b>6ES5710-8MA31</b>
• 35 mm (1.38 in), length 2 m (6.56 ft)	<b>6ES5710-8MA41</b>
<b>Labeling sheets DIN A4</b> 10 units Each sheet contains 60 labeling strips for I/O Modules and 20 labeling strips for Interface Modules	
• petrol	<b>6ES7193-4BH00-0AA0</b>
• red	<b>6ES7193-4BD00-0AA0</b>
• yellow	<b>6ES7193-4BB00-0AA0</b>
• light beige	<b>6ES7193-4BA00-0AA0</b>
<b>Accessories for coding</b>	
<b>Color coding plates</b> For TM-P, TM-E, 200 units	
• white	<b>6ES7193-4LA20-0AA0</b>
• yellow	<b>6ES7193-4LB20-0AA0</b>
• yellow/green	<b>6ES7193-4LC20-0AA0</b>
• red	<b>6ES7193-4LD20-0AA0</b>
• blue	<b>6ES7193-4LF20-0AA0</b>
• brown	<b>6ES7193-4LG20-0AA0</b>
• turquoise	<b>6ES7193-4LH20-0AA0</b>
<b>Labels, inscribed</b> 200 units	
• For slot numbering (1 to 20) 10 ×	<b>8WA8861-0AB</b>
• For slot numbering (1 to 40) 5 ×	<b>8WA8861-0AC</b>
• For slot numbering (1 to 64) 1 ×, (1 to 68) 2 ×	<b>8WA8861-0DA</b>
<b>Labels, blank</b> 100 units	
• For slot numbering	<b>8WA8848-2AY</b>

<sup>1)</sup> The function of the failsafe kit is already integrated into High Feature motor starters.

### Overview



- Compact, cost-effective I/O devices for processing digital signals
- Designed for use without a control cabinet with IP65/67 degree of protection with flexible and fast connections
- Comprises of a basic module and various connection blocks for application-specific implementations
  - ECOFAST: 2 × RS 485 hybrid fieldbus connection with identification plug for setting the PROFIBUS address
  - M12: 2 × M12 and 2 × 7/8" with 2 rotary coding switches for assigning the PROFIBUS address
- Connection block contains T-functionality for PROFIBUS DP and power supply so that during commissioning and service, the modules can be disconnected and reconnected to the PROFIBUS without interruption
- Module variants:
  - 8 DI, 16 DI, 8 DI/8 DO (1.3 A), 8 DI/8 DO (2.0 A), 8 DO (2.0 A), 16 DO (0.5 A)
- Module diagnostics for load voltage and encoder short-circuit
- Transmission rates up to 12 Mbit/s

### Application

SIMATIC ET 200eco is the compact block I/O with IP65/67 degree of protection and is distinguished by simple handling and installation.

SIMATIC ET 200eco allows the user to cost-effectively process digital signals over PROFIBUS DP.

Thanks to its high degree of protection and ruggedness, it is particularly suitable for use close to the machine.

The flexible connection blocks can be used to connect PROFIBUS DP over M12 or a standardized hybrid fieldbus connection (ECOFAST).

The compact block I/O SIMATIC ET 200eco can be used as an expansion for applications with high degree of protection in addition to the SIMATIC ET 200pro modular I/O family.

### Design

ET 200eco comprises a basic module and a connection block.

For applications in many different industries, a compact, perfectly matched module spectrum of digital I/Os is available:

Number of channels	Type of connection
8 DI	8 individual channels over 8 × M12 screw connections for 8 digital input signals
16 DI	16 channels over 8 × M12 screw connections with double assignment for 16 digital input signals
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (2 A)
16 DO	16 channels over 8 × M12 screw connections with double assignment for 16 digital output signals (0.5 A)
8 DI/8 DO (2 variants)	16 channels over 8 × M12 screw connections with double assignment for 8 digital input and 8 digital output signals (2 A or 1.3 A)

With the variable and flexible connection blocks, PROFIBUS DP can be connected over 2 × M12, 2 × 7/8" or 2 × hybrid fieldbus interfaces (ECOFAST).

The T-functionality for PROFIBUS DP and power supply are integrated in the connection block so that machines can be operated without interruption during commissioning and service of bus lines and without having to use supplementary components.

The pin assignment for the actuators and sensors are modeled on the IP65/67 standardization trends.

The PROFIBUS address can be set and seen from the outside or plugged. The proven identification connector is used for ECOFAST interfaces. For M12 7/8" interfaces, two rotary coding switches which can be seen from the outside are used to set the PROFIBUS address.

### Function

Communication is handled completely over PROFIBUS DP.

Diagnostic functions are available for checking the mode of operation of the ET 200eco:

- BF (bus fault)
- SF (system fault)
- Encoder and power supply

The diagnostic data is indicated by LEDs on the module and can be evaluated by software on the PG/PC or by SIMOTION.

Short-circuits of the encoder supply as well as missing load voltages are diagnosed for each module.

The connection block can be removed from and screwed back to the basic module while the power is on so that PROFIBUS and the power supply remain active for the application all the time.

# SIMOTION I/O components

## Distributed I/O

### SIMATIC ET 200eco PN

#### Overview



SIMATIC ET 200eco PN is a compact block I/O with a PROFINET connection with IP65/IP67 degree of protection for cabinet-free installation directly at the machine.

Due to the fully potted, zinc die-cast housing, SIMATIC ET 200eco PN is extremely rugged and resistant to vibration, dust, oil and humidity.

SIMATIC ET 200eco PN can be flexibly expanded via PROFINET and supports star and line topologies within the same system.

#### Benefits

- Compact block I/O for processing digital, analog and IO-Link signals for connecting to the PROFINET bus system
- Cabinet-free installation with IP65/IP67 degree of protection with M12 connection system
- Extremely rugged and strong metal enclosure and fully potted
- Compact module in two types of enclosures
- 100 Mbit/s data transmission rate
- LLDP proximity detection without PG and fast startup (boot up within approx. 0.5 s)
- Channel-specific diagnostics

#### Application

The SIMATIC ET 200eco PN is ideal for applications directly at the machine in which space is at a premium. Due to its ruggedness and high degree of protection, it is implemented in a wide range of applications demanding a high degree of protection alongside the modular SIMATIC ET 200pro I/O family.

#### Design

SIMATIC ET 200eco PN comprises a basic module and a connection block.

For applications in many different industries, a compact, perfectly matched module spectrum of digital I/Os is available:

Number of channels	Type of connection
8 DI	8 channels over 4 × M12 screw connections with double assignment for 8 digital input signals
8 DI	8 individual channels over 8 × M12 screw connections for 8 digital input signals
16 DI	16 channels over 8 × M12 screw connections with double assignment for 16 digital input signals
8 DO	8 channels over 4 × M12 screw connections with double assignment for 8 digital output signals (1.3 A)
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (1.3 A)
8 DO	8 individual channels over 8 × M12 screw connections for 8 digital output signals (2 A)
16 DO	16 channels over 8 × M12 screw connections with double assignment for 16 digital output signals (1.3 A)
8 DI/DO	8 individual channels over 8 × M12 screwed connections for 8 digital input/output signals (1.3 A)
8 AI	8 individual channels over 8 × M12 screwed connections for 4 analog input signals (U/I) and 4 RTD/TC signals
4 AO	4 individual channels over 4 × M12 screwed connections for 4 analog output signals (U/I)
IO-Link master	16 channels over 8 × M12 screwed connections with double assignment for 4 IO-Link channels, 8 digital input signals and 4 digital output signals (1.3 A)

2 × M12 screwed connections with an integrated 2-port switch are used for connection to PROFINET IO, so line topologies can be configured.

The supply and load voltage connections are also implemented as 2 × M12 screwed connections. This makes supply voltage loop-through extremely easy. Using an optional terminal block, the supply voltage can be connected via insulating piercing terminals.

#### Function

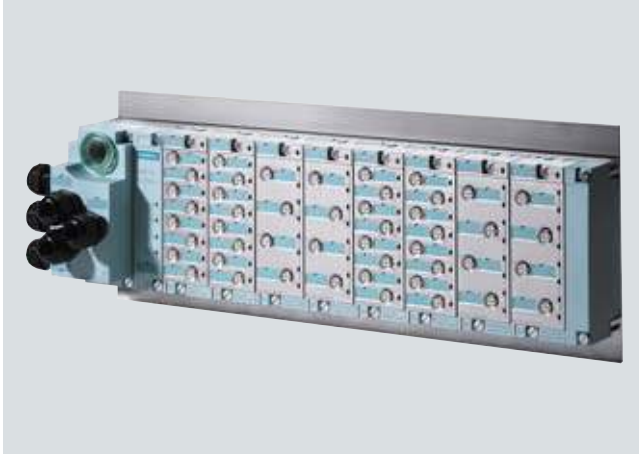
The communication is performed exclusively via PROFINET IO.

Diagnostic functions are available for checking the mode of operation of ET 200eco PN:

- BF (bus fault)
- SF (system fault)
- Encoder and power supply

The diagnostic data are indicated by LEDs on the module and can be evaluated by software on the PG/PC or by SIMOTION. Short-circuits of the encoder supply as well as missing load voltages are diagnosed for each module.

### Overview



SIMATIC ET 200pro is the modular I/O system with high IP65/67 degree of protection for local, cabinet-free applications. ET 200pro distinguishes itself through a small frame size and an innovative installation concept. The ET 200pro station can be easily adapted to the requirements of the corresponding automation task with respect to the connection method, required I/O and fieldbus connection. New features such as the integrated PROFI-safe safety technology, the PROFINET interface and the ability to hotswap modules permit it to be used for a wide range of applications.

### Benefits

- Distributed I/O system with high IP65/67 degree of protection
- Flexible fieldbus connection through interface modules for PROFIBUS DP and PROFINET
- Modular design with up to 16 expansion modules for flexible adaptation to the automation task
- Comprehensive module range
  - Digital and Analog Input and Output Modules
  - Power Module for simple implementation of 24 V load groups
  - Motor starter
  - PROFI-safe module
- Simple, quick assembly and high vibration strength of the module carrier
- Integration of safety technology with PROFI-safe
- High plant availability through permanent wiring and the ability to replace Electronic Modules during operation (hot swapping)
- Low space requirements through small footprint (I/O module e.g. 130 mm (5.12 in) high and 45 mm (1.77 in) wide)
- Graduated diagnostics concept, optionally with module-specific or channel-specific diagnosis of faults of connected sensors or actuators
- Simple configuration through ET 200pro configurator software

### Design

SIMATIC ET 200pro comprises of an interface module which contains the fieldbus interface and is expandable with a comprehensive module range.

The system bus and 24 V power wiring are configured with a busbar system which is integrated in the modules. Wiring using connecting cables is therefore not necessary.

Quick assembly and high vibration strength is achieved through a rack which is available in different options and is an integral part of the system. The modules are first latched onto this rack and then secured with a few screws to achieve a good fit and very high vibration strength.

SIMATIC ET 200pro is usually designed in two or three parts. Interface and Power Modules as well as Digital and Analog Expansion Modules comprise:

- one bus connector which constitutes the backplane bus of the system,
- one Electronics Module or Interface Module and
- one Connection Module.

The separation of module and bus/power connection technology, which has already been used for the ET 200eco, is now also used for the Digital and Analog Expansion Modules of the ET 200pro. For the interface module, this allows use of the T-functionality for the bus and 24 V power supply, and for the Expansion Modules it permits pre-wiring of sensor/actuator connections. This permanent wiring allows exactly one Electronics Module to be hotswapped in the event of a fault without having to switch off the whole station. This ensures very high machine and plant availability. When an electronics component is replaced, the whole I/O wiring can remain on the Connection Module and does not have to be marked or removed.

Power Modules can be added to the system if selective load groups have to be configured within a station or if a 24 V back-feed is required. The power modules interrupt the busbar integrated into the system for the 24 V load supply and feed the power back into the system at the point of connection.

- Up to 16 expansion modules can be used (max. station width: 1 meter (3.28 ft))
- Build-as-you-go busbars for 24 V power and communication within the station
- Flexible connection system
  - Connection for PROFIBUS DP and 24 V power supply over direct coupling (M20 cable gland), ECOFAST or M12 / 7/8"
  - Connection for PROFINET and 24 V power supply over M12 / 7/8"
  - Sensors and actuators for 8-channel I/O modules can be optionally connected to 4 × M12 or 8 × M12.

# SIMOTION I/O components

## Distributed I/O

### SINUMERIK Analog Drive Interface for 4 Axes ADI 4 • SIMATIC Interface Module IM 174

#### Overview



The ADI 4 Analog Drive Interface for 4 Axes and the IM 174 Interface Module can be used to connect drives with analog  $\pm 10$  V setpoint interfaces.

The IM 174 Interface Module also allows stepper drives with pulse/direction interfaces to be connected.

#### Application

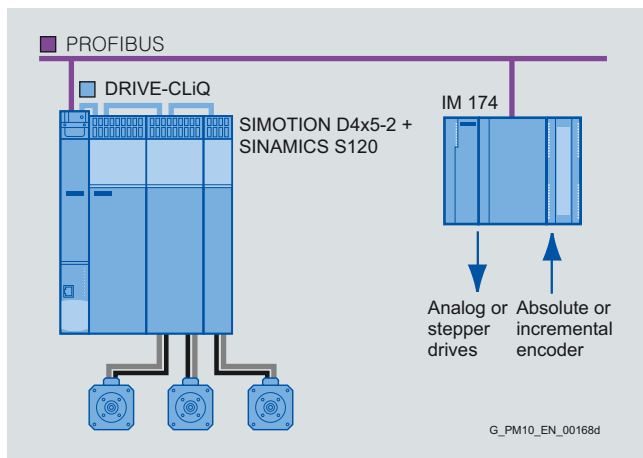
Up to four drives with analog setpoint interfaces can be operated on each of these modules. The isochronous PROFIBUS DP is used for coupling to SIMOTION.

The following can be connected:

- Electrical servo drives with analog  $\pm 10$  V setpoint interface
- Hydraulic drives with analog  $\pm 10$  V setpoint interface (e.g. for servo hydraulic valve)
- Stepper drives with pulse/direction interface (IM 174 Interface Module only)

ADI 4 and IM 174 can also be used for external encoders; at least one axis must be created.

Mixed operation of the 4 drive interfaces is possible.



Connection of an IM 174 to a SIMOTION D module via PROFIBUS DP

#### Design

##### Interfaces

##### Display and diagnostics

- Onboard status display on 4 diagnostics LEDs

##### Drive interfaces

- 4 analog outputs  $\pm 10$  V for connecting drives with analog setpoint interface
- For IM 174 only: 4 interfaces for controlling stepper drives with or without encoder connection
- 4 relay contacts for drive enable axes 1 to 4

##### Encoder interfaces

- 4 encoder inputs for position acquisition. Each input can be connected either to an RS422 incremental encoder or to an SSI absolute encoder. Encoders with SINE/COSINE signals (1 Vpp) can be connected using external pulse shaping electronics (EXE) which convert the signals to the 5 V TTL level.

##### Communication

- PROFIBUS DP interface with Motion Control functionality (isochronous, max. 12 Mbit/s)

##### Digital inputs and outputs

- 10 DI, 24 V DC (e.g. for BERO, probe and "Drive Ready" signal)
- 8 DO, 24 V DC, 0.5 A (e.g. for drive enable)

##### Additional interfaces

- 2 relay contacts for "Ready" signal

An external power source (24 V DC) is required for supplying the module and the digital outputs.

All connections are at the front panel.

#### Function

The following functions are available in connection with SIMOTION:

- Speed-controlled axes
- Position-controlled axes
- External encoder for SIMOTION (at least one axis must be configured)
- Homing over BERO or
- Homing over zero marks (non-distance-coded zero marks/reference marks)
- Measuring over Sensor 1 and Sensor 2 (one edge, rising or falling)

#### Integration

The modules are not certified PROFIBUS DP standard slaves and can therefore only be used in combination with the controllers intended for this purpose (e.g. SIMOTION C/P/D). The modules do not support acyclic communication and the I/O interfaces can only be used in combination with the encoder or drive functions.

ADI 4 and IM 174 must be operated on an isochronous PROFIBUS DP.

Supported PROFIBUS DP cycles:

- ADI 4: 1 ms and above (isochronous, max. 12 Mbit/s)
- IM 174: 1.5 ms and above (isochronous, max. 12 Mbit/s)

#### Technical specifications

	ADI 4	IM 174
<b>Input voltage</b>	24 V DC	24 V DC
<b>Power consumption, max.</b>	30 W	typ. 12 W
<b>Inputs/outputs</b>	Isolated	Isolated
<b>Relay contacts</b>	Max. current carrying capacity: 2 A for 150 V DC or 125 V AC  Switching cycles: - for 24 V DC, 1 A: $1 \times 10^7$ - for 24 V DC, 2 A: $1 \times 10^5$	Max. current carrying capacity: 1 A for 30 V DC  Switching cycles: - for 30 V DC, 1 A: at least. $5 \times 10^5$
<b>Encoder inputs</b> Can be used alternatively for incremental encoders (symmetrical) or absolute encoders (SSI)	4	4
<b>Drive interfaces</b>	4	4
• Analog drives (over analog output $\pm 10$ V)	Yes	Yes
• Hydraulic drives (hydraulic valve over analog output, $\pm 10$ V)	Yes	Yes
• Stepper drives (over pulse/direction interface)	No	Yes
<b>Communication</b>		
• PROFIBUS DP interfaces	1 (isochronous, max. 12 Mbit/s)	1 (isochronous, max. 12 Mbit/s)
• Minimum PROFIBUS DP cycle	1 ms	1.5 ms
<b>Degree of protection to EN 60529</b>	IP20	IP20
<b>Condensation</b>	Not permissible	Not permissible
<b>Permissible ambient temperature</b>		
• Storage	-20 ... +55 °C (-4 ... +131 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Transportation	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)
• Operation	0 ... +55 °C (+32 ... +131 °F)	0 ... +60 °C (+32 ... +140 °F)
<b>Design</b>	Housing in booksize format; fixed by screwing	SIMATIC S7-300 design (no backplane bus, connected over PROFIBUS)
<b>Weight, approx.</b>	1.5 kg (3.31 lb)	1 kg (2.21 lb)
<b>Dimensions (W x H x D)</b>	48.5 x 325 x 154.4 mm (1.91 x 12.80 x 6.08 in)	160 x 125 x 118 mm (6.30 x 4.92 x 4.65 in)

#### Selection and ordering data

Description	Order No.
<b>SINUMERIK Analog Drive Interface for 4 Axes ADI 4</b>	<b>6FC5211-0BA01-0AA4</b>
<b>SIMATIC Interface Module IM 174</b> (Interface Module for 4 Axes)	<b>6ES7174-0AA10-0AA0</b>
<b>Accessories</b>	
<b>Front connector with screw-type contacts</b> 40-pole, 100 units	<b>6ES7392-1AM00-1AB0</b>
<b>Front connector with spring-loaded contacts</b> 40-pole, 100 units	<b>6ES7392-1BM01-1AB0</b>
<b>Front connector FastConnect</b> 40-pole, 1 unit	<b>6ES7392-1CM00-0AA0</b>

# SIMOTION I/O components

## Distributed I/O

### AS-Interface

#### Overview



An important characteristic of the AS-Interface technology is the use of an unshielded two-core cable for data transmission and distribution of auxiliary power to the sensors and actuators. The special AS-Interface power supply unit supports the AS-Interface transmission method. The mechanically coded and thus polarized AS-Interface cable is used for wiring. The AS-Interface Modules are connected to the AS-Interface cable with insulation piercing contacts.

The ASIsafe concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network.

#### Application

##### *Process or field communication*

Complex control cable wiring in the control cabinet and control cabinets full of terminal blocks can be replaced with AS-Interface. Thanks to a specially developed ribbon cable (easily recognized by its yellow color) and insulation piercing technology, the AS-Interface cable can be connected anywhere. This concept results in enormous flexibility and significant cost savings. AS-Interface is an open standard (EN 50295 / IEC 62026-2). Leading manufacturers of actuators and sensors worldwide support AS-Interface.

AS-Interface is used where individual actuators/sensors are spatially distributed over a machine (e.g. in a bottling plant or production line). AS-Interface replaces complex cable harnesses as well as connects binary and analog actuators and sensors such as proximity switches, measuring sensors, valves or indicator lights with a SIMOTION control. In practice this means: Installation runs smoothly because data and power are transported together over a single line. No special expertise is required for installation and commissioning. Furthermore, through simple cable laying, the freely configurable network topology as well as the special design of the cable, you not only significantly reduce the risk of errors, but also service and maintenance costs.

##### *Safety included*

The ASIsafe concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network. These are fully compatible with the other AS-Interface components (masters, slaves, power supply units, repeaters, etc.) and are operated together on the yellow AS-Interface cable.

The signals of the safety sensors are evaluated by a safety monitor. The safety monitor not only monitors the switching signals of the safety sensors, but also continuously checks whether data transmission is functioning properly. Depending on the variant, the safety monitor has one or two release circuits which are used to put the machine or plant into a safe state. Each release circuit has two switching contacts to fulfill Safety Category 4 in accordance with EN 954-1 or SIL 3 to IEC 61508. Sensors and monitor can be connected at any point in the AS-Interface network. It is also possible to use several safety monitors on a single network.

A fail-safe control or special master is not necessary. The master treats safety slaves in the same way as all other slaves. The safety data is evaluated in the safety monitor. In this way, existing AS-Interface networks can also be expanded.



### Design

#### AS-Interface network topology

AS-Interface is a single master system. A communications processor (CP 343-2 P), which controls the process or field communication as a master, is used for central application with SIMOTION C or distributed applications over SIMATIC ET 200M. The DP/AS-Interface Link 20E and DP/AS-Interface Link Advanced are used to establish a direct connection between ASInterface and PROFIBUS DP.

IE/AS-Interface Link PN IO can also be used to connect AS-Interface to PROFINET.

The gateways enable AS-Interface to be used as a subnet for PROFIBUS DP or PROFINET on SIMOTION.

Up to 62 slaves can be operated on the AS-Interface. SIMOTION supports all digital and analog AS-Interface slaves (with Analog Profile 7.3 and higher).

The maximum extension of an AS-Interface network is 200 m (656 ft) (with AS-i extension plug) or 100 m (328 ft) (without AS-i extension plug). This length can be increased with the help of repeaters.

The following AS-Interface masters are available for SIMOTION:

- DP/AS-Interface Link 20E and DP/AS-Interface Link Advanced connect PROFIBUS DP to AS-Interface.
- The IE/AS-Interface Link PN IO connects PROFINET IO with AS-Interface.
- The CP 343-2 P is the AS-Interface master for central application with SIMOTION C or for the SIMATIC ET 200M distributed I/O system.

DP/AS-Interface Link Advanced and IE/AS-Interface Link PN IO support particularly easy diagnostics and commissioning on site over the integrated pixel graphics display and control keys or over the web interface using a standard browser.

The modules operate in compliance with the latest AS-i specification 3.0 and therefore also support the operation of digital A/B slaves with 4 inputs and 4 outputs as well as analog A/B slaves.

If the optional C-PLUG is used, modules can be replaced without the need to set PROFIBUS or Ethernet addresses.

The SCOUT command library contains standard functions for easy handling of the AS-Interface components, e.g.

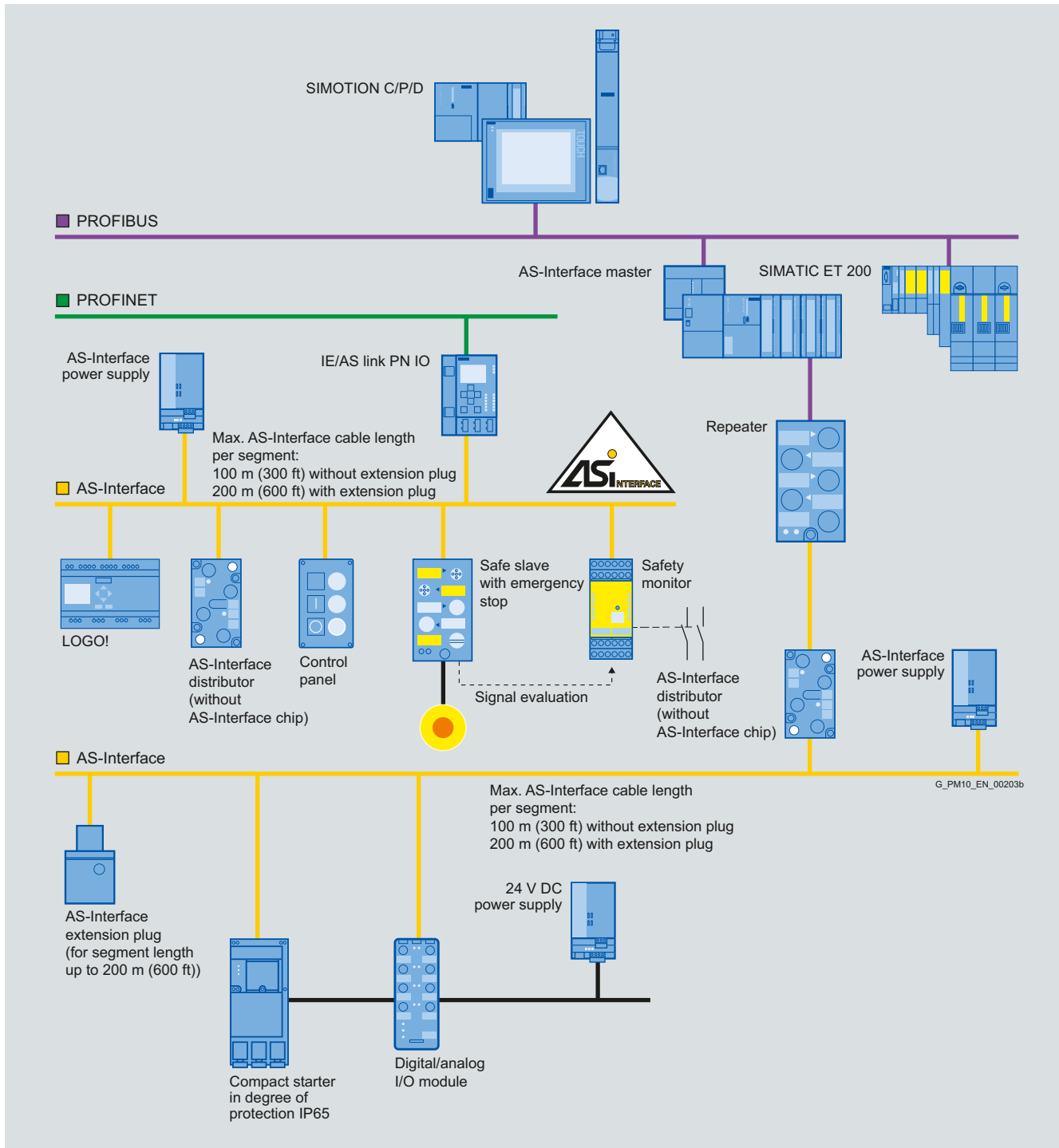
- for operating the command interface of the AS-Interface master
- for reading out the diagnostic information from the ASIsafe safety monitor

# SIMOTION I/O components

## Distributed I/O

### AS-Interface

#### Design (continued)



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### Selection and ordering data

Description	Order No.
<b>DP/AS-Interface Link 20E</b> Router between the PROFIBUS DP and AS-Interface with IP20 degree of protection	<b>6GK1415-2AA10</b>
<b>IE/AS-Interface LINK PN IO</b> Router between Industrial Ethernet and AS-Interface with master profiles M3, M4 in accordance with extended AS-I specification V3.0 for integration in PROFINET IO; IP20 degree of protection	
• Single master with display	<b>6GK1411-2AB10</b>
• Dual master with display	<b>6GK1411-2AB20</b>
<b>DP/AS-Interface Link Advanced</b> Router between PROFIBUS DP and AS-Interface; master profiles M3 and M4, extended AS-Interface specification V3.0; IP20 degree of protection; manual on CD-ROM	
• Single master with display	<b>6GK1415-2BA10</b>
• Dual master with display	<b>6GK1415-2BA20</b>
<b>C-PLUG</b> Swap medium for easy replacement of the devices in the event of a fault; for storing configuration data or engineering data and user data	<b>6GK1900-0AB00</b>
<b>RS 485 bus connector with angled cable outlet (35°)</b> With screw-type terminals, without PG interface	<b>6ES7972-0BA42-0XA0</b>
<b>IE FC RJ45 Plug 90</b> RJ45 plug-in connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 90° cable outlet	
• 1 pack = 1 unit	<b>6GK1901-1BB20-2AA0</b>
• 1 pack = 10 units	<b>6GK1901-1BB20-2AB0</b>
• 1 pack = 50 units	<b>6GK1901-1BB20-2AE0</b>
<b>CP 343-2 P communications processor</b> For connecting SIMOTION C and SIMATIC ET 200M to the AS-Interface; without front connector	<b>6GK7343-2AH11-0XA0</b>
<b>Front connector for CP 343-2 P</b>	
• With screw contacts	
- 20-pole, 1 unit	<b>6ES7392-1AJ00-0AA0</b>
- 20-pole, 100 units	<b>6ES7392-1AJ00-1AB0</b>
• With spring-loaded contacts	
- 20-pole, 1 unit	<b>6ES7392-1BJ00-0AA0</b>
- 20-pole, 100 units	<b>6ES7392-1BJ00-1AB0</b>
• With FastConnect	
- 20-pole, 1 unit	<b>6ES7392-1CJ00-0AA0</b>

### More information

For further information about AS-Interface slaves, ASIsafe and ordering data, see Catalog I K PI and the Industry Mall under Automation technology/Industrial Communication/AS-Interface and on the Internet at:

[www.siemens.com/as-interface](http://www.siemens.com/as-interface)

DP/AS-Interface manuals are available as PDF files at:

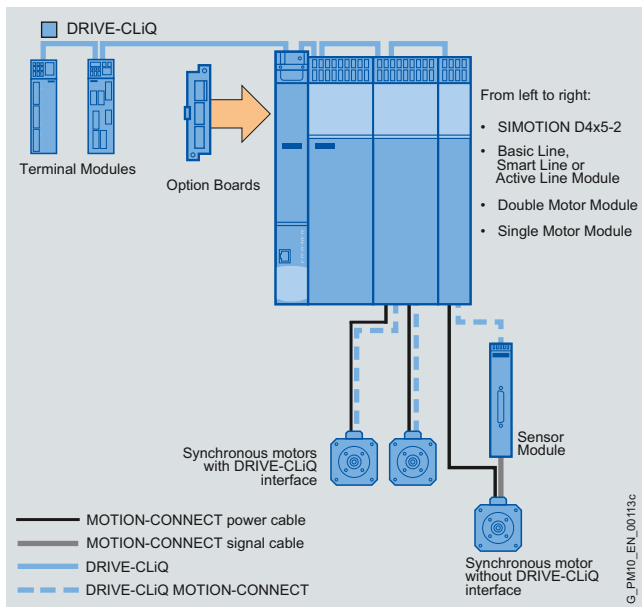
<http://support.automation.siemens.com/WW/view/com/47052644>

# SIMOTION I/O components

## SINAMICS drive I/O

### Summary

#### Overview



#### SINAMICS drive I/O

With the modules of the SINAMICS drive I/O, the SIMOTION Motion Control system as well as the SINAMICS S120 drive system can be expanded with digital and analog inputs and outputs as well as encoder interfaces. The following modules are available:

- TB30 Terminal Board that is plugged into the option slot of the SINAMICS CU320-2/SIMOTION D4x5-2 Control Unit. It provides additional digital and analog inputs and outputs.
- TM Terminal Modules that are connected to SINAMICS/SIMOTION over DRIVE-CLiQ. The Terminal Modules expand SINAMICS/SIMOTION with additional digital and analog inputs/outputs.
- SMC/SME Sensor Modules that are connected to the SINAMICS/SIMOTION Control Unit over DRIVE-CLiQ. The SMC Sensor Modules (for control cabinet installation) and SME (IP67 version for installation outside the control cabinet) are required if motors are to be connected without DRIVE-CLiQ and/or if other encoders must be evaluated in addition to the motor encoder.

#### Connection to SINAMICS/SIMOTION

The modules of the SINAMICS drive I/O are connected to SINAMICS/SIMOTION over DRIVE-CLiQ. The only exception is the TB30 Terminal Board, which is plugged directly into the SINAMICS or SIMOTION Control Unit as a plug-in card.

DRIVE-CLiQ is used to connect SINAMICS Control Units and SIMOTION controllers to other drive-based components, such as Line Modules, Motor Modules, motors and encoders. Set-points and actual values, control commands, status messages and electronic nameplate data for the connected components are transferred via DRIVE-CLiQ.

#### Benefits

- DRIVE-CLiQ significantly simplifies commissioning and diagnostics since all connected components are identified with the help of an electronic nameplate.
- The standardized cables and connectors reduce the variety of different parts and cut storage costs.

#### Application

##### Terminal Board TB30

#### Application

Expansion of the Control Unit with additional digital and analog inputs/outputs.

#### Main features

- Slide-in module for the option slot of Control Units SIMOTION D4x5-2 and SINAMICS S120 CU320-2
- 4 DI, 4 DO, 2 AI, 2 AO

##### TM15/TM17 High Feature Terminal Modules

#### Application

Implementation of measuring inputs and cam outputs as well as drive-related digital inputs and outputs with short signal delay times (TM17 High Feature can only be used in conjunction with SIMOTION)

#### Main features of TM15

24 isolated, bidirectional DI/DO with measuring input and cam functionality (measuring input and cam functionality is available only in connection with SIMOTION)

#### Main features of TM17 High Feature

16 non-isolated, bidirectional DI/DO with measuring input and cam functionality for the highest requirements with respect to resolution, accuracy and short input delay times. In addition, enabling inputs can be parameterized.

##### TM31 Terminal Module

#### Application

Expansion of digital and analog inputs and outputs over DRIVE-CLiQ

#### Main features

- 8 DI, 4 bidirectional DI/DO, 2 relay outputs
- 2 AI, 2 AO
- 1 temperature sensor input (KTY84-130 or PTC)

##### TM41 Terminal Module

#### Application

The TM41 Terminal Module is used for incremental encoder emulation. A master value (incremental signal) can be made available to a second control unit as an external encoder signal via the TM 41.

#### Main features

- 4 DI, 4 DI/O
- 1 AI
- 1 interface for TTL incremental encoder emulation (RS422)

##### TM54F Terminal Module

#### Application

The TM54F provides safe digital inputs and outputs for controlling the Safety Integrated functions of SINAMICS.

#### Main features

- 4 fail-safe digital outputs (F-DO)
- 10 fail-safe digital inputs (F-DI)

### Application (continued)

#### Terminal Modules TM120/TM150

##### Application

Temperature sensors can be evaluated using Terminal Modules TM120/TM150.

##### Main features of TM120

Terminal Module TM120 can be used to evaluate 4 temperature sensors (KTY84-130 or PTC). The temperature sensor inputs are safely electrically isolated from the evaluation electronics in Terminal Module TM120 and are suitable for temperature monitoring of special motors, e.g. 1FN linear motors and 1FW6 built-in torque motors.

##### Main features of TM150

Terminal Module TM150 can be used to evaluate temperature sensors (KTY, PT100, PT1000, PTC and normally closed bimetal contacts). Apart from motor temperature, other temperatures from the process can be acquired. Temperature sensor evaluation can be performed using a 2, 3 or 4-wire system. 12 temperature sensors can be evaluated with 2-wire evaluation, and 6 temperature sensors can be evaluated with 3 and 4-wire evaluation.

#### Sensor Modules SMC10/SMC20/SMC30

##### Application

Motor encoder and temperature evaluation of motors without DRIVE-CLiQ or when additional encoders are used (for example, machine encoders)

##### Main features of SMC10

One encoder connection for evaluating the resolver signals (two-pole and multi-pole). In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

##### Main features of SMC20

One encoder connection for evaluating

- Incremental encoders (sin/cos 1 Vpp)
- Absolute encoders (EnDat 2.1) and
- SSI encoders with incremental signals (sin/cos 1 Vpp)

In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

##### Main features of SMC30

One encoder connection for evaluating

- Incremental encoders (TTL/HTL)
- SSI encoders with and without incremental signals (TTL/HTL)

In addition, the motor temperature can be monitored with a KTY84-130 or PTC thermistor.

#### SME20/SME25 Sensor Modules External

##### Application

The SME20/SME25 Sensor Modules External are encoder evaluation units for machine encoders (direct measuring systems). The devices are designed with IP67 degree of protection. This means that the units can be installed outside the control cabinet near the machine encoder.

##### Main features of SME20

One encoder connection for evaluating incremental encoders (sin/cos 1 Vpp) without rotor position track (C and D track).

##### Main features of SME25

An encoder connection for evaluating absolute encoders (EnDat) and SSI absolute encoders with incremental signals (sin/cos 1 Vpp).

#### SME120/SME125 Sensor Modules External

The SME120/SME125 Sensor Modules External are encoder evaluation units with IP67 degree of protection, especially suitable for use in linear and torque applications in which the temperature signals must be reliably electrically isolated from the encoder signals and the 24 V supply. They can be installed close to the motor systems and encoders in the machine.

##### Main features of SME120

One encoder connection for evaluating incremental encoders (sin/cos 1 V<sub>pp</sub>).

##### Main features of SME125

One encoder connection for evaluating absolute encoders (EnDat).

With SME120 and SME125, the motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### DRIVE-CLiQ Hub Module DMC20/DME20

##### Application

The DMC20/DME20 can be used to increase the number of DRIVE-CLiQ interfaces.

##### Main features

DRIVE-CLiQ hub with 6 DRIVE-CLiQ sockets for connecting 5 additional DRIVE-CLiQ nodes.

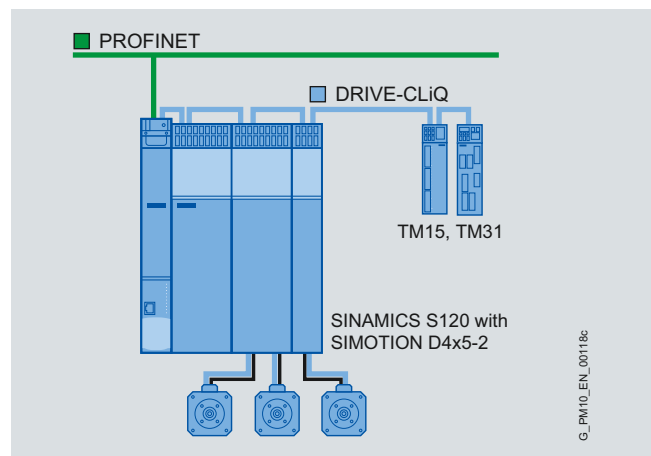
- DMC20 is the hub for mounting in the control cabinet
- DME20 is the hub for mounting outside the control cabinet (IP67 degree of protection).

### Integration

#### Integration of the SINAMICS drive I/O in a SIMOTION system

Two main options are available for SIMOTION for integrating the SINAMICS drive I/O via DRIVE-CLiQ:

- System configuration with integrated drives:  
In this configuration, the drive I/O are connected directly to SIMOTION D or to the SIMOTION CX32-2 Controller Extension (not shown in the figure).
- System configuration with external drives:  
In this configuration, the drive I/O are connected to a SINAMICS CU310-2 or CU320-2 Control Unit, which is connected to SIMOTION C, P or D (see figure) via PROFIBUS DP or via PROFINET IO.



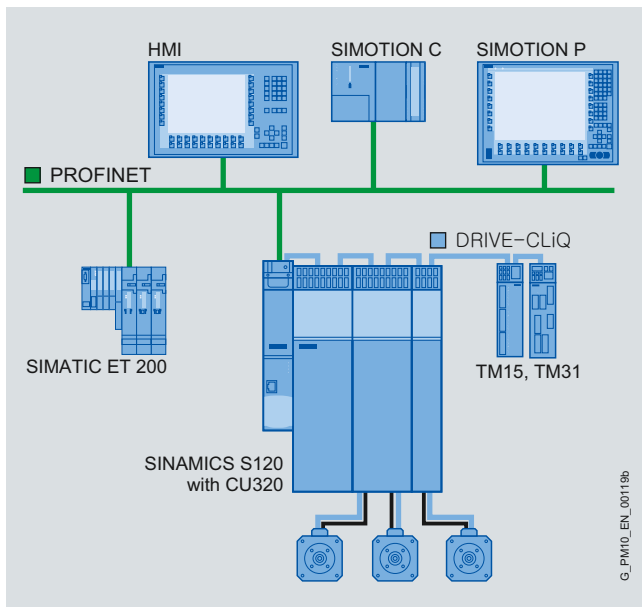
Coupling of TM15 and TM31 with SIMOTION D4x5-2

# SIMOTION I/O components

## SINAMICS drive I/O

### Summary

#### Integration (continued)

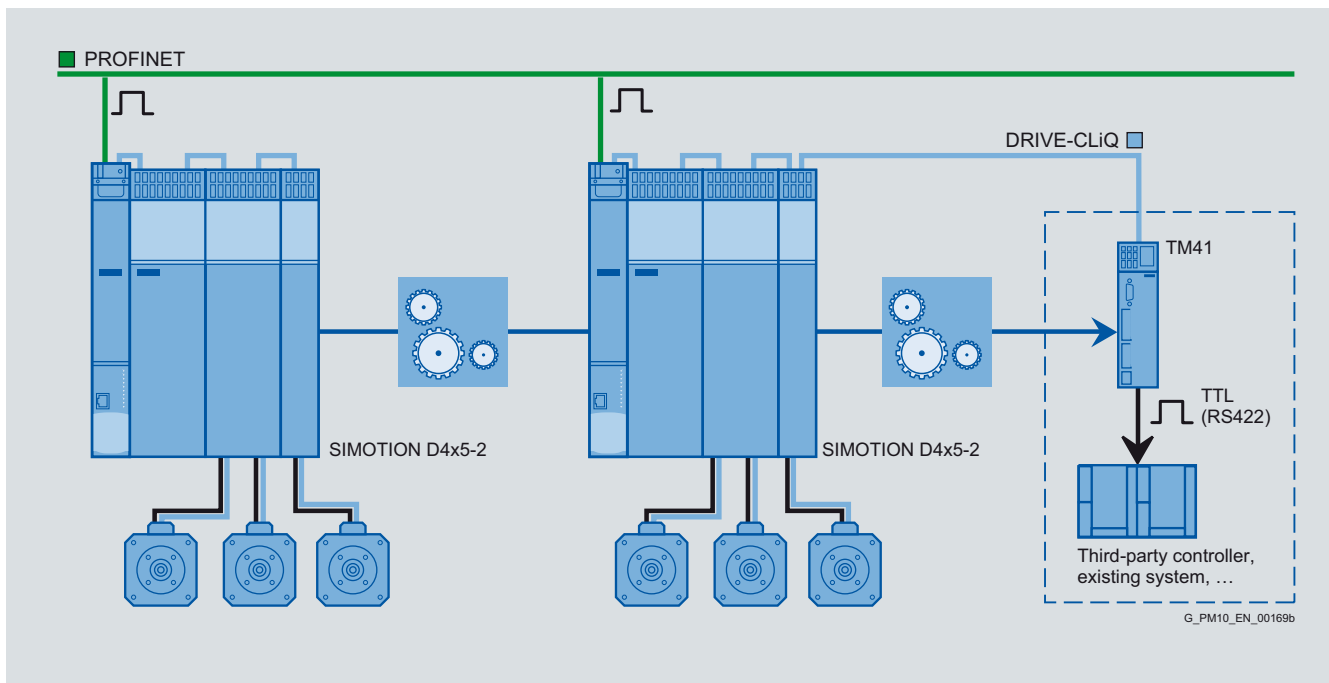


Coupling of TM15 and TM31 with SIMOTION C, P over CU320-2

#### Use of the TM41 as incremental encoder emulation

The TM41 Terminal Module supplies TTL signals for incremental encoder emulation, e.g. for a higher-level control. The encoder interface (incremental encoder emulation) can be linked to an encoder signal from the Control Unit, e.g. incremental encoder sin/cos, by parameter assignment.

Alternatively, as far as SIMOTION is concerned, TM41 can be handled in the same manner as an axis. This allows you to return the axis position (a master value) as an encoder signal to a second controller, for example.



TM41 Terminal Module as incremental encoder emulation

#### More information

Further information

- on the TM15 and TM17 High Feature Terminal Modules can be found on the next pages.
- on the remaining components of the SINAMICS drive I/O can be found in the chapter "SINAMICS S120".

### TM15 and TM17 High Feature Terminal Modules

#### Overview



Terminal Modules TM15 (left) and TM17 High Feature (right)

TM15 and TM17 High Feature Terminal Modules provide the measuring inputs and output cams for the Motion Control System SIMOTION. Furthermore, the Terminal Modules provide drive-related digital inputs and outputs with short signal delay times.

The "Measuring input", "Cam" and "Cam Track" technology objects support easy integration in SIMOTION.

#### Application

The main field of application for the TM15 and TM17 High Feature Terminal Modules are applications which in addition to digital inputs and output cams require very accurate measuring inputs and output cams. Several measuring inputs or output cams can be assigned to a real axis, virtual axis, or external encoder.

Examples for precise sensing with binary signals:

- Edge detection
- Quality monitoring (e.g. product is good/bad)
- Product tracing (e.g. product is available/not available)
- Detection of print marks
- Print mark correction
- Tool monitoring (e.g. for presses)
- Machine status monitoring (e.g. for broken threads in the textile industry)

Examples for precise output of binary signals

- Position-dependent switching of actuators
  - Camera trigger signal (quality assurance)
  - Control of an air nozzle for blowing away cut-offs
  - Controlling a nozzle for applying glue
- Product extraction from production line
- Implementation of line Motion Control systems
- Output of pulse patterns

#### Design

##### Interfaces

##### Display and diagnostics

- The status of the TM15 and TM17 High Feature Terminal Modules is indicated via a multi-color LED.
- The logical status of a channel is indicated with the corresponding green status LED.

##### Interfaces for I/O

- TM15: 24 DI/DO, parameterizable channel-by-channel
- TM17 High Feature: 16 DI/DO, parameterizable channel-by-channel

##### Communication

- 2 DRIVE-CLiQ sockets

##### Power supply

- Connection for the electronic power supply over the 24 V DC infeed connector

##### Installation

The signal cable shield is connected to the TM15 and TM17 High Feature Terminal Modules with a shield connection terminal, e.g. type SK8 by Phoenix Contact or type KLBÜ CO 1 by Weidmüller.

The TM15 and TM17 High Feature Terminal Modules are snapped onto a standard mounting rail according to EN 50022 (35 mm × 15 mm / 7.5 mm (1.38 in × 0.59 in / 0.30 in)).

# SIMOTION I/O components

## SINAMICS drive I/O

### TM15 and TM17 High Feature Terminal Modules

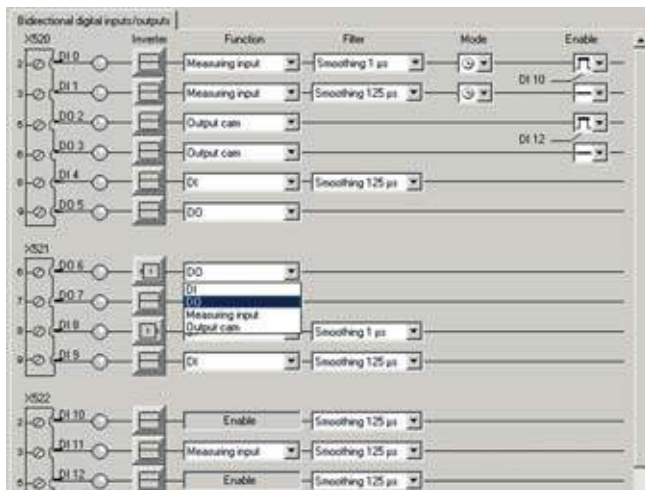
#### Function

Each of the 24 DI/DO (TM15) or 16 DI/DO (TM17 High Feature) can be parameterized channel-by-channel as:

- Digital input (DI) or digital output (DO)
- Measuring input
- Output cam

Each channel can also be inverted, as required.

Parameterization is performed with the SIMOTION SCOUT engineering software.



Parameterization of the TM17 High Feature Terminal Module

The differences between the TM15 and TM17 High Feature Terminal Modules depend on the field of application. TM17 High Feature has fewer I/O channels than TM15, but more functionality.

TM17 High Feature is distinguished by especially high resolution and accuracy as well as a parameterizable input filter and enabling inputs.

Parameterized enable inputs can enable measuring inputs or output cams (gate function).

- Level-controlled enable for measuring inputs
- Level or edge-controlled enable for output cams

TM17 High Feature also supports cyclic measuring of up to 2 edges per servo/interpolator cycle.

Due to their high accuracy, the DI/DO channels of the TM17 High Feature are non-isolated.

#### Integration

The TM15 and TM17 High Feature Terminal Modules can be connected directly to SIMOTION D via DRIVE-CLiQ. Alternatively, TM15 and TM17 High Feature can be connected to a SINAMICS CU310-2 or CU320-2 Control Unit, which is connected with SIMOTION C/P/D over PROFIBUS or PROFINET.

The number of Terminal Modules which can be used depends on the number of axes configured with SIMOTION as well as the functionality configured for TM15 and TM17 High Feature.

For further information, refer to the [Commissioning Manual of the TM15 and TM17 High Feature Terminal Modules](#).

#### Note:

TM17 High Feature can only be used on a SINAMICS CU310-2 or CU320-2 Control Unit in conjunction with the SIMOTION motion control system.



#### Technical specifications

General data	TM15 Terminal Module	TM17 High Feature Terminal Module
Power supply (rated value)	24 V DC	24 V DC
Current consumption (no-load), max.	0.15 A	0.2 A
Power loss, max.	3 W	4 W
Conductor cross-section, max.	2.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>
<b>Number of DRIVE-CLiQ interfaces</b>	2	2
<b>I/O</b>		
• Digital inputs/outputs	24 DI/DO, parameterizable channel-by-channel	16 DI/DO, parameterizable channel-by-channel
• Isolation	Yes, in groups of 8	No
• Connections	Plug-in screw-type terminals	Plug-in screw-type terminals
• Conductor cross-section, max.	1.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>
<b>Digital inputs</b>	Each channel can be parameterized as: Digital input/measuring input	Each channel can be parameterized as: Digital input/measuring input/enabling input (max. 6 units)
<b>Input voltage (rated value)</b>	24 V DC	24 V DC
• For "0" signal	min. -30 V max. 5 V	-30 V 5 V
• For "1" signal	min. 15 V max. 30 V	15 V 30 V
<b>Input delay</b> at rated value of input voltage	0 → 1 / 1 → 0: typical 50 μs/100 μs	1 μs/125 μs ± 15 % (parameterizable in 2 steps)
<b>Probe function</b>		
• Reproducibility	± 125 μs	≤ ± 1 μs
• Resolution	125 μs	1 μs
<b>Digital outputs</b>	Each channel can be parameterized as: Digital output/output cam The logical status of the digital outputs can be read back for diagnostic purposes	Each channel can be parameterized as: Digital output/output cam The logical status of the digital outputs can be read back for diagnostic purposes
<b>Output voltage (rated value)</b>	24 V DC	24 V DC
• Sustained-short-circuit-proof	Yes	Yes
• Output current per channel	0.5 A	0.5 A
<b>Total current of outputs (per group)</b>		
• Up to 60 °C (140 °F), max.	2 A	2 A
• Up to 50 °C (122 °F), max.	3 A	3 A
• Up to 40 °C (104 °F), max.	4 A	4 A
<b>Output delay (resistive load)</b>		
At "0" to "1" transition		
• Typical	50 μs	50 μs
• Max.	100 μs	100 μs
At "1" to "0" transition		
• Typical	150 μs	75 μs
• Max.	225 μs	150 μs
<b>Cam function</b>		
• Reproducibility	± 125 μs	≤ ± 10 μs
• Resolution	125 μs	1 μs
<b>Weight, approx.</b>	0.86 kg (1.90 lb)	0.86 kg (1.90 lb)
<b>Dimensions (W × H × D)</b>	50 × 150 × 111 mm (1.97 × 5.91 × 4.37 in)	50 × 150 × 111 mm (1.97 × 5.91 × 4.37 in)
<b>Approvals, according to</b>	UL and cULus	UL and cULus

#### Selection and ordering data

Description	Order No.
<b>TM15 Terminal Module</b> 24 DI/DO; 24 V/0.5 A DC (without DRIVE-CLiQ cable)	<b>6SL3055-0AA00-3FA0</b>
<b>TM17 High Feature Terminal Module</b> 16 DI/DO; 24 V DC/0.5 A (without DRIVE-CLiQ cable)	<b>6SL3055-0AA00-3HA0</b>

#### More information

For further information about accessories that can be used and about the DRIVE-CLiQ cables, see the section "MOTION-CONNECT connection systems".

For the Terminal Modules TM15 and TM17 High Feature, the same DRIVE-CLiQ cables for the Terminal Module TM31 can be used.

# SIMOTION I/O components

## Other I/O modules

### SIPLUS extreme

#### Overview



SIPLUS extreme is the product family with hardened/specially designed components based on standard products (e.g. SIMATIC S7, ET 200, MICROMASTER, POSMO A). SIPLUS permits distributed use of automation components, even under demanding environmental conditions.

- Ambient temperature range from -40/-25 °C (-40/-13 °F) to +60/+70 °C (+140/+158 °F)
- Condensation, increased humidity, increased degree of protection (dust, water)
- Extreme atmospheric exposure, e.g. toxic atmospheres
- Increased mechanical load, increased noise immunity
- Voltage ranges deviating from the standard
- Sector-specific solutions

#### More information

For further information on SIPLUS, see:

[www.siemens.com/siplus](http://www.siemens.com/siplus)

### SIMATIC RFID systems

#### Overview



SIMATIC RFID systems control and optimize the material flow. They identify reliably, quickly and economically, are unaffected by contamination and store data directly on the product.

The data exchange between the tag (mobile data memory) and the reader (write/read device) is fully automatic and contactless by means of radio frequencies (RF) and does not require a direct line of sight.

SIMATIC RFID systems are available for different fields of application, e.g. for smart labels (ultra-slim data memory) for logistics, rugged tags for production lines or "long-range" tags for locating and localization.

For user-friendly, standardized data exchange between the SIMOTION system and the standard profile RFID systems (PIB = Proxy Ident Block), function blocks (FB) are available in the SCOUT command library. This standard profile is, for example, supported by the SIMATIC RFID system ASM 456, which is connected to SIMOTION over PROFIBUS DP.

#### More information

For further information on SIMATIC RFID systems, see:

[www.siemens.com/simatic-sensors/rf](http://www.siemens.com/simatic-sensors/rf)

### SIMATIC Machine Vision

#### Overview



Visual inspection and recognition of products in manufacturing is becoming more important because the demands on quality and production speed are increasing. The advantages:

- Increased productivity
- Reliable, automatic visual inspection saves time and costs
- Optimization of the material flow
- Reduced machine standstill times

The intelligent SIMATIC MV420, MV440, VS 120 and VS 130 vision sensors have been developed especially for application-specific image processing. Thanks to their user-friendly operation, no special image processing knowledge is required since the intelligent vision sensors are trained rather than programmed.

#### More information

For further information on Machine Vision, see:

[www.siemens.com/simatic-sensors/vs](http://www.siemens.com/simatic-sensors/vs)

### SIWAREX Weighing systems

#### Overview



Wherever forces or weights have to be measured in automation and process engineering today, modern weighing systems are involved in monitoring and controlling the different production sequences.

They are used in simple applications for monitoring forces, detecting fill levels of containers and even in complex portioning tasks such as filling containers with liquid and bagging solid material.

In the case of the SIWAREX FTA Weighing module in SIMATIC S7-300 design, the function block (FB) is an integral component of the SCOUT command library. SIWAREX FTA is therefore the optimum solution for applications that can be calibrated such as filling systems, loading stations, bagging stations, rotary packers or inspection stations.

Apart from SIWAREX FTA, the SIMATIC S7-300 module SIWAREX U as well as the ET 200S modules SIWAREX CS and SIWAREX FTC are available for simple applications such as load and force measurements for SIMOTION.

#### More information

For further information on SIWAREX Weighing systems, see:

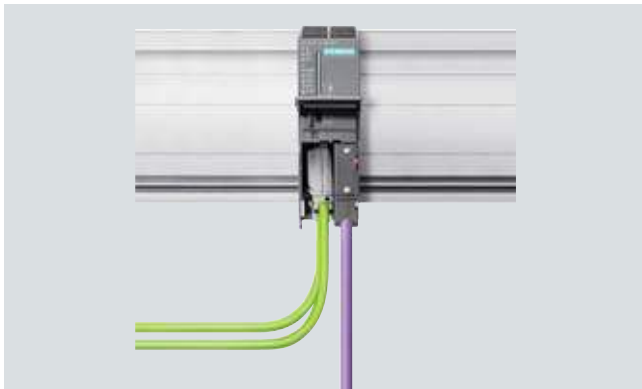
[www.siemens.com/siwarex](http://www.siemens.com/siwarex)

# SIMOTION I/O components

## Other I/O modules

### Other I/O modules / Notes on use

#### Overview



The PROFIBUS DP and the PROFINET IO fieldbuses are powerful, open and rugged bus systems for fast, cyclic data exchange between field devices. The openness of PROFIBUS DP or PROFINET IO permits connection of standard components from other manufacturers.

In addition to the I/O modules approved for SIMOTION, all certified standard slaves or PROFINET IO Devices can, in principle, be connected to SIMOTION if they support PROFIBUS DP with:

- Cyclic data traffic (DP-V0) and, possibly,
- Acyclic data traffic (DP-V1) or
- Isochronous data traffic (DP-V2)

and PROFINET IO

- Real-time communication (RT) or
- Isochronous Real-time Communication (IRT)

These modules are integrated via the GSD file or GSDML file of the respective device manufacturer. Please note that in individual cases further boundary conditions must be fulfilled in order to integrate standard slaves or PROFINET IO Devices into SIMOTION. Thus, "driver modules" that permit or simplify a linking, for example, in the form of function blocks, are required for some modules.

#### More information

For further information about industrial communication and field devices, see Catalog IK PI and the Industry Mall under Automation technology/Industrial Communication and on the Internet at:

[www.siemens.com/simatic-net](http://www.siemens.com/simatic-net)

A list of all the I/O modules that can currently be used with SIMOTION (centralized, distributed PROFIBUS/PROFINET, DRIVE-CLiQ) is available under the following link:

<http://support.automation.siemens.com/WW/view/en/11886029>

### Function blocks for I/O modules

#### Overview



Function blocks for I/O modules are available as an integral component of the SCOUT command library. The function blocks are easily copied into the application program by means of drag & drop. Sample programs are also provided in SIMOTION Utilities & Applications which demonstrate integration of the function blocks. SIMOTION Utilities & Applications are included in the scope of supply of SIMOTION SCOUT.

Function blocks are available in the SCOUT command library for the following I/O modules:

- SIMODRIVE POSMO A, intelligent positioning motor
- FM 350-1, single-channel Counter Module
- FM 350-2, 8-channel Counter Module
- FM 352, cam controller
- CP 340, Communication Module
- CP 341, Communication Module
- SIWAREX FTA, Weighing Module
- ET 200S, 1SI serial Interface Module (3964R, ASCII)
- ET 200S, frequency converter
- ASM 456, RFID system
- AS-Interface master (function block for operation of the command interface)
- ASIsafe safety monitor (with one or two enabling circuits)

## SIMOTION HMI devices



<b>11/2</b>	<b>Overview</b>
<b>11/3</b>	<b>Introduction</b>
<b>11/4</b>	<b>Mobile Panels</b>
11/4	SIMATIC Mobile Panel 177 SIMATIC Mobile Panel 277
<b>11/5</b>	<b>Touch Panels / Operator Panels</b>
11/5	SIMATIC TP 177B / SIMATIC TP 177B Widescreen / SIMATIC OP 177B
11/6	SIMATIC TP 277 / SIMATIC OP 277
<b>11/7</b>	<b>Multi Panels</b>
11/7	SIMATIC MP 177 / SIMATIC MP 277
11/8	SIMATIC MP 377
<b>11/9</b>	<b>Panel PCs</b>
11/9	SIMATIC HMI IPC277D
11/10	SIMATIC HMI IPC477C
11/12	SIMATIC HMI IPC577C
11/14	SIMATIC HMI IPC677C
<b>11/16</b>	<b>SIMATIC WinCC flexible ES engineering software</b>
<b>11/17</b>	<b>SIMATIC WinCC flexible RT visualization software</b>

# SIMOTION HMI devices

## Overview

	Designation	Description	Page
<b>Mobile devices</b>			
	SIMATIC Mobile Panel 177	Mobile HMI devices for direct operator control of the plant and machine from any point 5.7" STN display with touch screen, 256 colors, 14 configurable function keys	<b>11/4</b>
	SIMATIC Mobile Panel 277	Mobile HMI devices for direct operator control of the plant and machine from any point 7.5"/10" TFT display with touch screen, 65536 colors, 18 configurable function keys	<b>11/4</b>
<b>Touch Panels / Operator Panels</b>			
	SIMATIC TP 177B SIMATIC TP 177B Widescreen SIMATIC OP 177B	Touch Panel/Operator Panel with comprehensive functionality for demanding machine visualization Universal entry-level device with 4.3" color TFT Widescreen or 5.7" STN display	<b>11/5</b>
	SIMATIC TP 277 SIMATIC OP 277	Touch Panel/Operator Panel with comprehensive functionality for demanding machine visualization Comprehensive functionality 5.7" TFT display	<b>11/6</b>
<b>Multi Panels</b>			
	SIMATIC MP 177	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 5.7"/10.4" TFT display and touch screen	<b>11/7</b>
	SIMATIC MP 277	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 7.5"/10.4" TFT display	<b>11/7</b>
	SIMATIC MP 377	Multi Panels combine the rugged construction of Operator Panels with the flexibility of PCs 12.1"/15.1"/19" TFT display	<b>11/8</b>
<b>Panel PCs</b>			
	SIMATIC HMI IPC277D	For implementing simple visualization and control tasks	<b>11/9</b>
	SIMATIC HMI IPC477C	Industry-standard PC platform for PC-based automation Ultra-compact, rugged and maintenance-free	<b>11/10</b>
	SIMATIC HMI IPC577C	Industry-standard PC platform for PC-based automation Full PC-openness	<b>11/12</b>
	SIMATIC HMI IPC677C	Industry-standard PC platform for PC-based automation High performance, flexibility and safety	<b>11/14</b>
<b>Engineering / visualization software SIMATIC WinCC flexible</b>			
	SIMATIC WinCC flexible ES	Engineering tool for the configuration of SIMATIC HMI devices, of the SIMATIC Panel PCs as well as PLC-based visualization system WinCC flexible RT	<b>11/16</b>
	SIMATIC WinCC flexible RT	PC-based visualization software for single user systems directly at the machine	<b>11/17</b>

### Overview



#### HMI devices

A finely graded range of HMI devices is available for local operator control and monitoring.

#### Mobile Panels

The portable operator panels facilitate operator control and monitoring at the actual scene of the event with direct access and visual contact to the process. They offer simple and secure hot-swapping and can be used flexibly on individual machines or with entire systems.

#### Graphic panels of the 177/277 series

The graphic panels of the 177/277 series with full graphic display support the realistic presentation of process sequences (with 177B upwards, also in color). Either as Touch Panels (TP) with touch-sensitive display or as Operator Panels (OP) with membrane keyboard.

#### Multi Panels of the 177/277/377 series

The Multi Panels of the 177/277/377 series in variants with touch screen or membrane keyboard can be used like the Panels for operator control and monitoring. Multi Panels (MPs), however, also support the installation of additional applications.

#### Rugged and compact for use at machine level

With IP65/NEMA 4 degree of protection at the front, high EMC and extreme vibration resistance, the SIMATIC operator panels are ideally suited for use at the machine level in harsh industrial environments. Thanks to their compact design with a shallow mounting depth, the stationary operator panels can be fitted anywhere, even where only restricted space is available.

The extremely rugged and shock-proof enclosure with degree of protection IP65 makes the Mobile Panels especially suitable for industrial applications. Their low weight and ergonomic design means that they are user-friendly and easy to operate.

#### One configuration software for everything

SIMATIC WinCC flexible is the tool for the universal configuration of all SIMATIC Panels as well as PC-based systems with the visualization software WinCC flexible Runtime.

Graded variants are available for every task. The software permits simple and efficient configuration. Programming experience is not required.

Once created, configurations can be reused within the family.

#### Innovative operator control and monitoring

The Mobile Panels, panels and Multi Panels of the 177, 277 and 370 series, which are based on the Windows CE operating system, allow innovative operator control and monitoring combined with ruggedness, stability and simplicity. Standard hardware and software interfaces provide more flexibility and openness to the Office world via the MMC/PC/CF card, USB, Ethernet, PROFIBUS DP, Visual Basic scripts or customer-specific ActiveX controls.

#### HMI software

With the SIMATIC WinCC flexible and SIMATIC WinCC product families, SIMATIC HMI offers visualization and configuration software for the entire spectrum.

#### SIMATIC WinCC flexible

is the consistent further development of the SIMATIC HMI software products. WinCC flexible offers a significant boost in configuring efficiency and new innovative automation concepts for machine-level applications. For process-oriented plant and mechanical engineering as well as series production of machines, SIMATIC WinCC flexible 2008 also offers:

- Further productivity improvements (configuration efficiency) when creating HMI projects
- Implementation of innovative TCP/IP and web-based automation and HMI concepts
- Reduced downtime of the machines and systems through new service concepts
- Secure, flexible and world-wide access to process data
- New SIMATIC HMI devices

#### SIMATIC WinCC

SIMATIC WinCC is the process visualization system for plant monitoring with single-user and multi-user solutions and is a platform for IT & Business Integration with Windows 2000, XP Professional and Windows 7. A SIMOTION channel has been available since WinCC Version V7.0 SP2 for interfacing with SIMOTION. This software is available on the WinCC product DVD.

#### Other HMI systems

HMI systems from other manufacturers can be connected to SIMOTION over TCP/IP using the technology package MIIF.

#### More information

Further information on HMI can be found in

- the Catalog ST 80
- the Industry Mall under Automation technology/SIMATIC HMI Operator Control and Monitoring Systems

or on the Internet at:

- [www.siemens.com/panels](http://www.siemens.com/panels)
- [www.siemens.com/panel-pc](http://www.siemens.com/panel-pc)
- [www.siemens.com/winncc-flexible](http://www.siemens.com/winncc-flexible)

# SIMOTION HMI devices

## Mobile Panels

**SIMATIC Mobile Panel 177**  
**SIMATIC Mobile Panel 277**

### Overview



- Mobile HMI devices for direct operator control of the plant and machine from any point
- Support optimized monitoring of the workpiece or process providing at the same time direct access and direct line of sight to the HMI device
- Flexible implementation thanks to hot swapping
- Pixel graphics, brilliant 5.7" color STN display with touch screen (analog/resistive), 256 colors (MP 177)
- Pixel graphics, brilliant 7.5"/10" color TFT display with touch screen, 65536 colors (MP 277)
- PROFIBUS or PROFINET variants
- 14 user-configurable and user-label function keys (8 with LED) for MP 177
- 18 user-configurable and user-label function keys (18 with LED) for MP 277 7.5"
- Two three-stage enabling buttons
- Communication is supported via a serial, MPI/PROFIBUS or PROFINET link
- Connection point detection
- Fast system availability after plugging into the junction boxes
- Connected to the PLC and power supply via the junction box and the connecting cable

### Benefits

- Hot swapping without interruption of the emergency stop circuit (with junction box variants PLUS) and without the occurrence of bus faults
- Fast, accurate setup and positioning
- Ergonomic, compact and light-weight (approx. 1.3 kg)
- Rugged enough to withstand industrial use
- Graphics library available with off-the-shelf picture objects
- The data in the message buffer is retained without battery backup even when the Mobile Panel is disconnected from the supply
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 5 languages can be selected online on MP 177
  - Up to 16 languages can be selected online on MP 277

- Reduction of service and commissioning costs through:
  - Backup/restore via a process interface or via a standard Multi Media Card
  - Updates of the configuration with automatic transfer recognition via all device interfaces
  - Long service life of the backlit display
- Simple engineering with comprehensive documentation on the SIMATIC HMI Manual Collection DVD

### Application

Regardless of the industry or application, if mobility is required for the on-site control and monitoring of machines and plants, SIMATIC Mobile Panels offer many crucial advantages: The machine operators and commissioning engineers are therefore able to work exactly where they have the best view of the workpiece or process. Even with larger production facilities, complex or enclosed machines, long materials handling or production lines and conveyor systems, mobile HMI devices allow faster and more precise setting up and positioning during commissioning. They also ensure shorter downtimes during retooling, maintenance or repairs.

### Design

- Ergonomic and compact with different holding and gripping points (suitable for right-handed and left-handed personnel)
- Pixel graphics, brilliant color displays with touch screen (analog/resistive)
- User-configurable and user-label function keys with LED (not MP 277 10")
- The front is resistant to various oils, greases and standard detergents
- Two three-stage enabling buttons
- Extremely impact-resistant due to twin-wall construction and rounded enclosure
- Dust-proof and jet-proof enclosure with IP65 degree of protection on all sides
- Slot for a standard Multi Media Card for backups and restoring or for storing recipes
- Connection to the PLC via the rugged and reliable junction boxes with IP65 degree of protection
  - Junction box variant BASIC: Enables the STOP pushbutton to be integrated into the safety circuit
  - Junction box variant PLUS: Enables the STOP pushbutton to be integrated into the safety circuit. The emergency stop circuit remains closed regardless of whether a Mobile Panel is plugged in or not. If the Mobile Panel is disconnected during operation, the emergency stop circuit in the junction box is automatically closed which prevents triggering of the emergency stop circuit.
- Fast system availability after plugging into the junction boxes:
  - By using an optional rechargeable battery pack, the connection boot-up time of the Mobile Panel – after a short period of separation from the junction box – can again be significantly reduced.
- Detection of the connection point can be used to perform machine-specific HMI authorizations or actions depending on the selected connection point

### MP 277 IWLAN

For use in combination with SIMOTION from Mobile Panel 277 IWLAN V2 upwards and WinCC flexible 2008 SP3.

To use the MP277 IWLAN you will need an IWLAN infrastructure.

You will find further details in catalog ST80.



# SIMOTION HMI devices

## Touch Panels / Operator Panels

### SIMATIC TP 177B / SIMATIC TP 177B Widescreen / SIMATIC OP 177B

#### Overview



- Touch Panels TP 177B/TP 177B Widescreen and Operator Panel OP 177B for operator control and monitoring of machines and plants
- Touch/Key combination for OP 177B and TP 177B Widescreen
- Universal entry-level device in the touch panel class with graphics capability featuring an extensive range of functions
- Pixel graphics display with analog touch screen (analog/resistive)
  - 4.3" color TFT Widescreen (256 colors) or
  - 5.7" Blue mode/color STN (4 blue levels/256 colors)
- Configurable system keys for OP 177B and TP 177B Widescreen
- Interfaces for communication with SIMATIC S7 and SIMOTION are integrated (e.g. MPI, PROFIBUS DP, Ethernet interface for color variant)
- USB interface for I/O, e.g. for downloads, printer

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs
- Reduction of service and commissioning costs through:
  - Backup/restore via a process interface, USB or via a standard Multi Media Card
  - Remote downloading of the configuration with automatic transfer recognition even via WAN (Wide Area Network) using TeleService adapter
  - Maintenance-free design (no battery) and long service life of the backlit display
- Non-volatile, maintenance-free message buffer
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 online languages can be selected directly on the device
- Graphics library available with off-the-shelf picture objects

- Standard hardware and software interfaces for increased flexibility
- Standard Multi Media Card slot
  - Used for recipe data records and for backups of configuration/system data
- Integrated printer port
- Extensive documentation on the SIMATIC HMI Manual Collection DVD

#### Application

The TP/OP 177B Touch Panels can be used wherever machines and systems are controlled and monitored directly on-site – whether in production, process or building automation. They are used in all types of sectors and applications.

#### Design

- Display variants:
  - 4.3" TFT Widescreen display with 256 colors or
  - 5.7" STN display with 256 colors or 4 blue levels
- LED or CCFL<sup>1)</sup> backlit display with long service life
- Resistive analog touch screen
- Numerical "on-screen" system keyboard for decimal, binary and hexadecimal number formats
- On-screen alpha keyboard (English font)
- Compact design with low mounting depth
- Rugged plastic enclosure
- The front is resistant to various oils, greases and standard detergents
- A protective cover is available as an option to achieve NEMA 4 degree of protection and as additional protection against scratching
- Plug-in terminals for connecting the power supply
- Interfaces for connection of PLC, printer and engineering computer are integrated
- Standard Multi Media Card slot

<sup>1)</sup> Cold Cathode Fluorescence Lamps

# SIMOTION HMI devices

## Touch Panels / Operator Panels

### SIMATIC TP 277 / SIMATIC OP 277

#### Overview



- Touch Panel TP 277 and Operator Panel OP 277 with comprehensive functionality for demanding machine visualization
- Display:
  - TP 277: Pixel graphics 5.7" TFT touch screen (analog/resistive)
  - OP 277: TFT display, color (256 colors)
- Keyboard:
  - TP 277: Numeric and alphanumeric on-screen keyboard
  - OP 277: Membrane keyboard with 36 system keys, 24 user-programmable function keys, 18 of which with LEDs
- All interfaces are on-board, e.g. MPI/PROFIBUS DP, USB, PROFINET/Ethernet
- Maintenance-free, non-volatile (retentive) message buffer

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs
- Modular expansion possible with options such as:
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
- Reduction of service and commissioning costs through:
  - Backup/restore via USB, MPI, PROFIBUS DP, RS 232 (serial) and optional via Ethernet (TCP/IP) or CompactFlash card (CF card)
  - Remote download/upload of configuration and firmware
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library available with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 languages can be selected online
- Standard hardware and software interfaces for increased flexibility
- External Multi Media Card can be used for recipe data records, archives and for backups of configuration/system data
- Integrated USB interface for "hot swapping" of peripherals (printer, keyboard, mouse, barcode reader)
- Standard Windows storage formats (CSV) for archives and recipes for use with other standard tools (e.g. Microsoft Excel)
- The Smart Access and Smart Services options can be used

#### Application

The SIMATIC TP 277 Touch Panels/SIMATIC OP 277 Operator Panels can be used wherever machines and systems are controlled and monitored on-site – whether in production, process or building automation. They are used in all types of sectors and applications.

Diskless and fan-free operation, real-time capability and short boot-up times support demanding machine visualization even under harsh industrial conditions.

#### Design

- Display:
  - TP 277: Pixel graphics 5.7" TFT touch screen (analog/resistive)
  - OP 277: TFT display, color (256 colors)
- Keyboard:
  - TP 277: Numeric and alphanumeric on-screen keyboard
  - OP 277: Membrane keyboard with 36 system keys, 24 user-programmable function keys (18 with LEDs)
- Scripts and archives
- Compact design with low mounting depth
- IP65/NEMA 4/NEMA 12 (front) or IP20 (rear)
- The front is resistant to various oils, greases and standard detergents
- High electromagnetic protection and extreme vibration strength
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - MPI, PROFIBUS DP (up to 12 Mbit/s) as well as USB 1.1 (max. 100 mA) on-board
  - Ethernet (PROFINET IO capable)
- External Multi Media Card, can be used for the recipe data, records, archives and for backups of configuration and system data.

#### Overview



- Like Operator Panels, Multi Panels (MP) are used for on-site machine operation and monitoring
- Their functionality can be expanded with the installation of additional Windows CE applications (Multi Panel and Panel options)
- The SIMATIC MP 177/MP 277 Multi Panels running Windows CE combine the ruggedness of Operator Panels with the flexibility of PCs
- Pixel graphics TFT display, color (64 k colors) with 5.7" display diagonal for MP 177, with 7.5" or 10.4" display diagonals for MP 277
- MP 177, touch screen (analog/resistive)
- MP 277 8" Keys: 26 function keys or direct keys (e.g. over PROFINET IO)
- MP 277 10" Keys: 36 function keys or direct keys (e.g. over PROFINET IO)
- MP 277 8" and 10" Touch: Touch screen (analog/resistive)
- All interfaces are on-board, e.g. MPI, PROFIBUS DP, USB, Ethernet, serial
- Maintenance-free, non-volatile (retentive) message buffer
- Windows CE 5.0

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - ThinClient/MP for use as a terminal client on a Windows terminal server
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible/Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
  - WinCC flexible/OPC server for communication with applications from various manufacturers
  - MS Pocket Internet Explorer (already included in scope of delivery)
- Reduction of service and commissioning costs through:
  - Backup/restore via Ethernet (TCP/IP), USB, MPI, PROFIBUS DP, RS 232 (serial) or optional via PC/CF card
  - Remote download/upload for configuration and firmware
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library available with off-the-shelf picture objects

- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 16 languages can be selected online
- Standard hardware and software interfaces for increasing flexibility:
  - SD/Multi Media Card combination slot for memory expansions, backup/restore or additional interfaces
  - Ethernet (TCP/IP) for central data and project management; when configuring with WinCC flexible, and for communication with the control link to SIMATIC S7
  - Standard Windows storage formats (CSV) for archives and recipes permit use with other standard tools (e.g. Microsoft Excel)

#### Application

The SIMATIC MP 177/SIMATIC MP 277 Multi Panels can be used wherever machines and systems are operated and monitored directly on-site – whether in production, process or building automation. These are used in the most popular branches and applications and can be expanded in their applications with the Multi Panel options, e.g. displaying HTML documents via the Microsoft Pocket Internet Explorer.

Windows CE meets the basic prerequisites for applications in rough industrial environments. The diskless and fan-free design enables implementation in areas where high vibration or dust load limits the operation of a PC. Short boot-up times make the Multi Panels ready for operation quickly.

#### Design

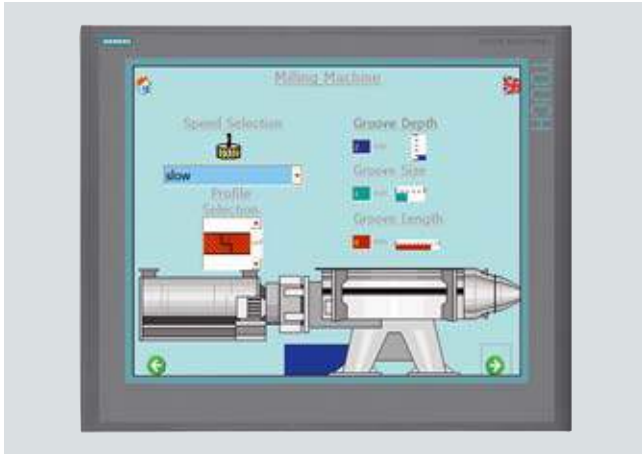
- Compact design with low mounting depth
- The front is resistant to various oils, greases and standard detergents
- Degree of protection IP65/NEMA 4x/NEMA 12 (front) or IP20 (rear)
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - RS 485/RS 422 or Ethernet interface for process connections (MPI, PROFIBUS DP up to 12 Mbit/s, PROFINET)
  - USB for mouse, keyboard, printer, barcode reader and downloading/uploading the configuration
  - Ethernet (TCP/IP), for exchanging data with a higher-level PC, connection of a network printer and downloading/uploading the configuration
- SD/Multi Media Card combination slot

# SIMOTION HMI devices

## Multi Panels

### SIMATIC MP 377

#### Overview



- Like Operator Panels, Multi Panels (MP) are used for on-site machine operation and monitoring
- Their functionality can be expanded with the installation of additional Windows CE applications (Multi Panel and Panel options)
- SIMATIC MP 377 devices running Windows CE combine the rugged construction of Operator Panels with the flexibility of PCs
- Pixel graphics 12.1", 15.1" and 19" TFT display, color (64 k colors)
- MP 377 12" Keys:  
38 system keys, 36 user-configurable and user-label function keys
- MP 377 12", 15", and 19" Touch:  
Touch screen (analog/resistive)
- All interfaces are on-board, e.g. MPI, PROFIBUS DP, PROFINET IO, USB, Ethernet, serial

#### Benefits

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Modular expansion possible with options such as:
  - Software PLC SIMATIC WinAC MP
  - WinCC flexible/Sm@rtAccess for communication between different SIMATIC HMI systems
  - WinCC flexible/Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
  - WinCC flexible/OPC server for communication with applications from various manufacturers
  - MS Pocket Internet Explorer (already included in scope of delivery)
  - Multimedia: Viewer for .pdf, .xls, .doc files; Internet Explorer, Media Player and cameras over standard interfaces
- Reduction of service and commissioning costs through:
  - Backup/restore via Ethernet (TCP/IP), USB, MPI, PROFIBUS DP, RS 232 (serial) or optional via PC/CF card
  - Remote download/upload for configuration and firmware changes
  - Specific drivers can be reloaded
  - Long service life of the backlit display
- Graphics library with off-the-shelf picture objects
- Can be used worldwide:
  - 32 languages can be configured (incl. Asian and Cyrillic character sets)
  - Up to 5 languages can be selected online

- Standard hardware and software interfaces for increasing flexibility:
  - PC/CF card slot for memory expansions, backup/restore or for additional interfaces
  - Ethernet (TCP/IP) for central data and project management
  - Standard Windows storage formats (CSV) for archives and recipes permit use with other standard tools (e.g. Microsoft Excel)

#### Application

The SIMATIC MP 377 Multi Panels can be used wherever machines and systems are operated and monitored directly on-site – whether in production, process or building automation. These are used in the most popular branches and applications and can be expanded with the Multi Panel options, e.g. by displaying HTML documents via the Microsoft Pocket Internet Explorer.

Windows CE meets the basic prerequisites for applications in rough industrial environments. The diskless and fan-free design enables implementation in areas where high vibration or dust load limits the operation of a PC. Short boot-up times make the Multi Panels ready for operation quickly.

#### Design

- Compact design with low mounting depth
- The front is resistant to various oils, greases and standard detergents
- Degree of protection IP65/NEMA 4x/NEMA 12 (front) or IP20 (rear)
- Plug-in terminals for 24 V DC power supply
- Interfaces:
  - TTY/RS 232, RS 485/RS 422 interface for process connections (MPI, PROFIBUS DP up to 12 Mbit/s)
  - USB for mouse, keyboard, printer, barcode reader and downloading/uploading the configuration
  - Ethernet (TCP/IP), PROFINET for exchanging data with a higher-level PC, connection of a network printer and downloading/uploading the configuration
- Retentive, maintenance-free message buffer
- Slot for CompactFlash card (CF card)
- Slot for PC card

### Overview



SIMATIC HMI IPC277D for implementing simple visualization and control tasks

- Offers great flexibility in the selection of rugged widescreen fronts
- From 7" to 12" for more freely-configurable display area
- High resolution, large viewing angle, and up to 100 % dimmable backlighting for a brilliant display with optimized power consumption
- Absolutely maintenance-free due to the use of CompactFlash and SSD as mass storage and fanless operation up to 50 °C (122 °F) ambient temperature
- Maximum industrial functionality due to non-volatile retentive memory
- Ready-to-run embedded bundles with visualization or/and control software

The following front installation versions are available:

- 7" Touch
- 9" Touch
- 12" Touch
- 15" / 19" available soon
- All fronts in widescreen design

### Application

The SIMATIC HMI IPC277D is a particularly compact and energy-saving Nanopanel PC with integrated touch displays with 7" screen diagonal or larger. The heart of the SIMATIC HMI IPC277D are high-performance Intel Atom processors of the latest generation. The Nanopanel PCs are designed for maintenance-free 24-hour continuous use as well as for high temperature, vibration, shock and EMC requirements in the following applications:

- Simple visualization and control tasks, for example in mechanical engineering, plant construction, transportation systems or power transmission.
- Acquisition, further processing and visualization of data

### Design

The HMI IPC277D is a compact device comprising an operator control unit with integral computer unit.

#### Computer unit:

- Rugged metal installation housing, resistant to vibration and shock, with high electromagnetic compatibility
- Processor / main memory configuration:
  - Intel Atom E640 1.0 GHz, 1 GB RAM GHz
  - Intel Atom E660 1.3 GHz, 2 GB RAM GHz available soon
- Interfaces (accessible from one side):
  - 2 x LAN 10/100/1000 Mbit/s Ethernet interface (RJ45)
  - 3 x high-speed USB V2.0
  - 1 x COM1 (RS232)
- Fieldbus
  - PROFINET Realtime via Standard Ethernet interface
- Retentive memory
  - 512 KB retentive memory (MRAM), of which 128 KB within the buffer time (optional)
- Isolated power supply: 24 V DC (20.4 to 28.8 V)
- Drives:
  - CompactFlash drive (replaceable, accessible): 2 GB, 4 GB or 8 GB
  - Solid-State Drive 50 GB (SLC technology)
- Preinstalled operating systems:
  - Windows XP Embedded Standard 2009
  - Windows XP Professional Multi-Language
  - Windows Embedded Standard 7 / Windows 7 available soon

#### Components of the operator control unit:

The operator control units are available in the following versions:

##### 7" Touch

- 7" TFT color display, 800 x 480 pixels
- Resistive analog touch screen

##### 9" Touch

- 9" TFT color display, 800 x 480 pixels
- Resistive analog touch screen

##### 12" Touch

- 12" TFT color display, 1280 x 800 pixels
- Resistive analog touch screen

##### 15" / 19" Touch available soon

# SIMOTION HMI devices

## Panel PCs

### SIMATIC HMI IPC477C

#### Overview



- Embedded PC platform with extremely high industrial compatibility for demanding tasks in the field of PC-based automation
- Maintenance-free (no rotating components such as fan and hard disk)
- Rugged construction:  
The PC can withstand the most harsh mechanical stresses while maintaining reliable operation
- Compact design (only 75 mm (2.95 in) mounting depth)
- High investment security
- Fast integration capability
- Front panel versions:
  - 12", 15" and 19" TFT Touch
  - 12" and 15" TFT Key

#### Benefits

- Excellent industrial compatibility due to rugged construction, even when subjected to extreme vibration and shock
- High investment protection thanks to assured spare parts availability of the components (for 5 years following the end of active marketing)
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- Front and rear USB 2.0 interfaces for quick and easy connection of additional hardware components
- High degree of industrial functionality thanks to integrated PROFIBUS DP/MPI and Ethernet interfaces
- Maintenance-free since there are no rotating parts (fans and hard disk)
- Reduction in downtime thanks to high system availability
  - Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - The high security and reliability of an embedded platform
- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced lifecycle costs
- Ready-to-run, complete solutions (software is already installed and preconfigured) for visualization and automation with WinCC flexible and WinAC RTX

#### Application

The SIMATIC HMI IPC477C is designed for use directly on-site at the machine, when a combination of ruggedness and reliability (i.e. the reliability of an embedded platform) and the openness of a PC are required (e.g. module expansions and the connection of I/O devices such as printers, keyboards, etc.).

Due to the low mounting depth of only 75 mm (2.95 in), it can also be used in confined spaces.

The PC can be used in production automation as well as in process automation and can be mounted in control cabinets, consoles, 19" cabinets/racks and in swing arms (booms).

SIMATIC Panel PCs are the ideal platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- PC-based control with SIMATIC WinAC RTX
- SIMATIC WinCC Web Client for web-based solutions with WinCC/Web Navigator

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

#### Design

Compact powerful industrial PC in embedded technology, comprising operator control unit with integrated computer unit.

##### Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor, configurable: Intel Celeron M 1.2 GHz, Intel Core 2 Solo 1.2 GHz and Intel Core Duo 1.2 GHz
- Main memory: 1 DIMM socket, DDR3, 1 GB, alternatively 2 GB or 4 GB
- Battery-backed retentive memory 2 MB
- Compact Flash Drive (internal) with pre-installed Windows XP Embedded (Image) operating system and optional software
- Graphics on-board (VGA analog, 1024 x 768)

##### Interfaces

- 2 x Ethernet on-board (10/100/1000 Mbit/s)
- 5 x USB 2.0 port, 500 mA (1 x front)
- 1 x COM 1 (RS 232)
- 1 x DVI-I interface (for connecting a second display unit)
- 2 x slot for CF card (2 GB, 4 GB or 8 GB) Solid State Disc (at least. 32 GB)
- Fieldbus: Configurable with PROFINET or PROFIBUS onboard

##### Power supply

- 24 V DC, with On/Off switch

### Design (continued)

#### Components of the operator control unit:

The operator control units are available in the following versions:

##### 12" Key

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

##### 12" Touch

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Touch screen (analog/resistive)

##### 15" Key

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

##### 15" Touch

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Touch screen (analog/resistive)

##### 19" Touch

- 19.1" TFT color display, 1280 x 1024 pixels (SXGA)
- Touch screen (analog/resistive)

The operator control units feature a USB 2.0 port on the front for connecting external peripheral devices, such as a mouse or keyboard. They fulfill the requirements of degrees of protection IP65 and NEMA 4. All operator control units are also available without a USB port on the front.

The computer unit is connected via a connecting cable attached at the rear of the operator control unit.

#### Expansion components

##### SIMATIC PC DiagMonitor

- PC diagnostics/alarm software for the early detection and diagnostics of PC problems
- Comprehensive monitoring of temperature and watchdog
- Operating hours counter for preventive maintenance
- Integrated log functions, comprehensive text messages, online help (English/German)
- Network-wide monitoring via SNMP and OPC interface possible

##### SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of mass storage contents (CF cards, hard disks)
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for adaptation of mass storage partitioning

##### 3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the Panel PC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

##### SIMATIC PC USB FlashDrive

- Mobile memory medium for SIMATIC PC/PG
- High-speed data transfer (USB 2.0) and high memory capacity
- Ultra-compact and rugged

##### Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

# SIMOTION HMI devices

## Panel PCs

### SIMATIC HMI IPC577C

#### Overview



- Industry-standard PC platform for demanding operator control and monitoring tasks
- Maximum performance thanks to high processor performance at an attractive entry-level price
- Fast integration capability
- Intel Core 2 Duo processors up to 1.86 GHz
- RAM DDR3 technology from 1 to 4 GB
- Gigabit Ethernet ports
- High-speed USB 2.0 port on front
- Front panel versions:
  - 12", 15" and 19" TFT Touch

#### Benefits

- Suitable for industrial environments subject to vibration and shock loads
- High investment protection thanks to guaranteed availability of spare parts
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- USB interface for quick and easy connection of required components
- Reduction in downtime thanks to high system availability
  - Efficient self-diagnostics (SIMATIC PC DiagMonitor)
  - Solutions for data backup
- Integral component of Totally Integrated Automation (TIA):
  - Increased productivity, minimized engineering, reduced lifecycle costs

#### Application

The SIMATIC HMI IPC577C is used in production and process automation and can be installed in control cabinets and switchboards.

SIMATIC Panel PCs are a flexible platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- Complex solutions with SIMATIC WinCC process visualization
- PC-based control with SIMATIC WinAC Software PLC or with SIMATIC WinAC Slot PLC

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

The SIMATIC HMI IPCs can be ordered together with WinCC flexible or WinCC as SIMATIC HMI Packages at a lower price (see SIMATIC HMI complete system).

#### Design

The SIMATIC HMI IPC577C comprises a computer unit and an operator control unit.

##### **Components of the computer unit:**

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor:
  - Intel Celeron M 1.2 GHz, 1 MB L2 cache, 800 MHz FSB
  - Intel Core 2 Solo 1.2 GHz, 3 MB L2 cache, 800 MHz FSB
  - Intel Core 2 Duo 1.86 GHz, 6 MB L2 cache, 1066 MHz FSB
- Main memory: 1 DIMM socket, DDR3, basic configuration 1 GB, expandable up to 4 GB
- 3.5" hard disk drive: ≥ 80 GB
- DVD-RW drive
- Interfaces:
  - 2 x Gbit Ethernet onboard
  - 4 x USB 2.0 port, 1 x USB at front
  - 1 x serial V.24 (9-pin)
  - 1 x parallel
  - 1 x slot for CF card
  - 1 x ext. graphics (DVI-I)
- Free slots for expansion:
  - 1 x PCI slot
- Fieldbus (configurable with PROFIBUS or PROFINET onboard)
- Power supply:
  - 100/240 V AC (autorange), 50/60 Hz
  - 24 V DC



### Design (continued)

#### Components of the operator control unit:

The operator control units are available in the following versions:

##### 12" Touch

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Touch screen (analog/resistive)
- USB 2.0 port on front

##### 15" Touch

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Touch screen (analog/resistive)
- USB 2.0 port on front

##### 19" Touch

- 19.1" TFT color display, 1280 x 1024 pixels (SXGA)
- Touch screen (analog/resistive)

#### Expansion components

##### SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of hard disk contents
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for hard disk partitioning

##### 3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the SIMATIC HMI IPC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

Operation of the USB disk drive with SIMATIC HMI IPCs:

- Windows XP: possible without separate driver
- Windows 2000: the required driver is included in the scope of supply of the operating system

##### Industrial USB Hub 4

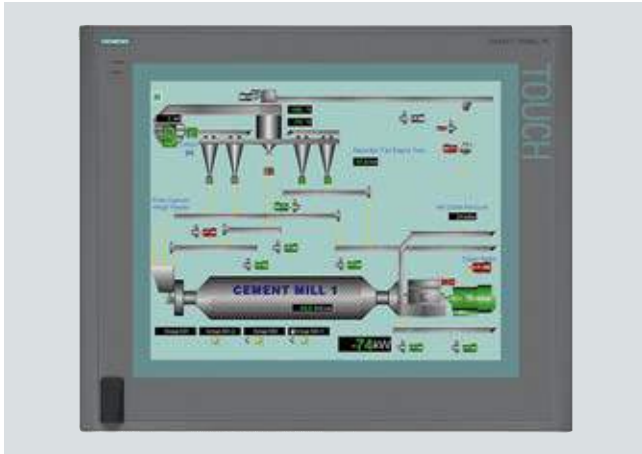
- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

# SIMOTION HMI devices

## Panel PCs

### SIMATIC HMI IPC677C

#### Overview



- PC platform with high degree of industrial compatibility for demanding tasks in the area of PC-based automation
- Rugged construction:  
The PC can withstand the most harsh mechanical stresses while maintaining reliable operation
- Compact design
- High investment security
- Fast integration capability
- Front panel versions:
  - 12", 15" and 19" TFT Touch
  - 12" and 15" TFT Key
- Operator control unit can be located at a distance of up to 30 m (98.4 ft) from the computer unit (optional)

#### Benefits

- Excellent industrial compatibility due to rugged construction, even when subjected to extreme vibration and shock
- High investment protection thanks to spare parts availability of the components (for 5 years following the end of active marketing)
- Excellent continuity of components for long-term machine concepts without any new engineering costs
- Savings in time and costs due to service-friendly equipment construction:
  - The operating unit and computing unit can be simply hinged apart for the rapid replacement of components or for future expansions
  - Front and rear USB 2.0 interfaces for quick and easy connection of additional hardware components
- High degree of industrial functionality thanks to integrated PROFIBUS DP/MPI and two Gigabit Ethernet interfaces
- Operational reliability:  
Using the optional direct key module, the process can be controlled without delay over PROFIBUS DP independently of the operating system
- 2 x ≥ 80 GB SATA hard disk system (configured as a single disk system or RAID1)
- Reduction in downtime thanks to high system availability
- Efficient self-diagnostics (SIMATIC PC DiagMonitor)
- Solutions for preventive data backup

- Integral component of Totally Integrated Automation (TIA): Increased productivity, minimized engineering, reduced life-cycle costs
- Additional mounting possibilities available due to separation of the computing unit and operating unit by means of the Remote Kit (up to 30 m (98.4 ft), optionally available as accessory)

#### Application

The SIMATIC HMI IPC677C is designed for use directly on-site at the machine. Due to the minimal mounting depth of only 105/130 mm (4.13/5.12 in), it can also be used in confined spaces.

The PC can be used in production automation as well as in process automation and can be installed in control cabinets and consoles, 19" cabinets/racks and in swing arms (booms).

The Dual Core CPUs with Intel Core Duo technology support high-performance control and visualization.

With PCIe (x4), the new PCI express (PCIe) cards (x1 and x4) are also supported.

A SIMATIC Panel PC is the ideal platform for PC-based automation:

- PC-based visualization on site at the machine with SIMATIC WinCC flexible
- Complex solutions with SIMATIC WinCC process visualization
- PC-based control with SIMATIC WinAC Software PLC or with SIMATIC WinAC Slot PLC

Siemens offers a complete modular system of automation components that are designed to integrate perfectly.

The SIMATIC Panel PCs can be ordered in combination with WinCC flexible or WinCC as SIMATIC HMI packages at a lower price.

#### Design

The SIMATIC HMI IPC677C comprises a computer unit and an operator control unit.

##### Components of the computer unit:

- Rugged metal installation housing, resistant to vibrations and shocks, with high electromagnetic protection.
- Processor:
  - Mobile processors
  - Core 2 Duo T7400, 2.16 GHz, Dual Core, 4 MB SLC
  - Core 2 Duo T5500, 1.66 GHz, Dual Core, 2 MB SLC
  - Celeron M 440, 1.86 GHz, 1 MB SLC
- Intel chipset: 945 GM Express with ICH7R - integrated RAID controller
- Intel graphics media accelerator GMA950 for high-performance graphics
- Standard main memory configuration:
  - 512 MB, expandable up to 4 GB (DDR2 667 RAM)
- SATA hard disks with up to 160 GB capacity and NCQ technology, the special vibration-absorbing hard disk support ensures reliable operation even under extreme mechanical stress
- On-board graphics
- Interfaces:
  - 2 x Ethernet 10/100/1000 Mbit/s ports (Gbit LAN)
  - 4 x high-speed USB 2.0 ports on the computing unit
  - PROFIBUS DP/MPI on-board, isolated
  - 1 x serial RS 232 C (9-pin)
  - DVI-I interface (for VGA and/or DVI-D monitor)

### Design (continued)

- Second monitor with identical screen content (Clone) or in extended monitor mode (Extended)
- Latching mechanism for innovative RJ45 FastConnect plug
- Slot for CompactFlash card externally accessible
- Diskless version (optional with Windows XPe on CompactFlash card)
- Slots either 2 x PCI or 1 x PCI and 1 x PCIe x4
- Power supply: 110 V/230 V AC (autorange), 50/60 Hz or 24 V DC
- 2 MB battery-backed SRAM memory on-board (for use with WinAC RTX 2005 SP2)

#### Optional additional components:

- Main memory expansion to 1 GB, 2 GB or 4 GB
- SATA hard disk  $\geq$  160 GB
- Double hard disk module 2 x  $\geq$  60 GB SATA
- DVD-ROM drive
- DVD $\pm$ RW $\pm$ R combo drive
- Direct key module

#### **Components of the operator control unit:**

The operator control units are available in the following versions:

#### 12" Key

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

#### 15" Key

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Membrane keyboard with international PC character set and 36 additional function keys with LED and an integrated mouse

#### 12" Touch

- 12.1" TFT color display, 800 x 600 pixels (SVGA)
- Touch screen (analog/resistive)

#### 15" Touch

- 15.1" TFT color display, 1024 x 768 pixels (XGA)
- Touch screen (analog/resistive)

#### 19" Touch

- 19.1" TFT color display, 1280 x 1024 pixels (SXGA)
- Touch screen (analog/resistive)

The operator control units feature a USB 2.0 port on the front for connecting external peripheral devices, such as a mouse or keyboard. They fulfill the requirements of degrees of protection IP65 and NEMA 4. All operator control units are also available without a USB port on the front.

The computer unit is connected via a connecting cable attached at the rear of the operator control unit.

### Expansion components

#### SIMATIC Panel PC Remote Kit

- Separate mounting of computer and operator control unit is possible
- At a maximum distance of 30 m (98.4 ft)
- Pure hardware solution, no need to install additional software
- Maintaining the panel PC front functionality

#### SIMATIC PC DiagMonitor

- PC diagnostics/alarm software for the early detection and diagnostics of PC problems
- Comprehensive monitoring of temperature, fans, hard disks (SMART), watchdog
- Operating hours counter for preventive maintenance
- Integrated log functions, comprehensive text messages, online help (English/German)
- Network-wide monitoring via SNMP and OPC interface possible

#### SIMATIC PC/PG Image & Partition Creator

- Software tool for data backup of hard disk contents
- Fast, bit-exact restoration of system and data partitions; application software and special installations are also backed up
- Software tool for hard disk partitioning

#### 3.5" USB disk drive

The USB disk drive is provided for the high-speed exchange of user data, such as recipes, or files. The drive should not be used as a cyclic archiving drive. The front-panel mounting and degree of protection IP54 permit data exchange from the front without opening the control cabinet door.

The device is connected via the USB interface of the Panel PC. The power is also supplied over the USB interface. A USB cable of 1 m (3.28 ft) length is included in the scope of supply. The disk drive complies with the USB 1.1 standard. 3.5" high density disks can be used (1.44 MB).

#### SIMATIC PC USB FlashDrive

- Mobile memory medium for SIMATIC PC/PG
- High-speed data transfer (USB 2.0) and high memory capacity
- Ultra-compact and rugged

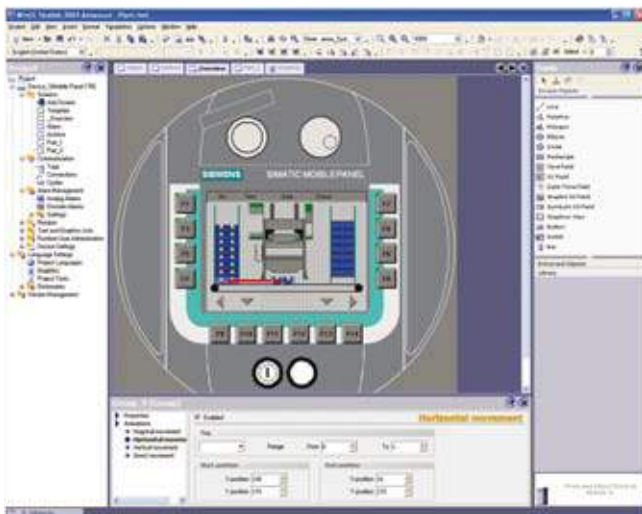
#### Industrial USB Hub 4

- USB peripherals can be connected and operated via the USB Hub 4 without opening the control cabinet door
- Industry-standard USB 2.0 Hub, Front IP65
- Mounting in control cabinet door or on DIN rail
- Inspection window and LEDs for each of the four interfaces

# SIMOTION HMI devices

## SIMATIC WinCC flexible ES engineering software

### Overview



- Uniform family of engineering tools for configuration SIMATIC HMI Operator Panels, the operator control part of SIMATIC C7 units, SIMOTION/SINUMERIK Panel PCs as well as the PC-based visualization software WinCC flexible Runtime.
- Runs under Windows XP Professional / Windows 7 Professional, Ultimate, Enterprise
- Current version:
  - SIMATIC WinCC flexible 2008 SP3 Micro
  - SIMATIC WinCC flexible 2008 SP3 Compact
  - SIMATIC WinCC flexible 2008 SP3 Standard
  - SIMATIC WinCC flexible 2008 SP3 Advanced

### Benefits

- The integrated configuration software reduces training, maintenance and service overhead and protects the customer's investments
- Minimized configuration overhead due to reuse of scalable and dynamizable objects
- Tools for efficient and simple configuration:
  - Wizard for defining the basic structure of the HMI project
  - Table-based editors simplify the generation and processing of similar types of object, e.g. for tags, texts, or alarms
  - Complex configuration tasks such as the definition of paths of motion or the creation of the fundamental operator prompting are simplified by means of graphical configuration
- Comprehensive support of multi-language configurations for worldwide use
  - Selectable views for entering configuration data in several languages
  - System and user-specific text lexicons
  - Export/import of language-dependent texts

### Design

The engineering tools of the SIMATIC WinCC flexible range are based on one another. The available editors largely depend on the respectively configured target systems and their functions. A more comprehensive engineering tool such as WinCC flexible Standard also offers the facilities of the smaller engineering tools, e.g. WinCC flexible Compact or Micro.

Upgrading of a smaller engineering tool to a larger one is possible using a Powerpack. An exception is WinCC flexible Micro.

The scope of functions of the WinCC flexible engineering tools already includes project support for the Runtime options available for SIMATIC Panels or WinCC flexible Runtime, independent of the RT licenses purchased. Separate licensing is required for the target system in order to use the configured Runtime options.

### Function

#### Integration into automation systems

- Integration into SIMATIC STEP 7/SIMOTION
  - Management of HMI projects within the SIMATIC Manager
  - Shared use of communication settings and process point definitions, i.e. symbols and messages
  - Display of the HMI configuring objects in the SIMATIC Manager
  - Transfer of configuring data via MPI/PROFIBUS/Ethernet using routing

#### Option for WinCC flexible Engineering

##### SIMATIC WinCC flexible/ChangeControl

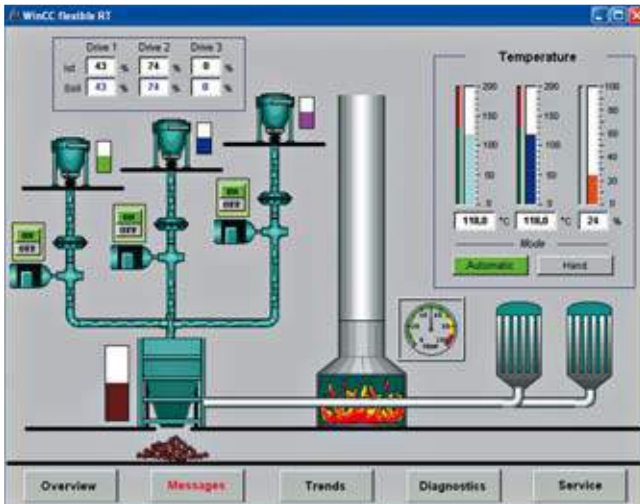
WinCC flexible/ChangeControl enables consistent backup of configuration data. The history of changes can be precisely traced in applications requiring uninterrupted tracking over the complete life cycle of a product.

- Delivered customer projects, approved reference states or development stages are managed in a database.
- Changes to the project data can be integrated without problems into the version management by means of new versions.
- A rollback is possible at any time.

# SIMOTION HMI devices

## SIMATIC WinCC flexible RT visualization software

### Overview



PC-based visualization software for single-user systems directly at the machine.

- Runs under Windows XP Professional and Windows 7 Professional, Ultimate, Enterprise
- Current version: SIMATIC WinCC flexible 2008 SP3 Runtime

SIMATIC WinCC flexible Runtime is configured with the SIMATIC WinCC flexible Advanced configuration software.

### Benefits

- Optimum price/performance ratio thanks to individually scalable system functionality
- Functions for all visualization tasks: Operator functions, graphical and trend displays, signaling system, log system, archiving (option), recipe management (option), Audit Trail (option), process fault diagnostics (option)
- Flexible runtime functionality thanks to Visual Basic scripts
- Innovative service concepts with remote operation, diagnostics and administration via intranet and Internet as well as e-mail communication to increase availability (option)
- Support for simple distributed automation solutions based on TCP/IP networks at the machine level (option)

### Application

SIMATIC WinCC flexible Runtime is the high-performance visualization software for simple visualization tasks at machine level. It can be used as a single-user solution for all automation applications in production automation, process automation and building services automation.

SIMATIC WinCC flexible Runtime can be employed in connection with the following operator devices:

- SIMATIC Panel PCs
  - Panel PC 277D
  - Panel PC 477B/477C
  - Panel PC 577/HMI IPC577C
  - Panel PC 677B
- SIMOTION P350
- Standard PCs with resolutions (W x H in pixels) of:
  - from 640 x 480 to 1600 x 1200 or Widescreen Displays 1440 x 900 and 1920 x 1200.

### Design

SIMATIC WinCC flexible Runtime is available as a software package with 128, 512, 2048 or 4096 PowerTags. The term PowerTags is used exclusively to identify process variables and range pointers that have a process link to the controller. Variables without process link, constant limit values of variables, and messages (up to 4000 bit-triggered messages) are also available for additional system performance.

The range of functions of WinCC flexible Runtime includes the centralized HMI components for visualizing and reporting, and it can be expanded to suit requirements and costs by using optional packages.

SIMATIC WinCC flexible Runtime is configured with the SIMATIC WinCC flexible Advanced configuration software.

### Options

WinCC flexible RT can be expanded with the following features:

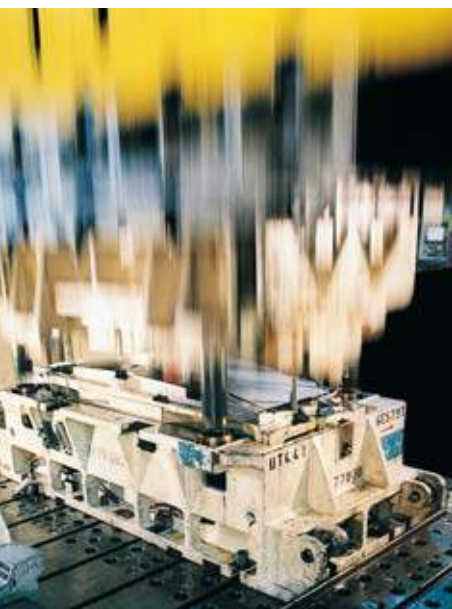
- WinCC flexible Archives for logging process values and messages
- WinCC flexible Recipes for managing data sets which contain associated machine or production data
- SIMATIC WinCC flexible /Audit for
  - Recording of operator actions in an Audit Trail
  - The ChangeControl option restricts users based on plant validation
  - Checking for later changes via security mechanisms
  - Simplified compliance with GPM guidelines
- SIMATIC Logon for central, plant-wide user administration
- WinCC flexible Sm@rtAccess for communication between different Simatic HMI systems
- WinCC flexible Sm@rtService for remote maintenance and servicing of machines/plants via the Intranet/Internet
- WinCC flexible OPC server for use as a data server (OPC server) for higher-level automation components such as control systems or systems in the office area.

# SIMOTION HMI devices

Notes

11

# Safety Integrated



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### Overview



#### Legal framework

Machine manufacturers and plant constructors must ensure that their machines or plants cannot cause danger due to malfunctions apart from the general risks of electric shock, heat or radiation.

In Europe, for example, compliance with the machinery directive is required by law by the EC occupational health and safety directive. In order to ensure the conformity with this directive, it is recommended that the corresponding harmonized European standards are applied. This initiates the assumption of conformity and gives manufacturers and operators the legal security in terms of compliance with both national regulations and the EU directive. With the CE marking, the manufacturer of a machine documents the compliance with all applicable directives and regulations in the free movement of goods.

#### Safety-related standards

Functional safety is specified in various standards. EN ISO 12100, for example, is concerned with the risk assessment and risk reduction of machines. IEC 61508 specifies the basic requirements for electronic and programmable safety-related systems. EN 62061 (only applicable for electrical and electronic control systems) and EN ISO 13849-1, which replaces the now withdrawn EN 954-1, define the functional and safety-related requirements of control systems with relevance to safety.

The above-mentioned standards define different safety requirements that the machine has to satisfy in accordance with the risk, frequency of a dangerous situation, probability of occurrence and the opportunities for recognizing impending danger.

- EN ISO 13849-1: Performance Level PL a ... e
- EN 62061: Safety Integrity Level SIL 1 ... 3

#### Trend toward integrated safety systems

The trend toward greater complexity and increasing modularity of machines have caused the safety functions to move away from the classical central safety functions (for example, deactivation of the complete machine using a main switch) and into the machine control system and the drives. This is often accompanied by a significant increase in productivity because the changeover times are shortened and during this changeover, depending on the type of machine, some subcomponents can even continue to manufacture.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, safety measures controlled by integrated safety systems are perceived as less interfering by the operator of the machine due to the custom actions, so the motivation to consciously bypass safety functions is significantly reduced.



**Function***Drive-integrated safety functions with SINAMICS S120*

SINAMICS S120 is characterized by a number of integrated safety functions. In combination with the sensor technology and safety control required for the safety function, they ensure that highly-effective protection for persons and machines is implemented in a practice-oriented manner.

They comply with the following requirements:

- Performance Level (PL) d and Category 3 according to EN ISO 13849-1
- Safety Integrity Level (SIL) 2 according to IEC 61508

In addition, the Safety Integrated functions of the SINAMICS S120 are generally certified by independent institutes. A list of certified components is available on request from your local Siemens sales office.

The Safety Integrated functions are completely integrated into the drive system. They are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

The motion control system SIMOTION provides support for SINAMICS drives that can execute safety-related monitoring functions (SOS, SLS, SDI) or stop reactions (STO, SS1, SS2). This support ensures that limit violations are prevented at the drive end in that SIMOTION controls (with SLS) the drive through the application, for example, within the permissible velocity range (with SLS) or brings it to a standstill (with SOS).

The functions SS1, SS2, SOS, SLS and SDI are activated and deactivated and their status is displayed with specific technological alarms and system variables on the axis.

The drive software from SINAMICS S120 is integrated into the SIMOTION D motion control system. The safety functions integrated into the drive can therefore also be used in combination with SIMOTION D.

The integrated safety functions that are currently available for the SINAMICS S120 drive system are described in the following. Their functional safety satisfies the requirements defined in the international standard IEC 61800-5-2 for variable-speed drive systems.

The safety functions integrated into the SINAMICS S120 drive system can be grouped into three classes:

- Functions for stopping a drive safely:
  - Safe Torque Off (STO)
  - Safe Brake Control (SBC)
  - Safe Stop 1 (SS1)
  - Safe Stop 2 (SS2)
  - Safe Operating Stop (SOS)
- Functions for safely monitoring the motion of a drive:
  - Safely Limited Speed (SLS)
  - Safe Speed Monitor (SSM)
  - Safe Direction (SDI)
- Functions for safely monitoring the position of a drive:
  - Safely Limited Position (SLP)
  - Safe Position (SP) – this function is not defined in IEC 61800-5-2

## Safety Integrated

### Function

#### Safe Torque Off (STO)

The STO function is the most common and basic drive-integrated safety function. It ensures that no torque-generating energy can continue to affect a motor and prevents unintentional start-ups.

#### Effect

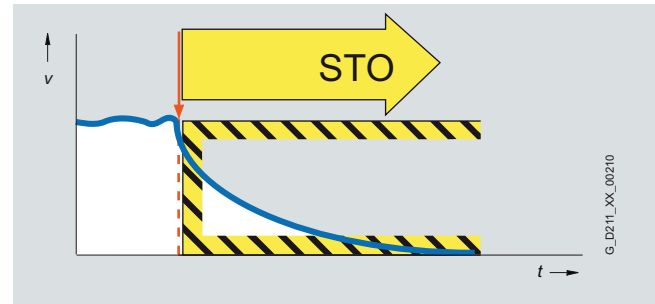
This function is a mechanism that prevents the drive from restarting unexpectedly, in accordance with EN 60204-1, Section 5.4. The STO function disables the drive pulses (corresponds to Stop Category 0 according to EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

#### Application

STO has the immediate effect that the drive cannot supply any more torque-generating energy. STO can be used wherever the drive will reach a standstill in a sufficiently short time based on the load or when coasting down of the drive will not have any relevance for safety.

#### Customer benefits

The advantage of the integrated STO safety function compared to standard safety technology using electromechanical switch-gear is the elimination of separate components and the effort that would be required to wire and service them. Because of the rapid electronic switching times, the function offers a shorter reaction time than a conventional solution comprising electro-mechanical components.



#### Safe Brake Control (SBC)

The SBC function permits the safe control of a holding brake. SBC is always activated in parallel with STO.

#### Effect

A holding brake which is active in a de-energized state is controlled and monitored using safe two-channel technology. Due to the two-channel control, the brake may still be operated in the event of an insulation fault in the control cable. Errors of this kind are detected early by means of test pulses.

#### Notes:

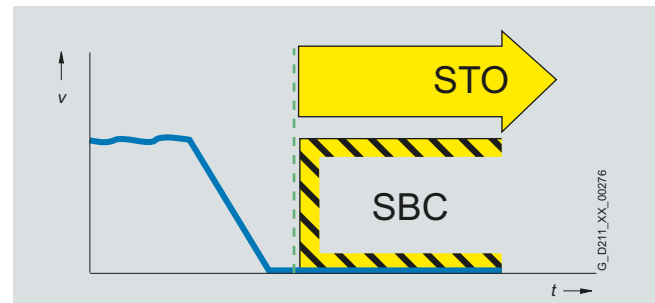
Safe Brake Control does not detect mechanical faults in the brake itself, such as worn brake linings. For Motor Modules in booksize format, the terminals for the motor brake are integrated. In the case of blocksize format an additional Safe Brake Relay is required, and in the case of chassis format an additional Safe Brake Adapter is necessary.

#### Application

The SBC function is used in conjunction with the functions STO or SS1 to prevent the movement of an axis in the torque-free state, e.g. because of gravity.

#### Customer benefits

Again, the function saves the use of external hardware and the associated wiring.



**Function****Safe Stop 1 (SS1)**

The SS1 function causes a motor to stop rapidly and safely and switches the motor to torque-free mode after the standstill by activating STO.

**Effect**

The SS1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes autonomously along a quick-stop ramp and automatically activates the Safe Torque Off and Safe Brake Control functions (if configured) when the parameterized safety delay time expires.

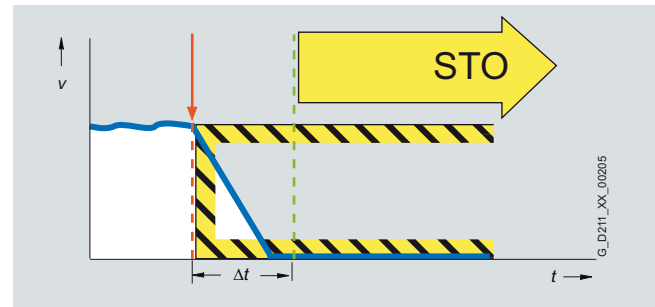
In firmware version V4.5 and higher, an additional variant of SS1 is available (SS1E). In this case, when SS1 is selected, automatic braking of the drive does not start, but the safe delay time starts to elapse instead. The higher-level controller remains in control of the setpoint which must bring the drive to a standstill within this time.

**Application**

The SS1 function is used when in the event of a safety-relevant incident the drive must stop as quickly as possible with a subsequent transition into the STO state. It is thus used to bring large centrifugal masses to a stop as quickly as possible for the safety of the operating personnel, or to brake motors at high speeds as quickly as possible. Typical application examples are saws, grinding machine spindles, centrifuges and stacker cranes.

**Customer benefits**

The targeted stopping of a drive by means of SS1 reduces the risk of danger, increases the productivity of a machine, and allows safety clearances in a machine to be reduced. This results from active stopping of the drive as opposed to sole use of the STO function.

**Safe Stop 2 (SS2)**

The SS2 function shuts down a motor quickly and safely and then monitors the standstill position.

**Effect**

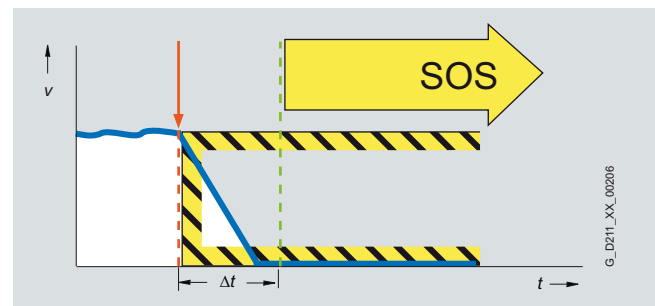
The SS2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick-stop ramp. In contrast to SS1, the automatic speed control remains operational afterwards, i.e. the motor can supply the full torque required to maintain zero speed. Standstill is safely monitored (SOS – Safe Operating Stop function).

**Application**

As with SS1, the SS2 function ensures the quickest possible deceleration of the motor. However, the motor power is not switched off, but prevented by a control system from leaving the standstill position even if affected by external forces.

**Customer benefits**

The SS2 function ensures a rapid axis stop. Because the control remains active, after the safety function is deselected, productive operation can continue without referencing. This ensures short setup and standstill times and high productivity.



## Safety Integrated

### Function

#### Safe Operating Stop (SOS)

With the SOS function, the stopped drive is kept in position and monitored by drive control.

##### Effect

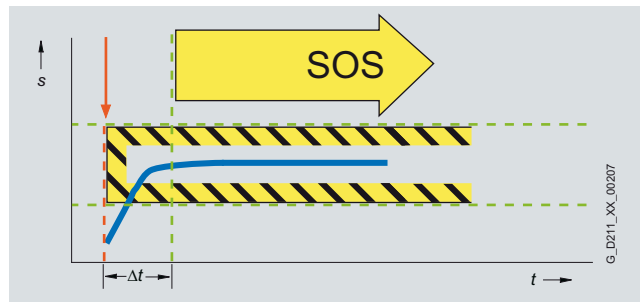
The SOS function represents safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced automatically by the drive.

##### Application

SOS is an ideal solution for applications for which the machine or parts of the machine must be at a safe standstill in certain steps, but the drive must also supply a holding torque. The speed control continues to operate and ensures that the drive remains in its current position despite opposing torques. SOS monitors the current standstill position. When SOS is selected, in contrast to SS1 and SS2, the drive does not influence the speed setpoint autonomously. Conversely, before SOS is activated the higher-level control has the option of ramping down the affected axes in a coordinated manner in the network within a delay time that can be set. This can be used to prevent any damage to the machine or product.

#### Customer benefits

No mechanical components are necessary to keep the axis in position despite any counterforce that might appear. Due to the short switching times and the fact that the drive control always remains active, setup and downtimes are reduced. Recalibration of the axis after exiting the SOS function is not necessary. The axis can immediately be moved again after deactivation of the SOS function.



#### Safely Limited Speed (SLS)

The SLS function ensures that the drive does not exceed a preset speed limit.

##### Effect

The SLS function monitors the drive against a parameterized speed limit. Four different limit values can be selected. As in the case of SOS, the speed setpoint is not automatically influenced. After SLS has been selected, the higher-level control must bring the drive down below the selected speed limit within a parameterizable time. If the speed limit is exceeded, a configurable drive-integrated fault reaction is instigated.

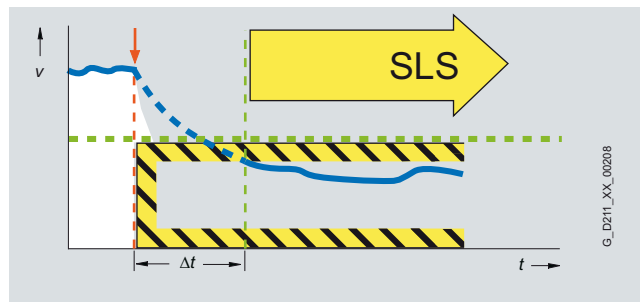
In firmware version V4.5 and higher, a factor can be applied to SLS limit 1 that is transferred over PROFIsafe in 16-bit resolution. This allows an almost unlimited number of limits to be specified.

##### Application

The SLS function is used if people are in the danger zone of a machine and their safety can only be guaranteed by reduced speed. Typical application cases include those in which an operator must enter the danger zone of the machine for the purposes of maintenance or setting up, such as a winder for which the material has to be fed in manually by the operator. To prevent injury to the operator, the roller may only spin at a safe reduced speed. SLS is often also used as part of a two-stage safety concept. While a person is in a less critical zone, the SLS function is activated, and the drives are only stopped in a smaller area with higher potential risk. SLS can be used not only for operator protection, but also for machinery protection, e.g. if a maximum speed must not be exceeded.

#### Customer benefits

The SLS function can contribute to a significant reduction in downtime, or greatly simplify or even accelerate setup. The overall effect achieved is a higher availability of the machine. Moreover, external components such as speed monitors can be omitted.



**Function****Safe Speed Monitor (SSM)**

The SSM function warns when a drive is working below an adjustable speed limit. As long as it remains below the threshold, the function outputs a safety-related signal.

**Effect**

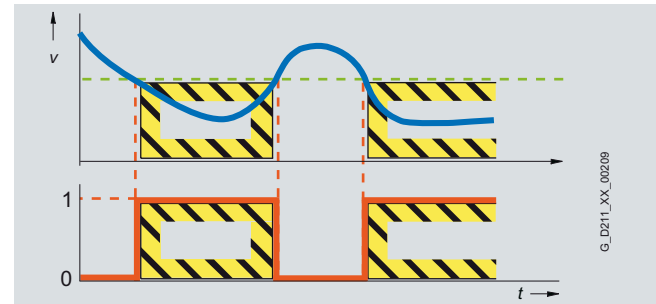
If a speed value drops below a parameterized limit, a safety-related signal is generated. This can be processed, for example, in a safety controller to respond to the event by programming, depending on the situation.

**Application**

With the SSM function, in the simplest case, a safety door can be released if the speed drops below a non-critical level.

**Customer benefits**

Unlike SLS, there is no drive-independent fault reaction when the speed limit is exceeded. The safe feedback can be evaluated in a safety control unit, allowing the user to respond appropriately to the situation.

**Safe Direction (SDI)**

The SDI function ensures that the drive can only move in the selected direction.

**Effect**

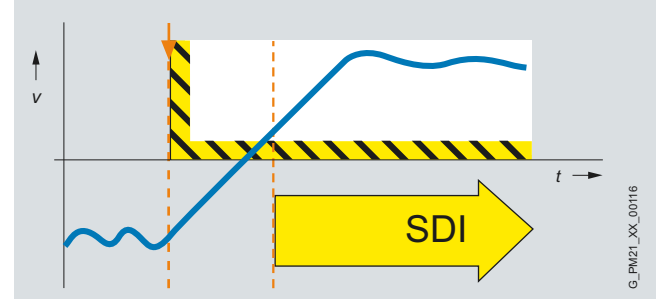
A deviation from the currently monitored direction of motion is reliably detected and the configured autonomous fault response of the drive is initiated. It is possible to monitor one or two directions of motion optionally.

**Application**

The SDI function is used if the drive is allowed to move in only one direction. A typical application is to make a danger area accessible to the operator, provided the machine is moving in the safe direction, i.e. away from the operator. In this status, the operator can safely feed material into or remove it from the working area.

**Customer benefits**

The function does away with the use of external components such as speed monitors and the associated wiring expense. The release of a danger zone while the machine is moving away from the operator also raises productivity. Without the SDI function, the machine would have to be stopped safely while material was fed in or removed.



## Safety Integrated

### Function

#### *Safely Limited Position (SLP)*

The SLP function monitors the axis to ensure that it remains within the permissible traversing range.

#### Effect

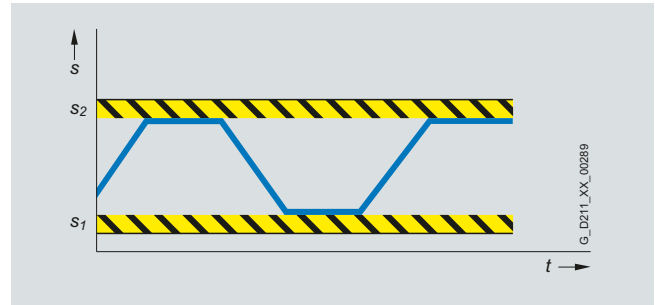
When SLP is activated, the traversing range limited by the configured software limit switch is safely monitored. It is possible to switch between two limit switch pairs. If the permitted traversing range is exited, a configurable fault reaction is instigated. SLP can only be used when the axis has been safely referenced.

#### Application

SLP is used for applications in which machine operators have to enter a protection area, e.g. for feeding in and removing material. Safe monitoring of the axis position ensures that the axis cannot move into the protection area released for operators, placing them in danger.

#### Customer benefits

SLP can be used for highly-effective protection area monitoring. The function does away with the use of external components such as hardware limit switches and the associated wiring expense. Due to the short reaction time following a limit overshoot, safety clearances can be reduced.



#### *Safe Position (SP)*

The SP function transfers the actual position values determined safely in the drive over safe PROFIsafe communication to a safety control.

#### Effect

In contrast to the SLP function that monitors the current actual position value against a limit and, in the case of an overshoot, activates a drive-integrated fault reaction, SP transfers the current actual position values to the safety control. Position monitoring is implemented in the safety program of the control. Extended PROFIsafe telegrams are available for transferring the position values. The position values can be transferred in 16-bit or 32-bit resolution, as required. A time stamp is also transferred with the position values.

#### Application

The monitoring function has to be implemented in the safety control, so this offers extensive possibilities. For example, a safe cam controller can be implemented in this manner. Depending on the performance capability of the control, multi-dimensional position or speed monitoring functions can be implemented.

SP will only output valid, absolute actual position values if the axis has been safely referenced. A time stamp is transferred with the actual position values to enable safe speed values to be calculated in the safety control. The axis does not have to be safely referenced for safe speed values to be calculated.

#### Customer benefits

Position monitoring or speed monitoring is implemented in the safety program of the control, so the user has the flexibility for implementing tailor-made safety functions. The reaction to a limit overshoot must also be specified in the safety program. This means a higher initial programming outlay, but it does offer the opportunity for initiating different fault reactions.

**Function****Basic Functions and Extended Functions**

The Safety Integrated functions of the SINAMICS S120 drive system are grouped into Basic Functions and Extended Functions.

The Basic Functions are included in the standard scope of supply.

The Extended Functions can only be enabled via a license.

- **Basic Functions**

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop 1 (SS1)

- **Extended Functions**

- Safe Stop 1 (SS1) with SBR or SAM
- Safe Stop 2 (SS2) with SAM
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)
- Safely Limited Position (SLP)
- Safe Position (SP)

With Extended Functions Safe Stop 1 (SS1) and Safe Stop 2 (SS2) with SAM, safe acceleration monitoring (SAM) is performed during braking to ensure that any faults during braking will be detected. If Safe Stop 1 is used as an encoderless function, safe brake ramp (SBR) can be configured as an alternative.

The Basic Functions – activated via on-board terminals on the device or via PROFIsafe – do not require an encoder.

**Activation of the integrated safety functions**

The safety functions integrated into SINAMICS S120 can be activated as follows:

- **Basic Functions:**
  - Over terminals on the CU320-2 or SIMOTION D4x5-2 Control Unit and on the power unit (STO, SBC, SS1 only)
  - Over the safety-related digital inputs of CU310-2 or SIMOTION D410-2
  - Over PROFIBUS or PROFINET with PROFIsafe profile
- **Extended Functions:**
  - Over the safety-related digital inputs of the TM54F Terminal Module
  - Over the safety-related digital inputs of CU310-2 or SIMOTION D410-2
  - Over PROFIBUS or PROFINET with PROFIsafe profile
  - The SLS and SDI functions can also be parameterized to be permanently activated

**PROFIsafe**

PROFIsafe is an open communications standard that supports standard and safety-related communication over the same communications cable (wired or wireless). A second, separate bus system is therefore not necessary. To ensure safe communication, the transmitted message frames are continuously monitored. Possible errors, such as lost or repeated messages or those received in the wrong order are avoided in that safety-related messages are numbered consecutively, their arrival is monitored within a defined period, and an identifier for the sender and receiver of a message is transferred. A CRC (cyclic redundancy check) data security mechanism is also used.

SINAMICS S120 supports the PROFIsafe profile based on PROFIBUS as well as on PROFINET.

# Safety Integrated

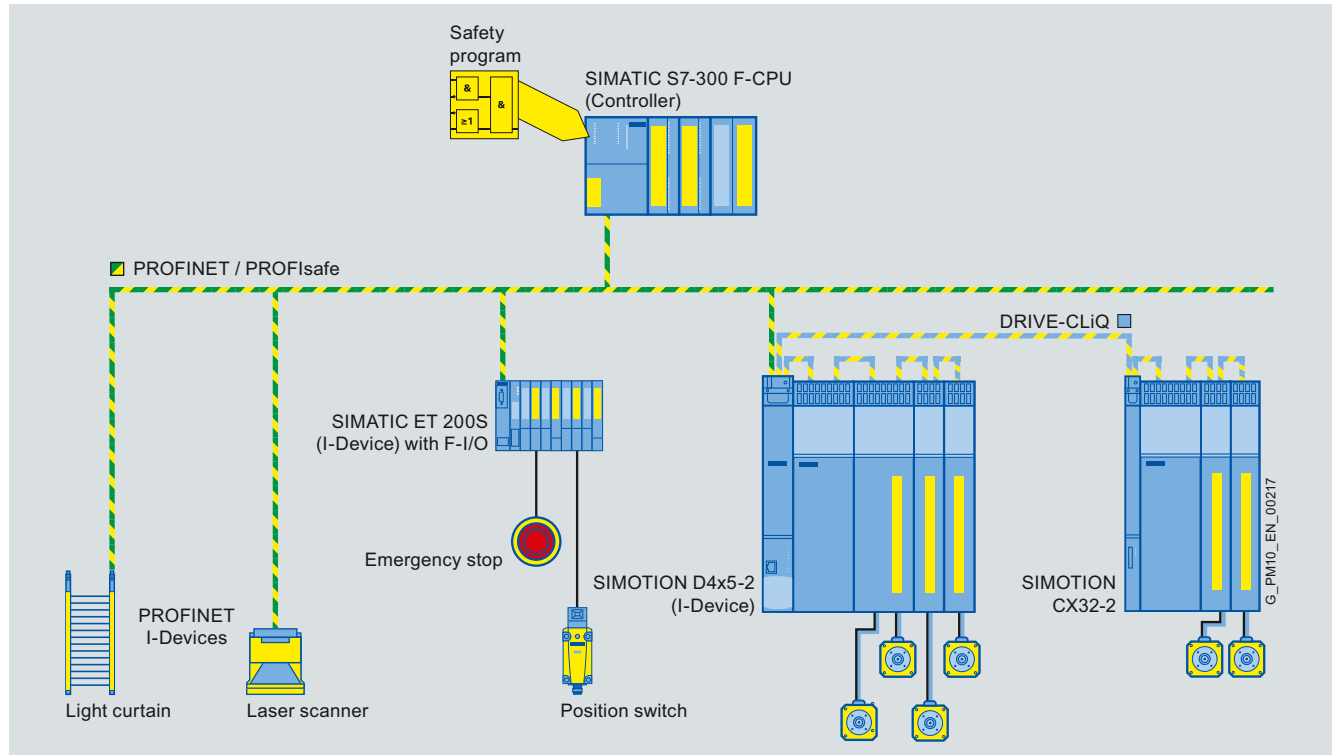
## Safety Integrated

### Function

#### PROFIsafe communication with SIMOTION D

A typical communication topology between a safety control and the drives integrated in SIMOTION D is shown in the diagram below based on the example of PROFINET. This topology is also possible with PROFIBUS as the basis.

In this case, the safety control must be configured as a PROFINET controller or PROFIBUS master respectively. SIMOTION D is an I-Device or I-Slave here. SIMOTION D transfers the PROFIsafe telegrams to the drives using the F-Proxy mechanism.



Safety Integrated solution based on the example of SIMOTION D4x5-2: Control of the safety functions via PROFINET with PROFIsafe



## Function

### Safe speed/position sensing

Incremental encoders or absolute encoders can be used for safe sensing of the position values on a drive. Safe actual value sensing relies on redundant evaluation of the incremental channels A/B that supply sin/cos signals of  $1 V_{pp}$ . Only encoders of the type whose A/B track signals are created and processed using purely analog techniques can be used.

The encoder signals can be read via SMC20, SME20/25 or SME120/125 Sensor Modules (for further information, see the chapter SINAMICS S120 drive system).

As an alternative, motors with an integrated DRIVE-CLiQ interface can be used. The speed or position actual values are generated directly in the motor as safe values and are transferred to the Control Unit over safe communication via DRIVE-CLiQ.

The encoder must be mechanically attached in such a manner that the encoder shaft is unable to unplug or slide off. For notes on this, see IEC 61800-5-2: 2007, Table D.16.

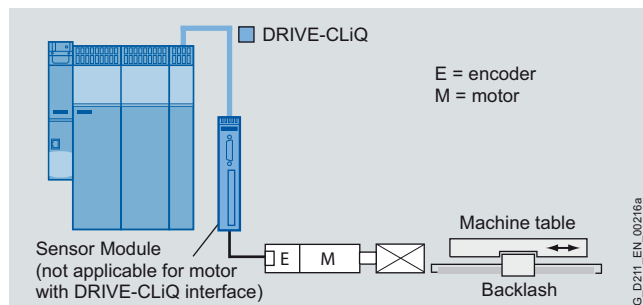
A list of Siemens motors that fulfill the electrical and mechanical requirements is available at:

<http://support.automation.siemens.com/WW/view/en/33512621>

The following can be used for safe speed/position sensing:

- Single-encoder systems or
- Dual-encoder systems

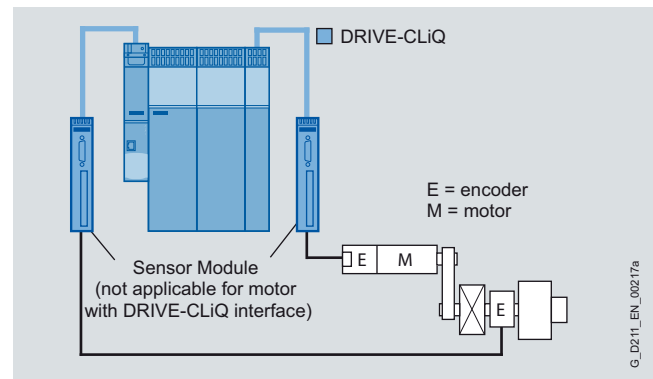
### Single-encoder system



Example: Single-encoder system

In a single-encoder system, the motor encoder is used exclusively for safe actual value sensing.

### Dual-encoder system



Example: Dual-encoder system on a spindle

The safe actual values for a drive are provided by two separate encoders. The actual values are transferred to the Control Unit over DRIVE-CLiQ. When motors without a DRIVE-CLiQ connection are used, a Sensor Module (SMC20/SME20/25/120/125) must be implemented. Each measuring system requires a separate DRIVE-CLiQ connection.

### Safe acquisition of actual values without encoders

The Extended Functions Safe Stop 1 (SS1) with SAM/SBR, Safely Limited Speed (SLS), Safe Speed Monitor (SSM) and Safe Direction (SDI) are also available for use without encoders (initially only in the Booksize or Blocksize performance range and in combination with induction motors and SIEMOSYN motors). An encoder that is used for the purposes of motor control has no significance for the safety function here.

The Safety Integrated Function Manual contains additional information about the encoderless safety functions.

The Extended Functions Safe Stop 2 (SS2), Safe Operating Stop (SOS), Safely Limited Position (SLP) and Safe Position (SP) always require a safe encoder system.

### Licensing

The Safety Integrated Basic Functions do not require a license.

In the case of Safety Integrated Extended Functions, however, a license is required for every axis using these functions. It is of no consequence here which safety functions are used and how many.

The required licenses can be optionally ordered with the CompactFlash card:

For the order numbers of the CompactFlash cards, see chapter SINAMICS S120 drive system and SIMOTION D.

### Notes:

Up to 6 safety axes with Extended Functions are possible in vector or servo control on one CU320-2, D4x5-2 or CX32-2. Up to 11 axes with Safety Integrated Extended Functions are possible in V/f control mode.

The CU310-2 and CU410-2 Control Units have been designed to control only single axes. Only one license is therefore required for the Safety Integrated Extended Functions (short code **F01**).

## Safety Integrated

## Function

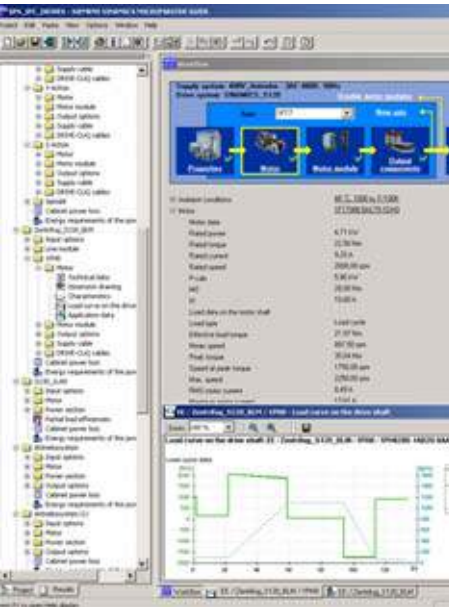
An overview of the Safety Integrated functions of SINAMICS S120 and their boundary conditions is given in the following table:

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required
<b>STO</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit or CUA31/CUA32 and on the Control Unit</li> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> </ul>	SBC (if activated)	–	No	No <sup>1)</sup>	No <sup>2)</sup>
<b>SBC</b>	<ul style="list-style-type: none"> <li>• With STO (directly or following expiry of the delay with SS1)</li> </ul>	–	–	–	No	No
<b>SS1</b>	<ul style="list-style-type: none"> <li>• EP terminals on the power unit or CUA31/CUA32 and on the Control Unit</li> <li>• PROFIsafe</li> </ul>	STO following expiry of the parameterized delay, SBC (if activated)	–	Parameterizable	No	No
<b>SS1 with SAM/SBR</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> </ul>	Safe acceleration monitoring (SAM) or safe brake ramp (SBR) during braking. STO and SBC (if activated) following expiry of the parameterized delay or undershooting of the minimum speed limit	STO	Parameterizable	No	Yes (per safety axis)
<b>SS2</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> </ul>	Safe acceleration monitoring (SAM) during braking. Following expiry of the parameterized delay SOS	SS1 → STO	No	Yes	Yes (per safety axis)
<b>SLS sensorless</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> <li>• Continuously activated</li> </ul>	–	SS1, STO (parameterizable)	Yes	No	Yes (per safety axis)
<b>SLS</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> </ul>	–	STO, SS1, SS2 or SOS (parameterizable)	Yes	Yes	Yes (per safety axis)
<b>SOS</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> </ul>	–	SS1 → STO	Yes	Yes	Yes (per safety axis)
<b>SSM</b>	<ul style="list-style-type: none"> <li>• Always active, if configured</li> </ul>	–	Message only	Yes	No	Yes (per safety axis)
<b>SDI</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2 or D410-2</li> <li>• PROFIsafe</li> <li>• Continuously activated</li> </ul>	–	STO, SS1, SS2, SOS (parameterizable)	Yes	No	Yes (per safety axis)
<b>SLP</b>	<ul style="list-style-type: none"> <li>• F-DI on TM54F</li> <li>• F-DI on CU310-2</li> <li>• PROFIsafe</li> </ul>	–	STO, SS1, SS2, SOS (parameterizable)	Yes	Yes	Yes (per safety axis)
<b>SP</b>	<ul style="list-style-type: none"> <li>• Always active, if configured</li> </ul>	–	–	Yes	Yes	Yes (per safety axis)

<sup>1)</sup> The activation option using terminals on TM54F currently requires an encoder.

<sup>2)</sup> The activation option using terminals on TM54F currently requires a license.

# System description – Dimensioning

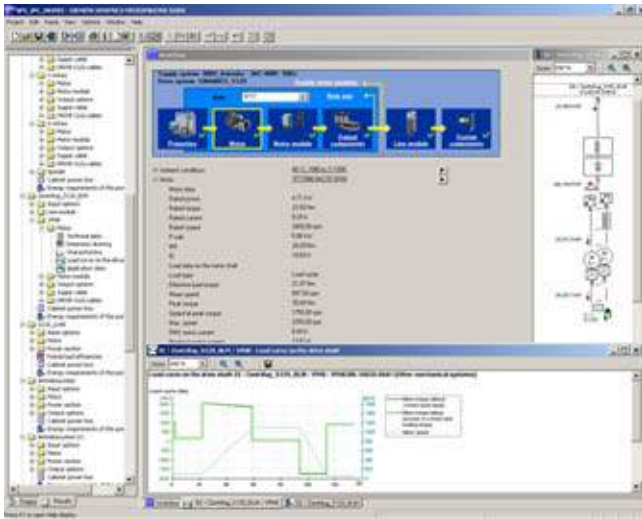


13/2	<b>SIZER for Siemens Drives engineering tool</b>
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13/29	<b>System components</b>
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13/32	External 24 V DC supply
13/33	<b>Mechanical configuration of the drive system</b>
13/33	Specification of components for connection system
13/33	Configuration of a drive line-up in booksize format
13/34	Configuration of a drive line-up in chassis format
13/34	Configuration of a mixed drive line-up
13/36	<b>Heat dissipation</b>
13/36	Mandatory minimum installation clearances
13/38	Calculation of internal control cabinet temperature
See Part 3	<b>Engineering software</b> STARTER commissioning tool Drive Control Chart (DCC) Drive ES engineering software
See Part 14	<b>CAD CREATOR</b> Dimension drawing and 2D/3D CAD generator <a href="http://www.siemens.com/cadcreator">www.siemens.com/cadcreator</a>

# System description – Dimensioning

## SIZER for Siemens Drives engineering tool

### Overview



The following drives and controls can be engineered in a user-friendly way using the SIZER for Siemens Drives engineering tool:

- SINAMICS Low Voltage and MICROMASTER 4 drive systems
- SINUMERIK CNC system
- SIMOTION Motion Control system
- SIMATIC Technology

It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

SIZER for Siemens Drives supports all of the configuring steps in a workflow:

- Configuring the power supply
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selecting the line-side and motor-side power options, e.g. cables, filters, and reactors

When SIZER for Siemens Drives was being designed, particular importance was placed on a high degree of usability and a universal, function-based approach to the drive application. The extensive user guidance makes using the tool easy. Status information keeps you continually informed about the progress of the configuration process.

The SIZER for Siemens Drives user interface is available in English, French, German and Italian.

The drive configuration is saved in a project. In the project, the components and functions used are displayed in a hierarchical tree structure.

The project view permits the configuration of drive systems and the copying/inserting/modifying of drives already configured.

The configuration process produces the following results:

- A parts list of the required components (export to Excel, use of the Excel data sheet for import to SAP)
- Technical specifications of the system
- Characteristic curves
- Statements on line harmonic distortion
- Mounting arrangement of drive and control components and dimension drawings of motors
- Energy requirements of the configured application

These results are displayed in a results tree and can be reused for documentation purposes.

Technological online help is available:

- Detailed technical specifications
- Information about the drive systems and their components
- Decision-making criteria for the selection of components
- Online help in German, English, French, Italian, Chinese and Japanese

#### Minimum system requirements

- PG or PC with Pentium III min. 800 MHz (>1 GHz recommended)
- 512 MB RAM (1 GB RAM recommended)
- At least 4.1 GB of free hard disk space
- An additional 100 MB of free hard disk space on the Windows system drive
- Screen resolution 1024 x 768 pixels (1280 x 1024 pixels recommended)
- Operating system:
  - Windows XP Home Edition SP2
  - Windows XP Professional 32 bit SP2
  - Windows XP Professional 64 bit SP2
  - Windows Vista Business
  - Windows 7 Ultimate 32 bit
  - Windows 7 Professional 32 bit
- Microsoft Internet Explorer V5.5 SP2

#### Selection and ordering data

Description	Order No.
<b>SIZER for Siemens Drives engineering tool</b>	<b>6SL3070-0AA00-0AG0</b>
DVD-ROM	
English, French, German, Italian	

#### More information

The SIZER for Siemens Drives engineering tool is available free on the Internet at:

[www.siemens.com/sizer](http://www.siemens.com/sizer)

## Overview

### General configuration sequence

The function description of the machine provides the basis for the configuration. The definition of the components is based on physical dependencies and is usually carried out as follows:

Step	Description of configuration activity
1	Clarification of type of drive
2	Specify the supplementary conditions and integration in the automation system
3	Definition of loading case, calculation of max. load torque, definition of motor
4	Definition of the Motor Module
5	Repetition of steps 3 and 4 for additional axes
6	Calculation of the required DC link power and definition of the Line Module
7	Specification of the required control performance and selection of the Control Unit, definition of component cabling
8	Specification of the line-side power options (main switch, fuses, line filters, etc.) and cable cross-sections for system connection and motor connection
9	Definition of additional system components
10	Calculation of the current requirement for the 24 V DC supply for the components and specification of power supplies (SITOP devices, Control Supply Modules)
11	Specification of components for connection system
12	Configuration of drive line-up components
13	Thermal design of the control cabinet

Configuration begins with the mechanical interface to the machine. A suitable motor is selected according to the specified torques and speeds. A matching power unit is then also chosen. Depending on the requirements of the machine, the motor is supplied as a single drive via a Power Module or within a multi-motor drive group via a Motor Module. Once the basic components have been defined, the system components for matching to the electrical and mechanical interfaces are selected.

The SIZER for Siemens Drives engineering tool allows the correct components to be selected quickly and easily. Based on the torque and speed characteristics entered, SIZER for Siemens Drives guides the user through the configuring process, identifying suitable motors and matching SINAMICS power units and other system components.

The following sections describe those SINAMICS S120 components which are needed to create a drive system subject to certain supplementary conditions. For information about individual components, please also refer to the online help of the SIZER for Siemens Drives engineering tool.

### EMC notes

The electromagnetic compatibility describes – according to the definition of the EMC directive – the "capability of a device to work satisfactorily in the electromagnetic environment without itself causing electromagnetic interference which is unacceptable for other devices present in this environment". To guarantee that the appropriate EMC Directives are observed, the devices must demonstrate a sufficiently high noise immunity, and also the emitted interference must be limited to acceptable values.

The EMC requirements for variable-speed drive systems are described in the product standard EN 61800-3. A variable-speed drive system (or Power Drive System PDS) consists of the Control Unit and Power Module or Control Unit, Line Module and Motor Module plus the relevant electric motors and encoders including connecting cables. The driven machine is not part of the drive system. EN 61800-3 defines different limit values depending on the location of the drive system, referred to as the first and second environments.

Residential buildings or locations at which the drive system is directly connected to a public low-voltage supply without intermediate transformer are defined as the **first environment**.

The term **second environment** refers to all locations outside residential areas. These are basically industrial areas which are supplied from the medium-voltage network via their own transformers.

Four different categories are defined in EN 61800-3 depending on the location and the power of the drive:

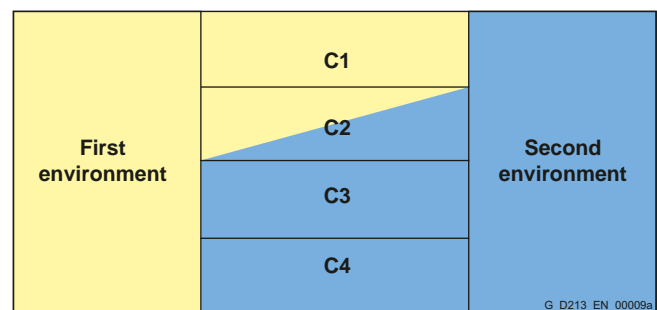
**Category C1:** Drive systems for rated voltages < 1000 V for unrestricted use in the first environment.

**Category C2:** Stationary drive systems for rated voltages < 1000 V for use in the second environment. Use in the first environment is possible if the drive system is marketed and installed by qualified personnel. The warning information and installation instructions supplied by the manufacturer must be observed.

**Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment.

**Category C4:** Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A for use in complex systems in the second environment.

The following diagram shows how the four categories are assigned to the first and second environments:



SINAMICS S120 built-in units are designed for use in the second environment.

In order to limit **emitted interference**, RFI filters (some of which are integrated in the unit) are provided which are capable of meeting the requirements of Category C3 or C2 (see chapter "SINAMICS S120 drive system").

SINAMICS S120 built-in units fulfill the requirements for **noise immunity** defined in EN 61800-3 for the second environment and consequently also the lower noise immunity values in the first environment.

It is essential to follow the installation instructions in order to ensure compliance with interference emission and immunity values.

# System description – Dimensioning

## SINAMICS S120 Control Units

### Overview

Simple technological tasks can be carried out by the SINAMICS S120 Control Unit itself. The CU320-2 Control Unit is available for multi-axis applications and the CU310-2 Control Unit for single drives.

Sophisticated Motion Control tasks are best supported by the powerful SIMOTION D Control Units (D410-2, D425-2, D435-2, D445-2, D455-2) with graded performance.

Each of these Control Units is based on an object-oriented SINAMICS S120 standard firmware which contains all the most popular  $V/f$  control modes and closed-loop control variants, that can be scaled to meet even the most advanced performance requirements.

The following are ready-to-configure drive objects (drive controls):

- The control for a line infeed: Infeed Control
- The control for the broad scope of rugged asynchronous (induction) motors and torque motors, including sensorless: Vector Control
- The control for permanent magnet synchronous and servo asynchronous motors with demanding dynamic requirements: Servo Control

All these control variants are based on the principle of field-oriented, closed-loop vector control.

The most commonly used  $V/f$  control modes are stored in the Vector Control drive object and are ideal for implementing even simple applications such as, for example, group drives with SIEMOSYN motors.

### Guide to selecting a closed-loop control variant

The two tables below titled "Closed-loop control characteristics" and "Performance characteristics" are provided to help users select the "right" type of closed-loop control.

The drive control functions integrated in the SIMOTION D410-2, D4x5-2 and CX32-2 Control Units are based on the drive control of the SINAMICS S120 Control Units (firmware version V4.x), although there is a slight difference in functionality. For example, the basic positioner (EPos) and the Basic Operator Panel BOP20 are not supported.

- SIMOTION D410-2 is based on the output control of a SINAMICS S120 Control Unit CU310-2 (62.5  $\mu$ s current controller clock cycle is not supported by SIMOTION D410-2)
- SIMOTION D4x5-2/CX32-2 is based on the output control of a SINAMICS S120 Control Unit CU320-2

For further information, see the [SIMOTION and SINAMICS documentation](#).

### Closed-loop control characteristics SINAMICS S

Criteria for assessing control quality	Explanations, definitions
<b>Rise time</b>	The rise time is the period which elapses between an abrupt change in a setpoint and the moment the actual value first reaches the tolerance band (2 %) around the setpoint. The dead time is the period which elapses between the abrupt change in the setpoint and the moment the actual value begins to increase. The dead time is partially determined by the read-in, processing and output cycles of the digital closed-loop control. Where the dead time constitutes a significant proportion of the rise time, it must be separately identified.
<b>Characteristic angular frequency -3 dB</b>	The limit frequency is a measure of the dynamic response of a closed-loop control. A pure sinusoidal setpoint is input to calculate the limit frequency; no part of the control loop must reach the limit. The actual value is measured under steady-state conditions and the ratio between the amplitudes of actual value and setpoint is recorded. -3 dB limit frequency: Frequency at which the absolute value of the actual value drops by 3 dB (to 71 %) for the first time. The closed-loop control can manage frequencies up to this value and remain stable.
<b>Ripple</b>	The ripple is the undesirable characteristic of the actual value which is superimposed on the mean value (useful signal). Oscillating torque is another term used in relation to torque. Typical oscillating torques are caused by motor slot grids, by limited encoder resolution or by the limited resolution of the voltage control of the IGBT power unit. The torque ripple is also reflected in the speed ripple as being indirectly proportional to the mass inertia of the drive.
<b>Accuracy</b>	Accuracy is a measure of the magnitude of the average, repeatable deviation between the actual value and setpoint under nominal conditions. Deviations between the actual value and setpoint are caused by internal inaccuracies in the measuring and control systems. External disturbances, such as temperature or speed, are not included in the accuracy assessment. The closed-loop and open-loop controls should be optimized with respect to the relevant variable.

## Configuration

## Performance characteristics SINAMICS S

Features	Servo Control	Vector Control	V/f Control	Notes
Typical application	<ul style="list-style-type: none"> <li>Drives with highly dynamic motion control</li> <li>Angular-locked synchronism with isochronous PROFIBUS/PROFINET in conjunction with SIMOTION</li> <li>For use in machine tools and clocked production machines</li> </ul>	<ul style="list-style-type: none"> <li>Speed-controlled drives with high speed and torque stability in general mechanical engineering systems</li> <li>Particularly suitable for asynchronous motors</li> </ul>	<ul style="list-style-type: none"> <li>Drives with low requirements on dynamic response and accuracy</li> <li>Highly synchronized group drives, e.g. on textile machines with SIEMOSYN motors</li> </ul>	Mixed operation of Servo Control and Vector Control is not possible on CU320-2. Mixed operation for the V/f Control modes is possible.
Dynamic response	Very high	High	Low	Highest dynamic response with 1FK7 High Dynamic synchronous motors and Servo Control.
Control modes with encoder	Position control/ Speed control/ Torque control	Position control/ Speed control/ Torque control	None	SIMOTION D with Servo Control is standard for motion control.
Control modes without encoder	Speed control	Speed control/ Torque control	All V/f control modes	With Servo for asynchronous motors only. With V/f Control the speed can be kept constant by means of selectable slip compensation.
Asynchronous motor	Yes	Yes	Yes	V/f Control (textiles) is recommended for SIEMOSYN motors.
Synchronous motor	Yes	No	No	
Torque motor	Yes	Yes	No	
Linear motor	Yes	No	No	
Permissible ratio of motor rated current to rated current of Motor Module	1:1 to 1:4	1.3:1 to 1:4	1:1 to 1:12	Maximum control quality in the case of Servo Control and Vector Control up to 1:4. Between 1:4 and 1:8 increasing restrictions as regards torque and rotational accuracy. V/f Control is recommended for <1:8.
Maximum number of parallel-connected motors per Motor Module	4	8	Unlimited in theory	Motors connected in parallel must be asynchronous (induction) motors with identical power ratings. With V/f Control, the motors can have different power ratings.
Setpoint resolution position controller	31 bit + sign	31 bit + sign	–	
Setpoint resolution Speed/frequency	31 bit + sign	31 bit + sign	0.001 Hz	
Setpoint resolution Torque	31 bit + sign	31 bit + sign	–	
Maximum output frequency	<ul style="list-style-type: none"> <li>For current controller clock cycle/pulse frequency</li> <li>With current controller clock cycle/pulse frequency (chassis frame sizes FX and GX)</li> <li>With current controller clock cycle/pulse frequency (chassis frame sizes HX and JX)</li> </ul>	<ul style="list-style-type: none"> <li>330 Hz at 250 µs/4 kHz</li> <li>160 Hz at 250 µs/2 kHz</li> <li>100 Hz at 400 µs/1.25 kHz</li> </ul>	<ul style="list-style-type: none"> <li>400 Hz at 250 µs/4 kHz</li> <li>200 Hz at 250 µs/2 kHz</li> <li>100 Hz at 400 µs/1.25 kHz</li> </ul>	<p>Note limit voltage (2 kV) and use of VPM Module with synchronous motors.</p> <p>For asynchronous motors only: When using edge modulation, 600 Hz are possible at 4 kHz, or 300 Hz at 2 kHz and 200 Hz at 1.25 kHz.</p>
Maximum field weakening	<ul style="list-style-type: none"> <li>For asynchronous motors</li> <li>For synchronous motors</li> </ul>	<ul style="list-style-type: none"> <li>5 ×</li> <li>2 ×</li> </ul>	<ul style="list-style-type: none"> <li>4 ×</li> <li>–</li> </ul>	<p>With Servo Control combined with encoder and appropriate special motors, field weakening up to 16 times the field-weakening threshold speed is possible.</p> <p>These values refer to 1FT7/1FK7 synchronous motors. Note limit voltage (kE factor) with non-Siemens motors.</p>

# System description – Dimensioning

## SINAMICS S120 Control Units

### Configuration

#### Fundamental closed-loop control characteristics of SINAMICS S

- Booksize format, pulse frequency 4 kHz, closed-loop torque control

	Servo Control		Vector Control		Notes
<b>Synchronous motor</b>	<b>1FK7 with R14DQ <sup>1)</sup></b>	<b>1FT7</b>	Vector Control is not designed as an operating mode for 1FK7/1FT7 synchronous motors.		
Controller cycle	125 µs	125 µs			
Rise time (without delay)	0.7 ms	0.5 ms			At a speed operating range from 50 rpm for resolver.
Characteristic angular frequency -3 dB	650 Hz	900 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Torque ripple	3 % of $M_0$	0.6 % of $M_0$			With speed operating range of 20 rpm up to rated speed. A ripple of < 1 % is possible with an absolute encoder ≤ 1 rpm. Not possible with resolver.
Torque accuracy	±1.5 % of $M_0$	±1.5 % of $M_0$			Measured value averaged over 3 s. With motor identification and friction compensation. In torque operating range up to ± $M_0$ . Speed operating range 1:10 up to rated speed. <b>Caution:</b> External influences such as motor temperature can cause an additional long-time inaccuracy (constancy) of about ± 2.5 %. Approx. ± 1 % less accuracy in field-weakening range.
<b>Asynchronous motor</b>	<b>1PH8 without encoder</b>	<b>1PH8 with incremental encoder 1024 S/R</b>	<b>1PH8 without encoder</b>	<b>1PH8 with incremental encoder 1024 S/R</b>	
Controller cycle	125 µs	125 µs	250 µs	250 µs	
Total rise time (without delay)	–	0.8 ms	2 ms	1.2 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	–	600 Hz	250 Hz	400 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback.
Torque ripple	–	1.5 % of $M_{rated}$	2 % of $M_{rated}$	2 % of $M_{rated}$	With encoderless operation in speed operating range 1:20, with encoder 20 rpm and above up to rated speed.
Torque accuracy	–	±3.5 % of $M_{rated}$	±2 % of $M_{rated}$	±1.5 % of $M_{rated}$	Measured value averaged over 3 s. With motor identification and friction compensation, temperature effects compensated by KTY84 and mass model. In torque operating range up to ± $M_{rated}$ . Approx. additional inaccuracy of ±2.5 % in field-weakening range. <b>Servo:</b> Speed operating range 1:10 referred to rated speed. <b>Vector:</b> Speed operating range 1:50 referred to rated speed.

<sup>1)</sup> R14DQ: Resolver 14 bit (resolution 16384, internal 2-pole).



**Configuration**

- Booksize format, pulse frequency 4 kHz, closed-loop speed control

	Servo Control		Vector Control		Notes
<b>Synchronous motor</b>	<b>1FK7 with R14DQ <sup>1)</sup></b>	<b>1FT7</b>	Vector Control is not designed as an operating mode for 1FK7/1FT7 synchronous motors.		
Controller cycle	125 µs	125 µs			
Total rise time (without delay)	3.5 ms	2.3 ms			With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	140 Hz	250 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Speed ripple	See note	See note			Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	≤ 0.001 % of $n_{rated}$	≤ 0.001 % of $n_{rated}$			Determined primarily by the resolution of the control deviation and encoder evaluation in the converter. This is implemented on a 32 bit basis for SINAMICS.
<b>Asynchronous motor</b>	<b>1PH8 without encoder</b>	<b>1PH8 with incremental encoder 1024 S/R</b>	<b>1PH8 without encoder</b>	<b>1PH8 with incremental encoder 1024 S/R</b>	
Controller cycle	125 µs	125 µs	250 µs	250 µs	
Total rise time (without delay)	12 ms	5 ms	20 ms	10 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	40 Hz	120 Hz	50 Hz	80 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback. Servo with encoder is slightly more favorable than Vector with encoder, as the speed controller cycle with Servo is quicker.
Speed ripple	See note	See note	See note	See note	Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	$0.1 \times f_{slip}$	≤ 0.001 % of $n_{rated}$	$0.05 \times f_{slip}$	≤ 0.001 % of $n_{rated}$	Without encoder: Determined primarily by the accuracy of the calculation model for the torque-producing current and rated slip of the asynchronous motor (see table "Typical slip values"). With speed operating range 1:50 (Vector) or 1:10 (Servo) and with activated temperature evaluation.

<sup>1)</sup> R14DQ: Resolver 14 bit (resolution 16384, internal 2-pole).

# System description – Dimensioning

## SINAMICS S120 Control Units

### Configuration

- Blocksize, booksize compact, booksize and chassis, pulse frequency 4 kHz, position control

	Servo Control		Vector Control		Notes
<b>Synchronous motor</b>	<b>1FT7</b>	<b>1FK7</b>	Vector Control is not designed as an operating mode for 1FT7/1FK7 synchronous motors.		
Position controller cycle	1 ms	1 ms			
Resolution	$4.19 \times 10^6$ incr./rev.	16384 incr./rev.			Correspondingly better with multi-pole resolver.
Attainable positioning accuracy	$10^5 \dots 10^6$ incr./rev.	4096 incr./rev.			In practice, the resolution must be higher than the required positioning accuracy by a factor of 4 to 10. These values are approximate nominal values only.
• In relation to the motor shaft, approx.	0.00072 °	0.1 °			
<b>Asynchronous motor</b>	<b>1PH8 with AM22DQ <sup>1)</sup></b>	<b>1PH8 with incremental encoder 1024 S/R</b>	<b>1PH8 with AM22DQ <sup>1)</sup></b>	<b>1PH8 with incremental encoder 1024 S/R</b>	
Position controller cycle	1 ms	1 ms	2 ms	2 ms	
Resolution	$4.19 \times 10^6$ incr./rev.	4096 incr./rev.	$4.19 \times 10^6$ incr./rev.	4096 incr./rev.	
Attainable positioning accuracy	$10^5 \dots 10^6$ incr./rev.	1024 incr./rev.	$10^5 \dots 10^6$ incr./rev.	512 incr./rev.	In practice, the resolution must be higher than the required positioning accuracy by a factor of 4 to 10. These values are approximate nominal values only. Vector is less accurate than Servo by a factor of approximately 2.
• In relation to the motor shaft, approx.	0.00072 °	0.35 °	0.00072 °	0.7 °	

<sup>1)</sup> AM22DQ: Absolute encoder 22 bit single-turn (resolution 4194304, encoder-internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions).

### Configuration

- Chassis format, pulse frequency 2 kHz, closed-loop torque control

	Servo Control		Vector Control		Notes
	1FT7 without encoder	1FT7 with AM22DQ <sup>1)</sup>	1PH8 without encoder	1PH8 with incremental encoder 1024 S/R	
<b>Synchronous motor</b>			Vector Control is not designed as an operating mode for 1FT7 synchronous motors.		
Controller cycle	250 µs	250 µs			
Total rise time (without delay)	–	1.2 ms			
Characteristic angular frequency -3 dB	–	400 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Torque ripple	–	1.3 % of $M_0$			A ripple of < 1 % is possible with an absolute encoder ≤ 1 rpm. Not possible with resolver.
Torque accuracy	–	±1.5 % of $M_0$			Measured value averaged over 3 s. With motor identification and friction compensation. In torque operating range up to $\pm M_0$ . Speed operating range 1:10 up to rated speed. <b>Caution:</b> External influences such as motor temperature can cause an additional long-time inaccuracy (constancy) of about ±2.5 %. Approx. ±1 % less accuracy in field-weakening range.
<b>Asynchronous motor</b>	1PH8 without encoder	1PH8 with incremental encoder 1024 S/R	1PH8 without encoder	1PH8 with incremental encoder 1024 S/R	
Controller cycle	250 µs	250 µs	250 µs	250 µs	
Total rise time (without delay)	–	1.6 ms	2.5 ms	1.6 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	–	350 Hz	200 Hz	300 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback.
Torque ripple	–	2 % of $M_{rated}$	2.5 % of $M_{rated}$	2 % of $M_{rated}$	With encoderless operation in speed operating range 1:20, with encoder 20 rpm and above up to rated speed.
Torque accuracy	–	±3.5 % of $M_{rated}$	±2 % of $M_{rated}$	±1.5 % of $M_{rated}$	Measured value averaged over 3 s. With motor identification and friction compensation, temperature effects compensated by KTY84 and mass model. In torque operating range up to $\pm M_{rated}$ . Approx. additional inaccuracy of ±2.5 % in field-weakening range. <b>Servo:</b> Speed operating range 1:10 referred to rated speed. <b>Vector:</b> Speed operating range 1:50 referred to rated speed.

<sup>1)</sup> AM22DQ: Absolute encoder 22 bit single-turn (resolution 4194304, encoder-internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions).

# System description – Dimensioning

## SINAMICS S120 Control Units

### Configuration

- Chassis format, pulse frequency 2 kHz, closed-loop speed control

	Servo Control		Vector Control		Notes
<b>Synchronous motor</b>	<b>1FT7 without encoder</b>	<b>1FT7 with AM22DQ <sup>1)</sup></b>	Vector Control is not designed as an operating mode for 1FT7 synchronous motors.		
Controller cycle	250 µs	250 µs			
Total rise time (without delay)	–	5 ms			With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	–	100 Hz			In this case, the dynamic response is determined primarily by the encoder system.
Speed ripple	–	See note			Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	–	≤ 0.001 % of $n_{rated}$			Determined primarily by the resolution of the control deviation and encoder evaluation in the converter. This is implemented on a 32 bit basis for SINAMICS.
<b>Asynchronous motor</b>	<b>1PH8 without encoder</b>	<b>1PH8 with incremental encoder 1024 S/R</b>	<b>1PH8 without encoder</b>	<b>1PH8 with incremental encoder 1024 S/R</b>	
Controller cycle	250 µs	250 µs	250 µs	250 µs	
Total rise time (without delay)	21 ms	8 ms	20 ms	12 ms	With encoderless operation in speed operating range 1:10, with encoder 50 rpm and above up to rated speed.
Characteristic angular frequency -3 dB	25 Hz	80 Hz	35 Hz	60 Hz	With encoderless operation in speed operating range 1:10. The dynamic response is enhanced by an encoder feedback. Servo with encoder is slightly more favorable than Vector with encoder, as the speed controller cycle with Servo is quicker.
Speed ripple	See note	See note	See note	See note	Determined primarily by the total mass moment of inertia, the torque ripple and especially the mechanical configuration. It is therefore not possible to specify a generally applicable value.
Speed accuracy	$0.1 \times f_{slip}$	≤ 0.001 % of $n_{rated}$	$0.05 \times f_{slip}$	≤ 0.001 % of $n_{rated}$	Without encoder: Determined primarily by the accuracy of the calculation model for the torque-producing current and rated slip of the asynchronous motor (see table "Typical slip values"). With speed operating range 1: 50 (Vector) or 1:10 (Servo) and with active temperature evaluation.

<sup>1)</sup> AM22DQ: Absolute encoder 22 bit single-turn (resolution 4194304, encoder-internal 2048 S/R) + 12 bit multi-turn (traversing range 4096 revolutions).

**Configuration**

Typical slip values for standard asynchronous motors (induction motors)

Motor power	Slip values	Notes
< 1 kW	6 % of $n_{rated}$ e.g. motor with 1500 rpm: 90 rpm	The slip values of 1PH asynchronous motors are very similar to those of standard motors
< 10 kW	3 % of $n_{rated}$ e.g. motor with 1500 rpm: 45 rpm	
< 30 kW	2 % of $n_{rated}$ e.g. motor with 1500 rpm: 30 rpm	
< 100 kW	1 % of $n_{rated}$ e.g. motor with 1500 rpm: 15 rpm	
> 500 kW	0.5 % of $n_{rated}$ e.g. motor with 1500 rpm: 7.5 rpm	

# System description – Dimensioning

## SINAMICS S120 Control Units

### Configuration

#### CU320-2: Axis licensing according to performance expansion (firmware version 4.3 and higher)

The CU320-2 is licensed purely according to axis number. The performance expansion is essentially required with four or more servo axes, four or more vector axes and seven or more *V/f* axes, irrespective of computing capacity.

	Dynamic response (current controller clock cycle)	Number of axes without performance expansion	Number of axes with performance expansion	Note
Servo Control	62.5 µs	3	3	3 servo axes are possible with a cycle time of 62.5 µs. The performance expansion is therefore ineffective. The performance expansion is required with 4 or more servo axes irrespective of computing capacity.
	125 µs	3	6	
	250 µs	3	6	
Vector Control	250 µs	3	3	3 servo axes are possible with a cycle time of 250 µs. The performance expansion is therefore ineffective. The performance expansion is required with 4 or more vector axes irrespective of computing capacity.
	500 µs	3	6	
<i>V/f</i> Control	250 µs	6	6	6 <i>V/f</i> axes are possible with a cycle time of 250 µs. The performance expansion is therefore ineffective. The performance expansion is required with 7 or more <i>V/f</i> axes irrespective of computing capacity.
	500 µs	6	12	

#### Mixed operation

Servo Control plus <i>V/f</i> Control	125 µs/500 µs	3+0; 2+2; 1+4; 0+6	6+0; 5+2; 4+4; 3+6 2+8; 1+10; 0+12	Two <i>V/f</i> axes can be computed instead of a servo or vector axis.
Vector Control plus <i>V/f</i> Control	500 µs/500 µs	3+0, 2+2; 1+4; 0+6	6+0; 5+2; 4+4; 3+6 2+8; 1+10; 0+12	

#### CU320-2: Possible quantity structures, maximum configurations

In addition to the number of axes, the following functions and hardware components also have an influence on the possible quantity structure (maximum configuration) of the CU320-2:

- Extended Safety (SS2, SOS, SSM, SLS)
- EPos
- DCC
- CAN bus
- High-speed Terminal Modules (task = 250 µs)

#### SIMOTION D4x5-2/CX32-2: Possible quantity structures, maximum configurations

When CX32-2 Controller Extensions are connected to SIMOTION D4x5-2, the possible quantity structure (maximum configuration) of the integrated drive control of the SIMOTION D4x5-2 is affected.

A performance extension is not necessary for the integrated drive control of the SIMOTION D4x5-2 Control Units and CX32-2 Controller Extension.

Some examples of possible quantity structures

#### Examples with servo

- 6 servo axes (125 µs) + 2 EPos + 2 extended safety
- 5 servo axes (125 µs) + 5 EPos + 5 extended safety
- 6 servo axes (250 µs) + 6 EPos + 6 extended safety + 100 DCC blocks (task: 2 ms)

#### Examples with vector

- 6 vector axes (500 µs) + 50 DCC blocks (task: 2 ms)
- 4 vector axes (500 µs) + 50 DCC blocks (task: 2 ms) + 2 winders (task: 4 ms, DCC-based)

#### Examples with *V/f*

- 12 *V/f* axes (500 µs) + 50 DCC blocks (task: 2 ms)
- 10 *V/f* axes (500 µs) + 100 DCC blocks (task: 2 ms) + 2 extended safety

The SIZER for Siemens Drives engineering tool can be used to perform very quick reliability checks on more complex quantity structures.

## Configuration

### Influencing variables on minimum required pulse frequency of power unit

Basic requirements such as maximum speed or necessary dynamic response of the control have a direct effect in determining the minimum pulse frequency of the power unit. If the minimum pulse frequency exceeds the rated pulse frequency, derating must be implemented accordingly (see chapter SINAMICS S120 drive system).

The following table provides a general overview.

Influencing variables		Minimum pulse frequency	Notes
Servo Control, Vector Control (required max. output frequency/speed)	100 Hz correspond to: 3000 rpm for $Z_p = 2$ 1500 rpm for $Z_p = 4$ 428 rpm for $Z_p = 14$ 352 rpm for $Z_p = 17$	1.25 kHz	$Z_p$ is the number of pole pairs of the motor. This equals 2 on 1PH asynchronous motors. 1FT7/1FK7 synchronous motors have between 3 and 5 pairs of poles. For torque motors, the numbers of pole pairs are typically 14 and 17.  When edge modulation is used (only possible for asynchronous motors), the output frequency is increased by a factor of 2.  <b>Caution:</b> For Servo Control with 1FT7/1FK7 motors only. <b>Note</b> field weakening requirements and suitable encoder system for higher speeds.
	160 Hz correspond to: 4800 rpm for $Z_p = 2$ 2400 rpm for $Z_p = 4$ 685 rpm for $Z_p = 14$ 565 rpm for $Z_p = 17$	2 kHz	
	200 Hz correspond to: 6000 rpm for $Z_p = 2$ 3000 rpm for $Z_p = 4$ 856 rpm for $Z_p = 14$ 704 rpm for $Z_p = 17$	2.5 kHz	
	300 Hz correspond to: 9000 rpm for $Z_p = 2$ 4500 rpm for $Z_p = 4$ 1284 rpm for $Z_p = 14$ 1056 rpm for $Z_p = 17$	4 kHz	
	400 Hz correspond to: 12000 rpm for $Z_p = 2$ 6000 rpm for $Z_p = 4$	4 kHz	
V/f Control (required max. output frequency/speed)	100 Hz correspond to: 6000 rpm for $Z_p = 1$ 3000 rpm for $Z_p = 2$	1.25 kHz	V/f Control is designed only for asynchronous motors and SIEMOSYN motors. $Z_p$ is the number of pole pairs of the motor. This is mainly between 1 and 4 on 1LA/1LG standard asynchronous motors. SIEMOSYN motors have 1 or 2 pole pairs or, with larger shaft heights, 3 pairs.
	160 Hz correspond to: 9600 rpm for $Z_p = 1$ 4800 rpm for $Z_p = 2$	2 kHz	
	200 Hz correspond to: 12000 rpm for $Z_p = 1$ 6000 rpm for $Z_p = 2$	2.5 kHz	
	300 Hz correspond to: 18000 rpm for $Z_p = 1$ 9000 rpm for $Z_p = 2$	4 kHz	
	400 Hz correspond to: 24000 rpm for $Z_p = 1$ 12000 rpm for $Z_p = 2$	4 kHz	
Dynamic response requirement (current controller clock cycle)	125 $\mu$ s 250 $\mu$ s 400 $\mu$ s 500 $\mu$ s	4 kHz 2 kHz 2.5 kHz 1 kHz	Servo Control requires a minimum pulse frequency of 2 kHz.
Sine-wave filter	–	4 kHz	<b>Caution:</b> If sine-wave filters are operated at low pulse frequencies, resonance problems can occur and cause the filters to severely overheat.
Output reactor to motor	Max. frequency: 150 Hz correspond to 4500 rpm for $Z_p = 2$		The output reactor can be operated at minimum 2 kHz only.

# System description – Dimensioning

## SINAMICS S120 Control Units

### Configuration

#### Core topologies: Component cabling with DRIVE-CLiQ

The components communicate with one another via the standard DRIVE-CLiQ interface.

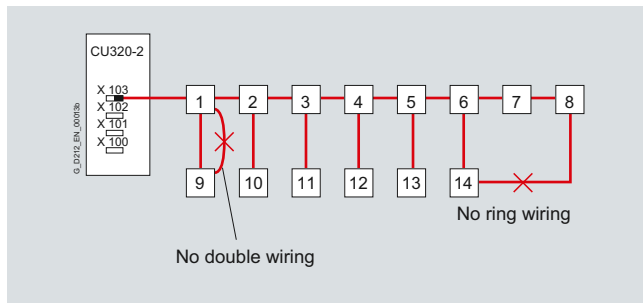
This interface connects a Control Unit with the power components, encoders and other system components, e.g. Terminal Modules. Setpoints and actual values, control commands, status messages and rating plate data of the components is transferred via DRIVE-CLiQ.

**Note:** The following basic rules governing the wiring of components with DRIVE-CLiQ are also applicable to SIMOTION D4x5-2 and CX32-2.

#### Basic rules for wiring with DRIVE-CLiQ

The following rules apply to the wiring of components with DRIVE-CLiQ:

- A maximum of 14 nodes can be connected to a DRIVE-CLiQ socket on the CU320-2 Control Unit.
- Up to 8 nodes can be connected in a row. A row is always seen from the perspective of the Control Unit.
- A maximum of 6 Motor Modules can be operated in a line
- Ring wiring is not permitted
- Components must not be double-wired
- The motor encoder should be connected to the associated Motor Module
- Up to 9 encoders can be operated on one Control Unit
- A maximum of 8 Terminal Modules can be connected
- The Terminal Module TM54F must not be operated on the same DRIVE-CLiQ line as Motor Modules
- The Terminal Modules TM15, TM17 High Feature and TM41 have faster sampling cycles than the TM31 and TM54F. For this reason, the two groups of Terminal Modules must be connected in separate DRIVE-CLiQ lines.
- A DRIVE-CLiQ Hub DMC20/DME20 counts as two nodes

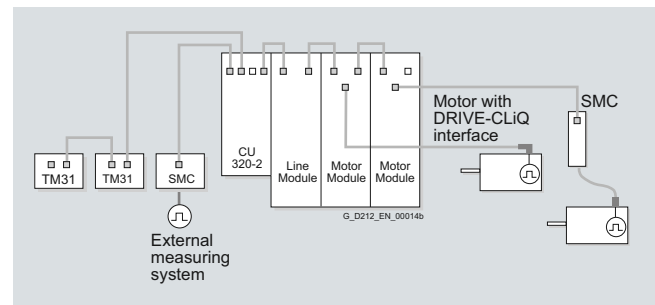


#### DRIVE-CLiQ configuration examples

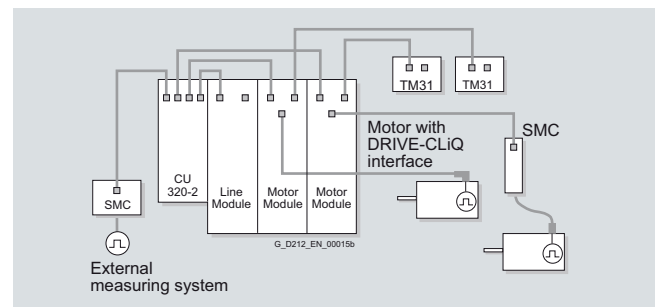
There is a basic clock cycle within a DRIVE-CLiQ connection. For this reason, only combinations of modules with the same sampling cycle or integer-divisible sampling times can be operated on a DRIVE-CLiQ connection. To simplify the configuring process, it is advisable to supply the Line Module and Motor Modules via separate DRIVE-CLiQ connections.

The power components are supplied with the required DRIVE-CLiQ connecting cable for connection to the adjacent DRIVE-CLiQ node in the axis grouping (line topology). Pre-assembled DRIVE-CLiQ cables in various lengths up to 100 m (328 ft) are available for connecting motor encoders, direct measuring encoders, Terminal Modules, etc.

The DRIVE-CLiQ cable connections inside the control cabinet must not exceed 70 m (230 ft) in length, e.g. connection between the CU320-2 Control Unit and the first Motor Module or between Motor Modules. The maximum permissible length of DRIVE-CLiQ MOTION-CONNECT cables to external components is 100 m (328 ft).



Example of a line topology for standard solutions

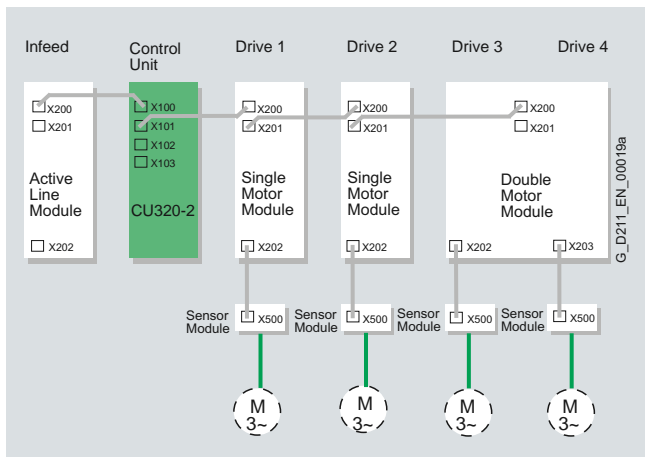


Example of a tree topology for high-performance solutions, e.g. high-dynamic axes in direct motion control group, selective access to individual axes/axis groupings for maintenance operation, etc.

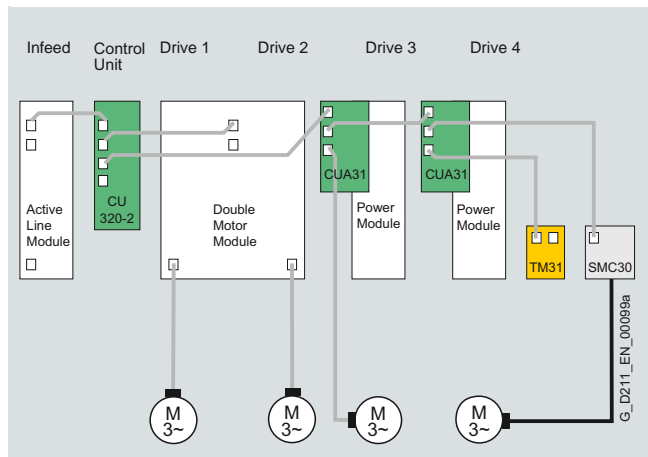


## SINAMICS S120 Control Units

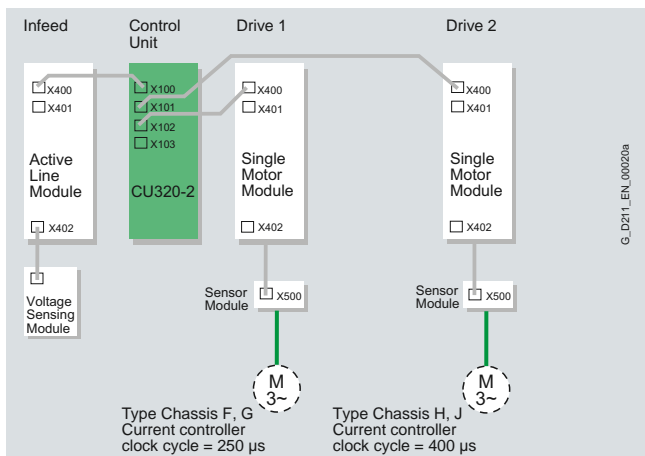
### Configuration



Preferred wiring of DRIVE-CLiQ connections illustrated by example of booksized format  
 Active Line Module: Current controller clock cycle 250  $\mu$ s.  
 Motor Modules: 4  $\times$  Vector Control = 500  $\mu$ s current controller clock cycle



Example of wiring: Power Modules can also be operated on a CU320-2 when connected via a CUA31



Wiring illustrated by example of chassis format with different current controller clock cycles

# System description – Dimensioning

## Motors

### Configuration

#### Motor selection

The motor is selected on the basis of the required torque, which is defined by the application, e.g. traveling drives, hoisting drives, test stands, centrifuges, paper and rolling mill drives, feed drives or main spindle drives. Gear units for movement conversion or for adapting the motor speed and motor torque to the load conditions must also be considered.

As well as the load torque, which is determined by the application, the following mechanical data are among those required to calculate the torque to be provided by the motor:

- Masses to be moved
- Diameter of the drive wheel/diameter
- Leadscrew pitch, gear ratios
- Frictional resistance data
- Mechanical efficiency
- Traversing paths
- Maximum velocity
- Maximum acceleration and maximum deceleration
- Cycle time

You must decide whether synchronous or asynchronous motors (induction motors) are to be used.

Synchronous motors should be selected for compact construction volume, low rotor moment of inertia and therefore maximum dynamic response.

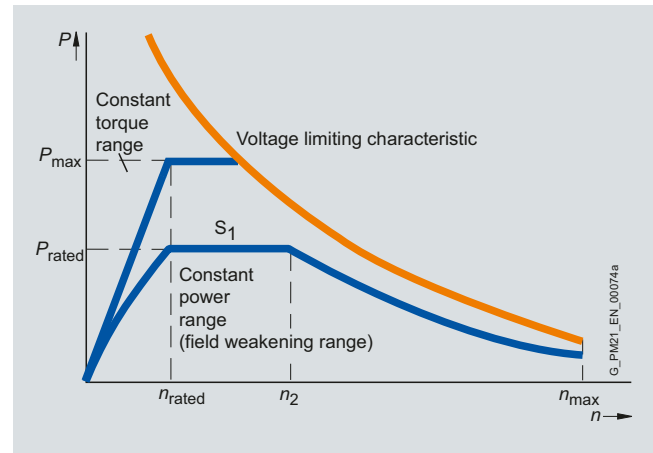
Asynchronous motors can be used to increase maximum speeds in the field-weakening range. Asynchronous motors (induction motors) for higher power ratings are also available.

The following factors are of prime importance during configuration:

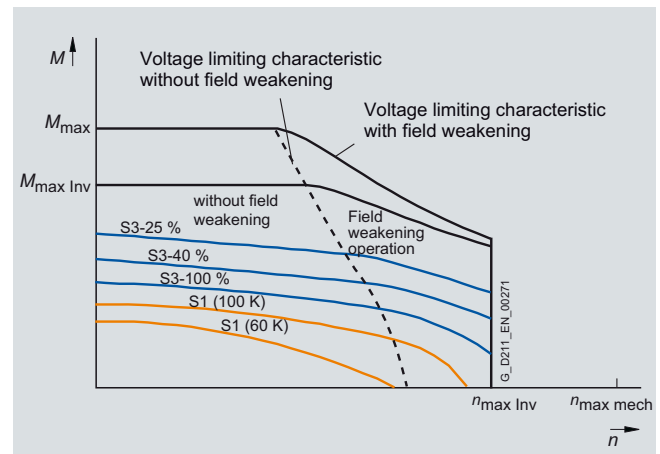
- The line supply configuration, when using specific types of motor and/or line filters on IT systems (non-grounded systems)
- The ambient temperatures and the installation altitude of the motors and drive components

The motor-specific limiting characteristics provide the basis for defining the motors.

These define the torque or power characteristic over speed and take into account the motor limits based on the DC-link voltage of the Power Module or Motor Module. The DC-link voltage in turn is dependent on the line voltage and, with multi-motor drives, on the type of Line Module.



Typical speed/power graph for asynchronous motors



Torque characteristics of synchronous motors

For detail engineering information, please refer to the motor configuration manuals.

An updated overview of configuration manuals is available in a number of languages on the Internet at:

[www.siemens.com/motioncontrol](http://www.siemens.com/motioncontrol)

Follow menu items

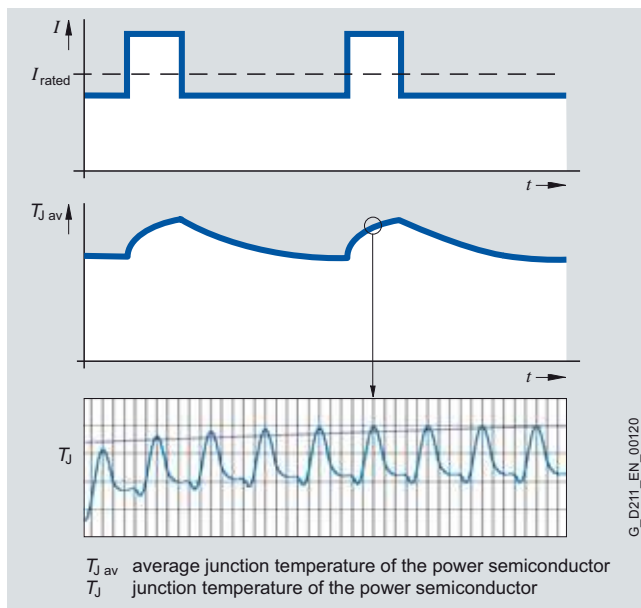
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The SIZER for Siemens Drives engineering tool is available to support engineering.

## Configuration

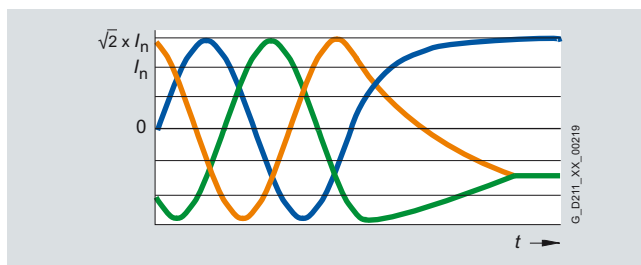
### Overload capability

The power units of the Line Modules, Motor Modules and Power Modules are designed for brief overloads, i.e. the Modules are capable of supplying more than the rated current  $I_{rated}$  for short periods. In this instance, the thermal capacity of the heat sink is utilized, allowing for the relevant thermal time constants. The power semiconductors and actual current sensing circuit are rated for a maximum current  $I_{max}$ , which must not be exceeded. The overload capability is determined by  $I_{max}$ ,  $I_{rated}$  and the thermal time constants. A number of characteristic duty cycles are defined in the technical specifications for the power units. The SIZER for Siemens Drives engineering tool calculates the load on the basis of a specified duty cycle with optional time characteristic and then identifies the power unit which is required.



The thermal time constant of a power semiconductor chip is typically within the range of 100 ms. With frequencies below 10 Hz, the overload capability is therefore limited. The software takes account of these limitations by means of a thermal model and protects the devices against overload in all operating states. It must be noted, especially at frequencies around 0 Hz, that the specified rated current  $I_{rated}$  is the root-mean-square value of a sinusoidal current. If the frequency of the three-phase system is reduced to 0 Hz, a pure direct current flows in all phases at standstill. The root-mean-square value of this direct current can reach the peak value of the sinusoidal current depending on the phase relation.

The output current in this state is greater than the rated current  $I_{rated}$  by a factor of  $\sqrt{2}$ . The individual motor terminals and cables are designed thermally for the rated current in normal operation, so the devices are protected against this overload while taking account of the thermal time constant.



### Derating characteristics

The power units can be loaded with rated current or power and the specified pulse frequency up to an ambient temperature of 40 °C (104 °F). The heat sink reaches the maximum permissible temperature at this operating point. If the ambient temperature increases above 40 °C (104 °F), the resulting heat loss must be reduced to prevent the heat sink from overheating.

At a given current, the heat loss increases in proportion to the pulse frequency. The rated output current  $I_{rated}$  must be reduced to ensure that the maximum heat loss or heat sink temperature for higher pulses frequencies is not exceeded. When the correction factor  $k_f$  for the pulse frequency is applied, the rated output current  $I_{ratedf}$  which is valid for the selected pulse frequency is adjusted.

When configuring a drive, please note that power units may not be capable of supplying the full current or power in the temperature range between 40 °C (104 °F) and 55 °C (131 °F). The power units measure the heat sink temperature and protect themselves against thermal overloading at temperatures of > 40 °C (104 °F).

The air pressure, and therefore air density, drops at altitudes above sea level. At these altitudes, the same quantity of air does not have the same cooling effect and the air gap between two electrical conductors can only insulate a lower voltage. Typical air pressure values are:

0 m (0 ft) above sea level:	100 kPa
2000 m (6562 ft) above sea level:	80 kPa
3000 m (9843 ft) above sea level:	70 kPa
4000 m (13123 ft) above sea level:	62 kPa
5000 m (16404 ft) above sea level:	54 kPa

At installation altitudes above 2000 m (6562 ft), the line voltage must not exceed certain limits to ensure that surge voltages can be insulated in accordance with EN 60664-1 for surge voltage category III. If the line voltage is higher than this limit at installation altitudes > 2000 m (6562 ft), measures must be taken to reduce transient category III surge voltages to category II values, e.g. equipment must be supplied via an isolating transformer.

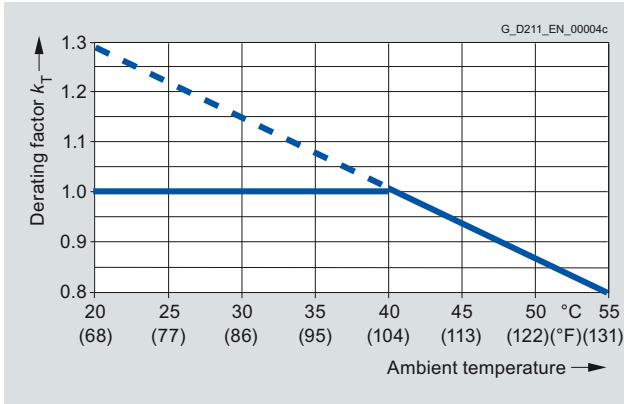
In order to calculate the permissible output current or power, the derating factors must be multiplied for the effects described above. The derating factor  $k_I$  for current as a function of installation altitude can be offset against the derating factor  $k_T$  for ambient temperature. If the result of multiplying derating factor  $k_T$  by derating factor  $k_I$  is >1, then the calculation must be based on a rated current of  $I_{rated}$  or  $I_{ratedf}$ . If the result is < 1, then it must be multiplied by the rated current  $I_{rated}$  or  $I_{ratedf}$  to calculate the maximum permissible continuous current. The derating factor  $k = k_f \times k_T \times k_I$  calculated by this method to obtain the total derating value must be applied to all current values in the specified duty cycles ( $I_{rated}$ ,  $I_H$ ,  $I_L$ ).

The derating characteristic curves of Power Modules, Line Modules and Motor Modules can be found in the technical data of the relevant Modules (see chapter SINAMICS S120 drive system).

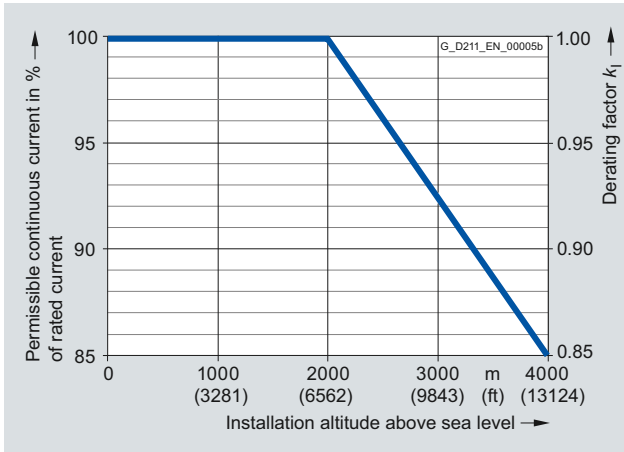
## Power units

## Configuration

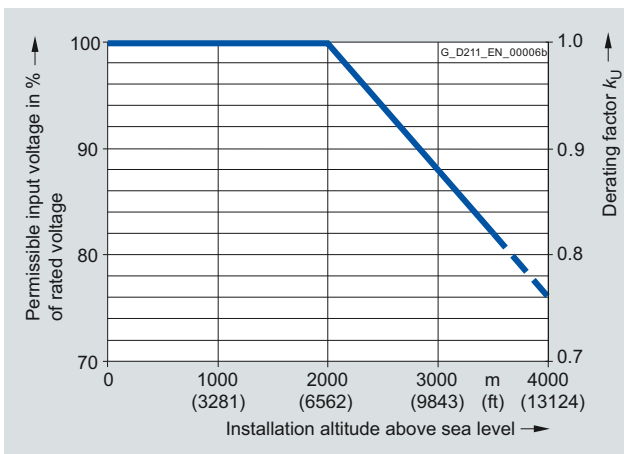
Examples of derating characteristic curves and calculation of the permissible output current:



Current derating as a function of the ambient temperature



Current derating as a function of the installation altitude



Voltage derating as a function of the installation altitude

## Example 1

A drive system is to be operated at an altitude of 2500 m (8202 ft) at a maximum ambient temperature of 30 °C (86 °F) and rated pulse frequency.

Since the ambient temperature is below 40 °C (104 °F), a compensation calculation (installation altitude/ambient temperature) can be applied.

Installation altitude 2500 m (8202 ft):  
Derating factor  $k_I = 0.965$ ,  $k_U = 0.94$

Max. ambient temperature 30 °C (86 °F):  
Derating factor  $k_T = 1.133$

$k_I \times k_T = 0.965 \times 1.133 = 1.093 \Rightarrow 1.0$  due to installation altitude/ambient temperature compensation

$k = k_I \times (k_I \times k_T) = 1.0 \times (1.0) = 1.0$

**Result:** Current derating is not required.

However, IEC 60664-1 stipulates that voltage derating is required.

The units in voltage range 380 V to 480 V can be operated up to a voltage of  $480 \text{ V} \times 0.94 = 451 \text{ V}$ , and the units in voltage range 660 V to 690 V up to  $690 \text{ V} \times 0.94 = 648 \text{ V}$ .

## Example 2

When a drive line-up is configured, a Motor Module with the order number 6SL3320-1TE32-1AA0 is selected (rated output current 210 A, base load current for high overload 178 A). The drive line-up is to be operated at an altitude of 3000 m (9843 ft) where ambient temperatures could reach 35 °C (95 °F) as a result of the installation conditions. The pulse frequency must be set to 4 kHz to provide the required dynamic response.

Installation altitude 3000 m (9843 ft):  
Derating factor  $k_I = 0.925$ ,  $k_U = 0.88$

Max. ambient temperature 35 °C (95 °F):  
Derating factor  $k_T = 1.066$

$k_I \times k_T = 0.925 \times 1.066 = 0.987 \Rightarrow$  insufficient installation altitude/ambient temperature compensation

$k = k_I \times (k_I \times k_T) = 0.82 \times (0.925 \times 1.066) = 0.809$

**Result:** Current derating is required.

Where these boundary conditions apply,

- the max. permissible continuous current of the Motor Module is:  
 $210 \text{ A} \times 0.809 = 170 \text{ A}$
- the base-load current for high overloading is:  
 $178 \text{ A} \times 0.809 = 144 \text{ A}$

IEC 60664-1 stipulates that voltage derating is required.

The selected unit can be operated up to a voltage of  $480 \text{ V } 3 \text{ AC} \times 0.88$  or  $720 \text{ V DC} \times 0.88 = 422 \text{ V } 3 \text{ AC}$  or  $634 \text{ V DC}$ , i.e. under these conditions, a 400 V asynchronous motor can be operated without restriction. Due to the installation altitude, however, derating might be required for the asynchronous motor (induction motors).

## Configuration

### Selection of the Power Module or Motor Module

The Motor Module is selected initially on the basis of standstill current  $I_{0\ 100\text{K}}$  (rated current for winding temperature rise 100 K) for synchronous motors and the rated current  $I_{\text{rated}}$  for asynchronous motors (induction motors), and is specified in the motor description. Dynamic overloads, e.g. during acceleration, must be taken into account by duty cycles and may demand a more powerful Power Module or Motor Module. In this context, it is also important to remember that the output current of the Power Module or Motor Module decreases as a function of installation altitude, ambient temperature and pulse frequency setting (see [explanations of derating characteristics](#)).

For an optimum configuration, the effective motor current  $I_{\text{load}}$  calculated from the duty cycle is replicated on the Power Module or Motor Module. The following must apply:

$$I_{\text{rated, Module}} \geq I_{\text{load}}$$

$I_{\text{rated, Module}}$  = permissible continuous current of Power Module or Motor Module taking derating characteristics into account

The Power Modules or Motor Modules can be required to supply a higher output current for specific time periods. The characteristics or overload capability must be noted (see [chapter SINAMICS S120 drive system](#)) when modules are engineered for overload.

The SIZER for Siemens Drives engineering tool is capable of performing precise overload calculations.

### Rated current – permissible and non-permissible motor/converter combinations

- Motor rated current higher than rated output current of the Power Module or Motor Module:  
In cases where a motor with a higher rated current than the rated output current of the Power Module or Motor Module is to be connected, the motor will only be able to operate under partial load. The following limit applies:  
The short-time current ( $= 1.5 \times$  base-load current  $I_{\text{H}}$ ) should be higher or equal to the rated current of the connected motor. If this dimensioning rule is not adhered to, the low leakage inductance of large motors causes current peaks which may result in a drive system shutdown or in a continuous output limiting by the internal protective electronic circuitry.
- Motor rated current significantly lower than rated output current of the Power Module or Motor Module:  
With the vector control system used, the rated motor current must equal at least  $1/8$  of the rated output current of the Power Module or Motor Module. With smaller motor currents, the drive can be operated in  $V/f$  control mode.

Using pulse width modulation, the Power Modules or Motor Modules generate an AC voltage to feed the connected motor from the DC voltage of the DC link. The magnitude of the DC link voltage is determined by the line voltage and, in the case of a Motor Module, by the Line Module used and thus the maximum possible output voltage (see [chapter SINAMICS S120 drive system](#)). The speed and loading of the connected motor define the required motor voltage. The maximum possible output voltage must be greater than or equal to the required motor voltage; it may be necessary to select a motor with a different winding.

It is not possible to utilize all modes of pulse width modulation when a sine-wave filter is connected. The maximum possible output voltage (see [sine-wave filter](#)) is lower as a result.

# System description – Dimensioning

## Power units

### Configuration

#### Long motor cables

Using pulse width modulation, the Power Modules or Motor Modules generate an AC voltage to feed the connected motor from the DC voltage of the DC link. Capacitive leakage currents are generated in clocked operation and these limit the permissible length of the motor cable. The maximum permissible motor cable length is specified for each Power Module or Motor Module in the component description.

Motor reactors limit the rate of rise and magnitude of the capacitive leakage currents, thereby allowing longer motor cables to be used. The motor reactor and motor cable capacitance form an oscillating circuit which must not be stimulated by the pulse pattern of the output voltage. The resonant frequency of this oscillating

circuit must therefore be significantly higher than the pulse frequency. The longer the motor cable, the higher the cable capacitance and the lower the resonant frequency. To provide a sufficient safety margin between this resonant frequency and the pulse frequency, the maximum possible motor cable length is limited, even when several motor reactors are connected in series. The maximum cable lengths in combination with motor reactors are specified in the technical specifications for the motor reactors.

Where a long motor cable is required, a higher rating of power unit must be selected or the permissible continuous output current  $I_{\text{continuous}}$  must be reduced in relation to the rated output current  $I_{\text{rated}}$ .

Rated output current $I_{\text{rated}}$	Length of the MOTION-CONNECT motor cable (shielded)			
	> 50 ... 100 m (164 ... 328 ft)	> 100 ... 150 m (328 ... 492 ft)	> 150 ... 200 m (492 ... 656 ft)	> 200 m (656 ft)
<b>Motor Module in booksize format</b>				
3 A/5 A	Use Motor Module 9 A	Use Motor Module 9 A	Not permissible	Not permissible
9 A	Use Motor Module 18 A	Use Motor Module 18 A	Not permissible	Not permissible
18 A	Use Motor Module 30 A or $I_{\text{max}} \leq 1.5 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.95 \times I_{\text{rated}}$	Use Motor Module 30 A	Not permissible	Not permissible
30 A	Always permissible	$I_{\text{max}} \leq 1.35 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.1 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.85 \times I_{\text{rated}}$	Not permissible
45 A/60 A	Always permissible	$I_{\text{max}} \leq 1.75 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.5 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.85 \times I_{\text{rated}}$	Not permissible
85 A/132 A	Always permissible	$I_{\text{max}} \leq 1.35 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.95 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.1 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	Not permissible
200 A	Always permissible	$I_{\text{max}} \leq 1.25 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.95 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.1 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	Not permissible
<b>PM340 Power Module</b>				
1.3 A 1.7 A 2.2 A 3.1 A 4.1 A	Not permissible	Not permissible	Not permissible	Not permissible
5.9 A 7.7 A	$I_{\text{max}} \leq 1.1 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.6 \times I_{\text{rated}}$	Not permissible	Not permissible	Not permissible
10.2 A	$I_{\text{max}} \leq 1.2 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.7 \times I_{\text{rated}}$	Not permissible	Not permissible	Not permissible
18 A	$I_{\text{max}} \leq 1.2 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.7 \times I_{\text{rated}}$	$I_{\text{max}} \leq 0.7 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.45 \times I_{\text{rated}}$	Not permissible	Not permissible
25 A 32 A	$I_{\text{max}} \leq 1.5 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.3 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.8 \times I_{\text{rated}}$	Not permissible	Not permissible
38 A 45 A 60 A	$I_{\text{max}} \leq 1.6 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.95 \times I_{\text{rated}}$ 1)	$I_{\text{max}} \leq 1.5 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.4 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.85 \times I_{\text{rated}}$	Not permissible
75 A 90 A	Always permissible	$I_{\text{max}} \leq 1.6 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.95 \times I_{\text{rated}}$	$I_{\text{max}} \leq 1.5 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.9 \times I_{\text{rated}}$	Not permissible
110 A 145 A 178 A	Always permissible	Always permissible	$I_{\text{max}} \leq 1.5 \times I_{\text{rated}}$ $I_{\text{continuous}} \leq 0.95 \times I_{\text{rated}}$	Not permissible

The permissible cable length for an unshielded motor cable is 150 % of the length for a shielded motor cable.

Motor reactors can also be installed in order to permit the use of longer motor cables.

1) Up to 70 m (230 ft) always permissible.

## Configuration

### Line Modules

In multi-axis drive applications, a number of Motor Modules are operated on a common DC link, which is supplied with power by a Line Module.

The first task is to decide whether a Basic Line Module, Smart Line Module or an Active Line Module will be used. On the one hand, this depends on whether the drive must be capable of regenerative feedback to the supply and, on the other hand, whether the power supply infeed is to be unregulated and therefore dependent on the power supply voltage, or regulated to a constant DC link voltage.

The chassis format units are available in the 380 V to 480 V voltage range, but also include units in the 500 V to 690 V range. Basic Line Modules are designed for infeed operation only. Active Line Modules have regulated infeeds which feature a step-up function.

In order to calculate the required DC link power and select the correct Line Module, it is important to analyze the entire operating sequence of the drive line-up connected to the DC link. Factors such as partial load, redundancies, duty cycles, coincidence factors and the operating mode (motor / generator mode) must be taken into account.

The DC link power  $P_d$  of a single Motor Module is calculated from the shaft output  $P_{\text{mech}}$  of the motor and the efficiency of the motor  $\eta_m$  and Motor Module  $\eta_{wr}$ .

The following applies in motor mode:  $P_d = P_{\text{mech}} / (\eta_m \times \eta_{wr})$

The following applies in generator mode:  $P_d = P_{\text{mech}} \times \eta_m \times \eta_{wr}$

The motor and generator outputs must be added with the corresponding sign in order to calculate the total DC link power. For the power calculation, the DC link voltage  $V_d$  can be assumed to be constant. The required DC link current is therefore calculated as  $I_d = P_d / V_d$

### Basic Line Modules

The DC link voltage  $V_d$  of the Basic Line Modules is load-dependent. Under no-load conditions, the DC link is charged to the line voltage crest value  $V_L$ , i.e.  $V_d = \sqrt{2} \times V_L$ , e.g.  $V_d = 566$  V when a 400 V supply system is connected.

Under load conditions, the DC link voltage reaches the average value of the rectified line voltage applied to the terminals. This average value is determined by the line voltage  $\times$  factor 1.35. Owing to the voltage drop across the line reactor and in the line feeder cable, the DC link voltage under full load conditions is slightly lower than the theoretical value. In practice, the range of the DC link voltage  $V_d$  is as follows:

$$1.41 \times V_L > V_d > 1.32 \times V_L \text{ (no load} \rightarrow \text{rated output)}$$

### Smart Line Modules

The DC link voltage  $V_d$  of Smart Line Modules is regulated to the average value of the rectified line voltage  $V_L$ , i.e.  $V_d \approx 1.35 \times V_L$

Due to the voltage drop across the line reactor and in the line feeder cable, the DC link voltage decreases in motor operation and increases in generator operation. The DC link voltage  $V_d$  thus varies within the same range as on drives with a Basic Line Module:

$$1.41 \times V_L > V_d > 1.32 \times V_L \text{ (rated output generator} \rightarrow \text{rated output motor)}$$

### Active Line Modules

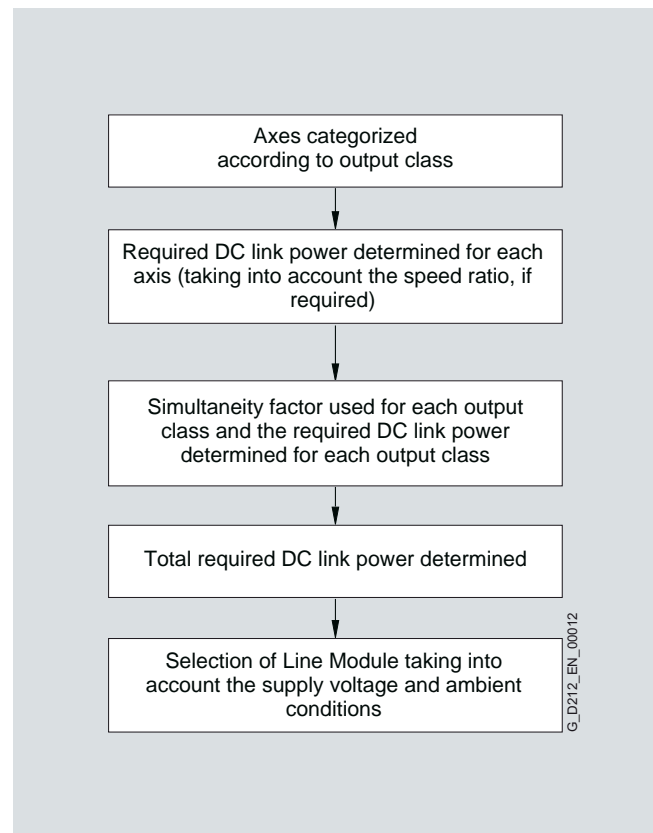
The DC link voltage  $V_d$  is regulated to an adjustable value (Active Mode). An Active Line Module can also be switched to Smart Mode and then operates like a Smart Line Module. In Active Mode, the Active Line Module draws a virtually sinusoidal current from the supply system.

The rated infeed power of the Line Module refers to a line voltage of 380 V, 400 V or 690 V (690 V applies only to chassis format Line Modules). The output power of the Line Modules may be affected if they are operated on line voltages other than those stated above.

Depending on the ambient conditions (installation altitude, ambient temperature), the rated infeed power of the Line Modules may need to be reduced (see chapter SINAMICS S120 drive system).

The coincidence factor takes into account the time characteristic of the torque for each individual axis.

On the basis of these principles, the following procedure can be used to dimension the Line Module:



## Power units

## Configuration

The following factors must also be taken into account when dimensioning the DC link:

**Braking operation**

As device losses are important in motor mode, the dimensioning for motor mode is also applicable to generator mode. With respect to motor braking operation, check that the energy fed back into the DC link does not exceed the permissible peak load capability of the Line Module.

In the case of higher regenerative outputs and to control the "line failure" operating scenario, a Braking Module must be provided, the Smart or Active Line Module must be overdimensioned or the regenerative output reduced by longer braking times.

For the configuration of the "EMERGENCY STOP" operating scenario, the Line Module must either be overdimensioned or an additional Braking Module must be used, in order that the DC link energy can be dissipated as quickly as possible.

**Checking the DC link capacitance**

During power-up, the Line Modules limit the charging current for the DC link capacitors. Due to the limits imposed by the pre-charging circuit, it is essential to observe the maximum permissible DC link capacitance values for the drive line-up specified in the technical specifications.

**DC link pre-charging frequency**

The pre-charging frequency of the DC link via a booksize format Line Module is calculated using the following formula:

$$\text{Number of precharges within 8 min} = \frac{\text{Max. permissible DC link capacitance infeed module in } \mu\text{F}}{\sum \text{DC-link capacitance of configured drive line-up in } \mu\text{F}}$$

For chassis format Line Modules, the maximum permissible DC link precharging interval is 3 minutes.

**Special considerations for operation on Basic or Smart Line Module**

Basic Line Modules and Smart Line Modules provide a lower DC link voltage than Active Line Modules. As a result, the following boundary conditions apply:

- When operating asynchronous motors (induction motors), a lower maximum motor power is available at high speeds at the same line voltage.
- On synchronous motors, a reduction in the dynamic drive characteristics must be expected at high speeds.
- On synchronous motors, the rated motor speed cannot be fully utilized when an overload capability is required.

**Parallel connection of power units**

Up to 4 Motor Modules or Line Modules in chassis format can be connected in parallel. Parallel connections can operate only in Vector Control mode.

Parallel connections may only include Motor Modules or Line Modules of the same type and with the same voltage and output ratings. Mixtures of different modules, e.g. Basic Line Modules and Active Line Modules, cannot be connected in parallel. The CU320-2, SIMOTION D4x5-2 or CX32-2 Control Unit can control only one drive object of type "Parallel connection Line Modules" and one of type "Parallel connection Motor Modules". It is assumed that all Line Modules or Motor Modules linked to the Control Unit are connected in parallel. A Control Unit can control, for example, the following components:

- 1 Line Module + 2 parallel-connected Motor Modules
- 2 parallel-connected Line Modules + 3 parallel-connected Motor Modules

Combinations such as the following are not permissible:  
2 Line Modules + 2 Motor Modules connected in parallel + 1 Motor Module

In order to ensure symmetrical current distribution among all parallel-connected modules, inductances must be provided for subsystem decoupling. However, the current compensatory control cannot completely prevent asymmetrical current distribution, which means that the following derating factors apply to parallel connections:

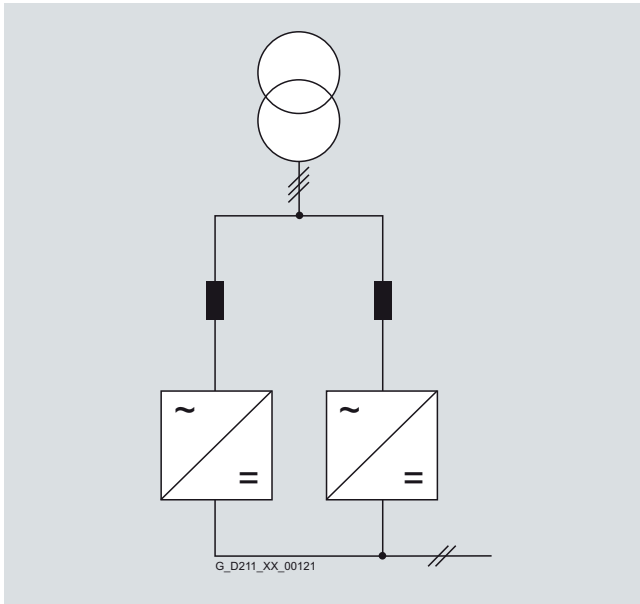
Designation	Derating factor for parallel connection of 2 to 4 Modules	Max. permissible number of parallel-connected Modules
Active Line Modules	0.95	4
Basic Line Modules	0.925	4
Motor Modules	0.95	4



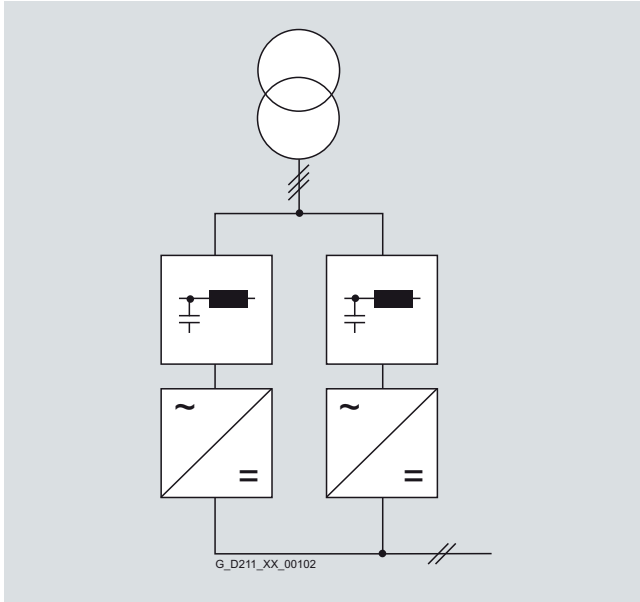
## Configuration

### Chassis format Line Modules

Line reactors are needed to decouple individual Basic Line Modules, while the appropriate Active Interface Modules are required to decouple Active Line Modules.



Parallel connection of Basic Line Modules using line reactors



Parallel connection of Active Line Modules using Active Interface Modules

### Chassis format Motor Modules

Three-wire or four-wire cables should be used where possible to connect Motor Modules in parallel.

In this case, a minimum clearance of 50 mm (2 in) must be left between the cables of the individual subsystems. A three-phase system must be connected to each of the cables of equal length (U2, V2, W2). In order to ensure adequate decoupling between subsystems, the motor cables must be of a minimum length so as to provide the necessary inductance.

Motor Module	$P_M$	$I_{rated\ rms}$	Minimum length of motor feeder cable
Frame size	kW	A	m
<i>Output voltage 380 ... 480 V</i>			
FX	110	210	30
FX	132	260	27
GX	160	310	20
GX	200	380	17
GX	250	490	15
HX	315	605	13
HX	400	745	10
HX	450	840	9
JX	560	985	8
JX	710	1260	6
JX	800	1405	5
<i>Output voltage 500 ... 600 V</i>			
FX	75	85	80
FX	90	100	72
FX	110	120	65
FX	132	150	55
GX	160	175	50
GX	200	215	40
GX	250	260	32
GX	315	330	25
HX	400	410	20
HX	450	465	18
HX	560	575	15
JX	710	735	13
JX	800	810	11
JX	900	910	10
JX	1000	1025	8.5
JX	1200	1270	7
<i>Output voltage 660 ... 690 V</i>			
FX	75	85	100
FX	90	100	90
FX	110	120	80
FX	132	150	70
GX	160	175	60
GX	200	215	50
GX	250	260	40
GX	315	330	30
HX	400	410	25
HX	450	465	25
HX	560	575	20
JX	710	735	18
JX	800	810	15
JX	900	910	12
JX	1000	1025	10
JX	1200	1270	8

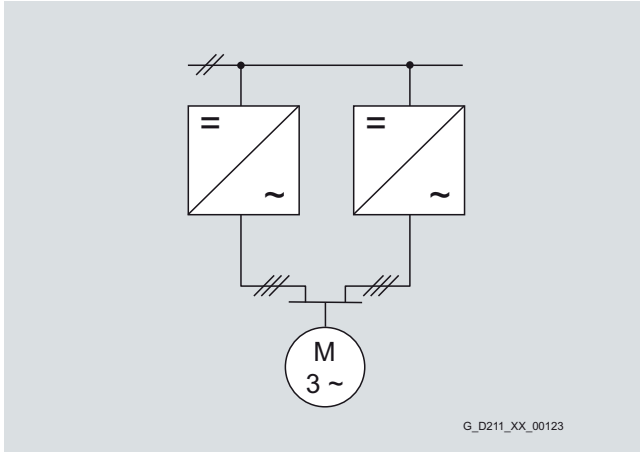
# System description – Dimensioning

## Power units

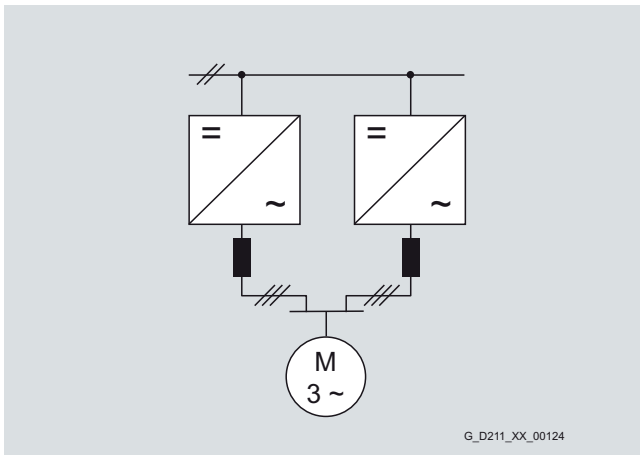
### Configuration

If the drive configuration cannot accommodate the minimum required cable length, the appropriate motor reactor for the Motor Module must be installed. Alternatively, motors with two separate winding systems can be used.

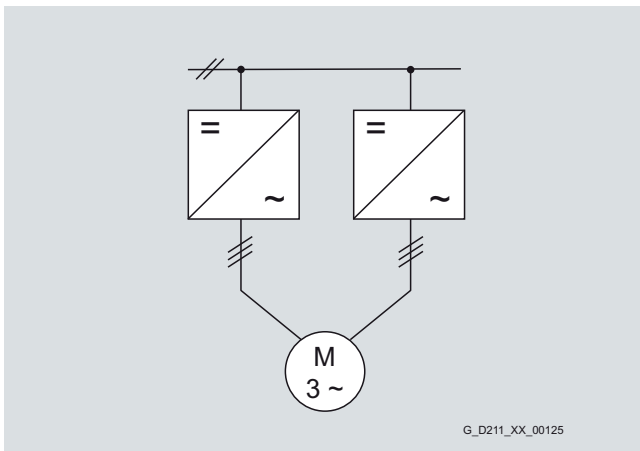
The latter option is preferable for drives with higher outputs, as the motor terminal boxes are subject to current limits in this case.



Parallel connection with identical motor cables of the required minimum length



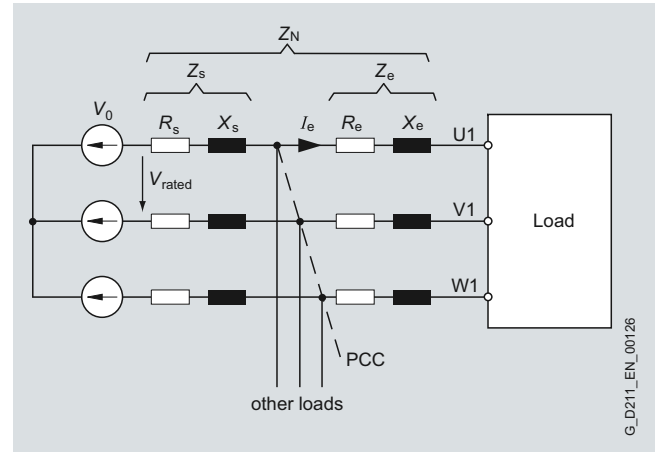
Use of motor reactors



Asynchronous motor (induction motor) with two separate winding systems

### Line harmonic distortion

The voltage drops across the impedance between the supply system and a load as soon as the load draws current. In a symmetrical three-phase supply system, this is the network impedance  $Z_n$  which is calculated from the impedance  $Z_s$  of the supply system and the line-side impedance  $Z_e$  of the load.



Effective impedances when a load is connected to a three-phase supply system

$$Z_n = Z_s + Z_e = R_s + jX_s + R_e + jX_e = R_n + jX_n$$

On a variable-speed drive, the line-side impedance  $Z_e$  is normally the total impedance provided by the line reactor and the feeder cable up to the PCC (Point of Common Coupling) for further loads. The ohmic component  $R_n$  is generally negligible as compared to the inductive component  $X_n$ . The inductance of an RI suppression filter is irrelevant for the purpose of this calculation, as this inductance is effective only for asymmetrical interference voltages, but not for a symmetrical line current.

If a load causes voltage drops across the impedance  $Z_s$ , this system perturbation has an impact at the PCC and thus also in the supply voltage to all other loads.

The voltage drop is proportional to current  $I_e$  and the impedance. To facilitate comparison of voltage drops under different supply and load conditions, the voltage drop is specified – normally at rated current – with reference to the phase voltage  $V_0$ . The calculation formula, e.g. for the per unit voltage drop  $u_k$  across an impedance  $Z$  is as follows:

$$u_k = Z \times I_e / V_0$$

## Configuration

### Example 1:

A Power Module with rated line current  $I_e$  is directly connected to a low-voltage transformer and the PCC is the transformer connection terminal. The equation for the ratio between rated line current  $I_e$  of the Power Module and rated current  $I_{\text{rated}}$  of the transformer is  $I_e = 0.25 \times I_{\text{rated}}$ . The per unit voltage drop  $u_k$  of the 400 V transformer is 4 %. If the transformer is loaded with its rated current  $I_{\text{rated}}$ , the voltage drop across impedance  $Z_s$  is 9.2 V (corresponding to 4 % of the phase voltage  $V_0 = 230$  V).

$$u_k = (Z_s \times I_{\text{rated}}) / 230 \text{ V} = 0.04$$

The following formula applies to the rated line current  $I_e$  of the Power Module:  $I_e = k \times I_{\text{rated}}$

The per unit voltage drop across the transformer when loaded with  $I_e$  is thus:  $u_k = Z_s \times I_e / V_0 = Z_s \times k \times I_{\text{rated}} / V_0$

With the specified ratio between  $I_e$  and  $I_{\text{rated}}$ , the per unit voltage drop is calculated as  $u_k = 1 \%$  or 2.3 V. In relation to the Power Module, this transformer therefore functions like a line impedance in accordance with  $u_k = 1 \%$ .

The magnitude of system perturbation in converter systems is assessed on the basis of short-circuit power ratio  $R_{\text{sc}}$ :

$$R_{\text{sc}} = S_{\text{cv}} / P$$

According to this definition in accordance with EN 60146-1,  $P$  is the fundamental-wave apparent power drawn by the converter.  $S_{\text{cv}}$  is the short-circuit power drawn from the mains in the event of a short-circuit on the terminals U1, V1, W1. Since the ohmic components of impedances are negligible in practice, the following applies  $Z_n \approx j X_n$

$$S_{\text{cv}} \approx 3 \times V_0^2 / X_n$$

$$\text{and thus } R_{\text{sc}} \approx 3 \times V_0^2 / (X_n \times P)$$

The short-circuit power ratio  $R_{\text{sc}}$  is therefore dependent on the current output power  $P$  of the converter and is determined by network impedance  $X_n$ .

If we assume the power to be  $P \approx 3 \times V_0 \times I_e = \sqrt{3} \times V_{\text{rated}} \times I_e$

the short-circuit power ratio  $R_{\text{sc}}$  is in inverse proportion to the per unit voltage drop  $u_k$  across the effective line impedance.

$$R_{\text{sc}} \approx 3 \times V_0^2 / (X_n \times P) = 3 \times V_0^2 / (X_n \times 3 \times V_0 \times I_e) = V_0 / (X_n \times I_e) = 1 / u_k$$

The short-circuit power ratio for example 1 is  $R_{\text{sc}} \approx 100$  if no line reactor is installed ( $Z_e = 0$ ).

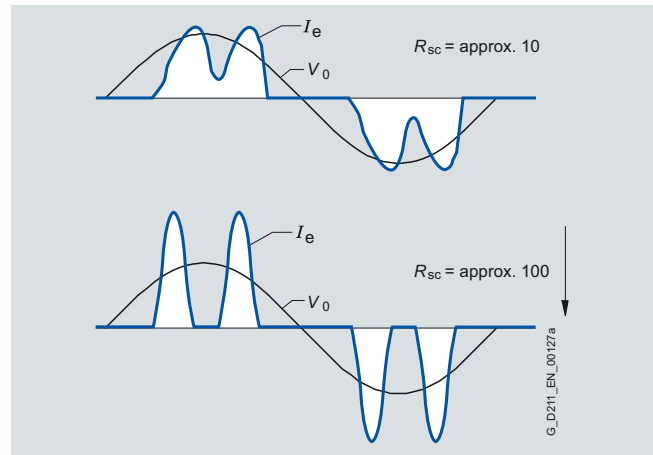
### Note:

The term "short-circuit power ratio" as used in technical standards is not a harmonized definition. The short-circuit power ratio  $R_{\text{sc}}$  defined according to IEC 61000-3-12 is calculated from the short-circuit power  $S_{\text{sc}}$  at the PCC referred to the power  $S_{\text{equ}} = 3 \times V_0 \times I_e$  consumed by the load.

Basic Line Modules and Power Modules are designed with a rectifier bridge on the line side. An inherent feature of the principle of rectification with load-side capacitance for DC link voltage smoothing are harmonics in the line current which result in a non-sinusoidal power input. The diagram shows the basic current waveform of a Power Module or Basic Line Module as a function of short-circuit power ratio  $R_{\text{sc}}$ .

Active Line Modules generate virtually no current harmonics (Active Mode) at all and are employed when system perturbation needs to be minimized, e.g. stipulation of IEEE 519 that THD (Total Harmonic Distortion) must be < 10 %.

The SIZER for Siemens Drives engineering tool calculates the line harmonic distortion on the basis of the supply data entered and lists them against the limit values of relevant standards.



Line current of a Basic Line Module or Power Module as a function of the short-circuit power ratio  $R_{\text{sc}}$

The rms of the line current  $I_e$  for which the line-side components must be rated comprises fundamental wave  $I_{e1}$  and the current harmonics, which increase in relation to the rise in short-circuit power ratio  $R_{\text{sc}}$ . If the DC link power  $P_d$  has been calculated (see [Line Modules](#)), the required line-side active power is a known quantity with Line Module efficiency, or the rectifier efficiency in the case of a Power Module. However, this active power is connected only with the current fundamental wave  $I_{e1}$ . The rms of the line current  $I_e$  is always greater than  $I_{e1}$  as a result of the current harmonics. The following applies to a short-circuit power ratio  $R_{\text{sc}} = 100$ :

$$I_e \approx 1.3 \times I_{e1}$$

The apparent power of a transformer selected to supply the drive must be greater than the drive power by a factor of about 1.3.

The harmonic currents produce only alternating power, but no active power. The following applies to the apparent power  $S$  on the line side:

$$S^2 = P^2 + Q_1^2 + D^2$$

- with active component  
 $P = 3 \times V_0 \times I_1 \times \cos \varphi_1$  produced solely by the current fundamental wave
- and reactive component  
 $Q_1 = 3 \times V_0 \times I_1 \times \sin \varphi_1$
- and the distortion component

$$D = 3 \times V_0 \sqrt{\sum_{v=2}^{\infty} I_v^2}$$

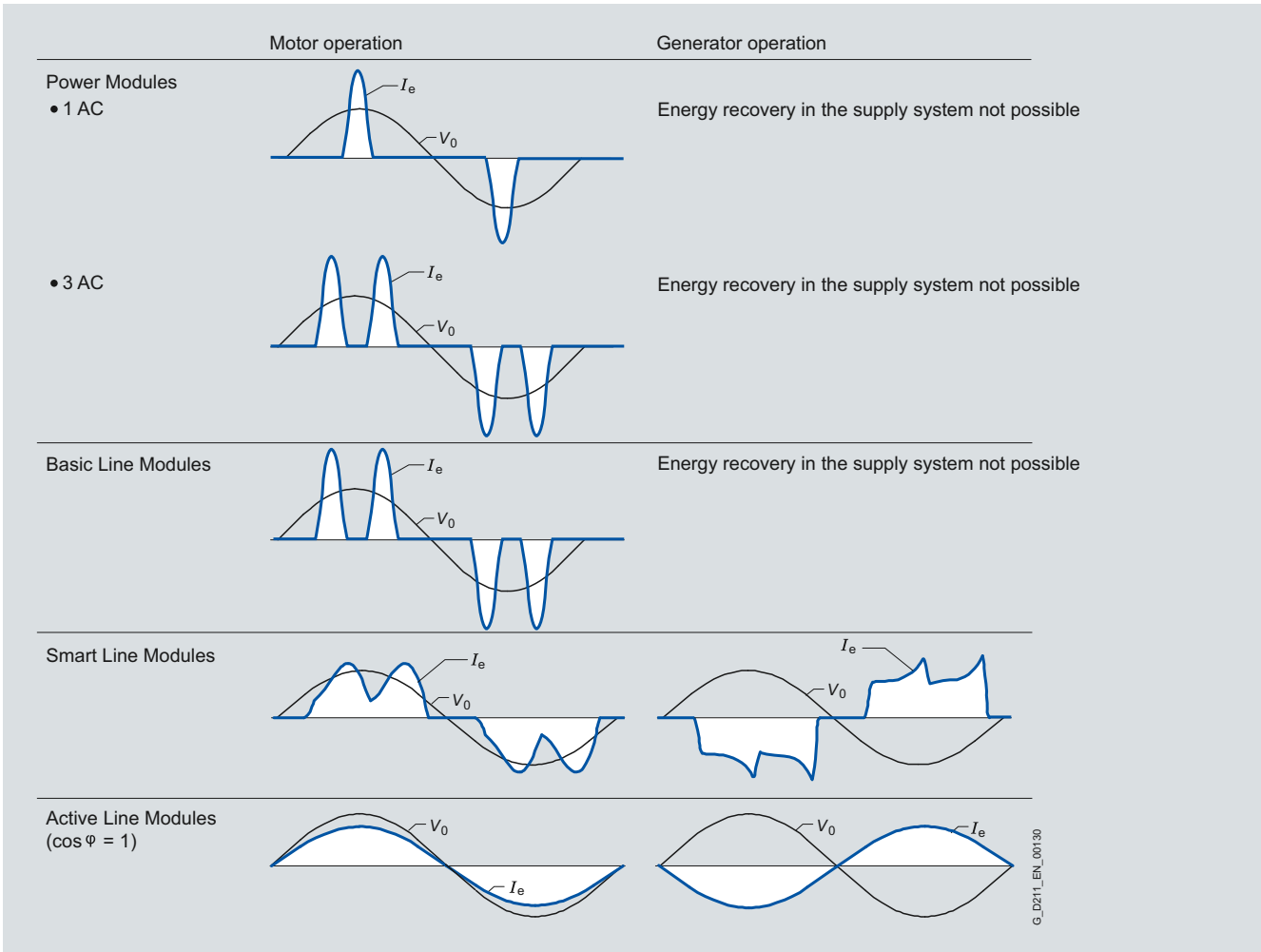
The ratio between active power and apparent power is referred to as total power factor  $\lambda$ :

$$\lambda = \frac{P}{S} = \frac{P}{\sqrt{P^2 + Q_1^2 + D^2}}$$

# System description – Dimensioning

## Power units

### Configuration



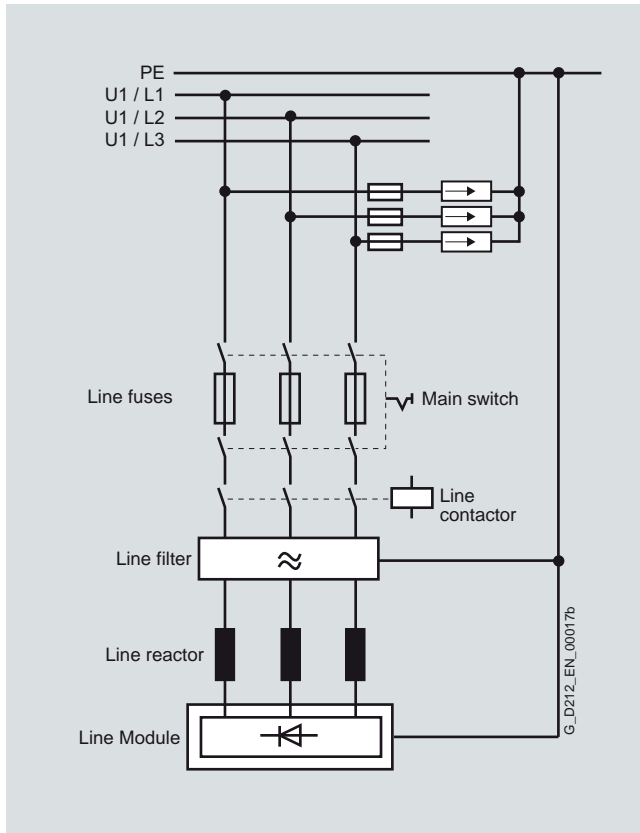
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Typical waveform of the line current with Power Modules and Line Modules

## Configuration

### Line-side power options (main switch, fuses, line filters, etc.)

The following line-side power options are recommended for the drive configuration:



General overview of line infeed

The main switch may take various formats:

- Main and EMERGENCY STOP switch + fuse switch disconnecter (with leading signal via auxiliary contact for trip mode)
- Load interruptor with fuses
- Circuit breaker

To protect the units against line-side surge voltages, it is advisable to install overvoltage protection directly at the infeed point (upstream of main switch). Overvoltage protection is essential in order to satisfy the requirements of Canadian standard CSA C22.2 No. 14-05.

For examples of suitable surge voltage arresters, go to [www.raycap.com](http://www.raycap.com) or [www.dehn.de](http://www.dehn.de)

Depending on the performance required, a fuse switch disconnecter combined with a contactor or a circuit breaker can be provided as the main switch.

A line contactor can be used, for example, if the drive has to be disconnected from the line supply in the event of a fault or for remote tripping. Follow the instructions in the SINAMICS S120 Manuals to interlock the line contactor in the context of safety functions.

A line filter should be used on TN (grounded) systems to reduce line harmonic distortion.

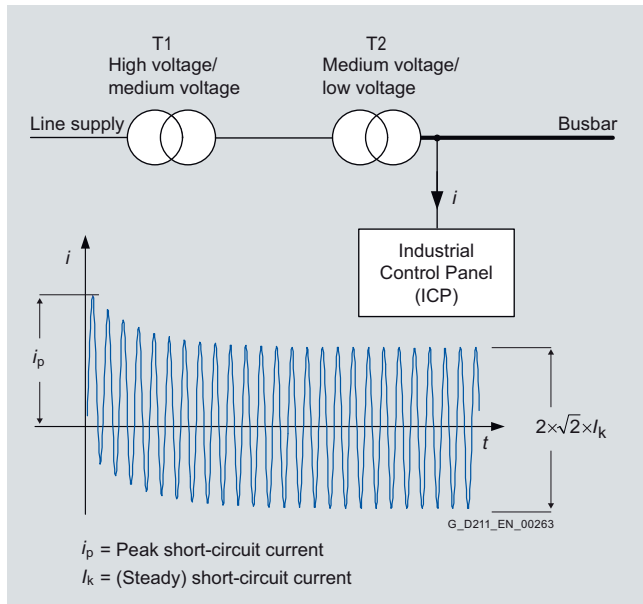
# System description – Dimensioning

## Power units

### Configuration

#### SCCR (Short Circuit Current Rating)

In the USA, a rating plate must be attached to switchgear (referred to as Industrial Control Panels (ICP) in the USA) which indicates the short-circuit current rating (or overall panel SCCR) of the installation. Specification of the SCCR became essential when the National Electrical Code (NEC) 2005 came into force. The SCCR is calculated on the basis of UL508A Supplement SB4.



In order to ensure that the switchgear can withstand a short circuit in the main circuit, e.g. defects caused by current effects or fire, without sustaining serious consequential damage, the maximum possible short-circuit current may not exceed the SCCR value of the switchgear. The data of the transformer T2 which supplies the switchgear provide an adequate basis for making a rough calculation of the maximum possible short-circuit current at the installation site. Based on the rated current  $I_{rated}$  of the transformer and the relative short-circuit voltage  $u_k$ , the short-circuit current  $I_k$  is calculated according to the following equation:

$$I_k = I_{rated} / u_k$$

#### Example:

A transformer for 460 V 3 AC with a rated power of 1 MVA has a rated current of approximately 1255 A. The relative short-circuit voltage  $u_k$  of the transformer is 6 %. The maximum possible short-circuit current  $I_k$  directly at the output terminals of this transformer (low-voltage busbar) is  $1255 \text{ A} / 0.06 \approx 21 \text{ kA}$ .

In order to calculate the short-circuit current, it is necessary to know the effective impedance of the supply cable and the transformers T1 and T2, as well as the short-circuit power of the line supply system. The maximum peak short-circuit current  $i_p$  is reached when the short circuit occurs at the voltage zero crossing. For method of calculating short-circuit currents, refer to IEC 60909-0.

The influence of the high-voltage and medium-voltage levels is slight and in most cases negligible for the selected example. When the effective impedance is taken into account, the maximum possible short-circuit current is lower than the previous value estimated from the data of the supply transformer, especially in the case of units which are not connected directly to busbars but over long cables to the transformer. Calculating the short-circuit current (peak short-circuit current) is complicated for systems which are supplied in parallel by multiple transformers and especially in the case of meshed systems.

The short-circuit current strength of the entire switchgear installation (overall panel SCCR) as specified on its rating plate is determined by the component in the main circuit with the lowest SCCR value.

Standard SCCR values for electrical equipment are specified in UL 508A Supplement SB4.2 (September 2005) and these can be used to calculate the overall panel SCCR. The following values are assumed for electric drives (motor controllers), for example:

Motor controller		SCCR
0 ... 50 hp	0 ... 37.3 kW	5 kA
51 ... 200 hp	38 ... 149 kW	10 kA
201 ... 400 hp	150 ... 298 kW	18 kA
401 ... 600 hp	299 ... 447 kW	30 kA
601 ... 900 hp	448 ... 671 kW	42 kA
901 ... 1500 hp	672 ... 1193 kW	85 kA

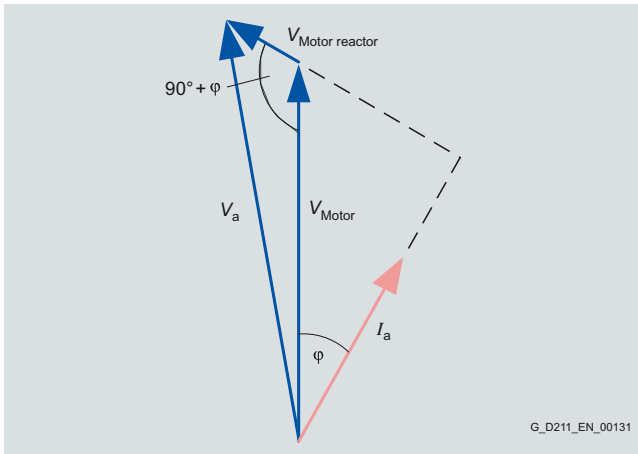
The SCCR values of the Power Modules and Line Modules are higher than the standard SCCR values listed in the table. The higher SCCR values apply only in combination with the fuses and circuit breakers specified in the manual! Fuses or circuit breakers can be exchanged for comparable types provided that the peak let-through current and breaking  $I^2t$  value of the replacement type is not higher than those of the recommended type.

## Configuration

### Motor reactors

High-speed switching of the power transistors causes capacitive charge/discharge currents in the motor cable and motor, as well as steep voltage rises and peak voltages in the motor windings. These currents can be reduced through the installation of a motor reactor.

The voltage drop across the motor reactor is normally negligible at output frequencies of 60 Hz and below. The per unit voltage drop  $u_k$  across the reactor is between 1 % and 4 % at rated current and 50 Hz. With a  $\cos \varphi$  of 0.86 and an output frequency of 50 Hz, the motor voltage across the motor reactor is about 2 % lower than in systems without a motor reactor.



Phasor diagram of motor with motor reactor

Motor reactors are compatible with all modulation types (space vector modulation, edge modulation).

### Sine-wave filters

Sine-wave filters are low-pass LC filters which allow easy passage to only the fundamental component of the square-wave, pulse-width-modulation output voltage of a Power Module or Motor Module. The resonant frequency of the sine-wave filter must be significantly lower than the pulse frequency of the Power Module or Motor Module and be dimensioned with a sufficient margin to the maximum permissible output frequency. Sine-wave filters therefore define the choice of pulse frequency and place a limit on the maximum possible output frequency. This type of filter is compatible only with space vector modulation. The output voltage of a Power Module or Motor Module is thus limited to an output voltage (rms value) of approximately  $0.67 \times$  DC link voltage. With the voltage drop across the sinusoidal filter, the maximum possible output voltage (rms value) is approximately  $0.63 \times$  DC link voltage. Parameters are used to register a sine-wave filter with the Control Unit. This ensures that all those values that are dependent on it, such as permissible modulation modes and maximum output frequency, are correctly predefined.

Sine-wave filters can be used only in conjunction with Vector Control and  $V/f$  Control modes.

### Sensor Modules

Signal conditioning for the various encoders (incremental encoder  $\sin/\cos$  1  $V_{pp}$ , absolute encoder, resolver) takes place remotely, i.e. in the vicinity of the encoder with customized Sensor Modules. Depending on the measuring system, SMC10, SMC20 or SMC30 Sensor Modules will be used. The Sensor Modules are designed to be mounted on DIN rails. They are also used for the signal conditioning of external (machine) encoders.

### Expansion modules

The CU320-2 Control Unit features interfaces and terminals for communication as standard. SINAMICS S120 offers the following expansion modules:

- TB30 Terminal Board (terminal expansion for plugging into the option slot on the CU320-2 Control Unit)
- TM31 Terminal Module (additional terminals for connection via DRIVE-CLiQ)

The following criteria regarding the use of expansion modules must be taken into account:

- Only one option board can be plugged into the option slot on the CU320-2 Control Unit.
- A maximum of 8 Terminal Modules may be operated in a drive line-up.

### Braking Modules and braking resistors

Braking units comprise a Braking Module and a braking resistor, which must be attached externally.

Braking units are used when

- regenerative energy occurs occasionally and briefly, for example when the brake is applied to the drive (EMERGENCY STOP) and the drive has no regenerative feedback capability
- the drive features regenerative feedback units, but cannot return the energy fast enough to the supply on an "EMERGENCY STOP"
- the drive needs to be shut down after a power failure

The braking units for Power Modules in blocksize format consist of braking resistors only, as they feature a Braking Module as standard.

A number of Braking Modules can be connected in parallel to the DC link in order to increase the braking power. Each Braking Module requires its own braking resistor. It is not permissible to operate a mix of braking units in booksize and chassis format on the same DC link.

The braking power required is calculated from the DC link power  $P_d$  of the drive line-up or Power Module in generator operation.

## System components

## Configuration

Braking Modules and braking resistors for booksize format

To operate booksize format Braking Modules, a minimum capacitance is required in the DC link. This capacitance is determined by the braking resistor used.

Braking resistor 0.3 kW/25 kW → DC link capacitance 220  $\mu\text{F}$

Braking resistor 1.5 kW/100 kW → DC link capacitance 330  $\mu\text{F}$

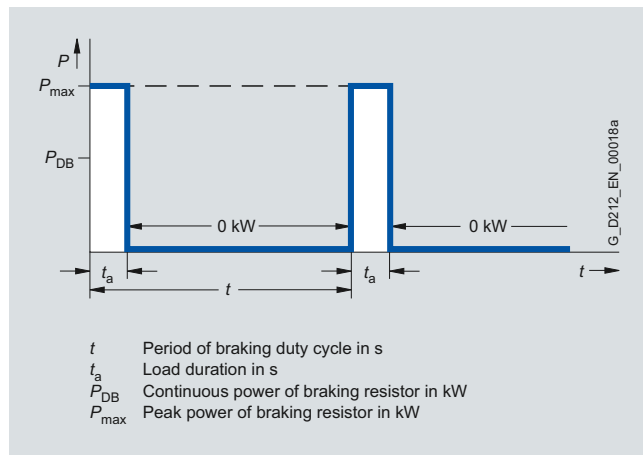
The capacitance of the booksize format Braking Module of 110  $\mu\text{F}$  is included in the total capacitance value. If the DC link capacitance is not sufficient for the use of one or more Braking Modules, a Capacitor Module can be added to increase the effective DC link capacitance of the drive line-up.

When booksize format Braking Modules are connected in parallel, the minimum capacitance specified above must be available for each Braking Module.

**Note:** Only booksize format modules that are directly connected to each other via the DC link busbar can be included in the total capacitance.

If the DC link capacitance is not sufficient for the operation of a number of Braking Modules, Capacitor Modules can be used to increase the DC link capacitance. The max. permissible DC link capacitance of a drive line-up on a Line Module must be taken into account. The max. DC link capacitances to be taken into account for precharging current limiting on the Line Modules are listed in the technical data for the Line Modules.

The braking resistor discharges the excess energy from the DC link:



Duty cycle for braking resistors

Braking Modules and braking resistors for chassis format

Braking Modules with a braking power of 25 kW (for type FX) and 50 kW (for types GX, HX and JX) are available with matching braking resistors for chassis format units. Braking units can be connected in parallel to obtain higher braking powers. In this case, the units can be installed at the Line Module end or Motor Module end.

When a Braking Module is installed in a Basic Line Module of size GB, the cables supplied for the DC link connection are too short. In this case, the cable harness set 6SL3366-2NG00-0AA0 must be ordered to make the Braking Module connection.

Frame size	Rated power $P_{DB}$ power	Peak power $P_{15}$	Max. possible mounting locations for Braking Module
FB	25 kW	125 kW	1
GB	50 kW	250 kW	1
FX	25 kW	125 kW	1
GX	50 kW	250 kW	1
HX	50 kW	250 kW	2
JX	50 kW	250 kW	3

The Braking Module features an electronics interface (X21) with monitoring function. The braking resistor housing contains a monitoring thermal contact. Both these monitors can be integrated into the warning or shutdown circuits of the drive system.



## Configuration

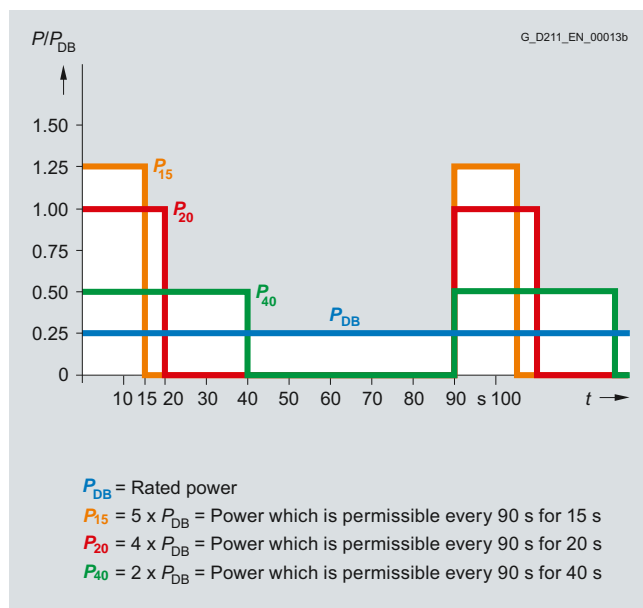
### Calculation of Braking Module and braking resistor requirements

- For periodic duty cycles with a cycle duration of  $\leq 90$  s, the average value of the braking power within this duty cycle must be defined. The relevant cycle duration must be applied as the time base.
- For periodic duty cycles with a cycle duration of  $\geq 90$  s or for sporadic braking operations, a time interval of 90 s in which the highest average value occurs must be selected. The 90 s period must be applied as the time base.

Apart from the average braking power, the required peak braking power must also be taken into account when braking units are selected (Braking Module and braking resistor).

### Basic data

Line voltage	Power range Motor Modules	Braking Module Continuous power $P_{DB}$	Braking Module Power $P_{40}$	Braking Module Power $P_{20}$	Braking Module Peak power $P_{15}$
380 ... 480 V	110 ... 132 kW	25 kW	50 kW	100 kW	125 kW
	160 ... 800 kW	50 kW	100 kW	200 kW	250 kW
660 ... 690 V	75 ... 132 kW	25 kW	50 kW	100 kW	125 kW
	160 ... 1200 kW	50 kW	100 kW	200 kW	250 kW



Load diagram

### Braking resistors for Power Modules in blocksize format

The braking resistors for the FSA and FSB frame sizes are designed as substructure components. Braking resistors for frame sizes FSC to FSF should be mounted outside the control cabinet owing to their high heat losses.

The Control Unit monitors the pulse/pause ratio (ON time/OFF time) of the braking resistor and shuts it down on faults if it calculates that the resistor is at risk of overheating.

Braking resistors feature a temperature switch with NC contacts that open when the permissible temperature is exceeded. The temperature switch must be evaluated to prevent consequential damage if the braking resistor overheats.

The braking power  $P_{mech}$  on the motor shaft is higher than the power loss of the braking resistor as this need only convert the DC link energy into heat.

The DC link power  $P_d$  of the Power Module in generator mode is calculated from the shaft power  $P_{mech}$  of the motor and the power loss in the motor  $P_{v\ motor}$  and in the Power Module  $P_{v\ Power\ Module}$  as:

$$P_d = P_{mech} - P_{v\ motor} - P_{v\ Power\ Module} = P_{braking\ resistor}$$

The power losses can be estimated from the efficiency values of the motor  $\eta_m$  and Power Module  $\eta_{wr}$ :

$$P_{braking\ resistor} = P_d = P_{mech} \times \eta_m \times \eta_{wr}$$

### Capacitor Module in booksize format

The Capacitor Module functions as a short-term energy buffer, e.g. for bridging brief power failures or for storing braking energy. The buffered energy  $W$  can be calculated with the following formula:

$$W = \frac{1}{2} \times C \times (V_{d1}^2 - V_{d2}^2)$$

$C$  = effective capacity of Capacitor Module 4 mF

$V_{d1}$  = DC link voltage when buffering starts

$V_{d2}$  = DC link voltage when buffering ends

Example:

$$V_{d1} = 600\text{ V}; V_{d2} = 430\text{ V}$$

The resultant energy calculation is  $W = 350\text{ Ws}$

With this energy, for example, it is possible to buffer a Motor Module with 3 kW load for about 100 ms.

### Control Supply Module in booksize format

The Control Supply Module provides a 24 V DC power supply via the line or DC link, in order to maintain the electronics power supply for the components in the event of a line failure. This makes it possible, for example, to make emergency retraction movements in the event of the failure of the line supply.

# System description – Dimensioning

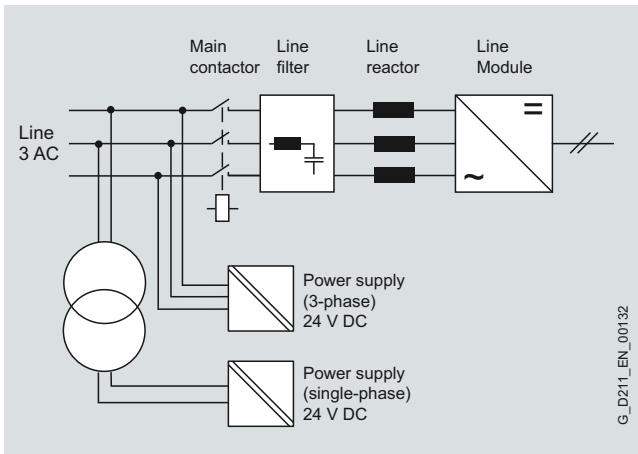
## System components

### Configuration

#### External 24 V DC supply of components

Power units (Power Modules, Line Modules and Motor Modules) and other system components must be provided with a 24 V DC voltage via an electronic power supply made available externally.

SITOP devices, which are available as a modular solution, are provided as the external 24 V DC electronic power supply.



Connecting the external electronic power supply

The current requirement  $I_{DC\ ext}$  is calculated with the following formula:

$\Sigma$  [Control Unit + built-in options (e.g. TB30 + CBC10) + system components + Line Module +  $\Sigma$  (Motor Modules + SMCxx + motor brake control)]

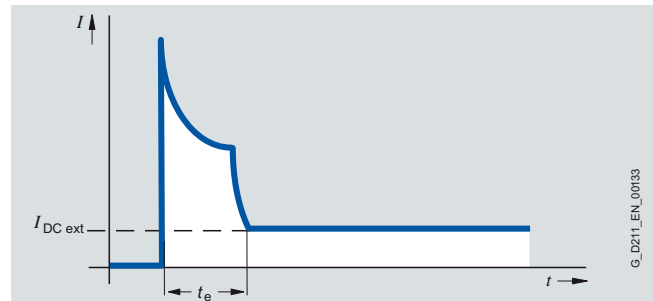
The other system components (e.g. line contactor) must also be taken into account.

The current requirement of individual components can be found in the relevant technical data.

#### Limit values for the configuration:

- The current-carrying capacity of the integrated 24 V DC busbar (featured only in booksize format) is max. 20 A.
- In the event of higher current requirements, a number of 24 V DC power supplies must be provided in one drive line-up. The other infeeds are implemented by means of 24 V terminal adapters (booksize format only).
- Cable cross sections of up to 2.5 mm<sup>2</sup> may be connected to the Control Units, Terminal Boards, Terminal Modules and Sensor Modules.
- Cable cross sections of up to 6 mm<sup>2</sup> may be connected to the 24 V terminal adapters (booksize format only) for the Line Modules and Motor Modules.
- The external 24 V DC power supply should only be used for the SINAMICS components and the direct loads.

Capacitors in the electronics supply of most components must be charged when the 24 V DC supply is first switched on. To charge these capacitors, the power supply must first supply a current peak which can be a multiple of the current requirement  $I_{DC\ ext}$  calculated above. Allowance must be made for this current peak when selecting protective elements, e.g. miniature circuit breakers, for incorporation in the 24 V DC supply system (types with let-through  $I^2t$  values according to characteristic D are recommended). The current peak flows for an interval  $t_e$  of a few 100 ms. The peak value is determined by the impedance of the 24 V DC supply and its electronically limited maximum current.



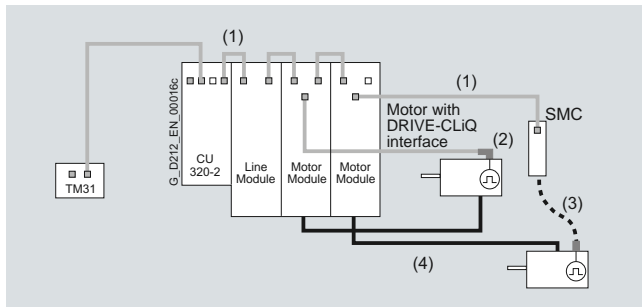
Typical waveform of the switch-on current of the external 24 V DC supply

## Configuration

### Specification of components for connection system

To complete the drive system, components such as motors and encoders must be connected to it via cables.

For motors with DRIVE-CLiQ interface, the 24 V DC power supply is provided via the DRIVE-CLiQ cables. On all other Sensor Modules, a separate 24 V DC power supply must be provided.



Drive connection system

Legend	Cable	Description
(1)	DRIVE-CLiQ cables	Standard cables for cabinet-internal configuration without 24 V cores
(2)	DRIVE-CLiQ MOTION-CONNECT 500/800 cables	MOTION-CONNECT 500 shielded cables with 24 V cores for fixed installation (e.g. in the cable duct), and MOTION-CONNECT 800 for flexible installation (e.g. in cable carriers)
(3)	MOTION-CONNECT 500/800 signal cables	Suitable for the measuring system in question; in versions MOTION-CONNECT 500 shielded cables for fixed installation (e.g. in the cable duct), and MOTION-CONNECT 800 for flexible installation (e.g. in cable carriers)
(4)	MOTION-CONNECT 500/800 power cables	MOTION-CONNECT 500 shielded motor cables for fixed installation (e.g. in the cable duct), and MOTION-CONNECT 800 for flexible installation (e.g. in cable carriers)

DRIVE-CLiQ cables are available in various designs and lengths (see MOTION-CONNECT connection systems).

The required bending radii apply particularly to short cables. In addition to the distance between the two DRIVE-CLiQ sockets to be connected by the cable, a cable length of at least 60 mm (2.36 in) must be allowed for the bending radii. For definition of lengths of pre-assembled cables, refer to chapter MOTION-CONNECT connection systems.

Unused DRIVE-CLiQ sockets can be protected with a blanking plug. Suitable blanking plugs are supplied in the accessories pack for the units.

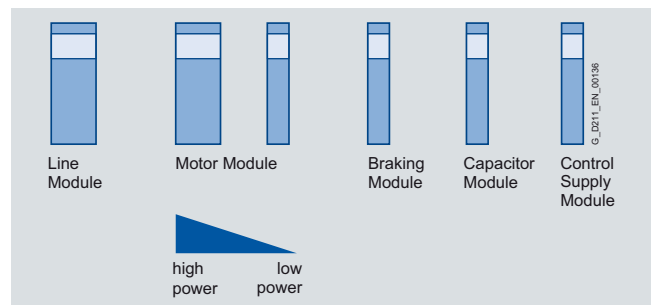
### Mechanical configuration of the drive

A SINAMICS S drive line-up comprises of a Line Module, Motor Modules, DC link components, a Control Unit, and the optional expansion modules.

### Configuration of a drive line-up in booksize format

The following criteria must be taken into account when a drive line-up of booksize format units is configured:

- The Smart Line Modules 5 kW and 10 kW must always be arranged on the left as the first module, and all other Line Modules should be arranged on the left as the first module. The CU320-2 Control Unit in this case can be "snapped onto" the left-hand side of the Line Module.
- The DC link busbars can be connected on the right and left with Basic Line Modules, Active Line Modules and Smart Line Modules rated from 16 kW. In this case, the drive can be configured in the reverse order (from right to left) or on both sides (see arrangement for chassis format units).
- Only one Line Module is permitted in each drive line-up.
- A number of drive line-ups must be configured for power supplies which cannot be provided by the highest rating.
- The Motor Modules must be arranged beside the Line Module in descending order of the rated currents, that is, the Motor Module with the highest rated current is to be mounted immediately adjacent to the Line Module, and the Motor Module with the lowest rated current is positioned furthest away from the Line Module.
- DC link busbars are integrated into the Line Modules, Motor Modules, Braking Modules, Capacitor Modules, Control Supply Modules and Voltage Clamping Modules for connecting the drive line-up. The current carrying capacity of the integral DC link busbars depends on the power rating of the module and is 100 A or 200 A (see technical specifications). Within the drive line-up, it must be ensured that the DC link busbars meet the current-carrying capacity requirements at every point in the drive line-up. When high-power Motor Modules (200 A DC link busbars) and low-power Motor Modules (100 A DC link busbars) are used together, the Braking Module for example (100 A DC link busbars) must be installed after the high-power Motor Modules.
- DC link adapters can be used to implement multi-tier configurations.
- The drive line-ups should be configured such that the total length of all power cables for the motor cables and the line cable, which should preferably be shielded, in each individual line-up does not exceed the permissible total cable length.



Power-oriented arrangement of booksize format Motor Modules

- The Control Unit configuration is flexible. The following configuration options are possible:
  - "Docking" on the left-hand side of the Line Module
  - Direct mounting next to the drive line-up on a mounting plate
  - Mounting in other cabinet areas, taking the permissible DRIVE-CLiQ cable lengths into account

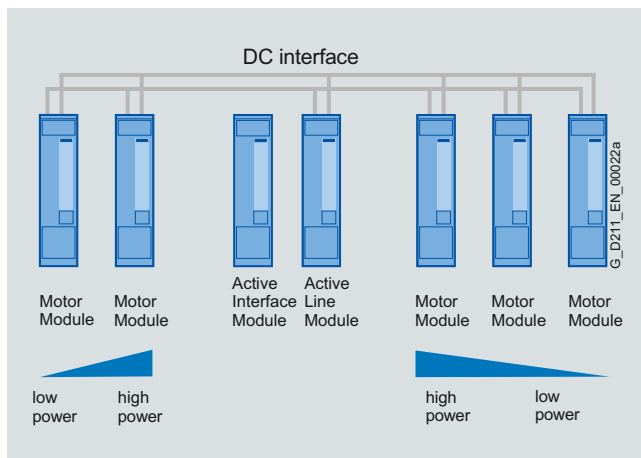
# System description – Dimensioning

## Mechanical configuration of the drive system

### Configuration

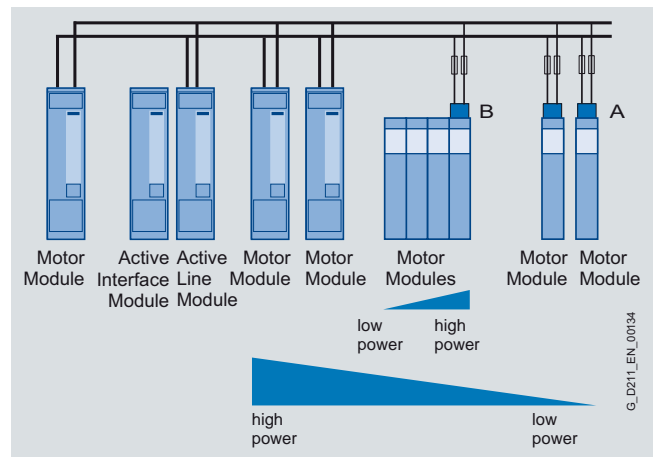
#### Configuration of a drive line-up in chassis format

- The Motor Modules must be positioned to the left or right of the Line Module with decreasing rated currents (i.e. the Motor Module with the highest rated current is positioned next to the Line Module on the left or right, while the Motor Module with the lowest rated current is at the end). You must ensure that the cables/busbars for the DC link meet the current-carrying capacity requirements for all connected Motor Modules.
- The inductance of the DC link busbars must be low, achieved, for example, by arranging the bars as close as possible in parallel, but observing the required creepage distances and air gaps.
- The Control Unit configuration is flexible. The following configuration options are possible:
  - "Docking" on the left-hand side of the Line Module
  - Direct mounting next to the drive line-up on a mounting plate
  - Mounting in other cabinet areas, taking the permissible DRIVE-CLiQ cable lengths into account



#### Configuration of a mixed drive line-up in chassis and booksize formats

A mixed drive line-up must be configured according to the rules for chassis format units. The Motor Modules in booksize format can be connected to the higher-level DC link busbars by means of DC link rectifier adapters. With (A), each Motor Module in booksize format is connected using the appropriate DC link rectifier adapter. With (B), Motor Modules in booksize format are connected to one another with the internal DC link busbars and a DC link rectifier adapter is used on the last Motor Module to make the connection to the higher-level DC link busbars. In the latter case, the DC link rectifier adapter must be attached to the last Motor Module on the right-hand side of the line. As regards the arrangement of modules with different current ratings, the guidelines specified under "Configuration of a drive line-up in booksize format" also apply to mixed drive line-ups.



Ideally, the entire length of the higher-level DC link busbars can be dimensioned for the rated DC link current of the Line Module. The busbars are then protected by the line fuses at the infeed end.

If the cross section of the DC link busbars or cabling is reduced, this branch must be designed to be short-circuit-proof. The current limiting mechanism of the Motor Modules connected to the branch with reduced cross section then protects it against overloading. It is not advisable to reduce busbars or cables down to the mandatory minimum cross section. No additional overload protection (fuse) is required on the assumption that overloading cannot occur as a result of cable damage on the cable route to the Motor Module and that the circuit branch is protected against overloading by the Motor Module.

Where the cross section has been significantly reduced, or the circuit design is not inherently short-circuit-proof, a branch fuse must be installed at the beginning of the section with reduced cross section in order to protect the DC link connections involved. In the event of a fault, the fuse must be capable of interrupting DC fault currents; other types of miniature circuit-breakers are not suitable.

**Configuration**

Allocation of branch fuses for option (A) in a supply system with grounded neutral (TN system). The calculations are based on the assumption that  $\tau = L/R < 10$  ms applies to the time constant  $\tau$  in the DC fault circuit and that the fault current is interrupted by the fuse after a maximum of 1 s.

Motor Module booksize format $I_{\text{rated}}$	Recommended cable cross section for Cu conductors and PVC insulation with a permissi- ble operating temperature of 70 °C (158 °F) on the conductor mm <sup>2</sup>	DC link rectifier adapter	Branch fuse	
		Order No.	A	Order No.
A				
3	2.5	<b>6SL3162-2BD00-0AA0</b>	16	<b>3NE1813-0</b>
5	2.5		16	<b>3NE1813-0</b>
9	4		35	<b>3NE1803-0</b>
18	10		63	<b>3NE1818-0</b>
30	10		80	<b>3NE1820-0</b>
45	35		<b>6SL3162-2BM00-0AA0</b>	125
60	70	160		<b>3NE1224-0</b>
85	95	200		<b>3NE1225-0</b>
132	95	315		<b>3NE1230-0</b>
200	95	400		<b>3NE1332-0</b>
2 × 3	2.5	<b>6SL3162-2BD00-0AA0</b>		20
2 × 5	4		35	<b>3NE1803-0</b>
2 × 9	10		63	<b>3NE1818-0</b>
2 × 18	10		125	<b>3NE1022-0</b>

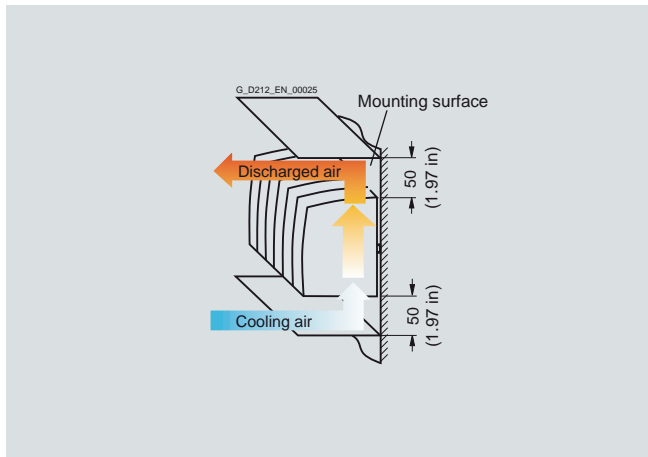
# System description – Dimensioning

## Heat dissipation

### Configuration

#### Mandatory minimum installation clearances

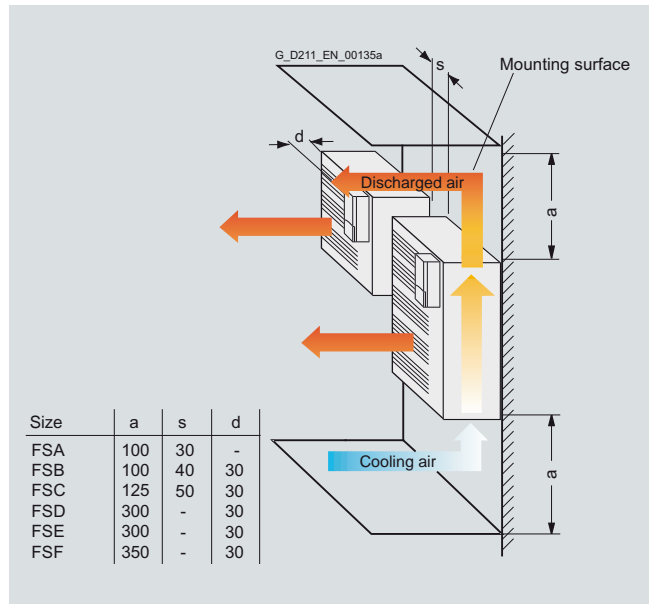
##### Ventilation clearances for Sensor Modules and Terminal Modules



Sensor Modules and Terminal Modules can be mounted directly adjacent to one another.

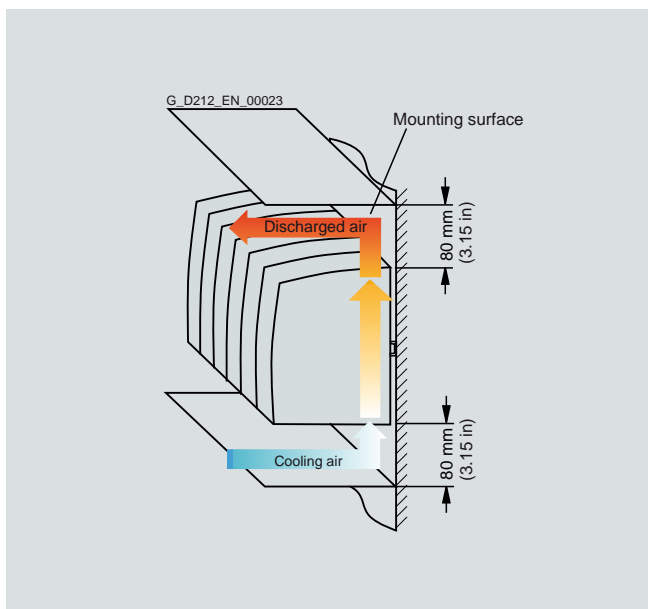
When mounted on the wall, line reactors and line filters require a ventilation space of 100 mm (4 in) above and below respectively.

##### Ventilation clearances for blocksize format components

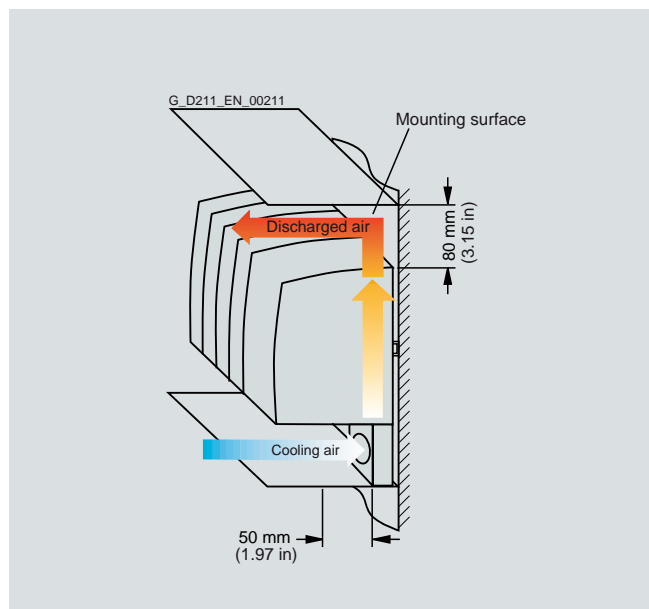


The PM340 Power Modules can be mounted side by side without sub-chassis components up to an ambient temperature of 40 °C (55 °F). In combination with sub-chassis components and at ambient temperatures of > 40 °C (max. 55 °C) (> 55 °F (max. 131 °F)), the specified lateral minimum clearances must be observed. Where combinations of different frame sizes are concerned, the longer of the two clearances shall apply. A clearance of 30 mm (1.18 in) must be provided at the front and to the left of the mounted Control Unit or Control Unit Adapter on frame sizes FSB to FSF.

##### Ventilation clearances for booksize format components with internal air cooling



Line Modules 5 kW to 55 kW  
Active Interface Modules  
Motor Modules up to 85 A

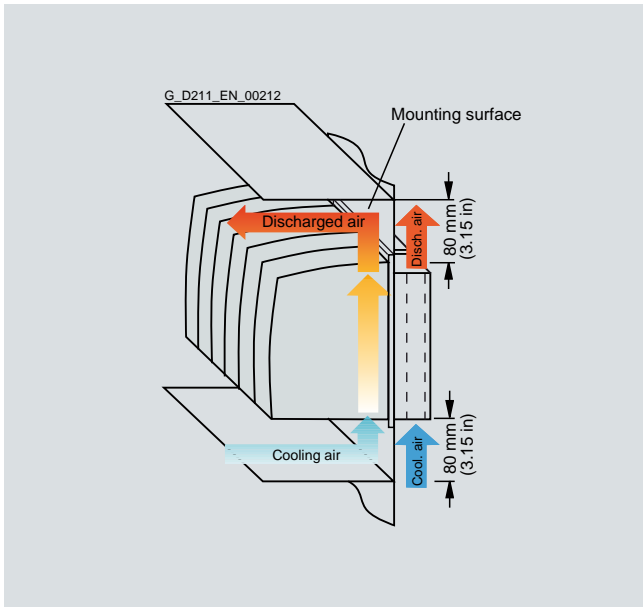


Active Line Modules 80 kW and 120 kW  
Motor Modules 132 A and 200 A

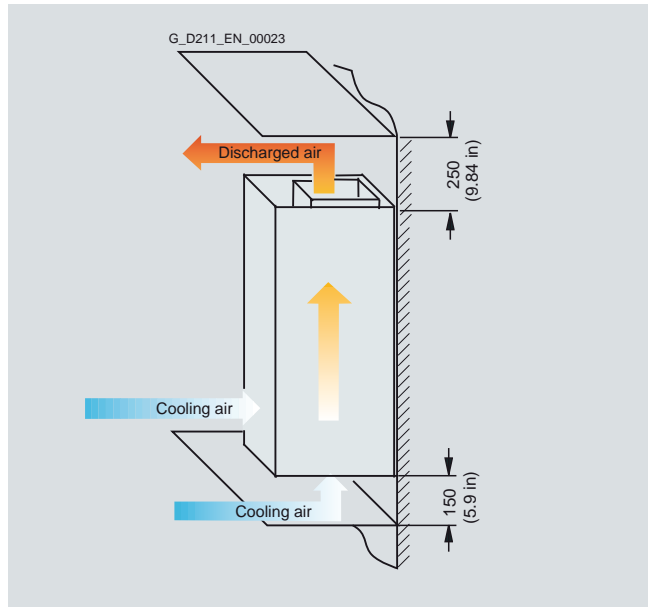
## Heat dissipation

### Configuration

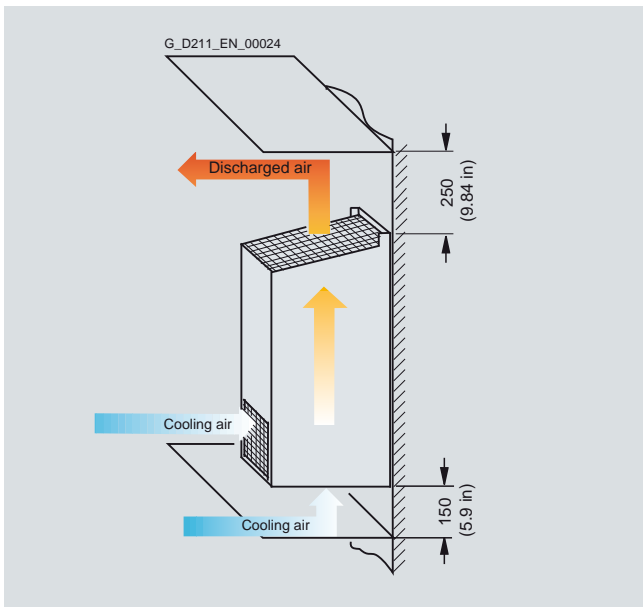
Ventilation clearances for booksize format components with external air cooling



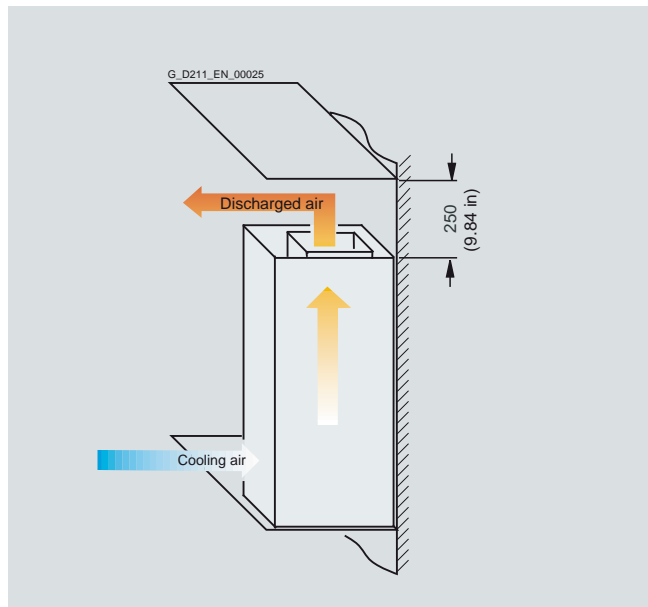
Ventilation clearances for chassis format components Basic Line Modules



Ventilation clearances for chassis format components



Active Interface Modules in frame sizes FI and GI



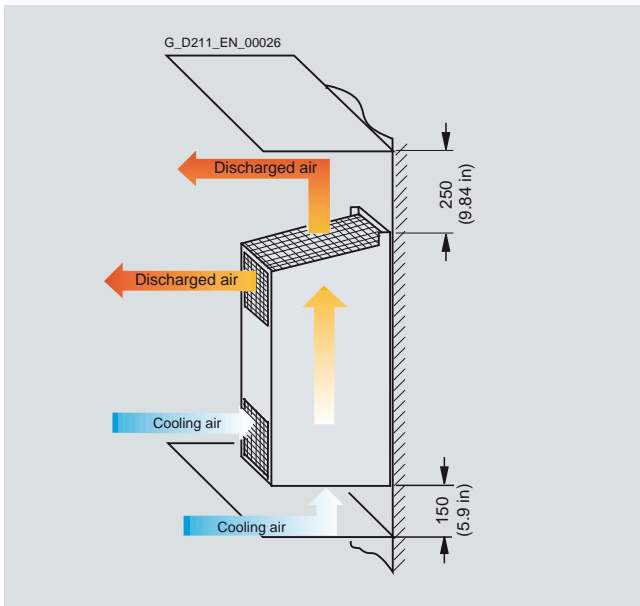
Active Interface Modules in frame sizes HI and JI

# System description – Dimensioning

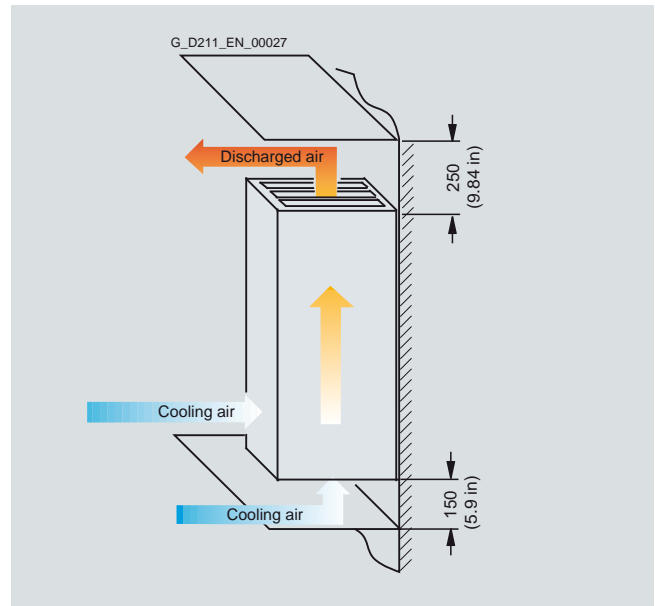
## Heat dissipation

### Configuration

#### Ventilation clearances for chassis format components



Power Modules, Motor Modules and Active Line Modules in frame sizes FX and GX



Active Line Modules in frame sizes HX and JX  
Motor Modules in frame sizes HX and JX

#### Calculation of internal control cabinet temperature

##### Control cabinet with forced ventilation

In a control cabinet with forced ventilation, the heat loss  $P_v$  passes to the through-flowing air that then rises in temperature by  $\Delta\vartheta$ . In the time interval  $\Delta t$ , the air absorbs the heat  $Q = c \times m \times \Delta\vartheta = P_v \times \Delta t$ , and at the same time the air volume  $V$  flows through the control cabinet ( $c$  is the specific heat capacity of the air). Mass  $m$  and volume  $V$  are linked via density  $\rho$ .  $m = \rho \times V$  applies. Used in the above formula, the following equation results:  $P_v = c \times \rho \times (V/\Delta t) \times \Delta\vartheta$

The heat loss  $P_v$ , that can be dissipated by forced ventilation, is thus proportional to the volume flow

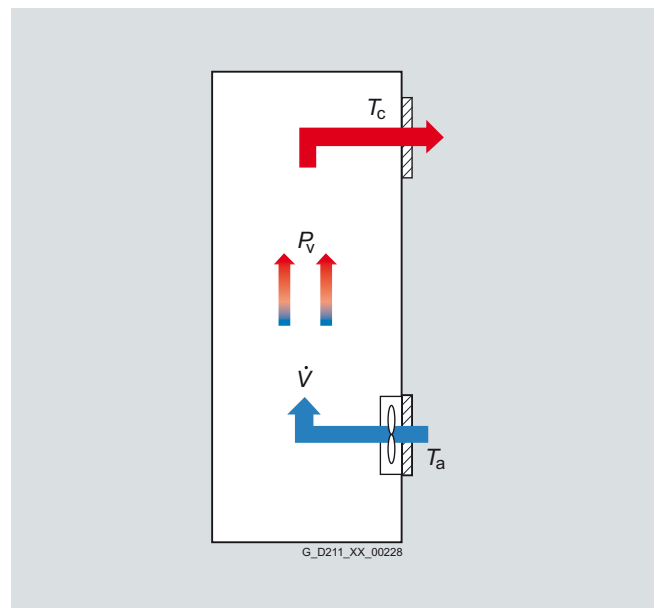
$\dot{V} = V/\Delta t$  that the fan drives through the control cabinet

and the permissible rise in temperature  $\Delta\vartheta = T_c - T_a$

The heat capacity and density of the air depend on the humidity level and atmospheric pressure. For this reason, the equation is dependent on other parameters. To estimate the level of control cabinet heating in a typical industrial environment,  $c = 1 \text{ kJ/kg} \times \text{K}$  and  $\rho = 1.2 \text{ kg/m}^3$  can be assumed. This results in the following quantity equation:

$$P_v [\text{W}] = 1200 \times \dot{V} [\text{m}^3/\text{s}] \times \Delta\vartheta [\text{K}]$$

where  $\Delta\vartheta = T_c - T_a$



The temperature  $T_c$  as the ambient temperature of the components in the interior of the control cabinet can be estimated with the formula given and must be checked by means of measurements for each application because local hot spots can form, e.g. in close proximity to a heat source or heat accumulation through unfavorable air circulation.



**Configuration**Control cabinet without forced ventilation

A control cabinet without forced ventilation conducts the heat loss  $P_v$  generated in the interior to the surrounding air (external temperature  $T_a$ ) via the surface.

For the heat flow  $\dot{Q}$  in the steady state, the following applies:

$$\dot{Q} = k \times A \times \Delta\vartheta = P_v$$

$k$  is the heat transfer coefficient,  $A$  is the effective cooling surface of the control cabinet, and  $\Delta\vartheta$  is the temperature difference between the internal cabinet temperature and the external temperature  $\Delta\vartheta = T_c - T_a$

The transfer of heat through the walls of the control cabinet is determined by the heat transfer of the interior air to the cabinet wall, heat conduction within the cabinet wall and heat transfer from the cabinet wall to the external air. The heat transfer must be calculated by the heat transfer coefficient  $\alpha$ , and heat conduction by the heat conductivity  $\lambda$  and the thickness  $d$  of the cabinet wall. The resulting equation for the possible heat loss  $P_v$  is:  $P_v = [1/(1/\alpha_i + d/\lambda + 1/\alpha_a)] \times A \times \Delta\vartheta = k \times A \times \Delta\vartheta$

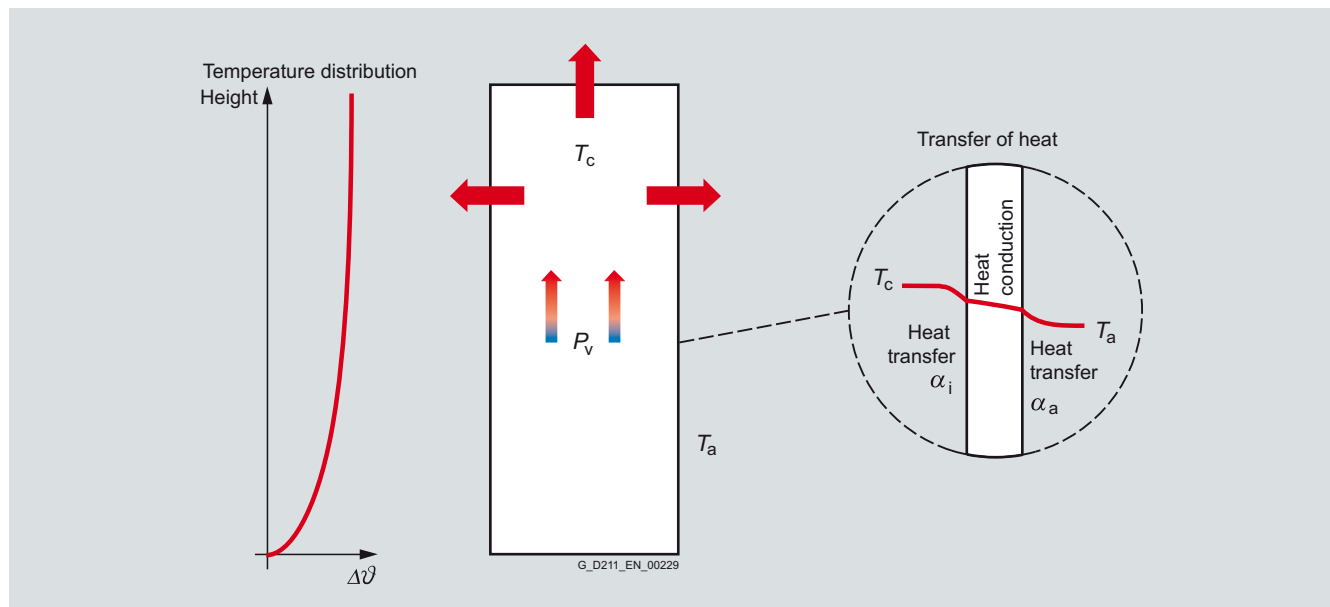
$$P_v = k \times A \times \Delta\vartheta$$

Typical values for the heat transfer coefficient  $k$  in the case of control cabinets with walls of painted stainless steel which are up to 2 mm (0.08 in) thick:

	<b>k value</b>
Non-circulating air in the control cabinet and non-circulating external air $\alpha_i = \alpha_a = 6 \text{ W}/(\text{m}^2 \times \text{K})$	approx. $3 \text{ W}/(\text{m}^2 \times \text{K})$
Circulating air in the control cabinet and non-circulating external air $\alpha_i = 40 \text{ W}/(\text{m}^2 \times \text{K}); \alpha_a = 6 \text{ W}/(\text{m}^2 \times \text{K})$	approx. $5.2 \text{ W}/(\text{m}^2 \times \text{K})$

The calculating procedures of IEC 60890 (VDE 0660 Part 507) can be used for determining the ambient temperature  $T_c$  in the interior of the control cabinet. All heat sources in the control cabinet must be taken into account in the calculation, e.g. Line Modules, Motor Modules, power supplies, filters, reactors. It is important to determine the effective cooling surface dependent on the method of setting up the control cabinet. The standard can also be used for control cabinets with ventilation openings (natural convection).

The estimated temperature  $T_c$  and the temperature distribution in the control cabinet must be checked with measurements for every application since local hot spots can form, e.g. in close proximity to a heat source or heat accumulation.



# System description – Dimensioning

## Heat dissipation

### Configuration

#### Control cabinet with air conditioner

The control cabinet emits heat via its surface and the air conditioner.

Manufacturers provide information on the design of the air conditioner, e.g. Rittal:  
[www.rittal.de/produkte/system-klimatisierung/index.asp](http://www.rittal.de/produkte/system-klimatisierung/index.asp)

#### Control cabinet with cold plate cooling

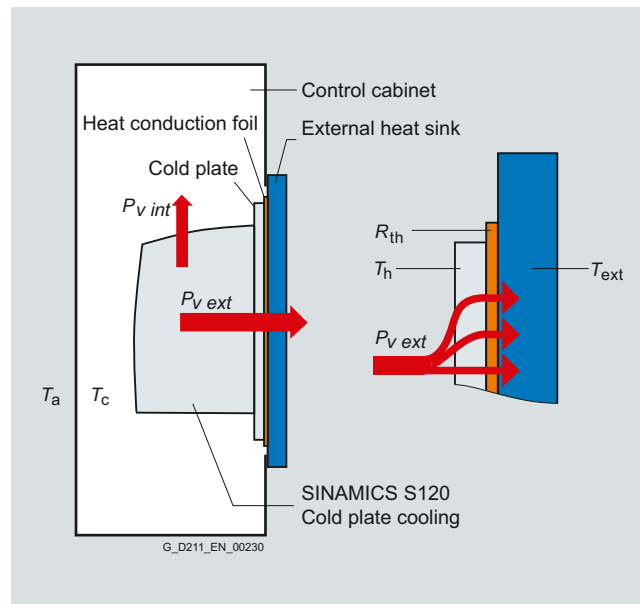
Devices with cold plate cooling dissipate part of the generated heat losses to the surrounding air in the control cabinet ( $P_{V\text{ int}}$ ). However, the greatest part is dissipated as  $P_{V\text{ ext}}$  via the back-plane designed as a cooling surface – the cold plate – to the external heat sink. The heat losses  $P_{V\text{ ext}}$  heat the cold plate to the temperature  $T_h$  that is linked via the thermal resistance  $R_{th}$  with the temperature  $T_{\text{ext}}$  of the external heat sink:

$$T_h = R_{th} \times P_{V\text{ ext}} + T_{\text{ext}}$$

To ensure the specified value for the thermal resistance  $R_{th}$ , the supplied heat conduction foil must be used between the cold plate and the external heat sink, the device must be screwed together with the specified tightening torque, and the surface finish of the external heat sink must be maintained. The temperature difference between the cold plate and the external heat sink ( $T_h - T_{\text{ext}}$ ) must not exceed 40 K, since otherwise mechanical warping can result. The devices with a width of 300 mm (11.81 in) are preferred in cold plate cooling for clocked applications that only briefly require the full rated current, but run on average with a smaller load, corresponding to the derating or less.

For the heat losses  $P_{V\text{ int}}$  given off in the control cabinet, one of the previously named calculation methods can be used for calculating the internal control cabinet temperature  $T_c$ .

All calculated maximum temperatures must be ensured by means of measurements under realistic load conditions after setup of the system.



You must ensure that the temperature  $T_{\text{ext}}$  of the external heat sink does not exceed the defined limit value on the surface contacting the heat conduction foil. Recommended external heat sink, e.g. Rittal DCP – Direct Cooling Package  
[www.rittal.de](http://www.rittal.de)

#### Condensation protection with cold plate cooling

On devices with cold plate cooling, warm surrounding air can condense on the cold surface of the external heat sink. The resulting condensate can cause electrical damage such as leakage current bridges and flashovers. The volume of condensate must be minimized by means of an appropriate temperature of the external heat sink by always maintaining the temperature of the heat sink above the dew point of the surrounding air. This can be achieved either by a permanently set and correspondingly high temperature, or by controlling the temperature of the heat sink in accordance with the surrounding air.

## Services and documentation



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# Services and documentation

## Applications

### Overview



Our understanding of an application is the customer-specific solution of an automation task based on standard hardware and software components. In this respect, industry knowledge and technological expertise are just as important as expert knowledge about how our products and systems work. We are setting ourselves this challenge with more than 160 application engineers at 20 locations in 13 countries.

#### Application centers

We currently have application centers in:

- Germany: Head Office Erlangen and 6 German regions, e.g. in Munich, Nuremberg, Stuttgart, Mannheim, Frankfurt, Chemnitz, Cologne, Bielefeld, Bremen, Hanover, Hamburg
- Italy: Bologna, Milan
- USA: Atlanta
- China: Beijing, Shanghai
- France: Paris
- Turkey: Istanbul
- India: Mumbai
- Switzerland: Zurich
- United Kingdom: Manchester
- Brazil: Sao Paulo
- Japan: Tokyo, Osaka
- The Netherlands: The Hague
- Denmark: Ballerup

These application centers specialize in the use of SIMOTION/SINAMICS. You therefore can rely on automation and drive specialists for implementing successful applications. By involving your personnel at an early stage in the process, we can provide a solid basis for rapid knowledge transfer, maintenance and further development of your automation solution.

#### Advice on applications and implementation

We offer a variety of consultation services to help you find the optimum solution for the SIMOTION/SINAMICS application you want to implement:

The quotation phase includes

- clarification of technical questions
- discussion of machine concepts and customer-specific solutions
- selection of suitable technology and
- suggestions for implementation.

A technical feasibility study is also performed at the outset. In this way, difficult points of the application can be identified and solved early on. If desired, we also configure and implement your application as a complete solution including control cabinet from a single source.

During the implementation phase a number of proven standards can be applied. This saves engineering costs.

The system can be commissioned by experienced, competent personnel, if required. This saves time and trouble.

If servicing is required, we can support you on site or via tele-service. For further information about servicing, please see "Industry Services".

#### On-site application training

Training for the implemented applications can also be organized and carried out on site. This training for machine manufacturers and their customers does not deal with individual products, but the entire hardware and software system (for example, automation, drives and visualization).

From an initial concept to successful installation and commissioning: We provide complete support for SIMOTION/SINAMICS! Contact your Siemens representative.

#### More information

For more information, go to:

[www.siemens.com/motioncontrol/apc](http://www.siemens.com/motioncontrol/apc)

**Overview*****Faster and more applicable know-how:  
Hands on training from the manufacturer***

Siemens Industry Training provides you with comprehensive support in solving your tasks.

Training by the market leader in the industry enables you to make independent decisions with confidence. Especially where the optimum and efficient use of products and plants are concerned. You can eliminate deficiencies in existing plants, and exclude expensive faulty planning right from the beginning.



First-class know-how directly pays for itself: In shorter startup times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, increased profits and lower costs.

***Achieve more with Siemens Industry Training***

- Shorter times for startup, maintenance and servicing
- Optimized production operations
- Reliable configuration and startup
- Minimization of plant downtimes
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

**Contact**

Visit our site on the Internet at:

[www.siemens.com/sitrain](http://www.siemens.com/sitrain)

or let us advise you personally. You can request our latest training catalog from:

***Siemens Industry Training  
Customer Support Germany:***

Phone: +49 (911) 895-7575

Fax: +49 (911) 895-7576

E-Mail: [info@sitrain.com](mailto:info@sitrain.com)

***Training office, US***

Phone: 1-800-241-44 53

E-mail: [sitrain.register.sea@siemens.com](mailto:sitrain.register.sea@siemens.com)

**Overview (continued)*****Highlights Siemens Industry Training*****Top trainers**

Our trainers are skilled teachers with direct practical experience. Course developers have close contact with product development, and directly pass on their knowledge to the trainers.

**Practical experience**

The practical experience of our trainers enables them to teach theory effectively. But since theory can be pretty drab, we attach great importance to practical exercises which can comprise up to half of of the course time. You can therefore immediately implement your new knowledge in practice. We train you on state-of-the-art methodically/didactically designed training equipment. This training approach will give you all the confidence you need.

**Wide variety**

With a total of about 300 local attendance courses, we train the complete range of Siemens Industry products as well as interaction of the products in systems.

**Tailor-made training**

We are only a short distance away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to have individual training instead of one of our 300 courses? Our solution: We will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

**The right mixture: Blended learning**

"Blended learning" is a combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.



# Services and documentation

## Training

### SINAMICS training courses

#### Overview

##### Training courses for SINAMICS S120 drive system



This provides an overview of the training courses available for the SINAMICS S120 drive system.

The courses are modular in design and are intended for a variety of target groups as well as individual customer requirements.

The system overview will acquaint decision-makers and sales personnel with the system very quickly.

The configuration course provides all the information you need to configure the drive system.

The basic and follow-up courses are sure to provide all the technical knowledge service engineers will need for servicing/ commissioning motion control applications, communication and extended functions such as DCC and Safety Integrated.

All courses contain as many practical exercises as possible in order to enable intensive and direct training on the drive system and with the tools in small groups.

You will find further information about course contents and dates in Catalog ITC and on the Internet.

Title (all courses are available in English and German)	Target group						Duration	Short title
	Decision makers, sales personnel	Project managers, project team members	Programmers	Commissioning engineers, configuring engineers	Service personnel	Maintenance personnel		
<b>Basic courses</b>								
Basics of Drive Systems		✓	✓	✓	✓	✓	5 days	SD-GAT
SINAMICS System Overview	✓	✓					2 days	DR-SN-UEB
SINAMICS S120 Engineering	✓	✓	✓				5 days	DR-SNS-PRJ
SINAMICS S120 Service and Commissioning			✓	✓	✓	✓	5 days	DR-SNS-SI
SINAMICS S120 Maintenance					✓	✓	5 days	DR-SNS-IH
<b>Advanced courses</b>								
SINAMICS S120 Drive Control Chart and Basic Positioner			✓	✓	✓		3 days	DR-SNS-DCC
SINAMICS S120 Servicing Chassis Units				✓	✓		2 days	DR-SNS-CHA
SINAMICS S120 Safety Integrated			✓	✓	✓	✓	2 days	DR-SNS-SAF
SINAMICS Communication			✓	✓	✓		5 days	DR-SN-COM

**Overview***Training courses for SIMOTION Motion Control System*

The SITRAIN training courses for SIMOTION offer a broad spectrum of courses that makes users fit for their tasks in project engineering, commissioning and maintenance. The standard courses are offered in Nuremberg-Moorenbrunn or also somewhere close to you. We also offer customer-specific courses in our training centers or at the customer site.

The practical exercises are based on the course content and are performed on specially developed and well-equipped training devices.

You will find further information about course contents and dates in Catalog ITC and on the Internet.

Title (all courses are available in English and German)	Target group							Duration	Short title
	Decision makers, sales personnel	Project managers, project team members	Programmers	Commissioning engineers, configuring engineers	Service personnel	Operating personnel, users	Maintenance personnel		
SIMOTION Overview Course	✓	✓						3 days	MC-SMO-UEB
SIMOTION System and Programming Course			✓	✓	✓			5 days	MC-SMO-SYS
SIMOTION Programming Course			✓	✓				5 days	MC-SMO-PRG
SIMOTION and SINAMICS S120 Maintenance					✓	✓	✓	5 days	MC-SMO-IH

# Services and documentation

## Siemens Automation Cooperates with Education

Applicable practical know-how

### Comprehensive teaching support for educational institutions

Cooperates  
with Education

Automation

SIEMENS

#### Siemens Automation Cooperates with Education (SCE)

offers a global system for sustained support of technical skills. SCE supports educational institutions in their teaching assignment in the industrial automation sector and offers added value in the form of partnerships, technical expertise, and know-how. As the technological leader, our comprehensive range of services can support you in the transfer of industrial knowledge.

#### Our services at a glance

- Training curriculums for your lessons
- Trainer packages for hands-on learning
- Courses convey up-to-date, specialist knowledge
- Support for your projects/textbooks
- Complete didactic solutions from our partners for your lessons
- Personal contact for individual support

#### Training curriculums for your lessons



Use our profound industrial know-how for practice-oriented and individual design of your course. We offer you more than 90 didactically prepared training documents on the topics of automation and drives technology free of charge. These materials are perfectly matched to your curricula and syllabuses, and optimally suited for use with our trainer packages. This takes into account all aspects of a modern industrial solution: installation, configuration, programming, and commissioning. All documents, including projects, can be individually matched to your specific requirements.

Particular highlight: the new SIMATIC PCS 7 curriculums and trainer packages. Using plant simulation, you can pass on basic, practice-oriented PCS 7 knowledge at universities within about 60 hours (= 1 semester).

[www.siemens.com/sce/documents](http://www.siemens.com/sce/documents)

#### Trainer packages for hands-on learning



Our SCE trainer packages offer a specific combination of original industrial components which are perfectly matched to your requirements and can be conveniently used in your course. These price reduced bundles available exclusively to schools include innovative and flexible hardware and software packages. SCE can currently offer more than 80 SCE trainer packages including related equipment. These cover both the factory and process automation sectors. You can use them to impart the complete course contents on industrial automation at a very low cost.

Trainer packages are available for:

- Introduction to automation technology with LOGO! compact controller and SIMATIC S7-1200
- PLC engineering with SIMATIC S7 hardware and STEP 7 software
- Operator control and monitoring with SIMATIC HMI
- Industrial networking over bus systems with SIMATIC NET
- Sensor systems with VISION, RFID, and SIWAREX
- Process automation with SIMATIC PCS 7
- Networked drive and motion technologies with SINAMICS and SIMOTION
- CNC programming with SinuTrain

#### Important ordering notes:

Only the following institutions are authorized to obtain trainer packages: vocational schools, Colleges and Universities, in-house vocational training departments, non commercial research institutions and non commercial training departments.

To purchase a trainer package, you require a specific end-use certificate, which you can obtain from your regional sales office.

[www.siemens.com/sce/tp](http://www.siemens.com/sce/tp)



# Services and documentation

## Siemens Automation Cooperates with Education

Applicable practical know-how

### Comprehensive teaching support for educational institutions (continued)

#### Courses convey up-to-date specialist knowledge



Profit from our excellent know-how as the leader in industrial technologies. We offer you specific courses for automation and drive technology worldwide. These support you in the practice-oriented transferring of product and system know-how, are in conformance with curriculums, and derived from the training fields. Compact technical courses especially for use at universities are also available.

Our range of courses comprises a wide variety of training modules based on the principle of Totally Integrated Automation (TIA). The focus is on the same subject areas as with the SCE trainer packages.

Every PLC and drive course is oriented on state-of-the-art technology. Your graduates can thus be prepared optimally for their future professional life.

In some countries we are offering classes based on our training documents. Please inquire with your SCE contact partner.

[www.siemens.com/sce/contact](http://www.siemens.com/sce/contact)

#### Support for your projects/textbooks



Automation and drive technology is characterized by continuous and rapid developments. Service and Support therefore play an important role.

We can provide you with consulting for selected projects and support from your personal SCE contact as well as our web based and regional Customer Support.

As a particular service, SCE supports technical authors with our know-how as well as with intensive technical consulting. Siemens library of special textbooks covering the industrial automation sector provides an additional resource for you and your students. These can be found at the SCE web site.

[www.siemens.com/sce/contact](http://www.siemens.com/sce/contact)  
[www.siemens.com/sce/books](http://www.siemens.com/sce/books)

#### Complete didactic solutions for your lessons



Our partners for learning systems offer a wide range of training systems and solutions for use in your courses or laboratory.

These models have been designed based on our trainer packages and thus save you the time and cost of self-construction of individual components. The Partner systems provide you with simple and effective help in the fulfillment of your teaching assignment.

[www.siemens.com/sce/partner](http://www.siemens.com/sce/partner)

#### Contact for individual support

You can find your personal SCE contact on our Internet site. Your local SCE Promoter will answer all your questions concerning the complete SCE offering, and provide you with timely and competent information about innovations. When you encounter challenges, you can profit from our global team of excellence.

If a direct SCE contact is not listed for your country, please contact your local Siemens office.

[www.siemens.com/sce/contact](http://www.siemens.com/sce/contact)

#### SCE Support Finder for your Internet request

You are an educator and need support on the topic of industry automation? Send us your request now:

[www.siemens.com/sce/supportfinder](http://www.siemens.com/sce/supportfinder)

Scan the QR  
code for further  
information  
(SCE homepage)



IA/DT SCE En 23.05.2012

# Services and documentation

## Mechatronic Support

### Overview

#### *Achieve the optimum machine quicker and more efficiently with Mechatronic Support*

The Mechatronic Support service ensures that already at the design stage of new machines, all the systems involved in mechanics, electronics, and IT are tested and optimized in a simulation environment in terms of their functionality and interaction, before they are actually built.

Mechatronic Support is thus the intelligent alternative to "trial and error". Innovative machine concepts are mutually compared, modified and optimized at the outset – a process which of course also takes account of your ideas for new mechatronic components.

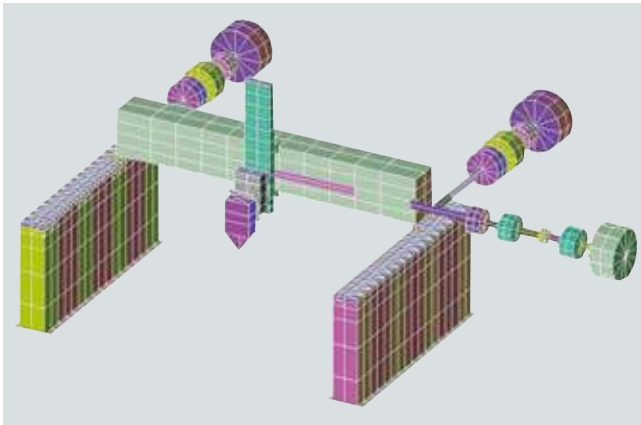
#### *Virtual simulation, real construction*

With the help of the Mechatronic Support service, machinery ideas and new developments can be mechatronically tested and modified in a short time at low expense. The first real prototype can be built immediately afterwards as a functioning machine.

As the machine manufacturer, you have the benefit of shorter development phases and faster time-to-market; or as the end customer, you benefit from an optimized high-performance machine solution.

### Benefits

- Shorter development times – shorter time to market
- Reliable achievement of development objectives
- Risk-free testing of innovative machine concepts
- Higher quality and productivity from the outset
- Get to the finished machine more quickly with specialist support



### Selection and ordering data

Description	Order No.
<b>Consulting</b> Technical consultation with customer	<b>6FC5088-1....</b>
<b>Machine optimization</b> Optimum setting of control and drives on the customer's machine	<b>6FC5088-2....</b>
<b>Machine analysis and optimization</b> Analysis of the machine and its limits. Recommendations for manufacturer	<b>6FC5088-3....</b>
<b>Machine simulation</b> Simulation of individual axes and the dynamic response on the machine	<b>6FC5088-4....</b>
<b>Machine simulation with interpolating axes</b> Simulation of interpolating axes	<b>6FC5088-5....</b>
<b>Machine simulation with FE model</b> Modeling of machine using the Finite Element method	<b>6FC5088-6....</b>

### More information

Please contact your local Siemens sales office or Regional Company for more information.

### Overview

#### *Complete equipment for machine tools and production systems*

Our supplied range of products and services also includes complete equipment for machine tools and production systems with all services in the process chain from consulting through to after-sales service.

We support you in the areas of engineering, production and logistics:

#### *Engineering support*

Siemens supports you with advice on design in accordance with standards and concepts for drive systems, control, operation and safety.

Our engineers configure for you in EPLAN P8 and other commonly used CAD systems, execute projects designed to cost and adapt your documents where necessary to UL or new systems.

Our Technical Competence Center Cabinets in Chemnitz supports you with selecting and optimizing the suitable control cabinet air-conditioning system. Apart from calculation and simulation, we also use instrumentation testing in our heat laboratory with load simulation.

We also offer the following services:

- Vibration measurements and control cabinet certification in the field
- Measurement of conducted interference voltages in our laboratory

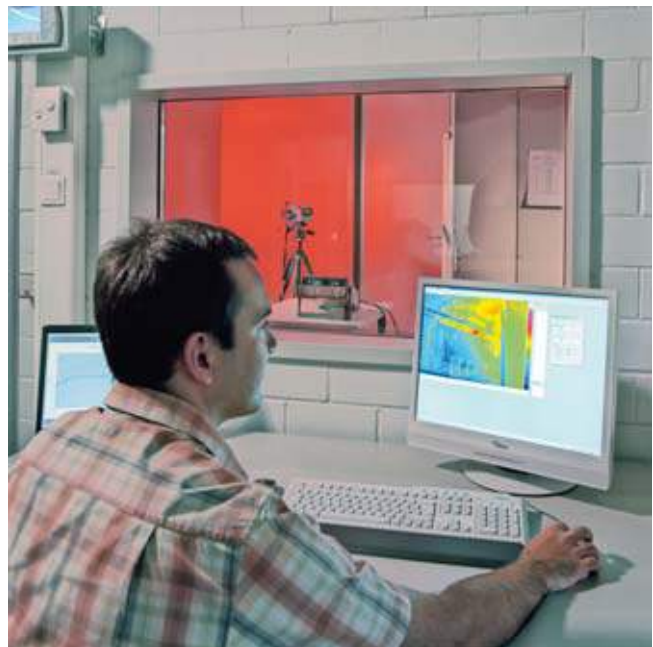
#### *Production at a high level of quality*

Complete equipment is manufactured at a high industrial level. This means:

- Examining consistency of the job documentation
- Checking for adherence to current regulations
- Collision check in 3D layout, taking into account the free space required thermally and electrically
- Automatic preparation of enclosures, cables and cable bundles
- Automated inspection and shipment free of faults
- Documentation and traceability
- Declaration of conformity regarding the Low-Voltage Directive and manufacturer's declaration on machinery directive
- UL label on request



Cabinet engineering



Testing in the heat laboratory

# Services and documentation

## Control cabinets

### Overview (continued)

#### Superior logistics

Everything from a single source offers you the following advantages:

- Cost savings for procurement, stockkeeping, financing
- Reduction in throughput times
- Just-in-time delivery

#### Individual support and maximum flexibility

Our technical consultants for complete equipment support customers and sales departments in the various regions. Our control cabinet customers are supported in the Systems Engineering Plant Chemnitz (WKC) by ordering centers and production teams that are permanently assigned to customers.

Distance does not present a problem; we also use web cams for consulting our customers.

Customer-specific logistics models, flexible production capacity and production areas as well as change management in all process phases ensure maximum flexibility.

#### Customized supplementary products

As part of its complete equipment program, Siemens also offers the development and construction of customized supplementary products, e.g. special operator panels and power supply systems.

#### Liability for defects

Of course we accept the same liability for defects for our complete equipment as for our SINUMERIK, SIMODRIVE and SINAMICS products.

Furthermore, you can use our worldwide repair service anywhere and at any time.

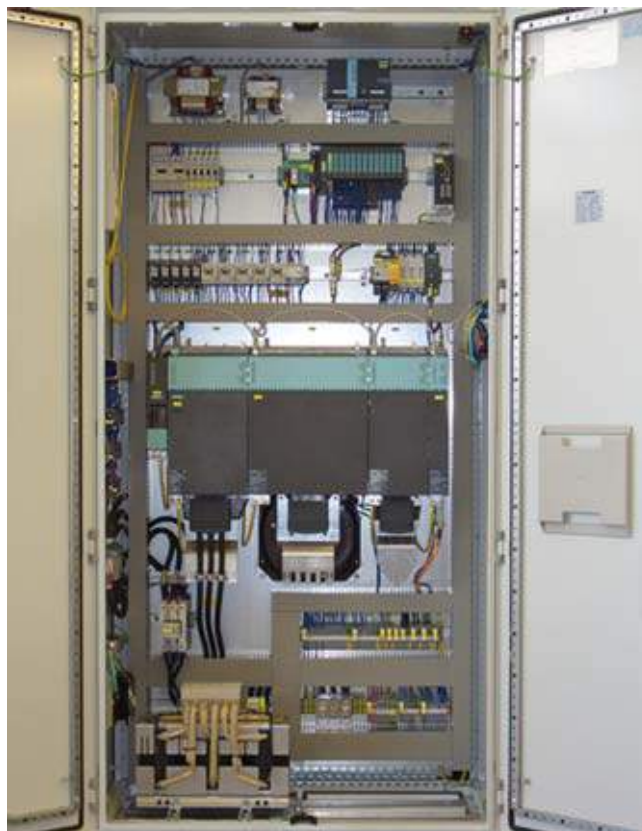
#### Your benefits

One partner, one quotation, one order, one delivery, one invoice, and one contact partner for liability of defects.

For series production or individual items, Siemens is your competent partner for complete equipment.



Worldwide repair service



Control cabinet with SINAMICS S120 in booksize format

#### Overview

##### *Increase plant availability through certification of control cabinets*

With our control cabinet certification service, we offer to inspect the control cabinet documentation to ascertain compliance with the planning guidelines defined for the components. You receive the result of the inspection in the form of a report which contains specific recommendations as to how the control cabinet design needs to be improved.

With this information as a guide, the control cabinet design can be improved and the cabinet subsequently constructed to the highest quality standards.

When the machine manufacturer has completed assembling the control cabinet, the control cabinet design is inspected and subsequently certified at the manufacturer's site.

This certification process is primarily intended for series control cabinets, but could also be applied to single cabinets.

##### *Certification sequence*

- Inspection of the control cabinet documentation and presentation of results in a report
- Inspection of a fully assembled control cabinet with inspection report and certification at the manufacturer's site (single cabinet or sample of a series control cabinet)
- In the case of a series control cabinet, another inspection is performed on a cabinet from the type series after approximately 12 months.

#### Benefits

- The control cabinet certification service helps to ensure a high quality of cabinet design, to prevent early failure of components as a result, for example, of inadequate cooling and to detect potential EMC problems.
- Certified control cabinet quality

#### Selection and ordering data

Description	Order No.
<b>Visual inspection of control cabinet schematic diagrams</b>	<b>6FC8500-0BX01-0AA0</b>
Inspection result report to the control cabinet designer	
<b>Individual certification</b>	
On-site inspection of control cabinet	<b>6FC8500-0EE01-0AA0</b>
Each additional control cabinet	<b>6FC8500-0EE02-0AA0</b>
<b>Series certification</b>	
On-site inspection of control cabinet	
• Up to 10 control cabinets	<b>6FC8500-0SE01-0AA0</b>
• Up to 20 control cabinets	<b>6FC8500-0SE02-0AA0</b>
• Up to 30 control cabinets	<b>6FC8500-0SE03-0AA0</b>
• Up to 50 control cabinets	<b>6FC8500-0SE05-0AA0</b>
• Up to 100 control cabinets	<b>6FC8500-0SE10-0AA0</b>
• More than 100 control cabinets	<b>6FC8500-0SE11-0AA0</b>
<b>Follow-up for series certification</b>	
Repeat certification after 12 months	<b>6FC8500-0FE01-0AA0</b>

#### More information

Please contact your local Siemens sales office or Regional Company for more information.

Contact information is available on the Internet at:

[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

# Services and documentation

## Repair service contract RSC

### Overview



#### RSC description of performance

In the context of the repair service contract (RSC), Siemens eliminates faults on components from Siemens Industry Sector, I IA&DT specified in the contract (with the exception of complete motor spindles) at the machine location on behalf of the machine tool/production machinery manufacturer and dealer.

#### RSC services

- Provision of servicing personnel
- On-site diagnostics
- On-site troubleshooting
- Proof of troubleshooting

**Diagnostics** refers to the components specified in the parts list of the final destination certificate. Diagnostics is carried out on the basis of a technical fault message clarified in advance by the manufacturer or dealer with specification of the contract number.

**Troubleshooting** is carried out by repairing and/or replacing faulty components. In the event of a machine standstill, troubleshooting is carried out with the response time specified for the country group.

Within the agreed contract period, faulty components which were not older than 12 months at the beginning of the repair service contract will be replaced free-of-charge.

Siemens provides qualified personnel for diagnostics and troubleshooting of our products. If mechanical work is also necessary, this must be provided or arranged by the manufacturer/dealer. Example: dismounting/mounting of motors or other mechanical components.

The services are provided during the usual working hours in the country of installation. Waiting times not caused by Siemens – longer than an hour – will be invoiced separately. The service request must be made via the organization that signed the RSC.

**Spare parts** are provided from our central or regional spare parts warehouses using our worldwide spare parts logistics infrastructure. All essential spare parts are stocked in our central spare parts stores. Regional spare parts warehouses are adapted to include the components specified in the final destination certificate<sup>1)</sup>.

The following components are not defined as spare parts:

- Motors<sup>2)</sup>
- Cables<sup>3)</sup>
- Special or customer-specific modules and components not available from Siemens as spare parts.

Faulty components<sup>4)</sup> are replaced free-of-charge within the agreed contract period. See under Service exclusions.

#### Contract prerequisites

- Final destination certificate
- Data backup at the user
- Parts lists for the individual components with order numbers and serial numbers.
- Access to machine/components<sup>6)</sup>

The manufacturer/dealer provides the final destination information in good time prior to commencement of the contract, and ensures that all machine data is backed up and available at the user. Particular data for the final destination certificate are: Machine No., machine type, machining technology, control system, drive system, number of measuring circuits, data for OEM application, date of commissioning at end user's site, country of end user, if possible full address of end user and parts list of components used with order number and serial number.

#### RSC certificate

As the RSC contract partner, the manufacturer or dealer is provided with a certificate with contract number (the contract number must be specified when requesting service) once the final destination certificate has been handed over (prerequisite for provision of services at the end customer site). This certificate contains the contract number and essential contract data such as machine number, machine type, contract start date, contract end date, and address for the provision of services.

#### Period of validity

The RSC commences on the date registered with Siemens for completion of the second commissioning procedure at the end customer site, and ends on expiry of the selected RSC period<sup>5)</sup>.

#### Contract periods

The RSC is offered for the period of liability (warranty period) that our customers (manufacturers/dealers) provide to their end customers. Different RSC periods permit various market requirements to be addressed. In the case of RSC periods exceeding the limitation period originally granted for Siemens I IA&DT components, the limitation period is extended with respect to claims for subsequent fulfillment of performance, with the exception of further rights and claims, in line with the extended RSC period.

#### Service exclusions

The contract shall not be deemed to have been performed in all cases of subclause VIII./7 Quality defects of the "General conditions of supply and delivery for the electrical industry"<sup>4)</sup>. In the case of parts subject to wear (e.g., motor bearings and fans or cables), replacements will be provided free-of-charge within 12 months of commencement of the RSC in the case of proper use, irrespective of the actual duration of the RSC.

#### Export license

Fulfillment of the service call may be subject to authorization due to the application or the type of replacement parts, equipment and documentation required. The service call is, therefore, subject to the granting of the necessary export licenses and the absence of any other obstacles relating to German or other applicable export regulations.

# Services and documentation

## Repair service contract RSC

### Overview (continued)

#### Country list

The repair service is offered for the following countries:

Continent	Country/region
<b>Country group 1</b>	
Americas	Brazil, Mexico, USA
Asia	China, India, Japan, South Korea, Taiwan, Thailand
Australia	Australia
Europe	Andorra, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey
<b>Country group 2</b>	
Africa	South Africa
Americas	Argentina, Canada
Asia	Indonesia, Malaysia, Singapore
Australia	New Zealand
Europe	Bulgaria, Estonia, Ireland, Latvia, Lithuania, Norway, Slovenia
<b>Country group 3</b>	
Africa	Egypt
Americas	Bolivia, Chile, Columbia, Costa Rica, Ecuador, El Salvador, Panama, Peru, Venezuela
Asia	Israel, Pakistan, Philippines, United Arab Emirates (Dubai), Bahrain, Qatar, Kuwait, Oman, Saudi Arabia, Vietnam
Europe	Belarus, Bosnia-Herzegovina, Croatia, Greece, Malta, Macedonia, Russia, Serbia and Montenegro, Ukraine

#### Countries not listed

Remaining countries  
For customers with framework contracts only.

#### Response time

As a rule, the following response times apply when the RSC is implemented in the case of a machine standstill:

Country group	
CG 1	Next working day
CG 2	Within two working days
CG 3	Depending on country-specific conditions
Countries not listed	Depending on country-specific conditions, only for customers with framework contracts for the price of the individual contract

We define the **response time** as the time from when your clarified order is placed until our service engineer starts to travel to the site stated in the order, or until troubleshooting commences using teleservice. The specified response times apply to "technically clarified fault notifications" within the usual working hours of the region (e.g. Monday to Friday 8:00 to 17:00) excluding public holidays.

### Benefits

- Protection against unknown costs with a fixed price
- RSC can be synchronized with the machine warranty period
- Planning certainty and calculable costs
- Easier processing of servicing jobs
- High machine availability thanks to a fast response to machine faults (contract priority)
- Reduced downtime thanks to stored product, final destination and contract information
- RSC can be ordered for machine deliveries to numerous countries
- Worldwide service infrastructure with experienced service personnel

- 1) Since the export of standard versions (components/system) is subject to a time-consuming official approval procedure, which applies in equal measure to the supply of such components for the purpose of servicing and spare parts supply, we recommend **supply of the export version** wherever possible. This applies in particular in cases where the control can be exported without official approval after the machine manufacturer has installed it in a machine tool. Please note in this regard the **Export control information**.
- 2) For selected motors, we centrally stock components for fast delivery in Germany and the USA. These motors can be manufactured and delivered within a few working days. You can obtain the current list from your Siemens sales partner.
- 3) The delivery times known to you usually apply.
- 4) Examples for service exclusions:
  - Non-compliance with the Siemens project engineering and user guidelines, e.g. incorrect installation, incorrect grounding, or incorrect operating characteristics
  - Function-critical fouling, e.g. oil, conductive substances, rust
  - Mechanical damage
  - External electrical influence, e.g. effects of overvoltage, compensation system without reactor or line harmonics
  - Machine commissioning or optimization
  - Intentional destruction
- 5) For example, in the case of an RSC with 12 months contract period, maximum of 24 months from the transfer of risk (delivery of the components).
- 6) The manufacturer/dealer must ensure
  - that the work can be performed without delay
  - problem-free access to the components including any software security mechanisms, e.g. Lock-it! required for performing diagnosis/troubleshooting
  - that a contact is provided who can be reached at any time for software-protected machines.

# Services and documentation

## Repair service contract RSC

### Types of contract for production machines

#### Overview



#### Data handling

To improve the service availability, Siemens Drive Technologies offers users the opportunity to register machines online and to save what is known as an identSNAPSHOT file. In addition to the component list and the software requirements of machines, this also includes information for machine manufacturers/and where relevant, dealers and end customers.

To simplify data handling, information about the final destination certificate can be saved using the XML function of identSNAPSHOT and transferred to Siemens using an online registration. This data can also be kept with the machine as data backup.

[www.siemens.com/identsnapshot/register](http://www.siemens.com/identsnapshot/register)

#### Selection and ordering data

Description	Order No.
<b>Repair service contract RSC</b>	
For Siemens I IA&DT components on production machines for countries in country groups 1 to 3	
• <b>12 month contract period<sup>1)</sup></b>	<b>6FC8507-0RX12-■■■■0</b>
• <b>24 month contract period<sup>2)</sup></b>	<b>6FC8507-0RX24-■■■■0</b>
Equipment value in €	
0.–	0
100000.–	1
200000.–	2
300000.–	3
400000.–	4
500000.–	5
600000.–	6
700000.–	7
800000.–	8
900000.–	9
0.–	A
10000.–	B
20000.–	C
30000.–	D
40000.–	E
50000.–	F
60000.–	G
70000.–	H
80000.–	J
90000.–	K
0.–	A
1000.–	B
2000.–	C
3000.–	D
4000.–	E
5000.–	F
6000.–	G
7000.–	H
8000.–	J
9000.–	K

#### Ordering example:

Contract period of 12 months and equipment value of 96000.– €  
6FC8507-0RX12- **0KG** 0

<sup>1)</sup> Max. 24 months from the transfer of risk (delivery of components).

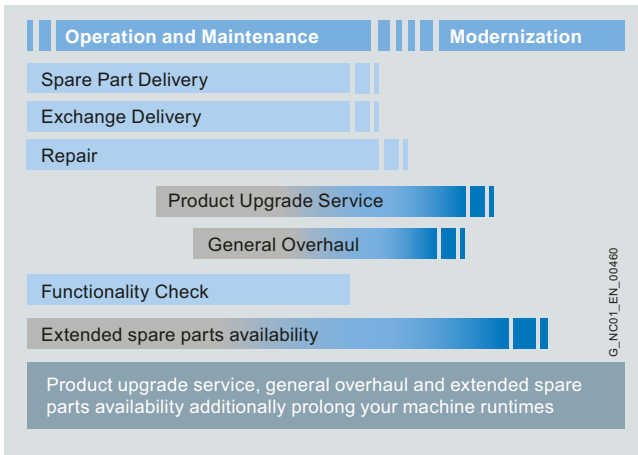
<sup>2)</sup> Max. 36 months from the transfer of risk (delivery of components).



### Spare parts services

### Delivery of spare parts

#### Overview



Spare parts services during the lifecycle

Siemens also provides constant support to customers after delivery of the machines or plant. This includes spare parts, repairs, as well as other supplementary services, and has a positive effect on machine operating times, inventories and costs.

When customers purchase a high-quality machine or plant, they intend to use it as intensively as possible, preferably for three shifts a day over many years. Under such circumstances, it is normal for parts to fail eventually. It is essential to replace the part as quickly as possible, because every hour of a plant stoppage costs money. To satisfy the multi-faceted requirements in the different areas, we have created comprehensive spare parts services.

You can sign up for the spare parts service that suits your requirements perfectly:

- Delivery of spare parts
- Delivery as exchange product
- Repair
- Product upgrade service
- General overhaul
- Function check
- Return of diagnostic parts
- Extended spare part availability and
- Stock reduction of your spare parts store

#### Benefits

- Optimum price/performance ratio and top quality
- Lifecycle management over the complete lifecycle
- Outstanding quality and availability of your machine and plant using Siemens original spare parts
- Global network and optimized logistics chains – 24 hours a day, 365 days a year
- Additional services from Siemens

#### More information

More information is available on the Internet at:

[www.siemens.com/motioncontrol/spareparts](http://www.siemens.com/motioncontrol/spareparts)

For further information, please approach your contact at your local Siemens office.

Contact information is available on the Internet at:

[www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

#### Overview

In every industry worldwide, plants and systems are required to operate with constantly increasing reliability. Lack of a specific spare part can result in considerable costs. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

Ordering mode	Logistics service	Note
<b>Standard</b>	Cost-optimized: Contracted shipping company	Delivery within the normal national delivery times through the contracted shipping company
<b>Plant stoppage</b>	Time-optimized: Express, courier, collection	You choose the shortest possible delivery time for your own benefit: <ul style="list-style-type: none"> <li>• Delivery by means of collection or courier service</li> <li>• Delivery by express service</li> </ul>
<b>Emergency service</b>	Special logistics: Courier	You can also order the spare parts from us outside normal working hours, as well as on weekends or national holidays round-the-clock. Your delivery will arrive by courier

#### Benefits

- New liability for defects for the spare part
- Long-term spare parts availability
- Optimum system compatibility

# Services and documentation

## Spare parts services

### Delivery as exchange product

#### Overview

In addition to the simple delivery of spare parts, with many products, we also offer you the option of an exchange. This has the advantage that you not only receive the spare part quickly, but are able to return the defective device to us for a credit. You therefore receive our spare part at the lower exchange price.

A credit will be awarded on condition that the repair code indicates that repurchasing is admissible, a replacement is obtained from the spare parts store, and that the returned product is repairable.

The ordering mode and logistics service determine the delivery of spare parts:

Ordering mode	Logistics service	Note
<b>Standard</b>	Cost-optimized: Contracted shipping company	Delivery within the normal national delivery times through the contracted shipping company
<b>Plant stoppage</b>	Time-optimized: Express, courier, collection	You choose the shortest possible delivery time for your own benefit: <ul style="list-style-type: none"> <li>• Delivery by means of collection or courier service</li> <li>• Delivery by express service</li> </ul>
<b>Emergency service</b>	Special logistics: Courier	You can also order the spare parts from us outside normal working hours, as well as on weekends or national holidays round-the-clock. Your delivery will arrive by courier

#### Return

For returns, we require the following information:

- Reason for return
- If defective: detailed description of the fault
- Machine number
- Machine/system manufacturer
- End customer

We will then be able to provide you with additional information in the repair report/inspection report regarding the diagnosis/inspection as well as information about the completed repair.

#### Benefits

- Savings thanks to the option of returning defective parts
- A spare part is available immediately in the event of failure
- New liability for defects for the spare part
- Long-term spare parts availability
- Optimum system compatibility

### Repair

#### Overview

Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum – with our worldwide repair facilities. The advantage for you: Defects can be rectified before they cause further harm.

Repair is a favorable option when you have specific reasons for not replacing the defective device or part with a new one (delivery as exchange product).

We maintain a global network of Siemens repair shops and certified partners to ensure that we will always be able to process your repairs quickly.

We can offer you different types of repair depending on your requirements:

#### Normal repair

Normal repair at standard conditions normally takes 10 working days following receipt of the defective item at our repair shop.

#### Fast repair

In particularly urgent cases, we offer you the option of a fast repair within 1 or 2 working days for many products at additional cost.

#### Turnaround repair

With a turnaround repair, we organize on your behalf collection of the device/component to be repaired.

#### Mobile repair service

We come to you and perform the required repairs on site, for example, when the device/component cannot be removed due to its weight.

#### Function repair

A function repair is the same as a normal repair but excludes the repair of cosmetic defects, e.g. scratches, labels, discoloration. The conditions applicable to function repairs should be observed in this case.

For repairs, we require the following information:

- Reason for return
- If defective: detailed fault report
- Machine number
- Machine/system manufacturer
- End customer

#### Benefits

- Short downtimes for machines and plants
- Only certified original parts are used
- Additional services from Siemens:
  - Longer availability of your machine/plant through the preventive replacement of wear parts and aging parts
  - Highest standards of quality
  - Use of the comprehensive test concept of series production, including software, firmware, ASICs, complex function blocks, etc.
  - Implementation of all the hardware and software/firmware enhancements known by development, production, service and quality management departments, as well as suppliers
- Information supplied by repair report/inspection report

### Product upgrade service

### General overhaul

#### Overview



Product upgrade service: From OLD to NEW

A long service life is expected from machines and plants. The service life of the electronic components is, however, limited and normally shorter than the planned machine/plant operating times. To ensure that the required extended availability of the machine/plant is achieved, we offer you the product upgrade service at an attractive price.

In the course of their lifecycle, electronic components are normally redesigned/updated several times. With the product upgrade service, you will always receive the latest technology.

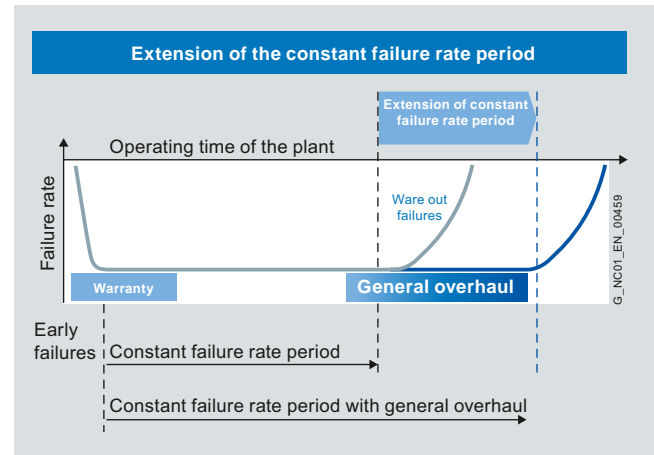
A planned product upgrade from OLD to NEW helps to prevent unplanned machine stoppages and supports a safer and longer machine/plant availability. The upgrade service is mainly offered for older components that will soon be discontinued.

For information about potential upgrades from the latest upgrade list, please ask your regional Siemens contact.

#### Benefits

- Price benefit through upgrade service
- New liability for defects for the new component
- Extended availability of your machine/plant
- Prevention of component failures due to wear and aging
- Prevention of machine stoppages due to unavailability of spare parts
- Reduced spare parts inventories
- Latest technology
- Easier servicing due to fewer variants
- Industry Services through Siemens are assured for the future

#### Overview



Extension of the period with a constant failure rate

A long service life is expected from machines and plants. The service life of electronic components and mechanical parts is, however, limited and normally shorter than the planned machine/plant operating times. For higher availability of the machines or plant, we offer a general overhaul (preventive maintenance) for electronic components and motors at favorable conditions.

During the planned general overhaul, wear parts and aging parts are replaced in accordance with their stated service life so as to reduce unplanned downtimes. In the case of motors, in addition to a general overhaul, replacement of bearings and encoders is also offered.

If a fault is detected during a general overhaul, troubleshooting and repair will be performed at the repair price without requesting confirmation or interrupting the process. In the case of extensive wear or damage, a general overhaul/repair will not be performed. A fixed lump sum for expenses will be charged in this case.

#### Benefits

- Preventive replacement of wear parts and aging parts in accordance with their stated service life
- Reduction in unplanned plant stoppages
- Enhanced production reliability
- Extended availability of your machine/plant
- New liability for defects for 12 months for the components subjected to a general overhaul
- Low price

# Services and documentation

## Spare parts services

### Function check

#### Overview

It is checked that the components function reliably.

The first step involves cleaning the component. Then all the hardware and software/firmware enhancements are implemented that are known by development, production, service and quality management departments, as well as suppliers. Using the comprehensive test concept of series production, all the functions of the software, firmware, ASICs, complex and less complex function blocks are checked.

If a fault is detected during the function check, troubleshooting and repair will be performed at the repair price without requesting confirmation or interrupting the process. In the case of extensive wear or damage, no repairs will be performed. A fixed lump sum for expenses will be charged.

#### Benefits

- The component is checked and can be deployed again
- The component contains all the known improvements
- The customer's own spare parts stock is up-to-date
- Low price

### Return of diagnostic parts

#### Overview



Spare parts used for diagnostic purposes from the spare parts store can be returned within 3 months and a credit note for up to 85 % is issued.

For unused spare parts in their original packaging, you will receive a credit of 100 % in which case you will be charged a fixed price for handling.

#### Benefits

- Can be used for diagnostics
- Reduced spare parts inventories
- Low costs

### Stock reduction in spare parts store

#### Overview



Thanks to fast delivery of spare parts from Siemens, manufacturers and plant operators are able to reduce their spare parts inventories. Siemens offers an analysis for this purpose to indicate exactly which parts must be available in the customer's stores for a specific combination of machines and which should be obtained directly from Siemens

#### Benefits

- Reduced costs
- Stock optimization
- Minimization of fault downtimes

### Extended spare part availability

#### Overview

We normally retain spare parts for all products and systems for a period of 10 years after discontinuation of product marketing.

In individual cases, when we do not carry spare parts, we will offer a repair.

For a wide range of products and systems, we extend the availability of spare parts. We can provide you with the current spare parts availability for your machine/plant as a service once you have registered online with identSNAPSHOT.

[www.siemens.com/identsnapshot/register](http://www.siemens.com/identsnapshot/register)

If you require longer availability of spare parts, please contact your regional sales representative.

#### Benefits

- Higher plant availability
- Investment protection
- Reduction of lifecycle costs

# Services and documentation

## Industry Services

Your machines and plants can do more – with Industry Services from Siemens.

### Overview

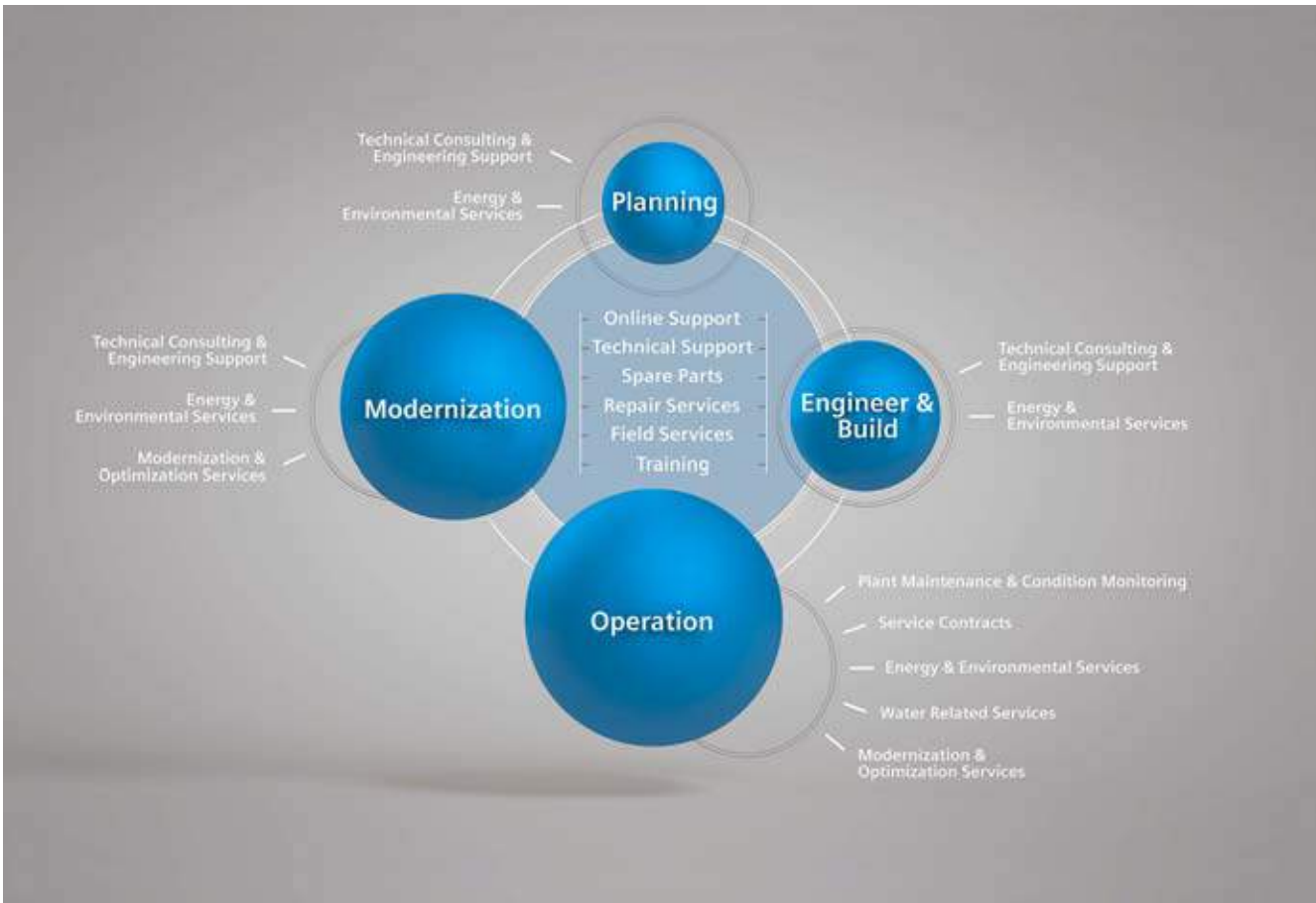


In view of rising cost pressure, growing energy costs, and increasingly stringent environmental regulations, industrial services are a crucial competitive factor in manufacturing as well as in process industries.

All over the world, Siemens supports its customers with product, system, and application-related services throughout the entire lifecycle of a plant. Right from the earliest stages of planning, engineering, and building all the way to operation and modernization, these services enable customers to benefit from the Siemens experts' unique technological and product knowledge and industry expertise.

Siemens Industry Services help reduce downtime and optimize the utilization of resources. The bottom line: increased plant productivity, flexibility, and efficiency, plus reduced overall costs.

Discover all advantages of our service portfolio: [www.siemens.com/industry-services](http://www.siemens.com/industry-services)



Siemens supports its clients with technology based Services across a plants entire life cycle.

#### Overview (continued)

##### Online Support:



Fast technical information on all products of Siemens Industry in the form of manuals, FAQs or application examples can sometimes supersede contact with an expert.

The Siemens Industry Online Support provides everything you need – even the opportunity to share know-how, experiences, and ideas with other users.

##### Technical Support:



Technical inquiries about products and systems can occur any time - from optimal use to fault clearance.

The Technical Support specialists provide 24/7 support and answer questions about the functionality and utilization of products and systems.

##### Spare Parts:



A missing spare part can compromise plant availability and cause production losses.

It is good to know that the specialists from Siemens ensure a fast and smooth exchange process.

##### Repair Services:



Motors and converters that operate reliably are vital in any plant. All over the world, the specialists from Siemens provide comprehensive service and take care of all repairs in order to ensure their utmost efficiency.

# Services and documentation

## Industry Services

Industry Services  
for the entire life cycle

### Overview (continued)

#### Field Services:



The availability of machines and plants is of highest importance in all industries. Field Services from Siemens facilitate smooth commissioning and maintenance and ensure the fast clearance of faults in industrial plants.

#### Training:



In view of today's rapid technological progress, up-to-date knowledge increasingly becomes a key success factor. Siemens delivers know-how and practical knowledge directly from the manufacturer in the SITRAIN – Training for Industry technical training programs. No one is closer to the business.

#### Technical Consulting & Engineering Support:



The basis for efficient industrial services is established as early as during plant planning and design. Systematic solutions throughout the entire lifecycle are in high demand. Siemens' Technical Consulting & Engineering Support provides ideally suited tools to the industry – from the first stages of project planning all the way to operation.

#### Energy & Environmental Services:



Sustainability, as well as energy and environmental responsibility in business processes, pays off in any business. Energy efficiency, energy management, and the sparing of resources are important topics in all industries today. Integrated solutions from Siemens unleash all technical and organizational efficiency potential and ensure successful environmental management.



#### Overview (continued)

##### *Plant Maintenance & Condition Monitoring:*



Plant efficiency and smooth processes are vital success factors in all industries.

Proactive maintenance concepts and customized service contracts are based on the Siemens specialists' long-standing experience and ensure maximum productivity.

##### *Service Contracts:*



A service contract ensures the high degree of security that is indispensable in all industries today.

Customized service packages for maintenance ensure minimum downtime and reduce maintenance costs. The opportunities of remote maintenance provide additional reliability.

##### *Water Related Services:*



Highest water quality is a crucial factor in many industrial processes. This is why the production of ultra-pure water is of great importance for many businesses. In addition to that, all industries have to recycle the waste water they produce. Siemens services for water and waste water ensure the profitability and environment-compatibility of water systems and secure sustainable business success.

##### *Modernization & Optimization Services:*



Expansions, modernizations, and optimizations are pretty common in all industries.

They are the most cost-efficient key to optimal productivity in industrial production and to the sustainable investment protection.

Good to know that Siemens provides professional service in this area, too.

# Services and documentation

## Industry Services

### Industry Online Support

#### Overview

Via our Online Support you have direct, central access to substantial information about products, systems, and applications for the industry as well as to a wide range of programming, configuration, and application examples. All content is available in six languages and accessible from all over the world with the mobile app. The Online Support's technical forum makes it possible to share ideas and experiences with other users, while Siemens' Technical Support experts can be contacted through Support Request.

The Siemens Industry Online Support, featuring up-to-date content and software updates as well as newsletters and tweets, keeps industry users continually up to speed.

[www.siemens.com/industry/OnlineSupport](http://www.siemens.com/industry/OnlineSupport)

#### Industry Online Support App



Access to more than 300.000 documents on all Siemens Industry products – anywhere and anytime

➤ Available for iOS and Android

Scan the QR code for information on our Online Support app.



[www.siemens.com/industry/OnlineSupportApp](http://www.siemens.com/industry/OnlineSupportApp)

Using the Online Support app, you can access over 300,000 documents covering all Siemens industrial products – anywhere, any time. Regardless of whether you need help implementing your project, fault-finding, expanding your system or are planning a new machine.

You have access to FAQs, manuals, certificates, characteristics curves, application examples, product notices (e.g. announcements of new products) and information on successor products in the event that a product is discontinued.

Just scan the product code printed on the product directly using the camera of your mobile device to immediately see all technical information available on this product at a glance. The graphical CAx information (3D model, circuit diagrams or EPLAN macros) is also displayed. You can forward this information to your workplace using the e-mail function.

The search function retrieves product information and articles and supports you with a personalized suggestion list. You can find your favorite pages – articles you need frequently – under "mySupport". You also receive selected news on new functions, important articles or events in the News section.

The app is available free of charge from the Apple App Store (iOS) or from Google Play (Android).

### Overview

#### SPARESonWeb – Online spare parts catalog



SPARESonWeb is a web-based tool for customers who are looking for spare parts for specific automation products and systems. After you have registered and entered the serial number and order number, the spare parts available for the relevant unit are displayed.

For example, the delivery state for specific orders can be displayed for all shipped SINAMICS products.

<http://workplace.automation.siemens.com/sparesonweb>

# Services and documentation

## My Documentation Manager

### Overview



Compile customized documentation

### My Documentation Manager – Customizing information

My Documentation Manager offers all Motion Control customers an innovation with extended usability: Machine manufacturers and end customers are not only able to assemble their own customized technical documents for a specific product or system, they can also generate complete libraries with individually configured contents. The content that matches your topic can be found from the full range of I IA&DT documentation stored under Service & Support using the operator interface and assembled using Drag & Drop into application-based libraries, generated and even combined with your own documentation. The self-generated collections can be saved in the commonly used RTF and PDF formats or even in XML format.

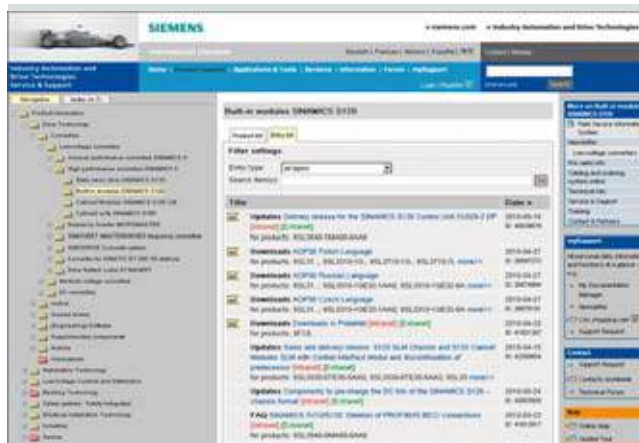
You must register for Configure and Generate/Manage (the existing login can be used, e.g. Industry Mall [www.siemens.com/industrymall](http://www.siemens.com/industrymall))

### Benefits

- Display  
View, print or download standard documents or personalized documents
- Configure  
Transfer standard documents or parts of them to personalized documents
- Generate/Manage  
Produce and manage personalized documents in the formats PDF, RTF or XML

### Design

My Documentation Manager is the web-based system to generate personalized documentation based on standard documents. It is part of the Industry Services Portal.



Search in the Industry Services Portal



Document in My Documentation Manager

### Function

#### Opening My Documentation Manager

There are two ways to open My Documentation Manager:

- Search in the Industry Services portal [www.siemens.com/industry-services](http://www.siemens.com/industry-services)
- Appropriate manuals are designated as "configurable". My Documentation Manager opens by clicking on "Display and configure". The selected document is displayed as the current document.
- Using the direct link from the Industry Services portal [www.automation.siemens.com/docconf/](http://www.automation.siemens.com/docconf/)
- After logon/registration, the online help is displayed as the current document.

### More information

Further information can be found on the Internet at:

[www.siemens.com/mdm](http://www.siemens.com/mdm)

### Overview

A high-quality programmable control or drive system can be used to maximum effect only if the user is aware of the performance of the products used as a result of intensive training and good technical documentation.

This is becoming more important due to the shorter innovation cycles of modern automation products and the convergence of electronics and mechanical engineering.

Comprehensive documentation is available for SIMOTION and the SINAMICS S120 drive system, including the Operating Manual, Programming Manual or Configuration Manual, as well as the Commissioning Manual.

Information is available in the following formats:

- Paper version, printed copy
- PDF file available for download on the Internet at: [www.siemens.com/automation/support](http://www.siemens.com/automation/support)

More information is available on the Internet at: [www.siemens.com/motioncontrol/docu](http://www.siemens.com/motioncontrol/docu)

Information and documentation relating to SIMOTION are available in the form of:

- Windows Help in conjunction with the SCOUT engineering system
- Documentation (PDF) on the product CD-ROM
- Documents/documentation at: <http://support.automation.siemens.com/WW/view/en/10805436/133300>

### Application

#### Notes on the manuals:

- **Equipment Manual/Configuration Manual**  
containing all necessary information about the intended use of the components of a system, e.g. technical data, interfaces, dimension drawings, characteristics and possible applications.  
Phases of use: Cabinet configuration/setup, circuit diagram configuration/drawing.
- **Commissioning Manual**  
containing all information relevant to commissioning after installation and wiring. It also contains all safety and warning notices relevant to commissioning in addition to overview drawings.  
Phases of use: Commissioning of components that have already been connected, configuration of system functions.
- **List Manual**  
containing all parameters, function charts, and faults/alarms for the product/system as well as their meanings and setting options. It contains parameter data and fault/alarm descriptions with functional correlations.  
Phases of use: Commissioning of components that have already been connected, configuration of system functions, fault cause/diagnosis.
- **Getting Started**  
providing information about getting started for the first-time user as well as references to additional information. It contains information about the basic steps to be taken during commissioning. The information in the other documentation should be carefully observed for all of the other work required.  
Phases of use: Commissioning of components that have already been connected.
- **Function Manual Drive Functions**  
containing all the relevant information about individual drive functions: Description, commissioning and integration in the drive system.  
Phases of use: Commissioning of components that have already been connected, configuration of system functions.

# Services and documentation

## Documentation

### General documentation

#### Selection and ordering data

Description	Order No.
<b>Catalog PM 21 · 2013</b>	
• German	<b>E86060-K4921-A101-A3</b>
• English	<b>E86060-K4921-A101-A3-7600</b>
• Italian	<b>E86060-K4921-A101-A3-7200</b>
<b>Catalog ST 70 · 2011</b>	
• German	<b>E86060-K4670-A101-B3</b>
• English	<b>E86060-K4670-A101-B3-7600</b>
• French	<b>E86060-K4670-A101-B3-7700</b>
• Italian	<b>E86060-K4670-A101-B3-7200</b>
• Spanish	<b>E86060-K4670-A101-B3-7800</b>
<b>Catalog ST 80/ST PC · 2012</b>	
• German	<b>E86060-K4680-A101-B9</b>
• English	<b>E86060-K4680-A101-B9-7600</b>
• French	<b>E86060-K4680-A101-B9-7700</b>
• Italian	<b>E86060-K4680-A101-B9-7200</b>
• Spanish	<b>E86060-K4680-A101-B9-7800</b>
<b>Decentralization with PROFIBUS-DP/DPV1</b>	<b>ISBN 978-3-89578-218-3</b>

Description	Order No.
<b>User/Manufacturer documentation</b>	
<b>SINAMICS Manual Collection</b>	<b>6SL3097-4CA00-0YG1</b>
SINAMICS (SW version 4.5) Manual Collection on DVD-ROM Edition: 08/2012 Languages: English, French, German, Italian, Spanish	

#### More information

Please send any queries or suggestions to:

[docu.motioncontrol@siemens.com](mailto:docu.motioncontrol@siemens.com)

### Selection and ordering data

Description	Order No.
<b>Manufacturer and Service documentation</b>	
<b>Manual SINAMICS S120 Control Units and Additional System Components</b>	
• German	6SL3097-4AH00-0AP2
• English	6SL3097-4AH00-0BP2
• Italian	6SL3097-4AH00-0CP2
• French	6SL3097-4AH00-0DP2
• Spanish	6SL3097-4AH00-0EP2
• Russian	6SL3097-4AH00-0PP2
• Chinese Simplified	6SL3097-4AH00-0RP2
• Japanese	6SL3097-4AH00-0TP2
<b>Manual SINAMICS S120 Booksize Power Units</b>	
• German	6SL3097-4AC00-0AP4
• English	6SL3097-4AC00-0BP4
• Italian	6SL3097-4AC00-0CP4
• French	6SL3097-4AC00-0DP4
• Spanish	6SL3097-4AC00-0EP4
• Russian	6SL3097-4AC00-0PP4
• Chinese Simplified	6SL3097-4AC00-0RP4
• Japanese	6SL3097-4AC00-0TP4
<b>Manual SINAMICS S120 Chassis Power Units</b>	
• German	6SL3097-4AE00-0AP2
• English	6SL3097-4AE00-0BP2
• Italian	6SL3097-4AE00-0CP2
• French	6SL3097-4AE00-0DP2
• Spanish	6SL3097-4AE00-0EP2
• Russian	6SL3097-4AE00-0PP2
• Chinese Simplified	6SL3097-4AE00-0RP2
<b>Manual Liquid Cooled Chassis Power Units</b>	
• German	6SL3097-4AM00-0AP2
• English	6SL3097-4AM00-0BP2
• Italian	6SL3097-4AM00-0CP2
• French	6SL3097-4AM00-0DP2
• Spanish	6SL3097-4AM00-0EP2
• Chinese Simplified	6SL3097-4AM00-0RP2
<b>Function Manual SINAMICS S120 Drive Functions</b>	
• German	6SL3097-4AB00-0AP2
• English	6SL3097-4AB00-0BP2
• Italian	6SL3097-4AB00-0CP2
• French	6SL3097-4AB00-0DP2
• Spanish	6SL3097-4AB00-0EP2
• Russian	6SL3097-4AB00-0PP2
• Chinese Simplified	6SL3097-4AB00-0RP2
• Japanese	6SL3097-4AB00-0TP2

Description	Order No.
<b>Manufacturer and Service documentation</b>	
<b>Commissioning Manual SINAMICS S120</b>	
• German	6SL3097-4AF00-0AP2
• English	6SL3097-4AF00-0BP2
• Italian	6SL3097-4AF00-0CP2
• French	6SL3097-4AF00-0DP2
• Spanish	6SL3097-4AF00-0EP2
• Russian	6SL3097-4AF00-0PP2
• Chinese Simplified	6SL3097-4AF00-0RP2
<b>Function Manual SINAMICS S120 Safety Integrated</b>	
• German	6SL3097-4AR00-0AP3
• English	6SL3097-4AR00-0BP3
• Italian	6SL3097-4AR00-0CP3
• French	6SL3097-4AR00-0DP3
• Spanish	6SL3097-4AR00-0EP3
• Russian	6SL3097-4AR00-0PP3
• Chinese Simplified	6SL3097-4AR00-0RP3
<b>Manual SINAMICS S120 AC Drive</b>	
• German	6SL3097-4AL00-0AP2
• English	6SL3097-4AL00-0BP2
• Italian	6SL3097-4AL00-0CP2
• French	6SL3097-4AL00-0DP2
• Spanish	6SL3097-4AL00-0EP2
• Chinese Simplified	6SL3097-4AL00-0RP2
• Japanese	6SL3097-4AL00-0TP2
<b>List Manual SINAMICS S120/150</b>	
• German	6SL3097-4AP00-0AP3
• English	6SL3097-4AP00-0BP3
• Italian	6SL3097-4AP00-0CP3
• French	6SL3097-4AP00-0DP3
• Spanish	6SL3097-4AP00-0EP3
• Russian	6SL3097-4AP00-0PP3
• Chinese Simplified	6SL3097-4AP00-0RP3
• Japanese	6SL3097-4AP00-0TP3
<b>Getting Started SINAMICS S120</b>	
• German	6SL3097-4AG00-0AP1
• English	6SL3097-4AG00-0BP1
• Italian	6SL3097-4AG00-0CP1
• French	6SL3097-4AG00-0DP1
• Spanish	6SL3097-4AG00-0EP1
• Portuguese	6SL3097-4AG00-0KP0
• Russian	6SL3097-4AG00-0PP1
• Chinese Simplified	6SL3097-4AG00-0RP1
<b>EMC Design Guidelines</b>	
• German	6FC5297-0AD30-0AP3
• English	6FC5297-0AD30-0BP3
• Italian	6FC5297-0AD30-0CP3
• French	6FC5297-0AD30-0DP3
• Spanish	6FC5297-0AD30-0EP3
• Chinese Simplified	6FC5297-0AD30-0RP3

# Services and documentation

## Documentation

### Motors for SINAMICS

#### Selection and ordering data

Description	Order No.
<b>Manufacturer and Service documentation</b>	
<b>Configuration Manual 1FT7 Synchronous Motors</b>	
• German	6SN1197-0AD13-0AP4
• English	6SN1197-0AD13-0BP4
• Italian	6SN1197-0AD13-0CP4
• French	6SN1197-0AD13-0DP4
• Spanish	6SN1197-0AD13-0EP4
• Chinese Simplified	6SN1197-0AD13-0RP4
<b>Configuration Manual 1FK7 Synchronous Motors</b>	
• German	6SN1197-0AD16-0AP4
• English	6SN1197-0AD16-0BP4
• Italian	6SN1197-0AD16-0CP4
• French	6SN1197-0AD16-0DP4
• Spanish	6SN1197-0AD16-0EP4
• Russian	6SN1197-0AD16-0PP0
• Chinese Simplified	6SN1197-0AD16-0RP4
<b>Configuration Manual 1PH7 Asynchronous Motors</b>	
• German	6SN1197-0AC71-0AP0
• English	6SN1197-0AC71-0BP0
• Italian	6SN1197-0AC71-0CP0
• French	6SN1197-0AC71-0DP0
• Spanish	6SN1197-0AC71-0EP0
• Chinese Simplified	6SN1197-0AC71-0RP0
<b>Configuration Manual 1PH8 Synchronous/ Asynchronous Motors</b>	
• German	6SN1197-0AD74-0AP1
• English	6SN1197-0AD74-0BP1
• Italian	6SN1197-0AD74-0CP1
• French	6SN1197-0AD74-0DP0
• Spanish	6SN1197-0AD74-0EP0
• Chinese Simplified	6SN1197-0AD74-0RP1
<b>Configuration Manual 1FN3 Linear Motors Peak Load and Continuous Load</b>	
• German	6SN1197-0AB86-0AP0
• English	6SN1197-0AB86-0BP0
<b>Configuration Manual 1FN6 Linear Motors</b>	
• German	6SN1197-0AB78-0AP3
• English	6SN1197-0AB78-0BP3
• Italian	6SN1197-0AD78-0CP3
• French	6SN1197-0AD78-0DP3
• Chinese Simplified	6SN1197-0AD78-0RP3
<b>Configuration Manual 1FW3 Complete Torque Motors</b>	
• German	6SN1197-0AD70-0AP6
• English	6SN1197-0AD70-0BP6
• Italian	6SN1197-0AD70-0CP6
• French	6SN1197-0AD70-0DP6
• Spanish	6SN1197-0AD70-0EP6
• Chinese Simplified	6SN1197-0AD70-0RP4
<b>Configuration Manual 1FW6 Built-In Torque Motors</b>	
• German	6SN1197-0AE00-0AP5
• English	6SN1197-0AE00-0BP3
• Italian	6SN1197-0AE00-0CP3
• French	6SN1197-0AE00-0DP3
• Spanish	6SN1197-0AE00-0EP3
• Chinese Simplified	6SN1197-0AE00-0RP3

### Measuring systems

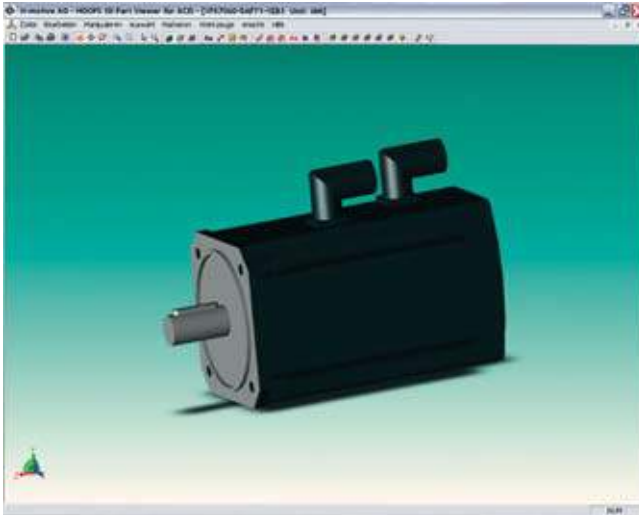
#### Selection and ordering data

Description	Order No.
<b>Manufacturer and Service documentation</b>	
<b>User Manual SIMODRIVE sensor Absolute Value Encoder with PROFIBUS DP</b>	
• English/German	6SN1197-0AB10-0YP4



### Overview

#### CAD CREATOR – Dimension drawing and 2D/3D CAD generator



Thanks to the user-friendly operator interface of the CAD CREATOR, it is easy to configure controls, drives and motors. With the support of the CAD CREATOR, product-specific dimension drawings and 2D/3D CAD models can be created quickly. The CAD CREATOR assists the machine manufacturer's designers, offer drafting engineers and project engineers.

### Benefits

- Provision of dimension drawings as 2D/3D-CAD models in mm and inches
- With the online version, 3D models and dimension drawings can also be displayed in the form of a direct downloadable PDF
- Support for all general geometry interfaces STEP, IGES, Parasolid, SAT, VDA, and for special interfaces such as Ideas, NX, Solid Edge, Pro/Engineer, Autocad, Inventor, Mechanical Desktop, Catia and Solidworks
- Multi-language operator interface in English, French, German, Italian and Spanish, and direct Help (English and German)
- Dimension drawings and 2D/3D CAD models for
  - Motors
    - 1FT6/1FT7/1FK7 synchronous motors
    - 1FE1 built-in synchronous motors
    - 1FW3 torque motors
    - 1FW6 built-in torque motors
    - 1FT6/1FT7/1FK7 geared motors
    - 1PH8 synchronous/asynchronous motors
    - 1PH7/1PH4/1PL6/1PM4/1PM6 asynchronous motors
    - 2SP1 motor spindles
    - 1FN3, 1FN6 linear motors
  - SINAMICS S110, SINAMICS S120
    - Control Units
    - Power Modules (Blocksize/Chassis, Combi)
    - Line Modules (Booksize/Chassis)
    - Line-side components
    - Motor Modules (Booksize/Chassis)
    - DC link components
    - Additional system components
    - Load-side power components
    - Encoder system connection
    - MOTION-CONNECT connection system

### Benefits (continued)

- SINUMERIK
  - CNC systems
  - Operator components for CNC systems
- SIMOTION
  - SIMOTION D
  - SIMOTION C

The CAD CREATOR offers a variety of options for configuring, but also different methods for searching for a product:

- According to order number
- According to technical description

After successful configuration of the product, the dimension drawings and models are displayed with the integrated viewer and made available for export.

### Selection and ordering data

Description	Order No.
<b>CAD CREATOR</b>	<b>6SL3075-0AA00-0AG0</b>
Dimension drawing and 2D/3D CAD generator on DVD-ROM	
Languages: English, French, German, Italian, Spanish	

### More information

The CAD CREATOR is available on DVD-ROM and as an Internet application.

More information is available on the Internet at:

[www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)

# Services and documentation

Notes

14

## Sector-specific solutions

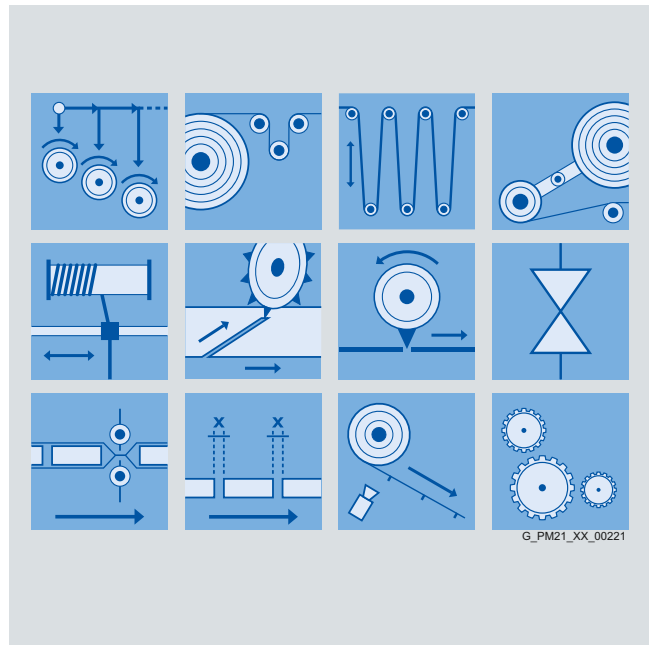


<b>15/2</b>	<b>Introduction</b>
<b>15/4</b>	<b>Packaging solutions</b>
15/4	OPL Software Toolbox
15/6	Molding, filling and sealing machine
15/8	SIMOTION carton packer
15/10	SIMOTION Intelligent Belt
<b>15/12</b>	<b>Printing presses</b>
15/12	Commercial printing
15/14	Flexo printing
15/16	Rotogravure package printing
15/18	Newspaper printing
15/20	Digital printing
15/21	Integrated register control
<b>15/22</b>	<b>Textile machines</b>
15/22	Fleece folding machine
15/24	Weaving machine
<b>15/26</b>	<b>Converting</b>
15/26	Printing, stamping and embossing machines
15/28	Continuous web coating and laminating technology
15/30	Machines for the manufacture of hygiene and tissue products
<b>15/32</b>	<b>Plastics</b>
15/32	Automation for extruders
15/34	Servo pump
<b>15/36</b>	<b>Metal forming technology</b>
15/36	Roll feeds
15/38	Electronic transfer
15/40	Mechanical universal press
15/42	Pipe bending
15/44	Hydraulic presses
15/46	Wire wrapping
15/48	Wire-drawing and cable machines
15/49	Servo press
<b>15/52</b>	<b>Handling</b>
15/52	SIMOTION Handling Toolbox
<b>15/54</b>	<b>Customer applications</b>
15/54	Optimized Packaging Line
<b>15/56</b>	<b>Renewable energy</b>

# Sector-specific solutions

## Introduction

### Overview



Examples of function blocks for SIMOTION

Siemens offers a completely unique spectrum of products for machine construction: Integrated, energy-efficient and flexible automation and drive systems for any task – in any industry. With our innovative products, systems and integrated solutions, we help you to build a better machine – faster and cheaper.

The ability to innovate and to directly address the interests of customers is more important today than ever. Products alone, as innovative as they may be, do not suffice any longer. To recognize trends and respond to them, that is the key – whether in the form of innovative systems, intelligent solutions or the provision of unique services.

#### *Innovative systems*

One of the most important trends is toward modular machines and plants. One-off solutions are being gradually replaced by modular systems and distributed automation concepts. This offers advantages especially with regard to project runtimes and enhanced quality through the use of tried and tested modules in the hardware and software.

Siemens is offering an integrated solution here with distributed automation concepts in combination with a drive system.

Our extremely wide range of powerful and innovative standard components for automation technology and drive systems has a uniform system basis and supports integrated programming, data management and communication. This prevents problems with interfaces. Holistic, integrated solutions are created with uniform handling and uniform engineering and yet considerable scope remains for implementing your individual solutions.

#### *Intelligent solutions*

Our specialists have used our SIMOTION and SINAMICS system platforms in order to develop standardized function blocks and sample applications for you. Because we use open standards, our solutions and components allow you to integrate your own developments and therefore your own specialist knowledge. You can access an application database, which is supplied with information from around the world, containing ready-to-apply, provenly successful solutions created by Siemens application engineers.

These are not finished applications, but modules for typical sub-tasks on machines. A project can be implemented faster by using them. These modules can be adapted very rationally to the requirements of individual applications. Your special expertise is neither changed nor revealed. Using the ProjectGenerator easyProject, you can very rapidly create a structured, executable basic framework which supports basic functions such as boot check, error and message handling, communication and basic axis functionality.

However, our specialists will also be happy to help you to create individual complete solutions, either for new projects or for the modernization of existing plants. Our application centers can offer reliable system selection, a system concept optimized according to customer specifications, short development time, budget security, certainty that the required performance and scope of functions will be delivered by deadline and on budget, and the flexibility afforded by Motion Control solutions which are modular and mechatronic in design. In a Siemens technology and application center, it is possible (machine size and material flow permitting) to precisely measure and optimize the machine performance that can be achieved with the Motion Control solution under real conditions with the help of high-speed cameras, digital storage oscilloscopes, FFT analyzers, balance and vibration detectors, accelerometers, load cells and laser measuring instruments.

Our technology is as long-lived as your machines. Expansions are still possible after many years, you can therefore rely on a system expansion capability that is assured for the long term.

**Overview** (continued)*Provision of unique services*

Innovative services such as mechatronic support and application advice round off Siemens' range of products, systems and services. With "Mechatronic support", for example, the generally costly construction of a prototype can become considerably less risky and faster by using virtual prototypes – the first real prototype is then final. The time to market and construction costs are therefore drastically reduced. The range of complete solutions offers potential for rationalization, e.g. a completely assembled, tested and customized control cabinet that can practically be delivered to the production line of the end customer with plug and play functionality.

Another emerging trend is the transformation into a "full supplier". In this case, the end customer requests everything from a single source for the new production line with vertical and horizontal integration throughout the complete process. To satisfy these and further future requirements and to open up new markets at the same time, machine manufacturers need strong partners at their side. With Siemens, you have an experienced partner that focuses on a wide range of different industries and that will support you with individual solutions, powerful systems and innovative services and which, as a global player, maintains an all-encompassing, worldwide service network. Wherever your machine may be one day: our technology complies with the applicable standards – and is supported locally. If you wish, round the clock, every day of the year. Always exactly what you want.

*All types of references*

Our extensive experience in various industries helps us to concentrate on the important aspects. This is one of the reasons for the considerable amount of positive feedback concerning our complete range of products and services.

*Investment in the future*

We are a competent and reliable partner for Motion Control solutions in machine construction. We will be happy to work out future-oriented solutions with you for many different industries. Partnership with Siemens secures your future.

Below you will find a selection of various industry-specific solutions implemented with SIMOTION. We make a distinction here between system-tested packages that can be ordered and applications in the form of ordering examples that we will be happy to adapt to your specific machine.

**More information**

You will find further information about reference projects and industry-specific solutions with SIMOTION on the Internet at

[www.siemens.com/simotion](http://www.siemens.com/simotion)

and

[www.siemens.com/machinebuilding](http://www.siemens.com/machinebuilding)

or get in touch with your contact at your local Siemens sales office.

# Sector-specific solutions

## Packaging solutions

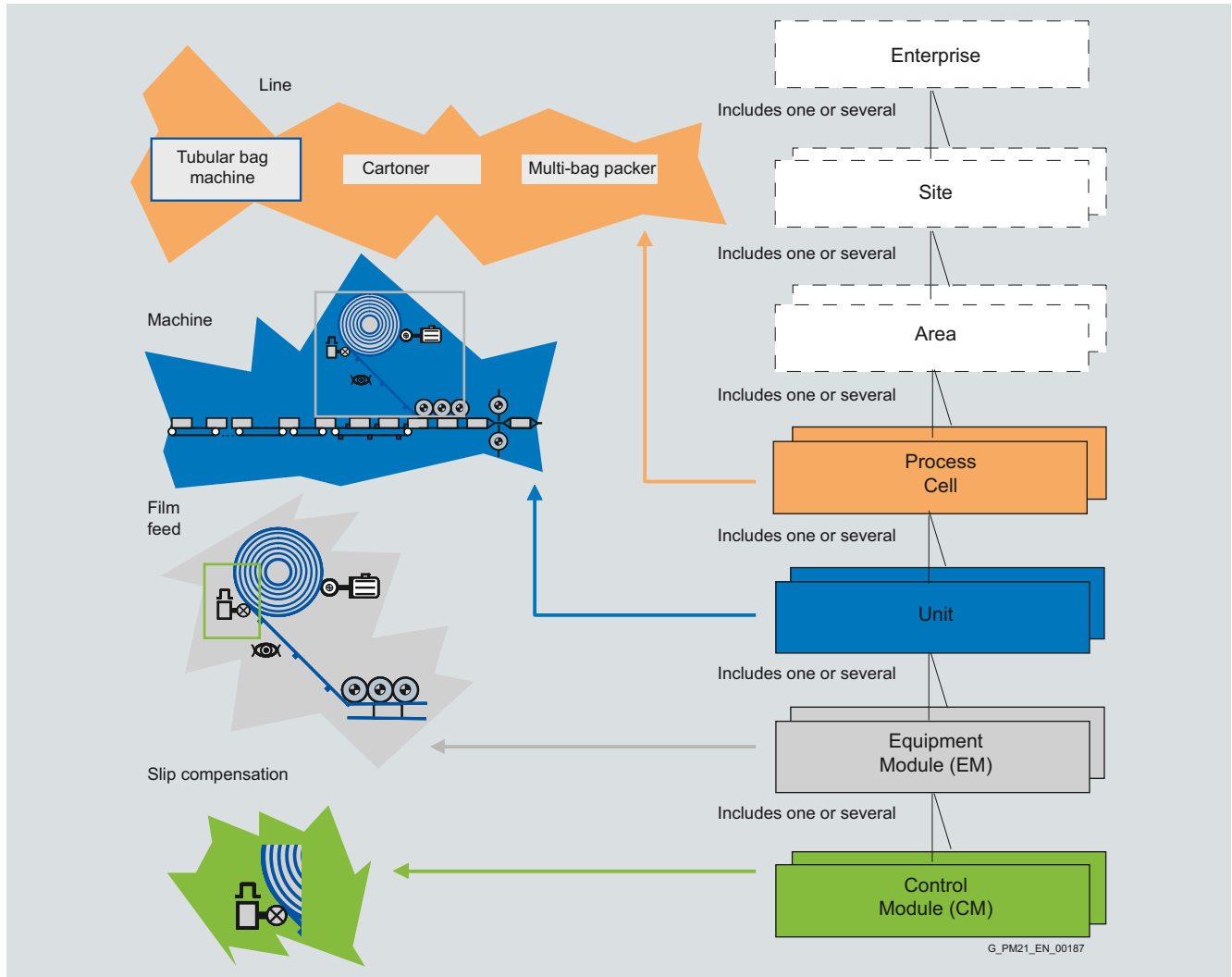
### OPL Software Toolbox

#### Overview

Efficient engineering is the key to short development and commissioning times in the packaging industry and thus for machines which can compete on international markets. Tried and tested basic functions as well as technology, application and communication modules based on the ProjectGenerator are

available for the packaging industry. In addition, comprehensive Web diagnostic pages, which are generated automatically, help significantly in the existing commissioning and maintenance scenarios.

#### *Hierarchical model according to ISA-S88 (Make2Pack)*



The diagram shows an example of a packaging line based on the hierarchical model ISA S88 (Make2Pack)

The ProjectGenerator enables you to create a hierarchical machine model and is suitable for the use of equipment modules developed specially for the packaging industry.

You can reap many of the benefits of using the ProjectGenerator. This applies both to series machines where you might want a simple method of implementing flexible machine variants with modularized components, and to single machines which are often based on standardized function units.

The integrated basic functions alone such as the boot check, message handling and operating mode management functionality provided by the ProjectGenerator often account for a large portion of the programming and configuring work which must usually be done manually and can be time-consuming and error-prone.

**Overview** (continued)*Hierarchical structures for modular machine construction*

The ProjectGenerator also supports the modularization and standardization of machine functions via so-called equipment modules that are widely used particularly in the packaging industry. The equipment modules include film take-off, cross sealer or winder for the fast, modular configuration, for example, of form/fill/seal machines, cartoning machines or indeed any other type of production machine. In turn, each equipment module can also contain one or more control modules, such as a print-mark correction, a temperature controller or just a single technology axis. The ProjectGenerator therefore complies with the specifications of the international ISA-S88 Make2Pack standard.

There are two distinct advantages of this standardized, hierarchical structure: All components integral to the project utilize standardized interfaces and a uniform communication protocol. This level of standardization is so far-reaching that a standardized machine interface containing command, status, administration and alarm information can be used to integrate fundamentally different machines in a single line and supply all the data required for higher-level visualization and diagnostics.

The software for the different modules need only be created once and can be selected and configured in the ProjectGenerator with just a few clicks of the mouse. In this case, the modules might be simply a frame object with standardized interfaces or take the form of fully programmed entities.

Thanks to this standardization, individual modules of the ProjectGenerator, whether they are configured within a single machine or between multiple machines, can be integrated in a single line.

*Customized expansions are possible*

With the basic, technology and application modules provided by the ProjectGenerator, it inherently covers a broad spectrum of packaging machine applications. However, it can be adapted and expanded to meet specific customer requirements. For example, you can incorporate additional functions and user-specific modules into the automated engineering process with the ProjectGenerator.

*Equipment modules for packaging machines*

The OPL Software Toolbox for packaging machines supplies you with a kit of equipment modules with which you can automate any number of different types of packaging machine.

Examples:

- Packaging solutions for molding, filling and sealing machines
- Packing solution for carton packers
- Packaging solution Intelligent Belt

For details about the packaging solutions listed above [see the following pages](#).

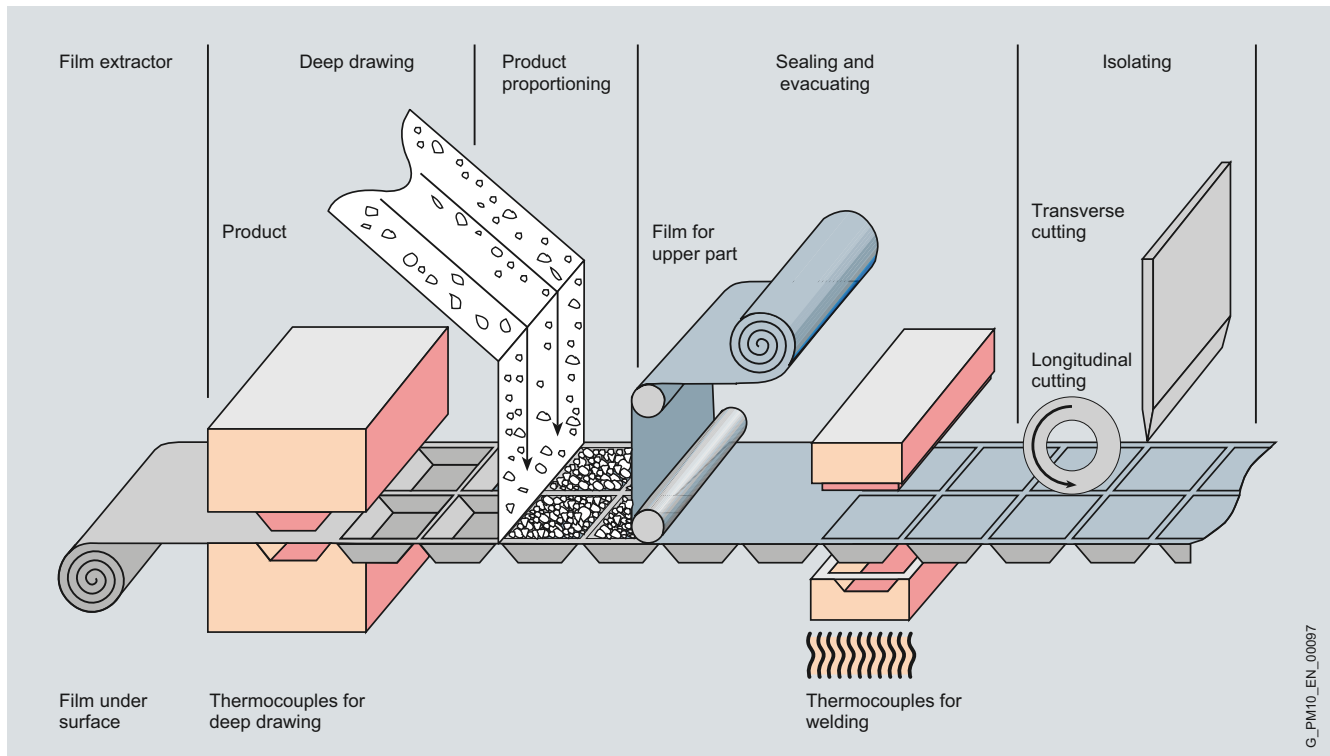
For further information about the ProjectGenerator [see Chapter 9 on page 9/93](#).

# Sector-specific solutions

## Packaging solutions

### Molding, filling and sealing machine

#### Overview



Operating principle of the molding, filling and sealing machine

#### Machine requirements

With the molding, filling and sealing machine, the film for the underparts is transferred from station to station by a main drive.

The film is molded to suitable containers in accordance with the product that is to be packed. The mold that is submerged in the film is guided at different velocity levels that depend on the path of the tool and with the appropriate heating temperature.

The product must be filled into the container accurately in terms of clock cycle and quantity.

To prevent deterioration of the product and to seal it, the covering film must be drawn off a second coil. The heated surface is then placed on the container from the top and the container is sealed due to the effect of the heat.

The sealed packages are then cut into smaller units and removed for further packaging.

The cross-cutter is moved pneumatically or electrically. The objective is to control the procedure such that as many parts as possible pass through the machine per unit of time. Foil-specific parameters have to be taken into account on accelerating and braking.

High clock rates and changes in format at the press of a button are the main requirements.

The following Motion Control and technology functions are used to implement the machine:

- Position
- Cam
- Output cam
- Longitudinal cutter
- Temperature control

#### Benefits

The SIMOTION automation solution described below offers the following advantages:

- ONE system for the logic, Motion Control and technology functions. The engineering is considerably simplified and the hardware outlay is minimized.
- Libraries for the FFV machine are included in the OPL Software Toolbox. Machine projects are easy to generate with these libraries.
- Comprehensive diagnostic functions with SIMOTION, such as trace functions, Alarm S concept and teleservice reduce commissioning times, increase the availability of the machine and its productivity.
- Smooth running of the machine thanks to the cam and servo drives
- High productivity
- Machine parameters can be easily and flexibly adjusted on the operator panel, e.g. print pattern shift, sealing time
- OPL line integration on the basis of communication libraries and operating data management, e.g. in accordance with OMAC, are available in the OPL Toolbox and can be integrated easily.

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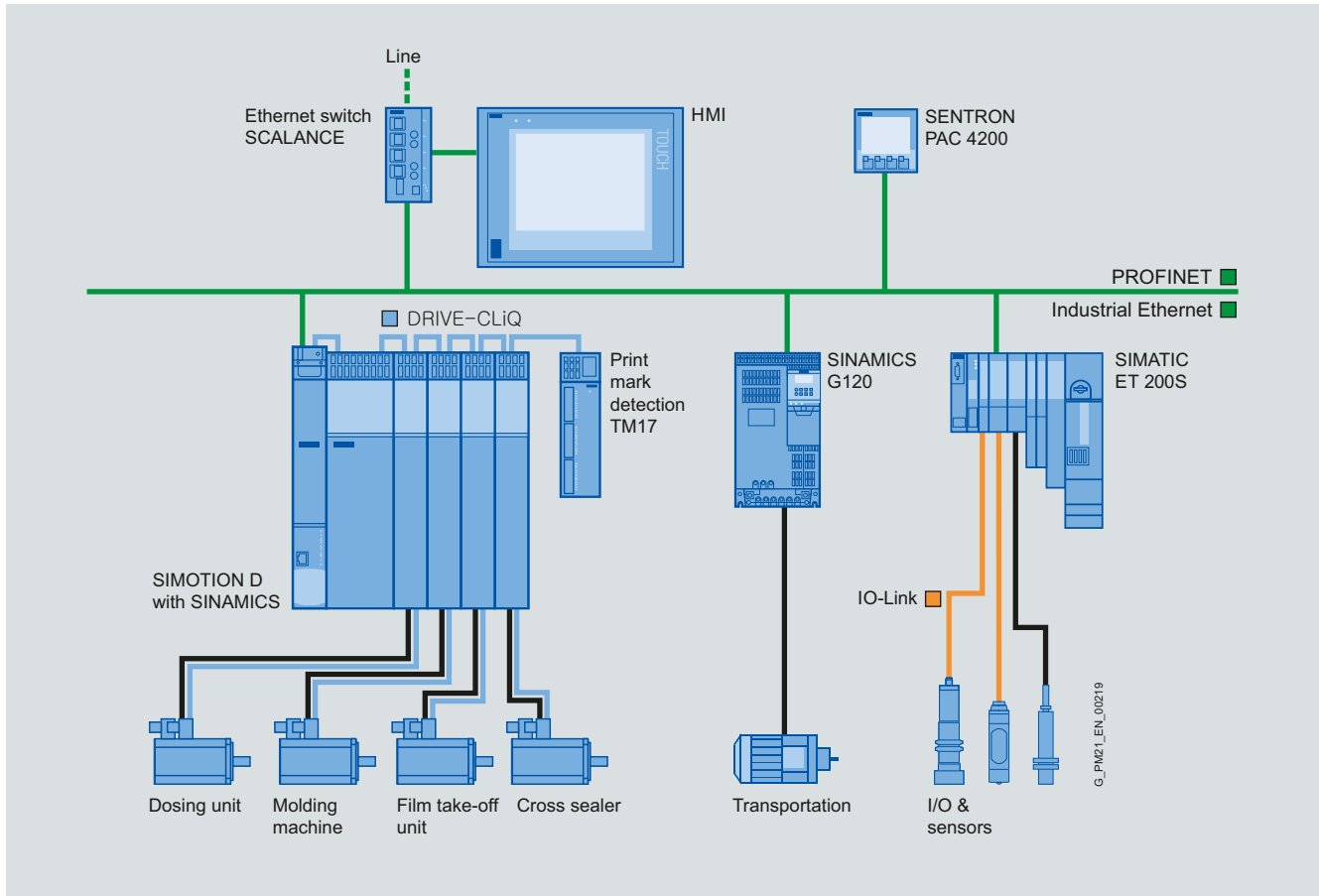


**Design****Automation solution**

The drive-based version of SIMOTION for multi-axis applications, SIMOTION D4x5-2, is selected. With this choice, control logic, Motion Control, drive functionality and HMI functions are combined in a single hardware and software system.

User interfaces are available as templates for the HMIs.

The SINAMICS S120 drive system in combination with SIMOTICS S-1FK7 servomotors offers optimized interfacing to SIMOTION D. It resolves demanding drive tasks and provides an accurate, highly dynamic response.



Example of automation solution with SIMOTION D4x5-2

**More information**

More information can be found on the Internet at

[www.siemens.com/packaging](http://www.siemens.com/packaging)

# Sector-specific solutions

## Packaging solutions

### SIMOTION carton packer

#### Overview



#### Machine requirements

A cartoner packs products or individual packaged units into cartons. This process is divided into the following phases:

- Forming the packaging
- Filling
- Sealing

In the case of the cartoner, a distinction is made between two types depending on the packaging material used:

- Blank box erecting machine
- Folding box erecting machine

Basic process structure:

- The product is pushed onto the flat carton and both parts are pressed through the folding duct by a ram.
- The blank box is erected by folding baffles and guides.
- The glued connecting pieces are then pressed against the side walls.
- After folding, the carton is transported to another station where the lid is glued.
- Preassembled folding cartons are erected from a flat blank box.
- Independent synchronism of products and erected folding cartons
- Product and carton are brought together by so-called product infeed
- At this point, the product is pushed from the product conveyor belt into the box on the second conveyor belt.

#### Benefits

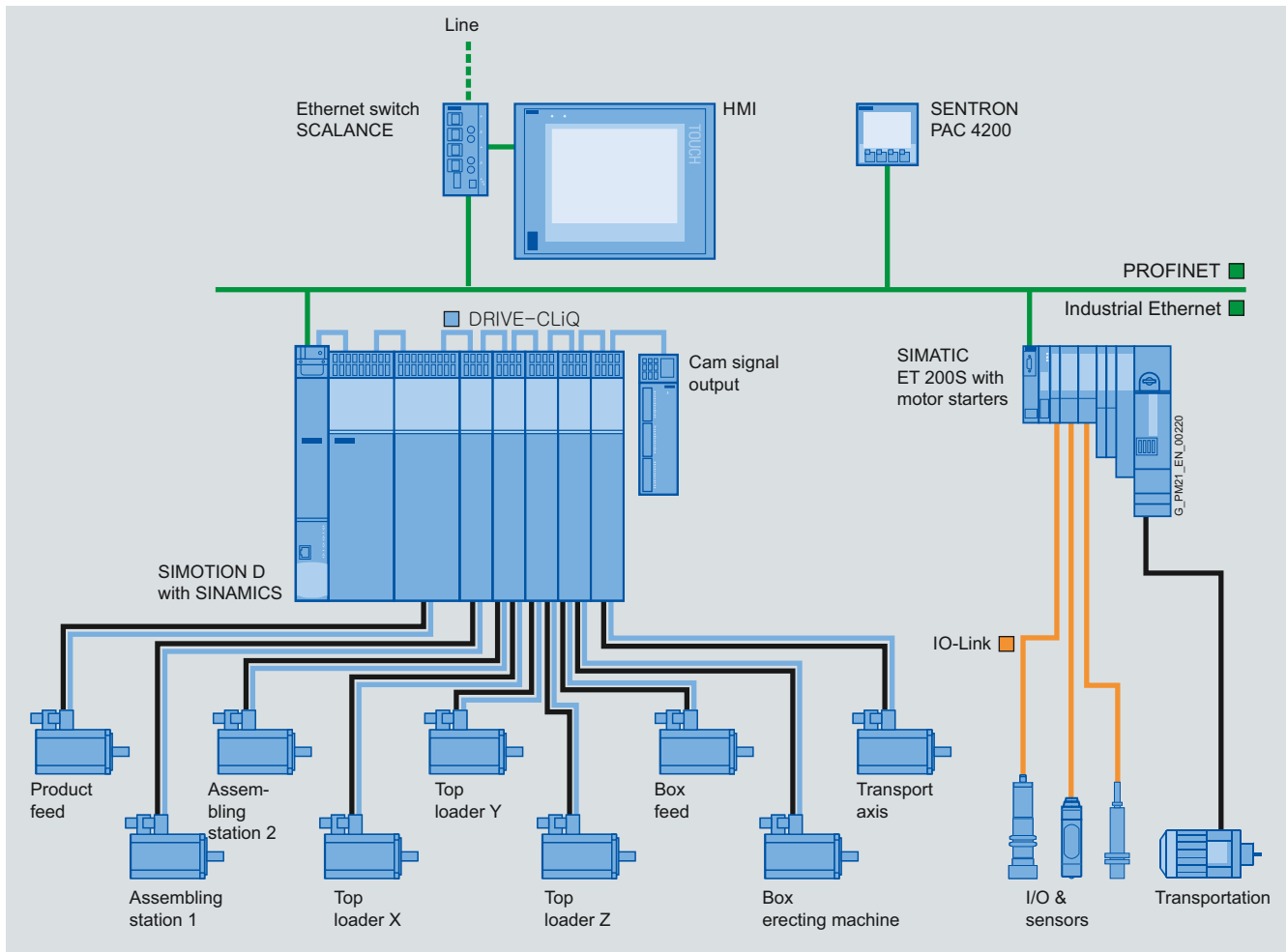
In order to pack products like bottles, bags or other very small products like lipsticks into folding boxes, it is necessary to precisely coordinate a variety of steps and motional sequences, sometimes in a seconds cycle.

Crucial to success with applications of this type are the drive-based SIMOTION Motion Control System and SINAMICS, compact systems into which the necessary performance and functionality are integrated.

Libraries for the cartoner are included in the OPL Software Toolbox. Machine projects are easy to generate with these libraries.

- Easy, reliable generation of the machine project using preconfigured, tested equipment modules to simplify commissioning
- Compatibility with all drives and encoder types reduces engineering costs
- All functions can be configured – programming has been reduced to a minimum – resulting in fast integration into the user program.
- Remote diagnostics, commissioning and configuring tools that are integrated into the uniform and scalable SCOUT engineering system reduce servicing and configuring times.
- The following are examples of equipment modules for the cartoner:
  - Suction
  - Ram
  - Conveyor belt
  - Product infeed
- These function blocks contain basic functions, automatic mode which can be configured in detail, and supplementary functions for manual operation (return to initial state, jogging, homing)
- OPL line integration on the basis of communication libraries and operating data management, e.g. in accordance with OMAC, are available in the OPL Toolbox and can be integrated easily.

## Design



Example application of a cartoner

### Automation solution

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the machine.

The performance characteristics are harmonized in accordance with process engineering requirements:

- Operator control/visualization/diagnostics
- Process control
- Motion control
- Drive-related control

### Machine control

The machine control is implemented with SIMOTION D4x5-2. It performs the following PLC and Motion Control functions:

- Logic
- Operating mode manager
- Setpoint input
- Closed-loop controls (tension, gluing)
- Machine monitoring
- Synchronous operation
- Cams
- Communication with upstream and downstream installations
- Interfacing of higher-level systems

### Operator control and monitoring (HMI)

Operator control and monitoring of the machine is performed, for example, using a Multi Panel with the WinCC flexible runtime and configuring software. The Panel Template contains the following screens:

- Operating mode management in accordance with OMAC
- Navigation bars
- Icon collection
- Diagnostics/remote diagnostics

### Drives

The integrated automation and drives structure is rounded off by the bus-coupled dynamic converter system SINAMICS S120 and SIMOTICS S-1FT7/-1FK7 motors.

### More information

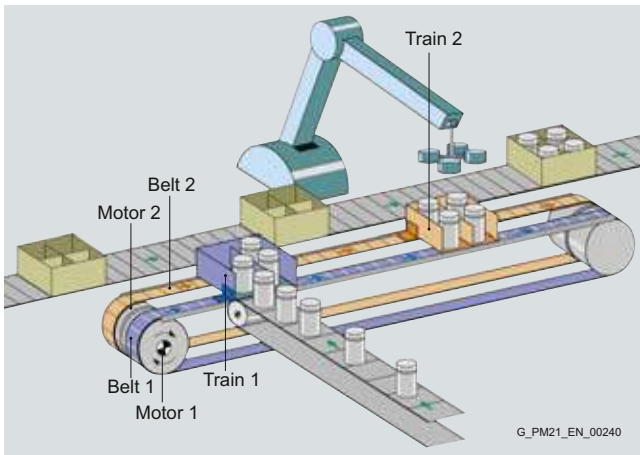
More information can be found on the Internet at [www.siemens.com/packaging](http://www.siemens.com/packaging)

# Sector-specific solutions

## Packaging solutions

### SIMOTION Intelligent Belt

#### Overview



#### Machine requirements

An "Intelligent Belt" is used to pick up multiple products arriving irregularly one after another and making them available together at an unloading location. The most important feature is how the loading and unloading phases are decoupled in terms of time. Scalable hardware platforms based on SIMOTION, SINAMICS and PROFINET are available to meet the requirements of different machines.

The SIMOTION Handling libraries are also often used for Intelligent Belt applications.

In addition to automatic operation of an Intelligent Belt (two-train), the Intelligent Belt equipment module in the OPL Software Toolbox also offers additional functions such as homing, positioning or jogging.

#### Benefits

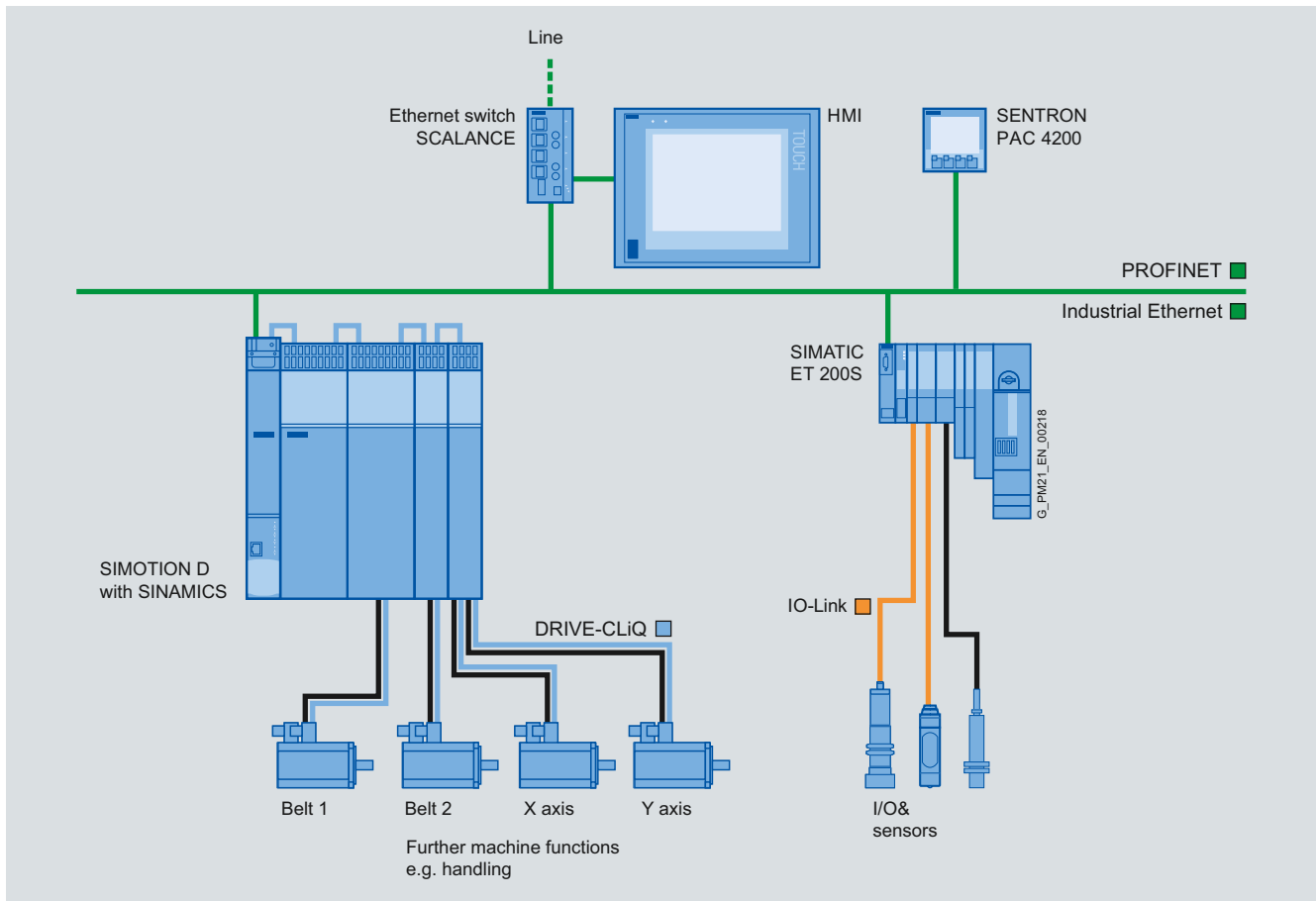
Intelligent Belt is designed to decouple production and packaging in automated conveyor belt systems. The technological basis of the packages is the SIMOTION Motion Control System.

- Easy, reliable generation of projects using preconfigured, tested software modules supported by the ProjectGenerator.
- Easier commissioning.
- Compatibility with all drives and encoder types reduces engineering costs.
- All functions can be configured – programming has been reduced to a minimum – resulting in fast integration into the user program.
- Remote diagnostics, commissioning and configuring tools that are integrated into the uniform and scalable SCOUT engineering system reduce servicing and configuring times.

The equipment module:

- The module contains basic functions (controller enables, monitors), manual operating modes (jogging, positioning, homing and return to initial state) as well as automatic mode which can be configured in detail.
- An Intelligent Belt comprises at least two trains which can be moved independently of one another on a shared track. Each train in turn comprises several pockets. The trains cannot pass one another.
- The belts or chains are run only in a positive direction. Once unloaded, the empty train is moved by the belt or chain on the underside of the mechanism back to the loading position.
- Intelligent Belt can be instantiated, which means that further belts can easily be added.

## Design



Example application with separate controls. (Can also be integrated into a single control.)

**Automation solution**

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the machine.

The performance characteristics are harmonized in accordance with process engineering requirements.

- Operator control/visualization/diagnostics
- Process control
- Motion control
- Drive-related control

**Machine control**

The machine control is implemented with SIMOTION D4x5-2. It performs the following PLC and Motion Control functions:

- Logic
- Operating mode manager
- Setpoint input
- Closed-loop controls (tension)
- Machine monitoring
- Synchronous operation
- Cams
- Homing
- Communication with upstream and downstream plant sections
- Interfacing of higher-level systems

**Operator control and monitoring (HMI)**

Operator control and monitoring of the machine is performed, for example, using a Multi Panel with the WinCC flexible runtime and configuring software. The Panel Template contains the following screens:

- Operating mode management in accordance with OMAC
- Navigation bars
- Icon collection
- Diagnostics/remote diagnostics

**Drives**

The integrated automation and drives structure is rounded off by the bus-coupled dynamic converter system SINAMICS S120 and SIMOTICS S-1FT7/-1FK7 motors.

**More information**

More information can be found on the Internet at [www.siemens.com/packaging](http://www.siemens.com/packaging)

# Sector-specific solutions

## Printing presses

### Commercial printing

#### Overview



The market for commercial printing presses demands wider and faster presses. At the same time, machine manufacturers and users require a higher automation level and greater number of axes. Our broad product range forms a perfect basis for implementing integrated solutions. An extremely wide range of drive concepts is supported: from line shaft drives to electronic line shafts with multiple drives on each printing unit and electronic cam profiles in the folder. All stations can be designed as one integrated system.

#### *System-based implementation of tailor-made solutions*

In combination with our AC motors, SINAMICS drives cover the entire performance range of commercial printing presses. Motion control and axes coordination is handled by SIMOTION. The drive system is ideally suited for the high, specialized requirements – particularly the electronic line shaft. The hardware supports a distributed, modular configuration with AC/AC devices as well as a centralized configuration with regulated or non-regulated power supply infeeds, DC bus and DC/AC devices.

#### *Integrated register control*

When used in combination with the camera-based register control TRC5000, SIMOTION can also be used as a color and cut-off register control. Integration into the drive system reduces dead times to a minimum and thus ensures the best dynamic response.

#### *Print Standard for commercial printing*

- Virtual and real master with machine ramp generator
- Plate cylinder positioning
- Color register and cut-off register adjustment
- Unwinder with flying splice

#### *Easier and more efficient communication with PROFINET*

The open industry standard PROFINET enables parallel use of automation data via standard Ethernet and isochronous drive axis data for distributed synchronous operation on one bus system. In this configuration a separate drive bus is not necessary. Your machine features a uniform network structure and cabling.

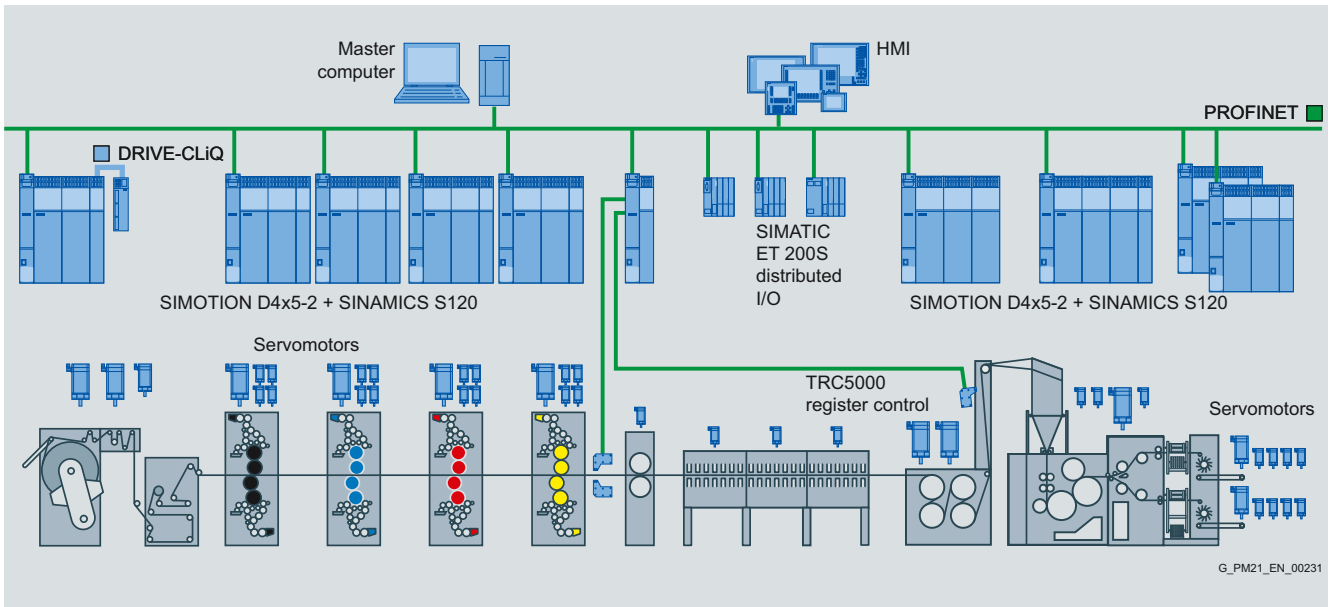
#### *The Mechatronic Team – your partner for innovations*

The development of high-speed and large-format printing presses places maximum technological demands on mechanical and electronic design. Our Mechatronic Team provides support in developing an optimum solution with their outstanding expertise. Through the simulation of the electromechanical system, it is possible, for example, to estimate the dynamic performance of a printing unit as early as the design phase.

#### **Benefits**

- Modular, scalable hardware and software
- Open software package Print Standard
- High-precision and reliable synchronization of individual drives
- Integrated system platform for all units of the printing press
- One bus system for synchronization and communication
- Safety functions available as Safety Integrated modules
- Standard components from tried and tested system families
- Wide product and performance range of synchronous and asynchronous motors as well as converters
- Integrated color and cut-off register control

#### Design



Automation solution for commercial printing

#### More information

More information can be found on the Internet at [www.siemens.com/printing](http://www.siemens.com/printing)

# Sector-specific solutions

## Printing presses

### Flexo printing

#### Overview



Whether simple stack-type presses, sophisticated multi-cylinder presses in unit design or high-quality central impression cylinder presses: Our range is the first choice for implementing tailor-made flexo printing solutions – modular automation structures arranged in a distributed topology at the machine as well as components centrally accommodated in a control cabinet or in a container. No matter what the topology, you always profit from well-proven components and tested applications: From the integrated register and temperature control to the certified safety functions.

#### Ultimate flexibility and adaptability

Drives from the SINAMICS S120 series are used for all of the machine axes. Their high dynamics and precise encoder evaluation enable easy adaptation of the closed-loop control to variable-size cylinder circumferences and masses. An extremely compact drive line-up can be realized by utilizing double-axis motor modules. The safety functions integrated in the drives can be flexibly activated using fail-safe SIMATIC controllers or low-cost terminal modules. The scope of our portfolio ranges from low-cost, non-regulated line infeeds to regulated infeeds without any phase effect, so you can choose the appropriate technology for the respective machine models and line conditions – for both distributed, modular configurations and centralized infeeds.

#### A comprehensive range of motors

From standard, servo and torque motors to linear motors for innovative direct drives in synchronous and asynchronous design: Our range features the right motor for any type of machine. Slow turning motors demand less current, thus smaller drives and lower costs.

Adapted asynchronous servomotors are especially useful for form cylinders and winder applications which are operated at a constant power range. In contrast, synchronous servomotors are used for small positioning drives – due to the high overload capability in positioning mode.

#### Integrated register control

The register control optimally integrated in the drive system improves the register accuracy according to a patented algorithm. It is based on innovative camera technology which is directly connected to the SIMOTION CPU via Ethernet. The list of advantages offered by this technology is long: Operator control, sequence control as well as process and production data management are standardized and the control signals are superimposed continuously without any delay on the angular synchronism of the electrical shaft. Sharing of software and hardware also reduces the overheads for materials, engineering and commissioning.

#### Print Standard for flexo printing

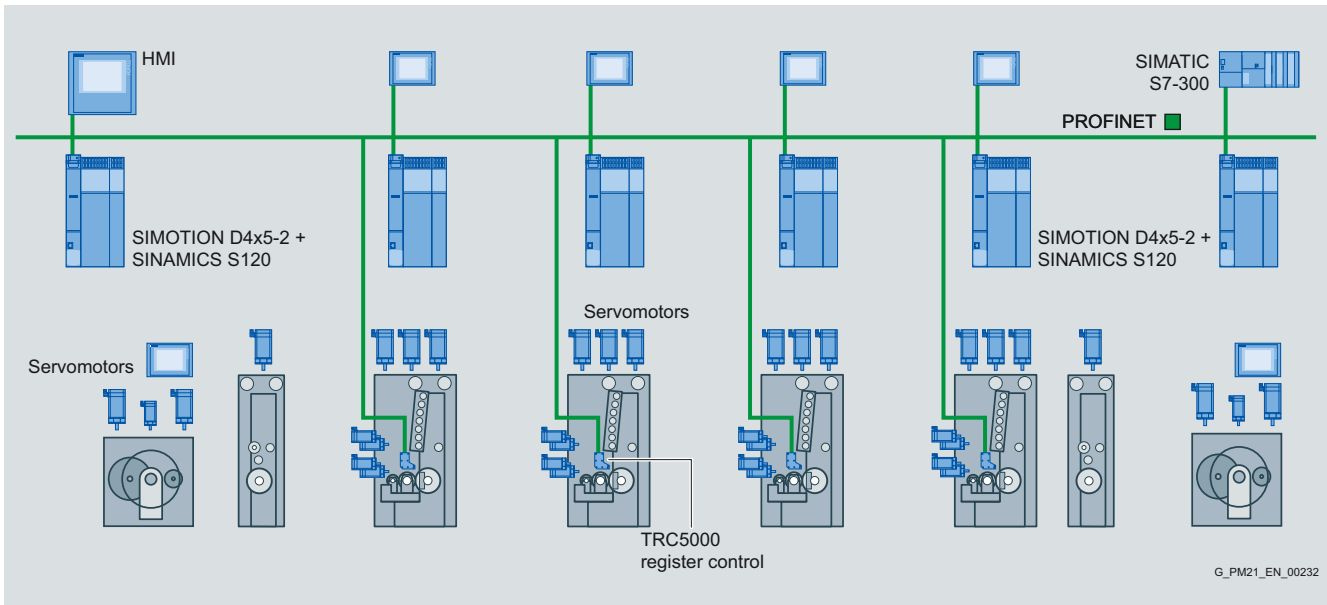
- Virtual master function
- Encoder for real master
- Continuous format adjustment and electronic circumferential register
- Operating standstill at the cylinder sleeve change position
- Electronic clutch for continuous operation of the anilox cylinder
- Positioning of the form cylinder and anilox cylinder with format-dependent position calculation
- Web winding with positioning functionality and integrated autopaster
- Web storage for mechanical zero-speed web splicer

#### Benefits

- Integrated, drive-based SIMOTION Motion Control System
- Highly dynamic SINAMICS drives in various designs
- Large selection of synchronous and asynchronous motors
- Expansion capability based on SIMATIC operator and control components
- Open and tested software applications for printing, winding and positioning axes
- Integrated register control with innovative camera technology
- Software for temperature control of the dryer and cylinder
- Standardized communication via PROFIBUS and PROFINET
- Integrated safety technology for manual sleeve/cylinder change on the fly



#### Design



Automation solution for flexo printing

#### More information

More information can be found on the Internet at [www.siemens.com/printing](http://www.siemens.com/printing)

# Sector-specific solutions

## Printing presses

### Rotogravure package printing

#### Overview



Rotogravure printing presses feature a variable format length, different form cylinder diameters, different printing materials and finishing stations. Based on our well-proven drive technology and sound automation expertise, you can optimally meet this wide variety of demands.

#### Flexible system configuration

A flexible hardware and software configuration enables easy implementation of various plant concepts: Our system supports a central control cabinet concept as well as the direct integration of the automation components into the various press stations. And PROFINET can be used to network all of the components. The printing press can be efficiently controlled from central and distributed operator stations.

#### High register precision

Individually driven rotogravure machines constitute a complex structure involving factors that mutually influence one another: Web length, transport and web stretch must be taken into account in order to guarantee a high quality print. The virtual master axis forms the electronic shaft, and ensures the precise synchronization of the printing cylinders, which are also responsible for transporting the material web. Thus, every drive axis has a direct influence on the web tension and adjusts the register. In turn, this changes the web tension, which has a negative impact on the register stability of the following printing units. The dynamic register decoupling function (DRD) eliminates this effect in the form of a software solution by networking all of the drive axes. This is the key to achieving precise, high-speed control of the register.

#### Integrated register control

High register precision is made possible by our control technique that has been specifically optimized for rotogravure printing. The closed-loop control has the advantage that it can quickly access internal process variables and that control signals are also transferred instantaneously to the drive control. Integrating the register control and sensors into the drive system significantly reduces the waste when starting up rotogravure machines. This is achieved by incorporating the measured register values into the machine starting sequence. As a consequence, the register stability can be guaranteed within a machine length, and the printing machine can go into automatic operation.

We are the only manufacturer who can equip the integrated register control with various sensor systems. For the tried and tested wedge-shaped marks, we can offer an inexpensive basic contrast probe which is suitable for most colors. A high-performance contrast probe with RGB evaluation offers complete data acquisition reliability for the inks, lacquers and materials generally used today. By contrast, dot marks – which reduce the amount of material used – can be reliably identified using a camera system. All of the sensors can handle the automatic mark search function, are directly connected to the Motion Controller and are certified according to ATEX for use in hazardous areas.

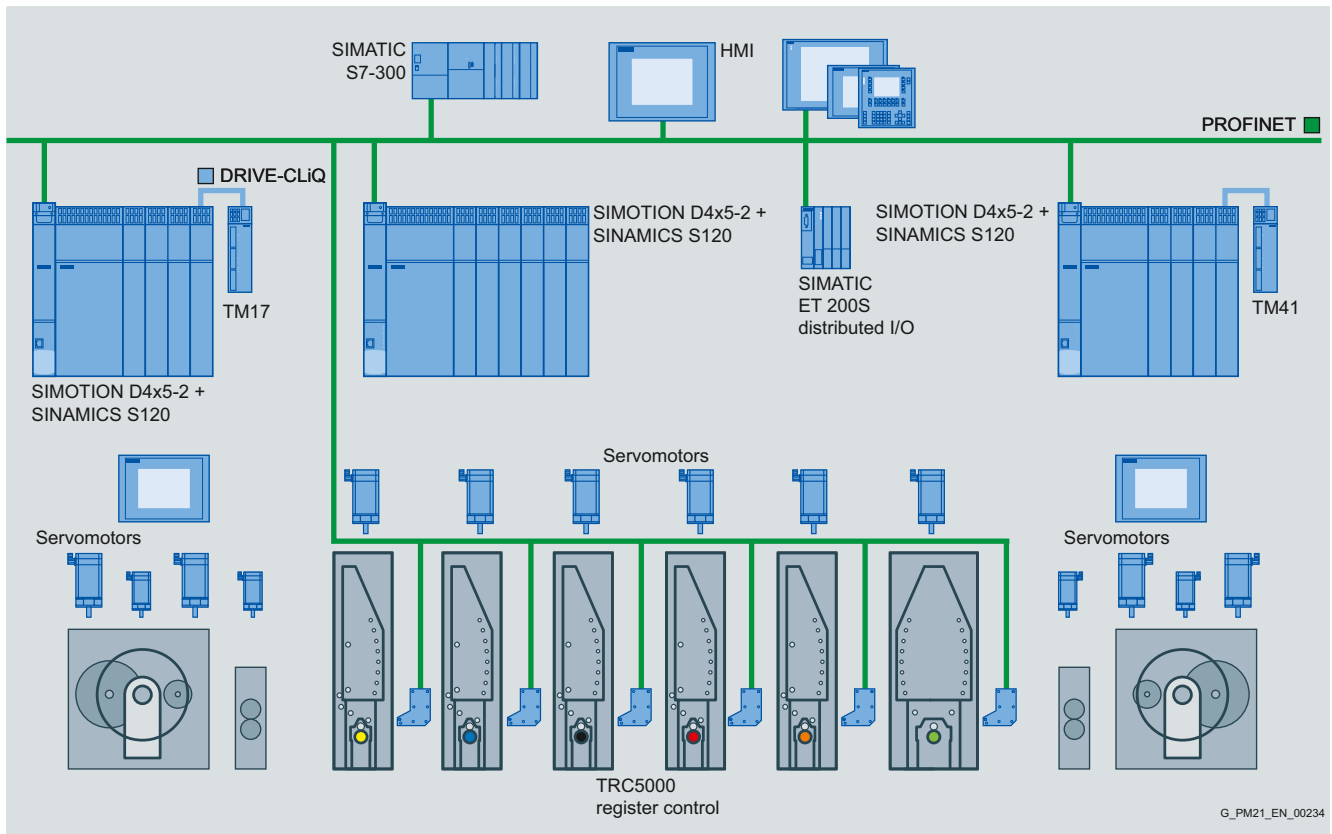
#### Preconfigured, ready-tested software modules

Print Standard includes tested software modules to address typical applications in rotogravure printing presses. These include function blocks for winding and unwinding, autopaster, tension control and cross-cutters.

#### Benefits

- Integrated safety functions
- Integrated register control
- High register precision
- Open and tested application Print Standard for printing, winding and positioning tasks

#### Design



Automation solution for rotogravure package printing

#### More information

More information can be found on the Internet at [www.siemens.com/printing](http://www.siemens.com/printing)

# Sector-specific solutions

## Printing presses

### Newspaper printing

#### Overview



With SIMOTION and SINAMICS, we are addressing the demand for increased flexibility in newspaper printing in that we supply integrated system modules, perfectly tailored for implementing a very broad range of drive concepts. SIMOTION controllers, available in different versions and scalable performance levels, handle the synchronization, open-loop and closed-loop control of the axes. The modular SINAMICS drive system – with servo and vector control for complex demanding drive applications – includes variants for single-axis and multi-axis applications ranging from 0.12 to 4500 kW.

#### **Flexible and redundant communication: PROFINET**

PROFINET allows a diverse range of network infrastructures to be created with different topologies such as ring, tree, line or star-type structures. In order to secure the highest level of system availability, a redundant communication structure can be created using a ring-type topology and the "bumpless" Media Redundancy Protocol (MRPD).

#### **Improved cost-effectiveness and greater energy efficiency**

Converters with regenerative feedback capability feed braking energy back into the supply system – and therefore make this energy available to other users in the system. Through the use of inverters with coupled drives, energy can be directly exchanged via the shared DC link. This minimizes power losses in the system and thus means that an infeed module of significantly smaller power rating or frame size can be used. Supplementary capacitors can be installed in the DC link in order to cover or prevent transient power peaks.

#### **Drive diagnostics with Print Diag**

Print Diag permanently acquires all the important motor and converter data and displays it – to secure full transparency of the drive system. The system permits optional read and write access to all parameters and also allows data to be recorded in real time and with a long-time trace. A comprehensive signaling and analysis system with help texts, fault clearance procedures and statistical functions speeds up and simplifies troubleshooting, and also makes it easier to identify weak points in the press. In this way this system provides you with a reliable overview, even if your installation is complex.

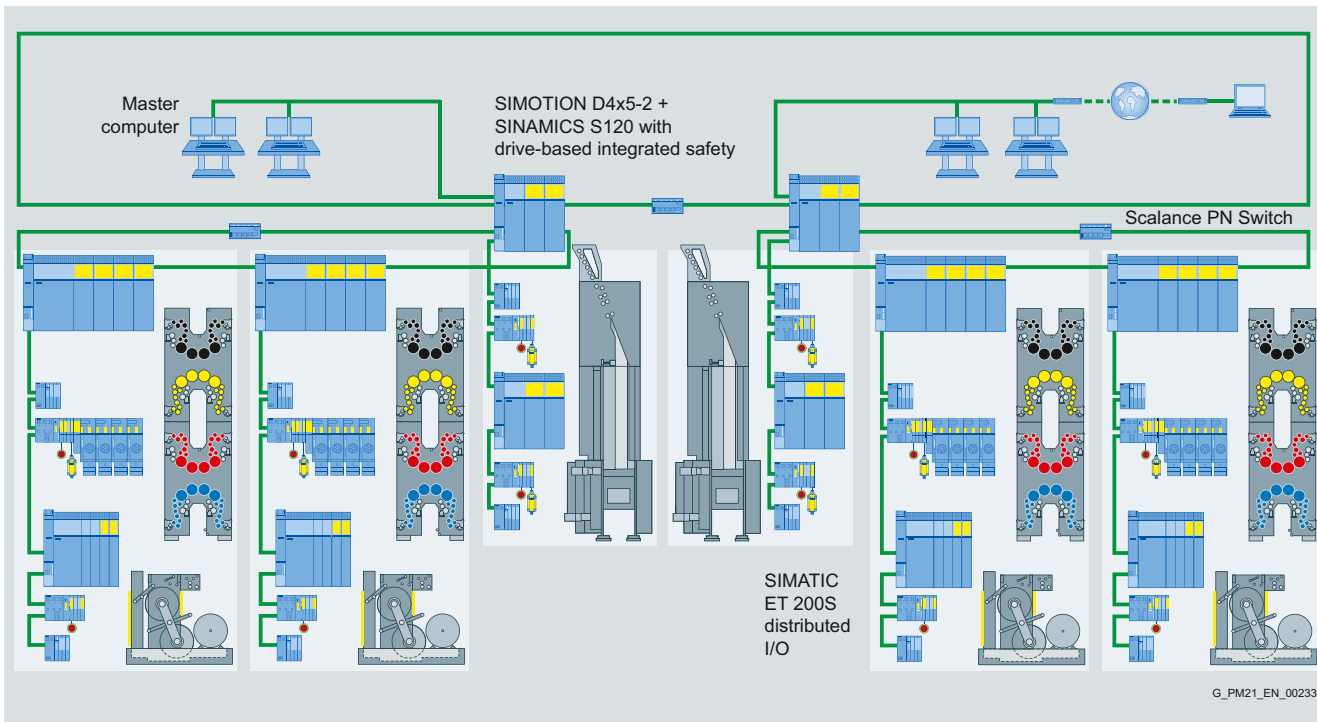
#### **Print Standard**

- Virtual and real master axes with ramp generator
- Motion superimposition, e.g. for ribbon and color register adjustment
- Positioning and homing functions
- Winding and unwinding functions

#### **More information**

More information can be found on the Internet at [www.siemens.com/printing](http://www.siemens.com/printing)

#### Design



Automation solution for newspaper printing

# Sector-specific solutions

## Printing presses

### Digital printing

#### Overview



The SIMOTION D drive-based control system makes it easy to implement applications involving ink-jet and electrophotographic digital printing presses. The free configurability in various programming languages can be combined with tested and proven technological functions: Both drive-related Motion Control functions as well as open-loop control and communication tasks including HMI interfacing can be implemented using just one system.

#### First choice for outstanding performance

The angular synchronism of the drives and servo drives involved in transporting the material web ensures low speed ripple and constant tension to produce the best print results. Frequently used applications, such as winders, tension control, multi-axis drives, positioners, winders etc., can be taken from the Print Standard and integrated in machine programs. Moreover, networking of all the various press stations via PROFINET ensures that the entire machine can perform to the highest level and also simplifies diagnostics and maintenance.

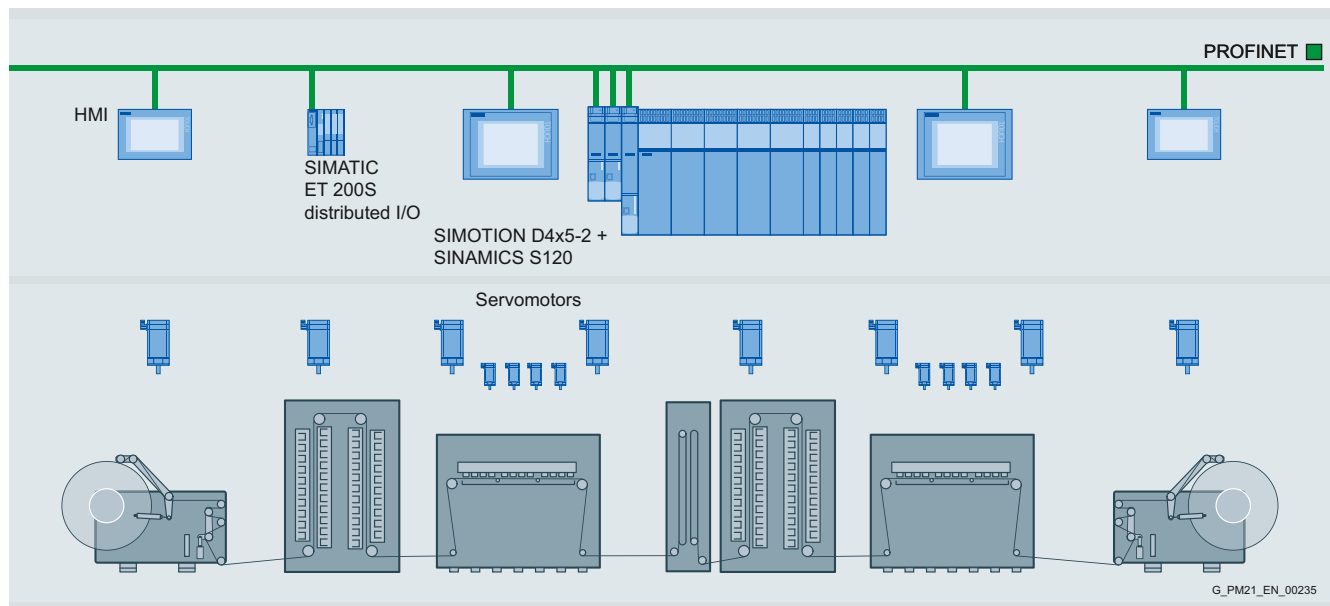
#### Benefits

- Flexible configuring of open-loop control, Motion Control and communication tasks
- Tried and tested Motion Control functions
- One drive system for linear and rotary drives
- High speed stability
- Parameterizable incremental pulse output
- Scalable hardware
- Simple to network via PROFINET

#### More information

More information can be found on the Internet at [www.siemens.com/printing](http://www.siemens.com/printing)

#### Design



Automation solution for digital printing press

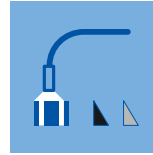
#### Overview



A powerful register control enhances the value of any printing machine: With multi-color printing, the simpler, faster and more precise the registration, the less waste is incurred – which translates into more time for productive printing and higher print quality.

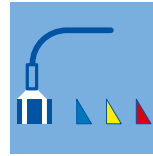
#### Integration – the key to register quality

Our register controls are fully integrated into the SIMOTION controller and Print Standard software package as function modules. This means that you won't need any additional control system or an extra control cabinet. As a result, the register control becomes an elementary component of the automated machine sequence control. To sense print marks, we can offer you various solutions based on sensors and fiber-optic cables for wedge-shaped marks as well as a camera-based solution for dot marks. Thanks to the open, customer-specific, adaptable SIMATIC WinCC flexible user interface, the register control can also be integrated into the machine operating control and the automated sequence control.



#### SIMOTION TRC1000 register control

This high-performance entry-level solution is ideal for especially price-sensitive segments in the printing press market. It operates with a high-quality monochrome sensor which automatically detects all of the usual wedge-shaped and block marks, measures up to two marks with respect to one another and communicates with the actual register control via PROFINET IO with IRT.



#### SIMOTION TRC3000 register control

With this solution a high-performance RGB sensor detects the standard colors, but can also sense challenging special colors and lacquers that are printed on materials that either have a weak contrast or are reflective. This intelligent sensor automatically measures up to 20 print marks, and is directly connected to the SIMOTION controller of the printing unit via PROFINET IO with IRT.



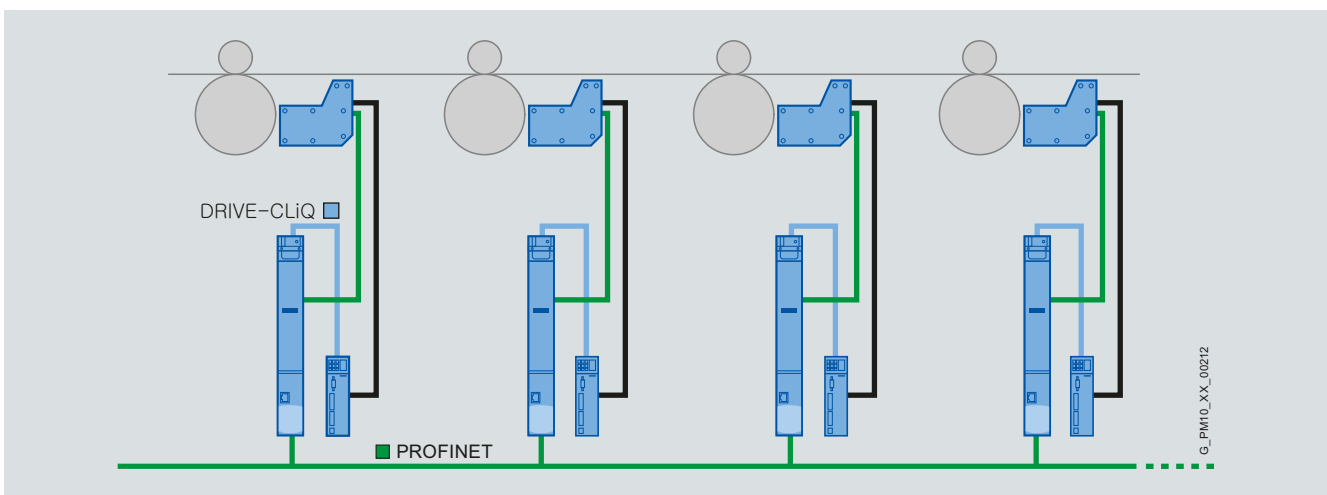
#### SIMOTION TRC5000 register control

The SIMOTION TRC5000 register control senses dot marks using an intelligent CCD camera, which – by contrast with a sensor-based system – detects all of the marks in a printed area simultaneously at a defined sampling instant. The result: An especially high measuring and repeat accuracy. Live camera images facilitate setup and monitoring of materials and print marks.

#### More information

More information can be found on the Internet at [www.siemens.com/printing](http://www.siemens.com/printing)

#### Design



Configuration of a TRC5000 register control

# Sector-specific solutions

## Textile machines

### Fleece folding machine

#### Overview



#### Machine requirements

The fleece folding or cross folding machine is arranged in a non-woven textile machine between the carding machine and the needle loom. The web arriving from the carding machine rarely has the weight per unit area required for the application. The cross folding machine therefore lays the number of web layers on top of each other that are required for the application.

The task to be resolved is to intermittently layer the web that is fed in at constant speed while achieving a constant weight per unit area. The material is transported to the actual laying position between the feeding conveyor and covering conveyor. Two traversing carriages layer the web in zigzag form on a conveyor belt that is arranged at a 90° angle to the machine axis.

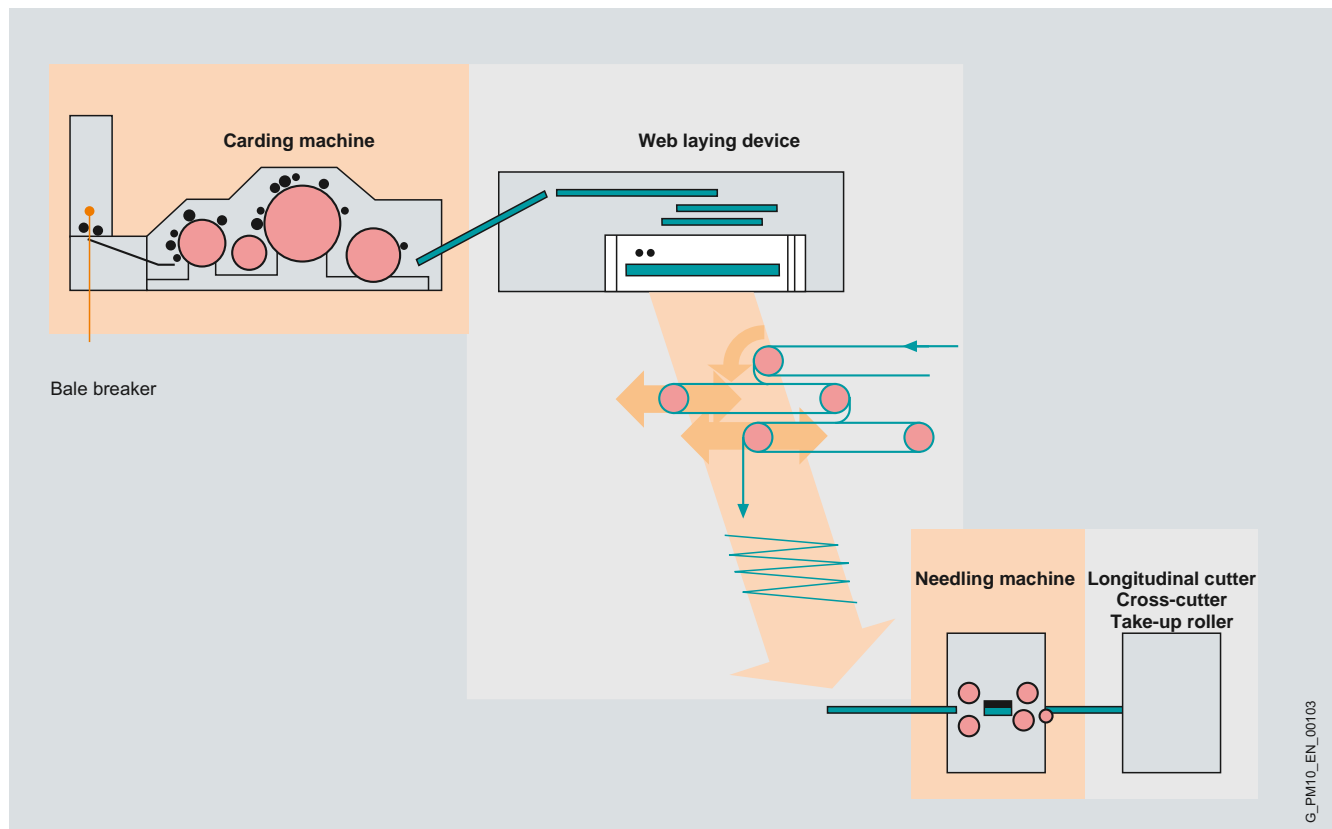
The motion of the lower carriage determines the width of the product and the upper carriage acts as a material buffer that compensates for the difference in velocity between the feeding conveyor and layering carriage.

The motion relationship between the two carriages is also influenced by process parameters, such as the required web drafts at the edges, also referred to as profiling. The highly dynamic reversing movements of the carriages are implemented with servomotors without additional gearing.

The required number of layers in the material cross-section and therefore the fleece strength (measured in  $\text{g}/\text{m}^2$ ) is determined by the velocity ratio between the infeed and output.

The machine has the following automation requirements:

- High dynamic response in the reversing motion for exact web edges
- Flexible traversing profiles for different material requirements
- Draft-free layering of the fibrous web at high velocity



Operating principle of the fleece folding machine

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## Fleece folding machine

**Benefits**

The SIMOTION automation solution described below offers you the following advantages:

- Memory space is saved due to cam calculation in real time
- Faster and more convenient set-up due to flexible adjustment of parameters
- Scalable and open software menus for integrating software parameters
- High flexibility and short resetting times when changing products
- Reproducibility of lots due to recipe memory
- Higher degree of user-friendliness due to graphics-based programming
- Transparency due to comprehensive diagnostic tools and dialog control via SIMOTION SCOUT
- All machines that are involved in the process, e.g. carding machines and needle looms, can be easily automated using SIMOTION and SIMATIC S7 programmable logic controllers and networked to form a line.
- The machine data that are relevant to the process are available on a SIMATIC Panel MP 277 with WinCC and can be supplied to an operating data management system through an OPC interface (Industrial Ethernet).

**Design***Automation solution*

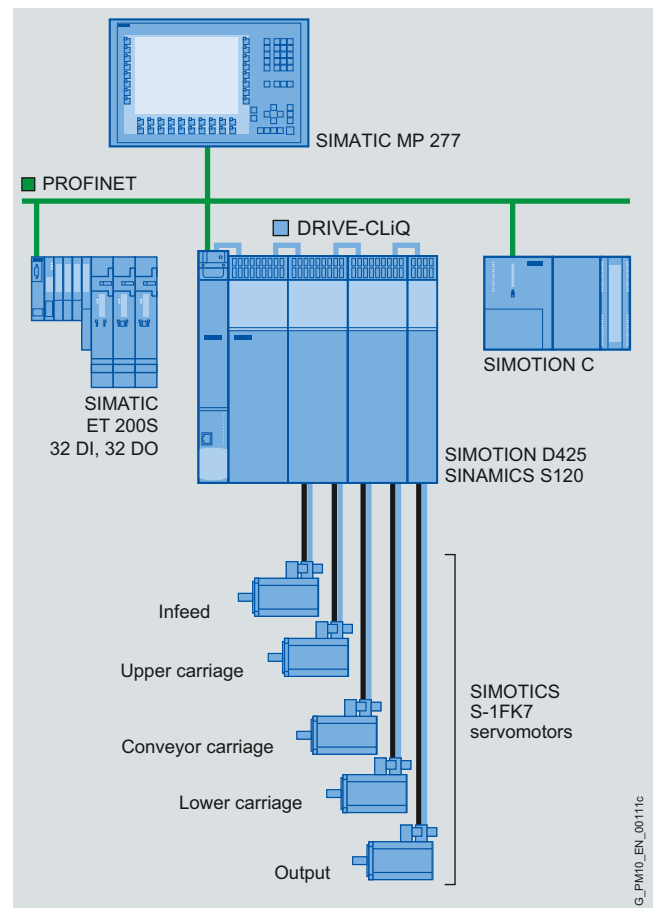
The SINAMICS S120 is used in combination with the SIMOTICS S-1FK7 High Dynamic servomotors as a drive system. SIMOTION as an open-loop and closed-loop control system allows motion control, PLC and technology tasks to be executed fully in a single system.

Even with a high volume of process data, this means that short cycle times can be achieved.

The complex motional sequences within individual cycles are programmed with the SCOUT engineering system using cams, for example. SCOUT supports graphical programming (Motion Control Chart) as well as more familiar PLC features such as ladder logic, function block diagram or high-level language (Structured Text).

Features of the automation solution:

- Calculation of the traversing curve profiles of the layering carriages and adaptation of the curve profiles in real time
- Transfer of data to the drives over PROFINET
- Following error offsets are scaled or the whole profile is extrapolated and applied in the relevant layering carriage tour
- Panels are available for visualization and operation, operated either by touch or keyboard, which can be linked via PROFINET to the automation system
- SIMOTION and the data acquisition system communicate via OPC server, guaranteeing data exchange for Windows-based systems with browser quality.



Example of automation solution with SIMOTION D and SINAMICS S120

**More information**

More information can be found on the Internet at

[www.siemens.com/textile](http://www.siemens.com/textile)

# Sector-specific solutions

## Textile machines

### Weaving machine

#### Overview

##### Machine requirements

Weaving is the most widely used method of fabric production for the decoration, clothing and home furnishing textile sectors. However, technical textiles, including wire cloth, are also produced on modern weaving machines.

Irrespective of the weft insertion method used, very high cycle and acceleration rates are essential for weaving machines. Furthermore, weaving machines are characterized by a large number of nonlinear motion sequences and time-critical starting times. Mechatronic solutions consisting of a combination of mechanical cams and servo drives for warp let-off and fabric take-up are the modern state of the art.

More recently, harness motion and weft insertion have also been implemented with individual electric drives in some instances.

The demands on the automation are:

- Constant velocity relation between warp let-off and fabric take-up as a function of the main drive
- Constant thread tension during the process (uniform fabric quality)
- Weft insertion synchronized precisely with cycle times
- Fast position-oriented supply of weft threads corresponding to the color selection
- Increase in machine cycle times
- Different weft insertion processes using a projectile, airjet, or picker
- Short resetting times for lot changes
- Reproducibility of process data
- Pattern data management and preparation

#### Benefits

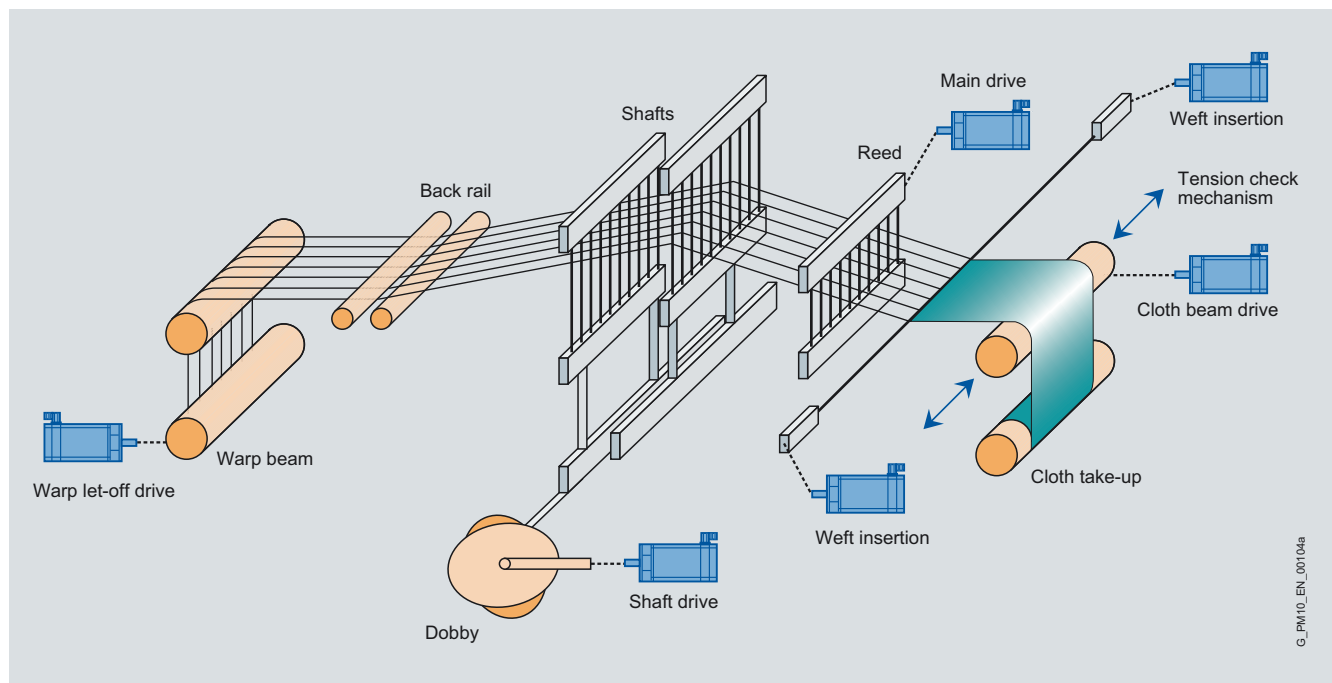
The SIMOTION automation solution described below offers the following advantages:

- To attain even faster resetting times, the mechanical cam can be replaced by a high resolution SIMOTION cam function for harness motions.
- The technology functions integrated in SIMOTION, particularly the electronic cam, make it easy to implement the required motion control easily and safely for the process. Furthermore, where necessary, they allow motion profiles to be modified flexibly and with minimum effort.
- Variable user interfaces enable process parameters to be quickly adapted to the execution system. These data can be reproduced at any time and assigned according to process technology. A lot change no longer requires you to make manual adjustments.
- Tools for commissioning, configuration and diagnostics integrated in the uniform, scalable SCOUT engineering system reduce service and configuring times.

#### More information

More information can be found on the Internet at

[www.siemens.com/textile](http://www.siemens.com/textile)



Operating principle of the weaving machine

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**Design****Automation solution**

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the weaving machine.

The performance features for

- Operator control/visualization/diagnostics/pattern
- Process control
- Motion control and
- Drive-related control

are coordinated in accordance with process engineering requirements.

The solution model is determined by preprocessing the process data and their implementation as a motion control process.

Machine control, implemented by SIMOTION D:

- Setpoint input
- Control of warp let-off and cloth take-off
- Weft insertion control
- Machine monitoring
- Harness control

Operator control and monitoring (HMI)

Using a touch panel (e.g. SIMATIC TP 177B) or a multi panel (e.g. SIMATIC MP 277B) based on the runtime and configuring software SIMATIC WinCC flexible:

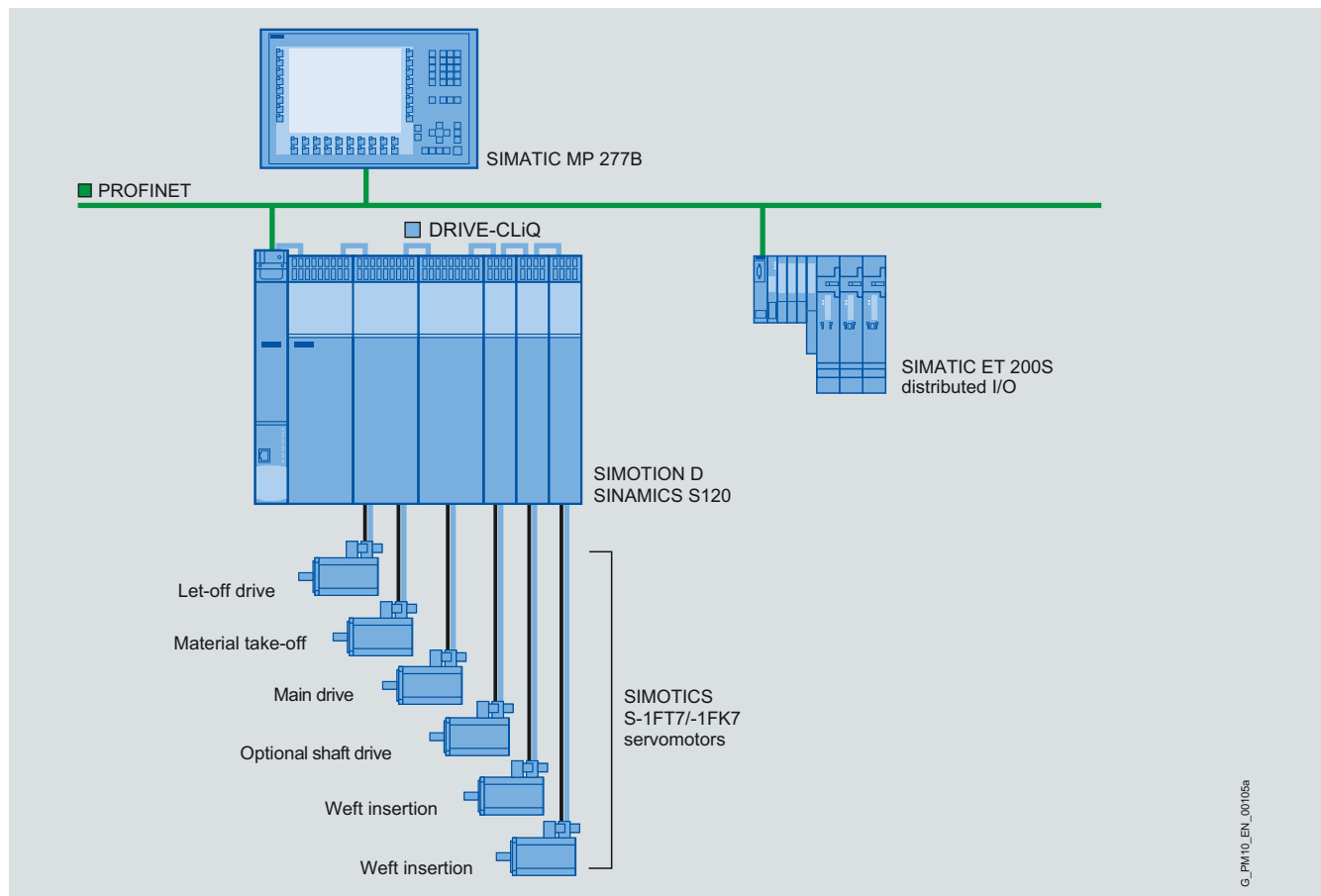
- Process data management, e.g.:
  - Speed specification
  - Presetting of weft density
  - Presetting of technology values
- Pattern management
- Diagnostics/remote diagnostics

Drives

The integrated automation and drives structure is rounded off by the bus-coupled dynamic SINAMICS S120 drive system and SIMOTICS S-1FT7/-1FK7 motors.

Features of the automation solution:

- Constant thread tension control during the winding and unwinding process, correct provision of thread and accurate positioning when entering the weft are closely coupled to the process control and are processed synchronously with the machine cycle. These control functions are performed by a SIMOTION D4x5-2.
- A master that obtains its actual values from an encoder mounted on the main shaft, outputs appropriate setpoint signals to the slaves of the drive and control system.
- Coupling through an OPC interface (Ethernet) ensures operating data management and exchange of data with the pattern system.



Example of automation solution with SIMOTION D4x5-2

# Sector-specific solutions

## Converting

### Printing, stamping and embossing machines

#### Overview



#### Machine requirements

Printing, stamping and embossing machines are used, for example, in the manufacture of labels and tickets. The material to be processed ranges from paper through plastic to metal film, depending on the product.

The original material is usually on a roll. The end product comprises either rolls (endless material) or sheets which are cut to a specified format by cross cutters.

Printing, stamping and embossing machines are constructed in modular form which demands a flexible automation concept with regard to hardware and functionality.

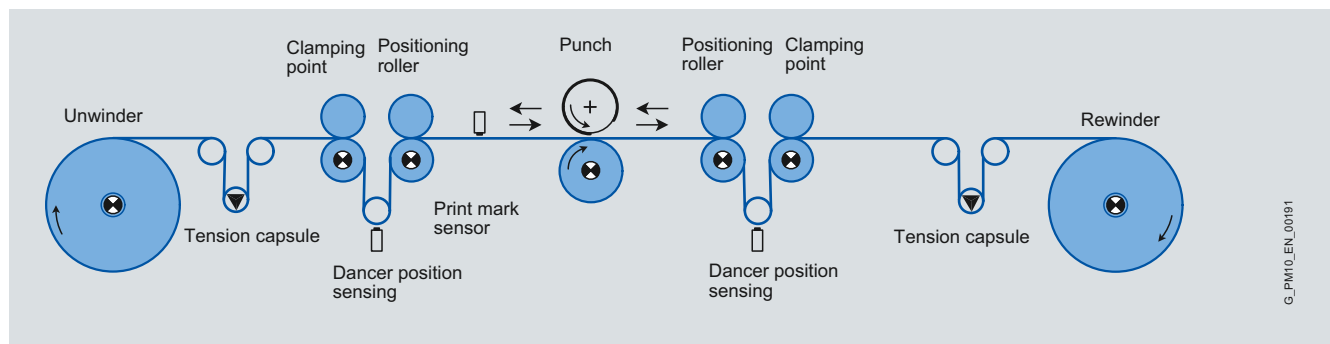
The function modules can, for example, be:

- Winder and unwinder
- Punching module
- Print module
- Coating module
- Laminating module
- Cross cutter module

Apart from the velocity of the machine, the accuracy and repeatability of product processing are also important. The required accuracy is  $< \pm 0.1 \text{ mm}$  (0.0004 in).

The demands on the automation are:

- Constant velocity ratio between the machine modules through geared synchronous motion or velocity ratio
- Constant tension during the process (tension and dancer roll control)
- Cams for motion control (punch and cross cutter)
- Winder control
- Print mark correction
- Modular software and hardware structure for the implementation of customized machine configurations
- Parameterizable software for adaptation to different materials and products



Basic structure of a punching machine

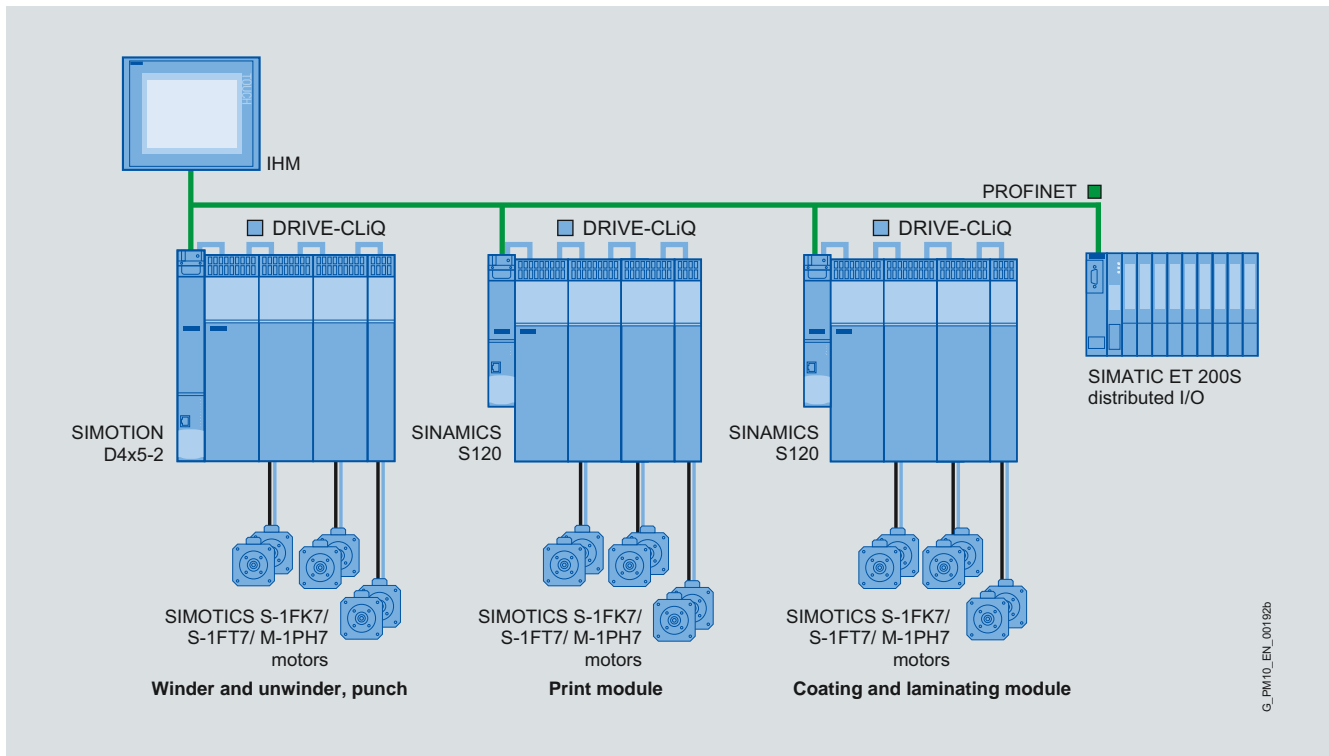
#### Benefits

The SIMOTION automation solution described below offers you the following advantages:

- Adaptation of the configuration to the machine design thanks to the modular software and hardware concept
- The SIMOTION controller combines functions such as logic, synchronous operation and cams as well as technology functions such as winder controls, print mark synchronization and cross cutters, so that the complete machine functionality can be implemented on the same controller hardware.
- Variable user interfaces enable process parameters to be quickly adapted to the execution system.
- Scalable hardware platform for different machine requirements
- Prepared software elements for simplifying commissioning from the Converting Toolbox and SIMOTION Easy Basics, e.g. operating mode manager, winder, axis control, cross cutter, etc.
- Remote diagnostics, commissioning and configuring tools that are integrated into the uniform and scalable SCOUT engineering system reduce servicing and configuring times.

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## Design



Example of automation solution with SIMOTION D4x5-2

### Automation solution

With the newest machine types, the flexible automation architecture is implemented in accordance with the technological requirements for the machine.

The performance features for

- Operator control/visualization/diagnostics
- Process control
- Motion control and
- Drive-related control

are coordinated in accordance with process engineering requirements.

### Machine control

The machine control is implemented with SIMOTION D4x5-2. It performs the following PLC and Motion Control functions:

- Logic
- Operating mode manager
- Setpoint input
- Closed-loop controls (winder, tensioner, dancer roll)
- Cross cutters
- Machine monitoring
- Synchronous operation
- Cams
- Print mark correction

### Operator control and monitoring (HMI)

Operator control and monitoring of the machine is performed, for example, using a Multi Panel with the WinCC flexible runtime and configuring software. The following functions are implemented using the Multi Panel:

- Machine module selection
- Process data management
- Speed specification
- Presetting of technology values
- Diagnostics/remote diagnostics

### Drives

The integrated automation and drives structure is rounded off by the bus-coupled dynamic converter system SINAMICS S120 and SIMOTICS S-1FT7/-1FK7 motors.

### More information

More information can be found on the Internet at

[www.siemens.com/converting](http://www.siemens.com/converting)

or

[www.usa.siemens.com/converting](http://www.usa.siemens.com/converting)

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# Sector-specific solutions

## Converting

### Continuous web coating and laminating technology

#### Overview



Continuous web coating is a technology applied to many different types of basic materials and end products. As a result of this broad range of applications, coating technology involves a vast array of different machine types, ranging from standard series machines to customized coating plants, while the requirements of the automation and drive systems themselves vary greatly. In all cases, the ultimate objective is to confer additional functional properties on a substrate by coating or lamination.

#### Benefits

##### *Requirements of the machine automation and drive systems*

- Improved productivity through increased machine speeds
- Time saving on machine setup times for product changes, e.g. different material width or application method
- Shorter ramp times (ramp-up, emergency stop) to avoid waste material
- Higher machine speed on automatic roll change to improve productivity
- Reduction in process energy by implementation of energy-saving concept for all machines and energy regeneration
- Enhanced machine availability achieved by reliable automation and drive system components, faster spare parts supplies, quick detection, localization and elimination of faults, preventive maintenance
- Constancy of tension through efficient, robust and adaptive tension control during the production process (tension or dancer control)
- Modular software and hardware structure for the implementation of customized machine configurations
- Software which can be parameterized and adapted for different materials and processes
- Less maintenance and more dynamic control through the use of direct drive technology

#### Application

Typical areas of application for coating technology are, for example, the manufacture of self-adhesive labels, electrical film barriers, electrode material, packaging material, building materials or technical textiles.

##### *Coating machines/plants*

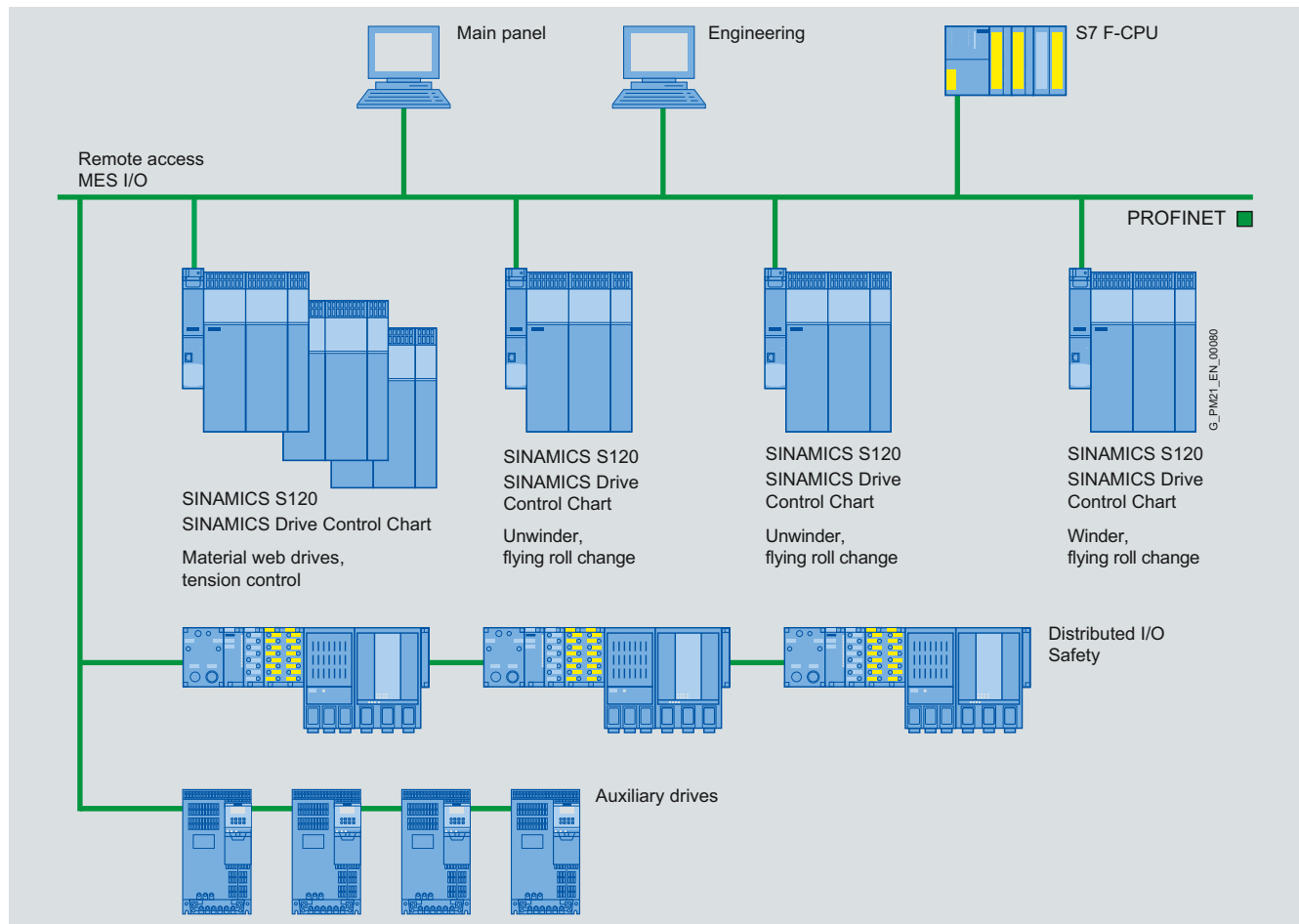
Webs of material are coated and laminated in a coating machine. This is done by uncoiling the substrate from the unwinder, then guiding it, for example, via a surface treatment unit to the applicator unit, and finally onto the dryer. The substrate can be coated on both sides in the applicator unit. Before further processing, the coated material is cooled and subsequently laminated, e.g. with an additional material. In many cases, several coats are applied in succession, or the laminating material is also coated before the substrate is laminated. The coated and laminated end product is then wound onto a rewinder for further processing.

A variety of different coating methods are employed in a coating machine depending on the type of substrate and coating mass, e.g. curtain coating, scraper technique, multi-roller application method or extrusion coating.

**Design**

Depending on requirements, a coating machine comprises a variety of machine modules, including, for example:

- Unwinder and rewinder, or reversing winder if desired
- Applicator units
- Laminating units
- Surface treatment, e.g. UV, corona
- Tension and/or dancer control
- Cooling systems, e.g. by means of cooling rollers
- Dryers, e.g. guide roller dryer, floatation dryer
- Perforation, stamping, punching
- Intermittent coating

**Automation solution**

Example of automation solution for a coating machine

The topology illustrated above shows an example of a distributed automation system for a medium-sized coating machine based on a machine control solution, e.g. a SIMATIC S7.

In this case, the control performs general machine logic functions such as operating mode management, interfacing of I/O systems, (optional) safety technology (SIMATIC S7 F-CPU) and auxiliary drives.

The web-guiding drives receive a master velocity setpoint from the machine control and operate by this method at synchronized velocity.

The internal machine network, i.e. the networking between central control, drives, I/O modules and peripheral systems is created with PROFINET. The network can thus also be provided with an interface to machine management level.

The process-oriented closed-loop control in the SINAMICS S120 drive system is implemented by means of SINAMICS Drive Control Chart, thereby minimizing processing times in the process-oriented control and reducing the load on the machine control. Process-oriented applications can be solved with modules from the Converting Toolbox, e.g. for the winder control, flying roll change and higher-level tension and/or dancer control.

A SIMATIC Panel with WinCC or WinCC flexible are provided as machine visualization equipment, i.e. as the HMI.

**More information**

More information can be found on the Internet at

[www.siemens.com/converting](http://www.siemens.com/converting)

or

[www.usa.siemens.com/converting](http://www.usa.siemens.com/converting)

# Sector-specific solutions

## Converting

### Machines for the manufacture of hygiene and tissue products

#### Overview



The SIMOTION Motion Control System when combined with SINAMICS S120 is the ideal product for automating a diverse range of machines used to produce hygiene and tissue products. Machines used in the manufacture of diapers of all kinds, incontinence products, sanitary towels, pantyliners and underpads, as well as toilet rolls (including the coremaker), plus the associated packaging and palletizing equipment can be rendered highly productive by the incorporation of this integrated system.

#### Machine requirements

The manufacturing process requires a variety of different technological functions, for example:

- Synchronous operation
- Cam
- Winders
- Punching
- Stamping
- Automatic roll change

These can be implemented by using a high-performance Motion Control System in combination with dynamic drives. A combination of the SIMOTION Motion Control System, SINAMICS S120 and the highly dynamic SIMOTICS S-1FK7 motors are the ideal answer to applications of this type. The solution is rounded off by the comprehensive range of HMI products and distributed I/O components.

The entire process can be implemented by a single system, from uncoiling the substrate, to punching different diaper formats, filling diapers with cellulose material and transferring them to a packaging machine.

Examples of function modules are:

- Winder control with material store for automatic roll change without braking the machine
- Adhesion devices
- Cross cutter module
- Longitudinal cutter
- Tension or dancer control for constant web tension
- Stamping module
- Printing module, print-mark correction
- Quality inspection for detecting, tracking and rejecting faulty products

#### The requirements on the automation are:

- Improved productivity through increased cycle times
- Time saving on machine setup times for product changes
- Inclusive diagnostic concept for all machines to prevent downtimes
- Modular software and hardware structure for the implementation of customized machine configurations and machine adaptation
- Integrated networking and synchronization of all drives to improve product quality
- Software which can be parameterized and adapted for different materials and processes
- Parameterizable and modular software and hardware plus automated engineering in order to cut the time and cost of engineering and commissioning
- User-friendly operation and visualization
- Scalable hardware to reduce component variety

#### Benefits

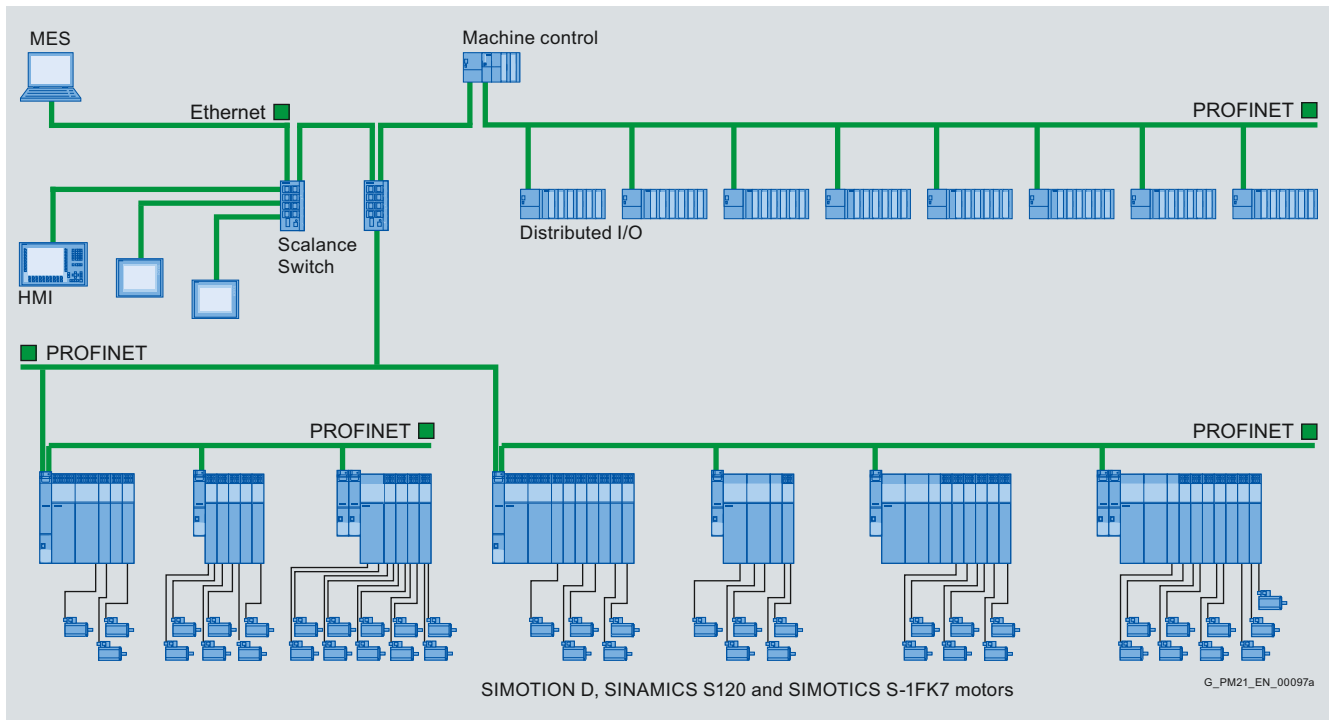
An optimized automation and drive concept makes it possible to create highly flexible machines which can improve productivity by cutting machine setup times for product changes as well as fulfill the growing market requirements of the end product. By selecting to use a uniform Motion Control System, it is also possible to reduce material rejects and thus increase the cost effectiveness of the machine overall.

By using PROFINET, it is possible

- to exchange data efficiently between the automation and drive components, and
- to integrate the network into the higher-level Manufacturing Execution System (MES)



## Design



Example of topology of a diaper processing machine

#### Topology of a diaper processing machine

An optimized automation and drive concept makes it possible to implement highly flexible machines. By selecting to use the high-performance SIMOTION Motion Control System in combination with dynamic drives from the SINAMICS S120 range with highly dynamic SIMOTICS S-1FK7 motors for all function modules, e.g. winder control, adhesion device, cross cutter module, stamping or printing module, it is possible to increase the cost effectiveness of the machine overall.

Using PROFINET offers the advantage of efficient data exchange between the automation and drive components and the option of integrating the network into the higher-level Manufacturing Execution System (MES).

#### More information

More information can be found on the Internet at

[www.siemens.com/converting](http://www.siemens.com/converting)

or

[www.usa.siemens.com/converting](http://www.usa.siemens.com/converting)

# Sector-specific solutions

## Plastics

### Automation for extruders

#### Overview



#### Machine requirements

Continuous material made of plastic is made into pipes, profiles, sheets and film on extrusion lines. During this process, the plastic in granule form is continuously fed to a screw conveyor which is rotating in a heated metal cylinder. The frictional heat works together with the heat applied over the heating zones to melt the granules. The plasticized mass is distributed and formed in the extrusion die so as to produce the correct product contour at the die outlet. The product is then shaped into its exact, final form by calibration and cooling units.

#### Requirements

- Scalable system for adaptation to the machine configuration
- Simple, intuitive operator interface
- Multilingual operator interface
- Various password levels which can be freely configured
- High-quality temperature control (heating and cooling)
- Recipe management
- Monitoring and documentation of process and quality data
- Integration of external ancillary equipment such as proportioning unit and melt pump

#### Benefits

The SIMATIC automation solution described below offers the following advantages:

- Significant cost savings on engineering through provision of preconfigured, typical basic functions
- Simple operation of the extruder based on simple, clear operating screens
- Easy expansion of system thanks to open software structure
- Optimum scaling of the control unit
- Easy to expand by Siemens drive systems

**Design****Automation solution**

The SIMATIC automation system provides a high-quality solution for extruders and extruder lines. It is designed as an open standard. The user can employ the basic functions of the standard, but also add or adapt functions to suit an individual machine configuration.

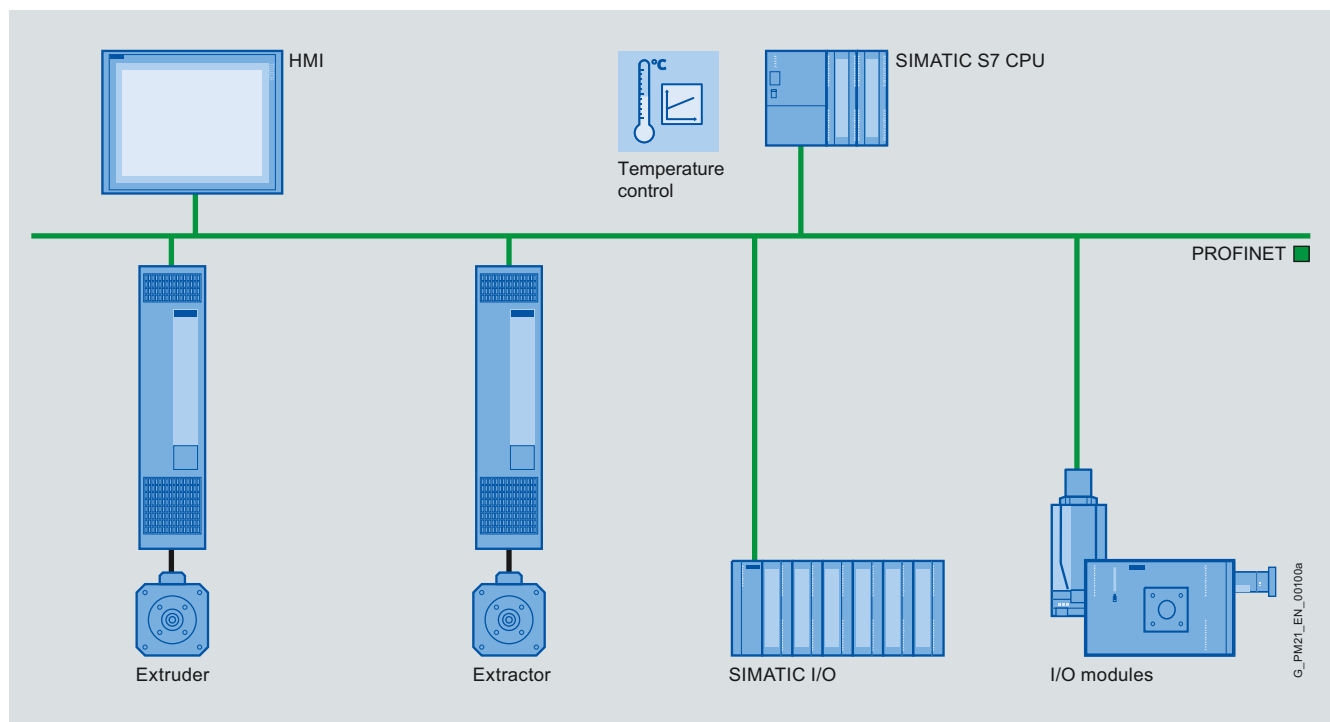
The SINAMICS drive system and SIMOTICS motors round off the solution perfectly.

**SIMATIC EXT 3370 application**

- **Supports** the complete machine control
- **Comprises** all the technology functions for controlling a pipe/profile extruder
  - Temperature control for up to 16 temperature zones
- **Scope of implementation:**
  - Drive-based control for up to 6 drives
  - Temperature control for up to 16 temperature zones
- **Executes on:**
  - Conventional SIMATIC controller with CPU, or
  - Soft PLC SIMATIC controller WinAC, PC-based
- **Extended by** SIMATIC Comfort Panels in the desired display size
- **Prerequisite** for using the application SIMATIC EXT 3370 is a software license

**Software functions**

- Operating screens created with WinCC Comfort
- Temperature control
  - Self-adjustment of control parameters, even at the operating point
  - Separate controllers for heating and cooling zones
  - Integrated multi-zone autotuning
  - Heating current monitoring with individual unit/group monitoring functionality
  - Seven-day timer
- Drive control
  - Starting function
  - Cold start function
- Mass pressure control
- Diagnostics, messages and trend graphs
- Recipe management



SIMATIC EXT 3370 automation solution

**More information**

More information can be found on the Internet at

[www.siemens.com/plastics](http://www.siemens.com/plastics)

# Sector-specific solutions

## Plastics

### Servo pump

#### Overview



*Servo pump – the energy-saving solution for hydraulic machines*

#### *Outstanding efficiency across the entire line*

Efficiency is becoming an increasingly important factor in the optimization of hydraulic machines and plants. This basically applies to all types of hydraulically driven axis, but particularly to the axes of presses, injection molding machines and blow molding machines, for example. In addition to the trend in favor of hydraulic machines which are partially or fully electrical in design, it is also beneficial to optimize the hydraulic units themselves.

#### *Energy saving made easy*

With its new, highly dynamic servo pump, Siemens has the perfect answer. With energy savings of up to 70 %, your investment in the future will pay off within a very short time. Suitable combinations comprising at least one hydraulic pump and a SIMOTICS synchronous motor – a development which is state of the art with respect to energy efficiency – will guarantee that you achieve maximum energy savings.

#### Application

##### *Process-optimized use of energy*

Energy-efficient, modernized systems generally consume only as much energy as the hydraulic machines need in the relevant phases. The energy saving effect is greatest during "idle times": The servo-driven pump is then virtually at a standstill and consumes only a minimal amount of energy, by contrast with the pump in conventional solutions which needed to continue running at a reduced output (15 to 20 %).

Our solutions are as individual as the requirements of your hydraulic application. At the same time, our product portfolio also includes turnkey systems in the 10, 20, 30 and 60 kW ratings range. Install, connect up and switch on – that is our motto! Minimum effort for a fair price. An appealing side effect of the servo pump is that it contributes enormously to reducing noise.



#### Benefits

##### *Advantages at a glance*

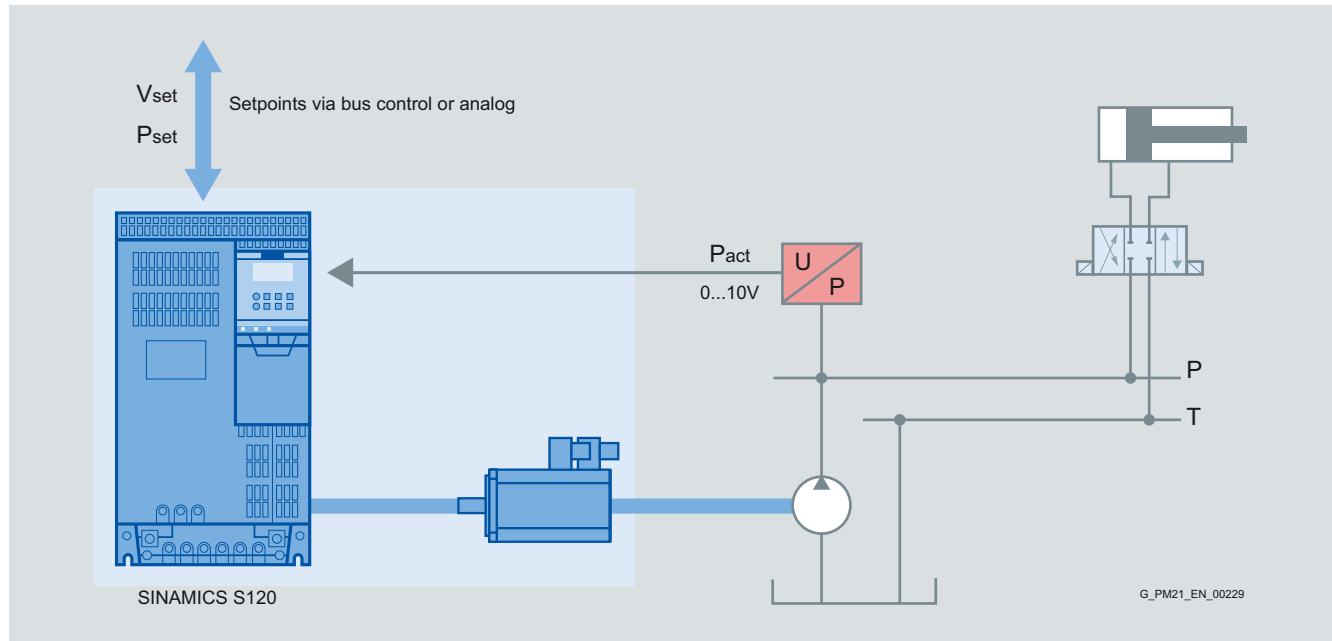
- High energy efficiency: savings of up to 70 %
- "DCC" for active closed-loop control of the servo pump
- Enormous reduction in noise emissions
- High efficiency
- Simple drive system with broad scope of functions
- Reduced complexity
- Easy system integration
- Simple preventive maintenance
- Reduction in quantity of valves
- Optimum adaptation of force and velocity to the pressing process
- Precise reproducibility of velocity, force and cycle times
- Small oil tank
- Highly developed diagnostics capability
- Modular design

**Design****Flexibility based on standard components**

The servo pump solution comprises the following standard components:

- SINAMICS S120
- SIMOTICS servomotors
- SD card with "DCC" control software

These components enable you to implement your individual requirements of the hydraulic application down to the very last detail. Our portfolio is rounded off by preconfigured "turnkey" solutions which are delivered ready to connect for ratings 10, 20, 30 and 60 kW.



Schematic representation of servo pump

**More information**

More information can be found on the Internet at

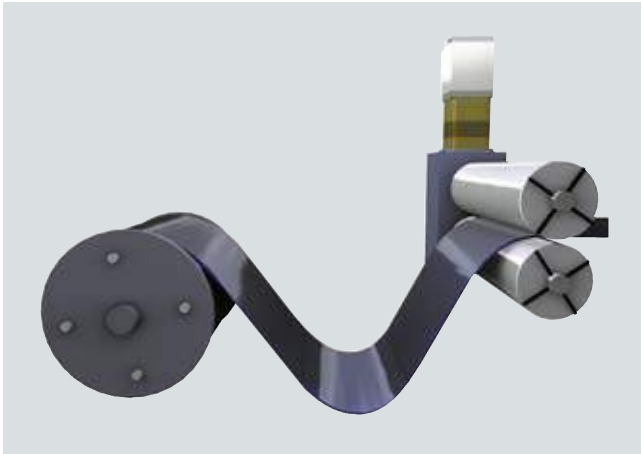
[www.siemens.com/servo-pump](http://www.siemens.com/servo-pump)

# Sector-specific solutions

## Metal forming technology

### Roll feeds

#### Overview



#### Machine requirements

The electronic roll feed is an integral part of almost every modern coil-fed press and punch and is frequently implemented as a stand-alone, electrically driven machine unit. The flexible feed automation replaces expensive mechanical designs. This increases the flexibility of production and in most cases the productivity of the plant. In sheet-metal processing too, the trend continues in cost-effective manufacturing both of large batches at maximum cycle rates as well as a broad range of components in small batches. Accordingly, the roll feed has to respond flexibly to changing production data and at the same time avoid unnecessary production downtimes.

The production stroke rate of the press or punch directly depends upon the positioning time of the roll feed. This can only be achieved when highly dynamic motional sequences are used. The sheet metal is transported between two rollers. In order to reduce the risk of impairing the surface of the sheet metal, the sheet metal strip between these rollers must be reliably prevented from slipping. For this reason, the motion control system must be highly dynamic and particular attention must be paid to jerk and G-Force characteristics.

The automation system must provide the following functions:

- Relative positioning to permit cycle-exact feeding of the material
- Special positioning algorithms to prevent slipping coupled with time-optimization

#### Benefits

The SIMOTION automation solution offers the following advantages:

- Maximum flexibility due to scalable products, systems and solutions
- Transparency in the process due to comprehensive diagnostic tools
- Preconfigured sample screens in WinCC flexible
- Highly dynamic and fast motion control
- Open, application-based solution which can be individually adapted by the OEM
- Industry-specific functions are provided, such as operating mode management, slip monitoring, encoder switchover, feed control, roller diameter compensation
- Feed lengths changed on the fly

**Design****Automation solution**

The modular SIMOTION Motion Control System in combination with the SINAMICS S120 drive system as well as highly dynamic servomotors provide a precise and highly dynamic response and therefore create a high-quality roll feed solution for optimum adaptation to the specific field of application.

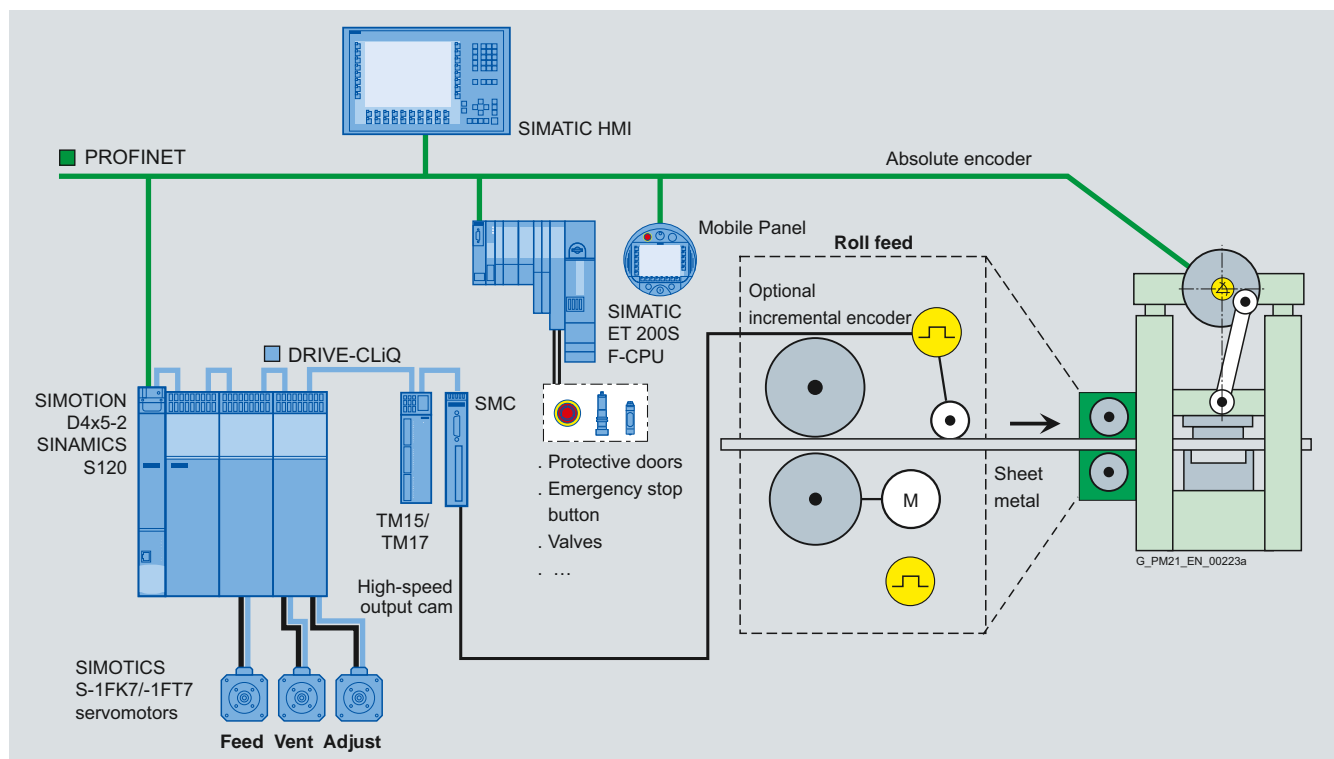
Due to the independence of the SIMOTION platform from the drives to be controlled, the SIMOTION application SimoRoll is also ideally suited for retrofitting of an existing plant.

The following variants are covered by the SIMOTION application SimoRoll:

- Single-axis roll feed
- Two-axis roll feed in the versions:
  - Double-axis roll feed comprising one roller pair in front and another roller pair behind the press or punch
  - Zig-zag roll feed comprising a roll feed in the direction of travel and a cross motion matched to the feed motion (optional)

For the purpose of achieving a highly dynamic traversing response and the resulting maximization of productivity, numerous process-oriented functions are provided:

- Specification of the feeding profile via position and velocity
- Specification of the velocity profile
  - Acceleration and deceleration limit ramp can be adjusted separately
  - Separately adjustable initial and final rounding
  - Presetting of maximum velocity
  - Override parameter can be adjusted during operation
- Operating modes:
  - Jog
  - Set-up
  - Reference point approach
  - Single traversing block MDI
  - Automatic single block and program processing
- Discharge rollers
- Actual value switchover from measuring wheel encoder to motor encoder
- Calculation of the maximum number of strokes for the specified dynamics and feed data
- Messages and monitoring functions:
  - Slip monitoring
  - Approach position reached (VPE)
  - Position reached and stop (PEH)
  - Difference between direct and indirect measuring system
  - Load ratio
- Documented sample project



Example of automation solution with SIMOTION D4x5-2 and SINAMICS S120

**More information**

More information can be found on the Internet at  
[www.siemens.com/metaforming](http://www.siemens.com/metaforming)

# Sector-specific solutions

## Metal forming technology

### Electronic transfer

#### Overview



#### Machine requirements

Transfer systems are used to transport workpieces within a press with transfer press tools or large-component transfer presses. They are designed as a stand-alone machine or integrated as a universal transfer into the press.

Transfer systems are employed in the sheet metal processing industry, in punching and metal forming, and in forging plants for cold, semi-cold and warm forming processes.

The ongoing trend to increase the degree of automation in industrial production processes is encouraging an ever growing number of machine manufacturers to replace conventional, mechanically coupled transfer systems (cams in a positive mechanical coupling with the ram) with fully parameterizable, electronic transfer controls. The modern electronic transfer has far fewer mechanical drive elements than the mechanical transfer system. These are almost entirely replaced by electrical positioning drives that operate synchronously with the main motion of the press.

Transfer systems generally are comprised of gripper rails which are controlled in three directions of motion and which transport workpieces in the press cycle time. These rails are equipped with either pneumatically operated active pincers or scoops (depending on the geometry of the sheet metal part) which hold the part during transport. At the same time, the axes are traversed continuously by means of electrical positioning drives in such a way that they follow a predefined traversing profile in accordance with the master setpoint of the ram encoder. Transfers thus offer a high degree of flexibility with regard to the motion sequence to be implemented and therefore offer considerable advantages when changing tools.

#### Benefits

The SIMOTION automation solution offers the following advantages:

- Configuration with the standard SIMOTION, SINAMICS, SIMATIC HMI components and I/O
- Graded performance of drive and operating components can be optimized to suit requirements
- Scalable number of axes
- Reduction in idle times, e.g. during maintenance and (re)commissioning after tool changes
- Flexible setting of motion sequence parameters by the press operator
- Movement according to variable polynomials ensures quick dynamic response and protection of mechanical components





# Sector-specific solutions

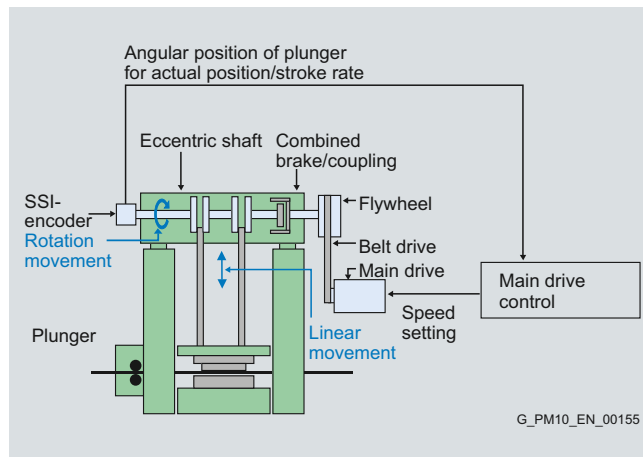
## Metal forming technology

### Mechanical universal press

#### Overview



Mechanical universal press



Operating principle of the mechanical universal press

#### Machine requirements

Mechanical universal presses are characterized by high flexibility since they are suitable both for cutting and forming. In combination with single, follow-on and progressive tools, small to medium-sized parts can be manufactured. With these machines, the drive concept of the main press drive is identical. The press ram complete with tool is driven via a mechanical transmission device (eccentric, toggle lever) using an electric drive and flywheel. The ram movement is initiated by the clutch-brake combination.

Material can be fed manually or continuously from a coil on automated presses (punching and forming machines). For automated presses with progressive dies, the workpiece will be moved along by roll or gripper feed to the press. The press control performs a variety of tasks such as operator control and monitoring, general machine control, operating mode and main drive control, tool management, cam controller, process control and positioning.

Automatic forming and punching machines place exacting demands on the sampling time for time-critical functions (cam controller, process control, etc.). Universal presses with stroke numbers up to 100, max. 200 strokes/min are mostly simple presses with a low degree of automation. Stroke numbers ranging from 200 to 500 strokes/min, even increasing to 2000 strokes/min in the case of punching presses, require more complex solutions and place higher demands on reaction times and degree of automation.

#### Benefits

The automation task demands almost complete integration of sequencing (logic) functions, motion functions and technology functions. With SIMOTION, it has been possible to resolve the different tasks with one system concept.

Sequence programming can be implemented in the familiar LAD or FBD languages.

Technology-specific programs are programmed wherever possible in Structured Text (similar to a high-level language) and the motion tasks are programmed with the graphical tool Motion Control Chart (MCC).

Different tasks are, for example:

- Operating mode control
- Main drive control with stroke number preset and ramp up
- Positioning of the main drive for stroke depth adjustment or tool changing
- Cam control with dynamic deceleration angle calculation for OT Stop
- Process monitoring functions such as tool position lock and press force monitoring

All these tasks can be programmed using the same engineering system and finally implemented with a machine-specific hardware platform.

Consequently,

- the number of interfaces is reduced,
- engineering and commissioning costs are optimized,
- and standardization is made easier.

**Design****Automation solution**

In the automation concept of mechanical universal presses presented here, the tested industry-specific application solutions have all been incorporated into the SIMOTION SimoPress application. With this technology software, we offer preconfigured press functions for the main drive control, cam controller, tool position lock and pressing force monitoring. SIMOTION D4x5-2 with the SINAMICS S120 drive system has been selected as the hardware platform.

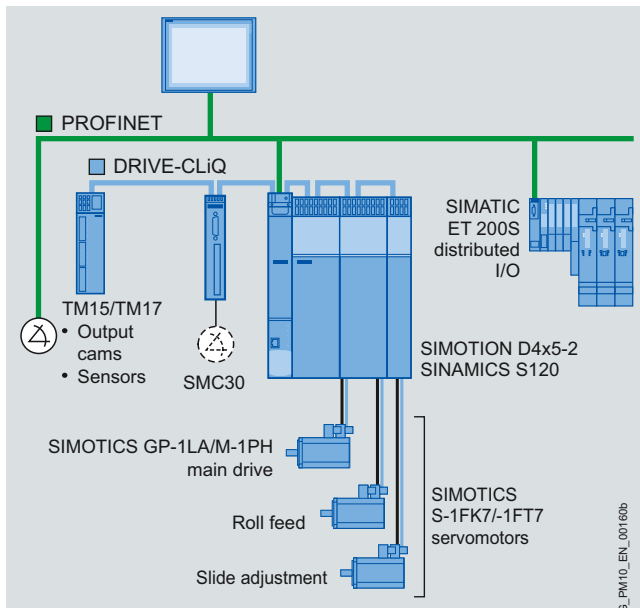
Both the machine control and the SIMOTION SimoPress technology functions are programmed on SIMOTION D4x5-2 and they control and monitor the machine through the distributed SIMATIC ET 200 I/O. The cam signals are output or sensor signals are acquired for process control over the drive-related, high-speed I/O modules TM15 or TM17 High Feature.

The motors are controlled by SINAMICS S120 Motor Modules. The SIMOTION SimoPress technology software covers all main properties for a mechanical universal press. The software together with the SIMOTION SimoRoll and SIMOTION SimoTrans solutions provides a complete press package.

**More information**

More information can be found on the Internet at

[www.siemens.com/metalfforming](http://www.siemens.com/metalfforming)



Example of automation solution with SIMOTION D4x5-2

# Sector-specific solutions

## Metal forming technology

### Pipe bending

#### Overview



#### Machine requirements

In pipe bending, round stock (pipe, rod, wire, conduit, etc) is actively reformed using a bending head. In this case, the bending head guides the material around a bending roller or die. The bending angle is determined by the end position of the bending head. The bending radius depends on the die and, therefore, cannot be changed during machining.

The bending programs are frequently created on the PC using special programs. The respective bending program comprising positions, angles, speed and pressure is selected via the operator panel and loaded into the controller. A bending machine typically has 3 to 5 positioning axes that are often implemented electrically, while the bending axes for large pipe diameters are frequently implemented hydraulically.

The pipe is inserted manually up to the end stop in the clamping chuck on the rotary axis. When the "start" command is given, the pipe is clamped hydraulically and the transport unit moves the pipe to the first bending point. The sliding rails or jaws are then hydraulically positioned. Clamping force and contact pressure values are set according to the material. The bending head is then rotated by a defined angle and the first bend is formed. The bending axis automatically tracks the pipe in the Y direction (follow-up mode) or is positioned by means of a cam. The bending radius is defined by the bending roller (tool) and cannot be changed. The sliding rail is then opened, the pipe is positioned at the next bending point and also rotated if necessary. Multi-dimensional structures can be created in this manner. Different radii are achieved by means of different dies of various heights, also referred to as "multi-groove dies". For this purpose, the pipe is moved using a mandrel and transport unit in the X direction away from the contour of the roller, then in the Z direction to the next roller and then positioned in the X direction on the roller again before it is moved to the next bending position. The sliding rails are then repositioned and the pipe is bent. This procedure is repeated until the bending program has been executed and the pipe can be removed manually.

In order to ensure the shortest possible bending procedures and reproducible quality, it is important to be able to adapt the various parameters, such as acceleration, speed and pressure, to suit the respective product.

The SIMOTION Motion Control System provides the following functions to perform these tasks:

- Positioning of electric and hydraulic axes
- Follow-up mode
- Cam
- Axis-dependent starting
- Output cam

#### Benefits

The automation concept with SIMOTION/SINAMICS combines the following advantages:

- Reduced engineering overhead due to configuration, programming and commissioning with one system, the SCOUT engineering system
- Fewer interfaces, since different tasks are performed on the same hardware
- Simplified commissioning of drives by means of an electronic motor rating plate
- Optimized machine operation due to user-friendly, flexibly adjustable and reproducible process parameters on the operator panel, e.g. pressure, positions
- Higher availability of the machine through wide-ranging diagnostic functions in SIMOTION in the case of a plant failure
- TIA integration simplifies integration of HMI, I/O and drives

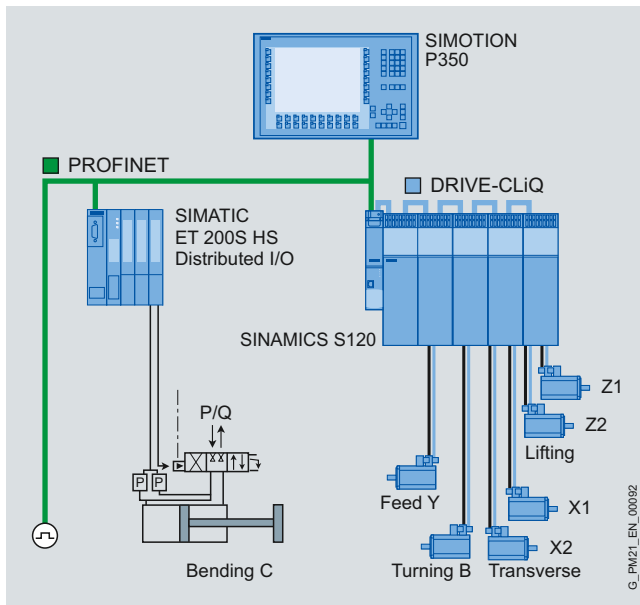
**Design****Automation solution**

As the system platform, SIMOTION P, the PC-based version with touch panel is a good choice. Without additional interfaces, the PC bending program, the Touch and HMI functions, the control logic and the Motion Control can all execute on a single hardware platform.

SINAMICS S120 and SIMOTICS S-1FK7 motors are used for the electric drives and provide highly dynamic and reproducible positioning. In the case of a hydraulic bending axis, the hydraulic servo valve can be activated via SIMATIC ET 200S HS (High Speed) with analog inputs and outputs. SSI encoders with interface to SIMATIC ET 200S HS or PROFINET encoders are available for sensing the bending axis position.

**More information**

More information can be found on the Internet at [www.siemens.com/metalfforming](http://www.siemens.com/metalfforming)



Example of automation solution with SIMOTION P and SINAMICS S120

# Sector-specific solutions

## Metal forming technology

### Hydraulic presses

#### Overview



#### Machine requirements

A hydraulic universal press is characterized by its piston mechanism in the form of one or more hydraulic cylinders. It is used for tasks such as punching, deep-drawing or pressing to internal high-pressure forming.

A machine comprises not just the hydraulic press itself, the tool can also include hydraulic actuators and control loops, especially in the case of internal high-pressure forming. A distinction is made between single or multiple-action drawing presses, depending on the number of axes acting on the metal sheet (pistons, die cushions, sheet metal holders, ejectors).

In the case of hydraulic universal presses, a distinction is made between closed-loop and open-loop controlled axis motion. With complex workpieces and molding processes such as internal high-pressure forming, intervention of the tool at the workpiece must be precisely controlled.

The seamless transition of the die cushion from position to pressure control and back to position control is essential. Also the exact press forces in the individual axes must be accurately controlled.

#### Benefits

The SIMOTION Motion Control System is the best possible choice for providing automation and drive technology for a complex hydraulic press. The SIMOTION platform is ideally suited for use with modular machines. Due to its open and modular structure, this Motion Control System combines all the necessary subareas of the overall machine control system: motion control, PLC functionality and technology functions.

An automation solution based on SIMOTION and PROFINET therefore offers the following advantages:

- Implementation of Motion Control, PLC and technology functions in one integrated system
- Optimized machine cycles due to deterministic real time and short cycle times result in high product quality and productivity
- Combination of any number of electric and hydraulic axes
- Preconfigured function modules (hydraulic control, synchronization, cams, cam control, etc.)
- Synchronized axes can be distributed between several control systems
- On-the-fly switchover between position and pressure control
- Automatic acquisition of the valve characteristic/controlled system
- Valve curves can be graphically edited and adapted using the CAM tool
- Press force measurement and tool position lock with scanning rates significantly lower than 1 ms due to fast signal acquisition/signal output via the SIMATIC ET 200S High-Speed I/O
- Open, application-based solution, can be individually adapted by the OEM

#### Flexible selection of the hardware platform

An application created using the SIMOTION SCOUT engineering system can be implemented on different hardware platforms. You can, therefore, always select the platform that suits your machine best:

- SIMOTION C, the compact controller in SIMATIC S7-300 design with interfaces for four position-controlled hydraulic drives (4 analog outputs and 4 encoder interfaces for SSI absolute encoders or RS422 incremental encoders)
- SIMOTION D, the solution integrated into the drive based on SINAMICS S120, for applications that require electric drives in addition to hydraulic drives
- SIMOTION P, the open PC-based solution for applications with demanding performance requirements or when, for example, visualization functions are required

**Design****Automation solution**

With SIMOTION P and the new SIMATIC ET 200S High Speed I/O, cycle times down to 250 µs can be achieved over PROFINET with IRT (Isochronous Real Time).

Highly dynamic control loops can therefore be achieved for hydraulic applications with position and pressure control.

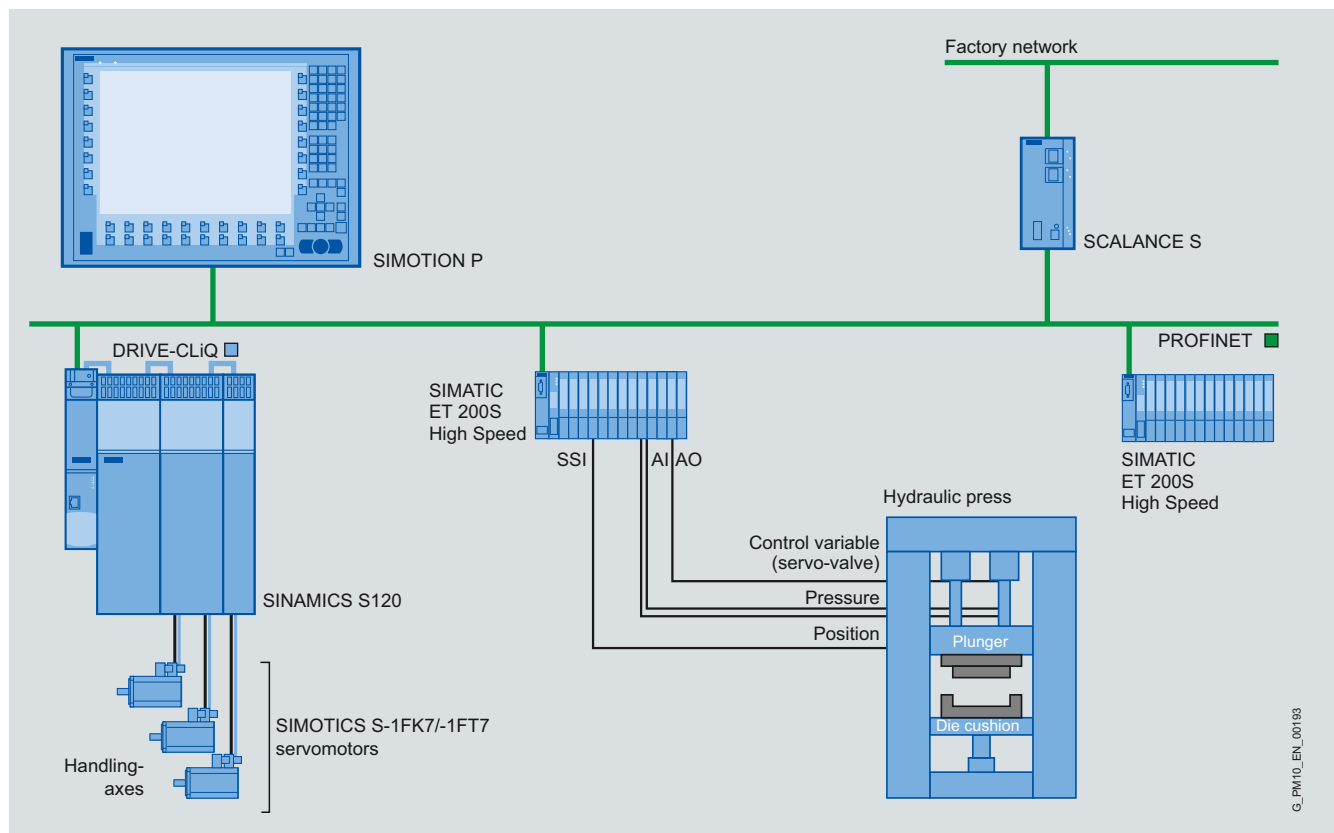
The necessary sensors and actuators, such as

- position encoders connected through the SSI interface,
- pressure sensors connected through analog inputs (AI),
- servo valves controlled via analog outputs (AO) and
- digital I/O for tool position lock and cam signal output

are connected over the SIMATIC ET 200S distributed I/O system, which was equipped with the necessary high-speed I/O modules beforehand to suit the application.

On the basis of PROFINET, it is therefore possible to synchronize hydraulic drives as well as electric drives.

In conveyor systems and press lines in the automotive industry or domestic appliance industry, uniform automation solutions can be implemented in this manner in which both electric drives (roll feeders, electronic transfer, feeders) and hydraulic drives (e.g. deep-drawing presses) are used.



Example of automation solution with SIMOTION P350 and SIMATIC ET 200S High-Speed

**More information**

More information is available on the Internet at

[www.siemens.com/metalfforming](http://www.siemens.com/metalfforming)

# Sector-specific solutions

## Metal forming technology

### Wire wrapping

#### Overview



Wire wrapping machines are used to manufacture coils, transformers and motor windings. The wire is wrapped from a coil directly on to the coil form or a template under an adjustable tensile force. Depending on the winding speed, the acentric geometry of the body to be wrapped produces fluctuating tensile forces that influence the process. The better the resulting tensile force peaks on the wire are limited by a high-performance control, the better the quality of the wrapped part. On the other hand, a higher speed limit during winding can also be achieved.

#### Benefits

##### *Advantages at a glance*

- Constant high quality of winding thanks to effective motion control and adaptive tensile force limiting algorithm
- Shorter production downtimes through time-optimized motion sequences
- High degree of flexibility thanks to an automation system which is fully integrated from the controller to the drive axes
- Standardized servicing and diagnostic options make servicing easier

#### Application

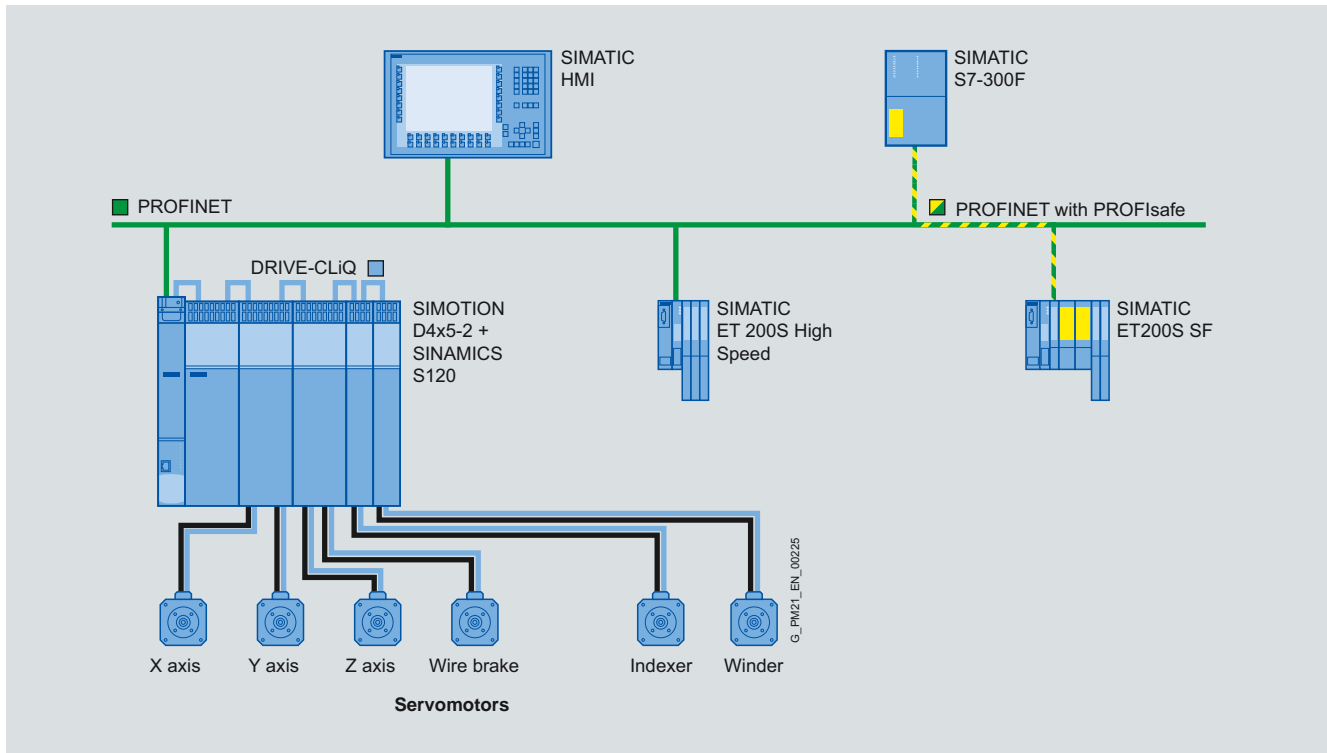
You are looking for an automation solution with which you can operate your wire wrapping machine at the highest possible performance and with the best possible winding quality? Irrespective of whether your machine technology is a flyer, template, needle or field coil winder, we provide the correct answer with SIMOTION. With innovative control algorithms for actively controlled wire braking, this Motion Control System combines a smooth winding process without wire stretching with an increased winding speed.



**Design**

The wire is unwrapped from a coil under adjustable tension by a "mechanical wire brake" and wound either directly onto the coil form or onto a template. During the winding process itself, the feed axes of the winding devices are in operation as well as the winding and braking axes. A further 5 to 6 drives are typically employed as feed, setup and part handling axes.

In an automotive production line, the wire wrapping machine is linked up to armoring and winding overhang forming machines, automatic pull-in machines (which draw the windings into the stator) and other handling machinery.



Automation solution for wire wrapping machine

**More information**

More information can be found on the Internet at  
[www.siemens.com/metaforming](http://www.siemens.com/metaforming)

# Sector-specific solutions

## Metal forming technology

### Wire-drawing and cable machines

#### Overview



#### Wire-drawing machines

In a wire-drawing machine, the surface and the structure of rolled or drawn wires is improved by reducing the cross-section (using a drawing die). Wire-drawing is a common and cost-effective procedure for this purpose.

#### Straight drawing machine

The wire to be drawn is taken from a wire roll or a drum, and fed to the first drawing block of several successively ordered drawing blocks. It is cold-formed and brought successively to the required final diameter. The finished wire is coiled using a spooler (the reel turns) or with a coiler (a rotating bell lays the wire in coil form, e.g. in a drum).

A controller, e.g. SIMATIC S7, calculates the setpoints for the drives, and performs the process data monitoring and the fault evaluation. PROFIBUS DP or PROFINET handles the data exchange of the systems with each other. Until 2008, MASTERDRIVES VC units have been used primarily for the drawing blocks. In recent years, however, these units have been replaced by SINAMICS G120 or, in the case of higher-quality applications, by SINAMICS S120. Although the SIMOTICS M-1PH7 or M-1PL6 and the successor model M-1PH8 have been chosen as preferred motors, SIMOTICS low-voltage motors 1LE1, 1LA, 1LG4 and 1LG6 with high energy efficiency are also used.

#### Cable machines

From the wire of a wire-drawing machine, extrusion produces a sheathed conductor. In a cable machine (stranding machine), this conductor is stranded with other conductors to form a bundle or a cable.

Depending on the traveled path of the capstan, the stranding curve  $\alpha = f(s)$  is followed. This can affect the electrical properties of the cable. High production speeds necessitate highly-dynamic stranding drives. Reversing times of 30 ms must be mastered here.

In this case, the stranding curve is specified by the SIMATIC or SIMOTION and transferred via PROFIBUS (or PROFINET) to the drives. Cams can be used to tailor the stranding curve to meet individual requirements.

The motors are inertia-optimized, permanently excited SIMOTICS S-1FK7/-1FT7 or SIMOTICS M-1PH synchronous motors.

Ready-to-use applications for SINAMICS S120 are available in DCC (Drive Control Chart) for winding and laying tasks and the appropriate programs in ST (Structured Text) for SIMOTION for cable and stranding machines.

#### More information

More information can be found on the Internet at

[www.siemens.com/converting](http://www.siemens.com/converting)

**Overview**

On servo presses, the main drive (servo torque motor) is directly connected to the eccentric of the press without a flywheel or coupling. The variation of the motor speed allows the plunger movement to be accelerated or decelerated as required. An automatically calculated motion profile allows the stroke numbers to be programmed individually and exactly. The press cycle can thus be individually controlled and thereby flexibly adapted to a wide range of tool and/or workpiece requirements.

**Benefits**

SIMOTION SimoPress Servo covers all significant properties for your servo press.

**Advantages at a glance**

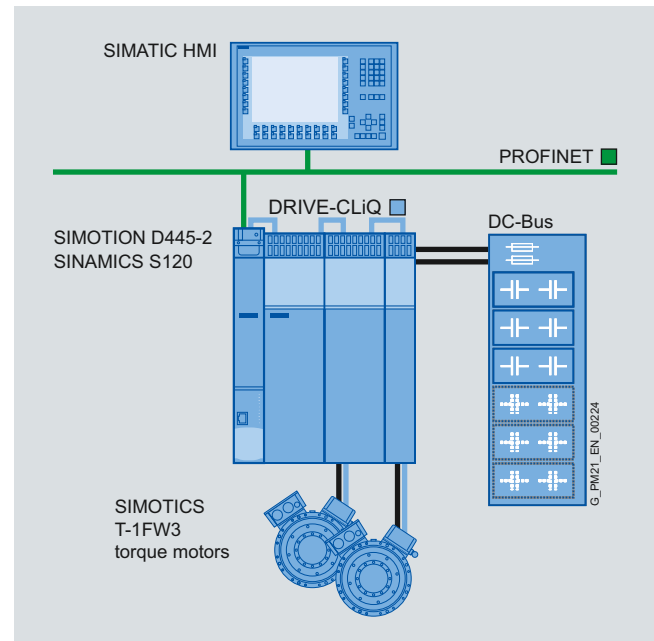
- Better productivity than can be achieved with conventional drive concepts
- High degree of flexibility because the machine can be set up quickly and easily for new production parts
- Mechanical design is simplified thanks to the use of direct drives
- Preconfigured function modules help to save time and costs
- Greater machine efficiency thanks to an energy-optimized motion profile for the press ram
- Optimization of the entire mechatronic system (mechanical components, drive, control system) means that the optimum machine can be designed faster on the basis of process-optimized drive design

**Application**

Decreasing lot sizes, an increasing number of different products, and the need to manufacture these products cost-effectively are the great challenge in metal forming technology. An ideal solution is provided by servomotor-driven mechanical presses, which combine the productivity of conventional presses with the flexibility of hydraulic presses. What is required is that all the components of the drive train be carefully tailored to the mechanics and kinematics of the respective press design.

**Design**

The consistent hardware basis for Siemens' universally applicable system solution for servo presses is formed by the SIMOTION Motion Control System, the SINAMICS S120 modular drive family and complete torque motors from the heavy duty series SIMOTICS T-1FW3/-1FW4. The PC-based SIMOTION variant or rugged operator panels and industrial PCs from the SIMATIC family provide visualization and order management.



Possible topology of a servo press with 2 main drive motors and electrical energy storage

# Sector-specific solutions

## Metal forming technology

### Servo press

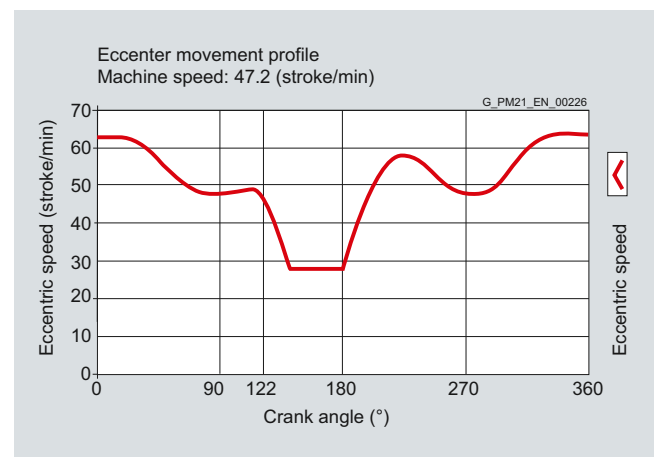
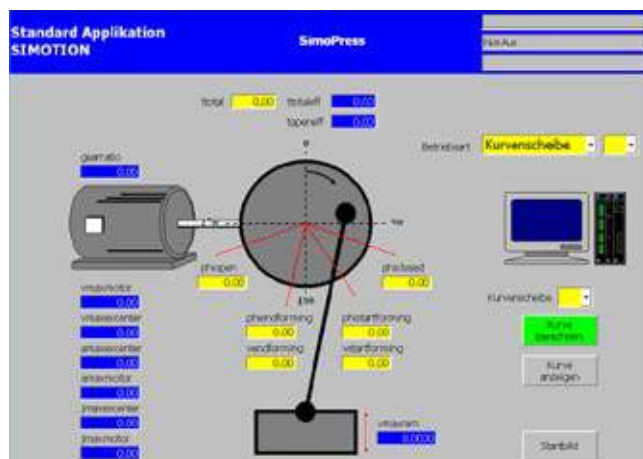
#### Function

The flexible motion profile allows cycles to be programmed individually and exactly. The result: a significant improvement in productivity. In order to shorten the cycle times, however, the ram must be accelerated rapidly to beyond the upper dead point during the no-press interval and then braked down again or operated with a pendulum stroke.

#### Optimized motion control

The functions in the SIMOTION SimeoPress Servo application use the parameters of the press, the forming process and the drive train (SINAMICS and SIMOTICS torque motor) to calculate ram kinematics which are optimized to save energy, in other words, an optimized traversing profile with smooth, flowing transitions which protect tools and materials and prevent excessive power and torque peaks.

The end user benefits considerably from the result: A new pressing tool can be set up quickly and easily with just a few parameters. SimeoPress Servo also includes an input screen with which the motion control of the servo press can be visualized in WinCC flexible.



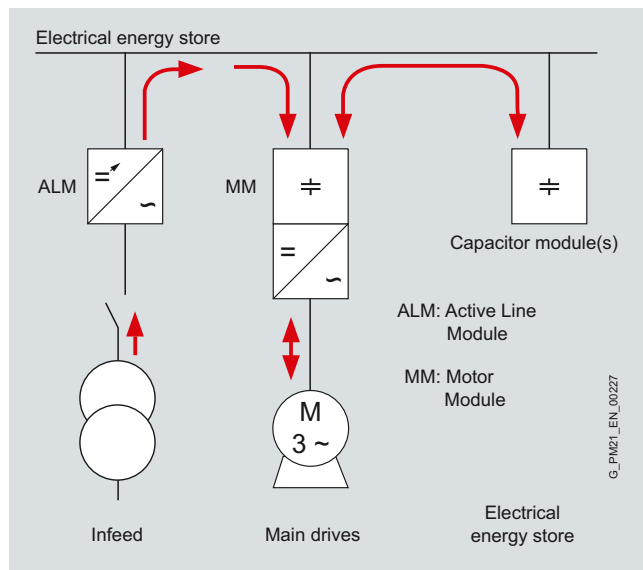
Input screen of SIMOTION SimeoPress Servo and the optimized energy-saving motion profile calculated on the basis of the input parameters

**Function** (continued)**Efficient energy management**

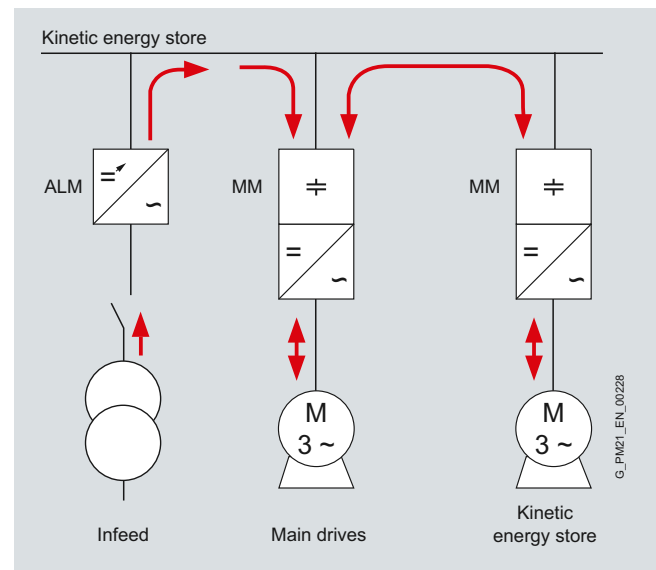
As on servo presses the energy for the motion and the forming process is provided exclusively by servo drives, there is an oscillation of energy resulting from sudden acceleration and subsequent sudden braking. This effect is cleverly used with intelligent energy storage methods so that the sudden acceleration and braking energy peaks are held in the machine and no longer have to be supplied by the factory power system. The

connected power for a servo press is therefore at the same level as a comparable conventional press. The following can be used as energy storage linked directly to the SINAMICS S120 DC link:

- Capacitor modules, several modules can be linked to increase the storage capacity
- Kinetic energy storage



Solutions for servo presses with SINAMICS Energy Management

**More information**

More information can be found on the Internet at [www.siemens.com/metalfforming](http://www.siemens.com/metalfforming)

# Sector-specific solutions

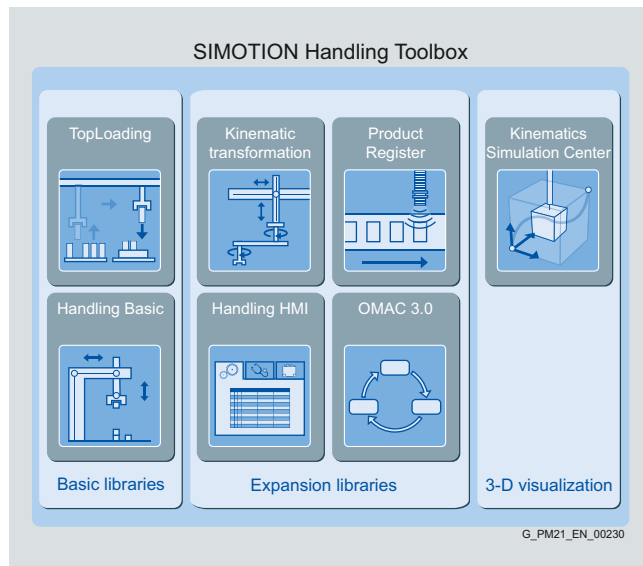
## Handling

### SIMOTION Handling Toolbox

#### Overview



#### Machine requirements



SIMOTION Handling Toolbox

#### Controlled motional sequences with functional solutions

Driven by the demand for ever faster product changes and ever higher productivity, the degree of automation of production lines is continually increasing. Flexible solutions and modular systems are the perfect answer.

Whether it is a matter of basic feed axes or complex mechanical systems, such as Delta Pickers in the packaging industry, or the automatic loading and unloading of presses: With its SIMOTION Motion Control System, Siemens is offering the ideal platform for first-class handling solutions – precisely tailored to specific handling tasks.

And with its SIMOTION Handling Toolbox, Siemens can also provide a solution toolkit which contains the right answers for virtually every application. Any requirement can be fulfilled simply and efficiently by the standardized, preconfigured application solutions.

Functions such as path planning, protection zones, traversing program editor, teach-in or safety concepts, or even product management using a camera system are already implemented in the toolkit – and can simply be adapted or extended as required.

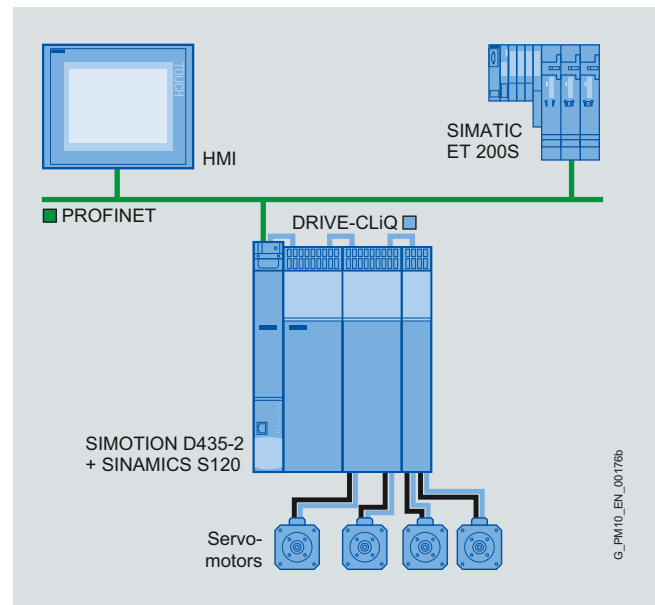
#### Benefits

SIMOTION Handling Toolbox: Advantages at a glance

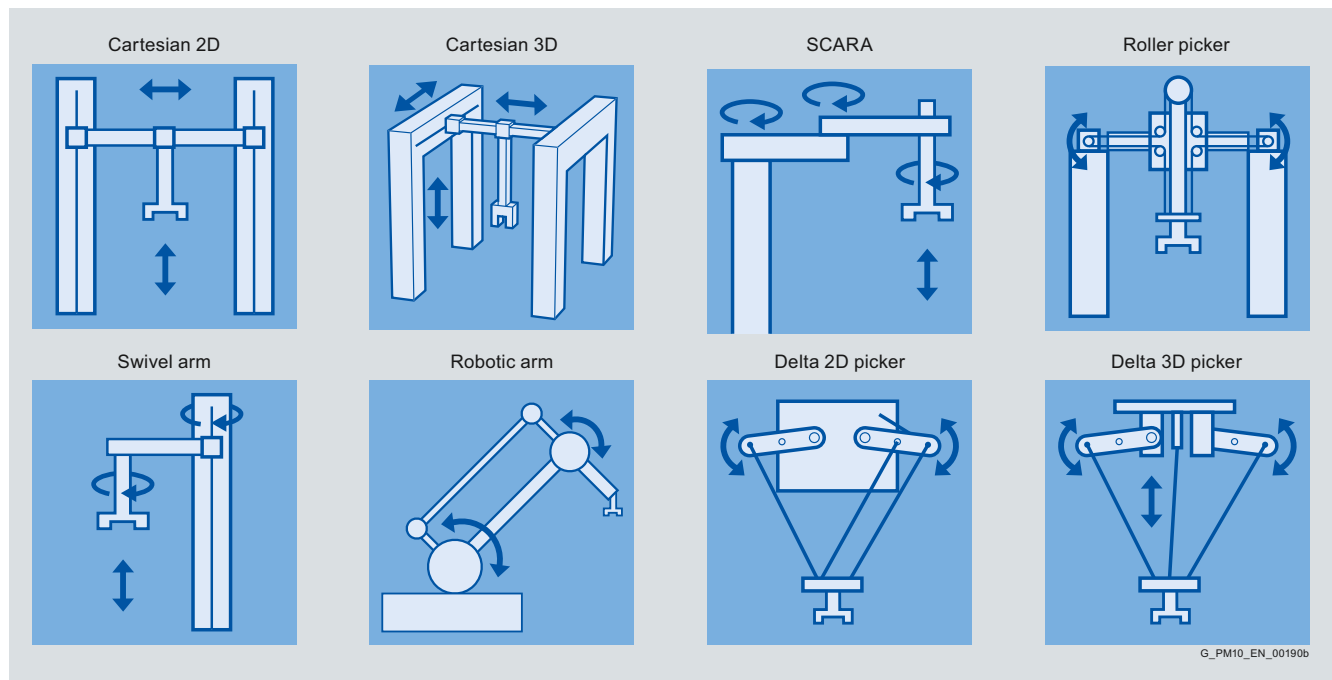
- Efficient engineering thanks to standardized software
- All commonly used kinematics are already stored in the system
- Customized kinematics can be integrated
- Integrated data management for vision systems for product management (position and orientation)
- Product register – management of products detected by means of sensors/camera systems
- Extremely easy programming for pick&place tasks on moving conveyor belts
- Ideal for any application due to free selection of the SIMOTION platform
- Zone management, e.g. for work area monitoring
- Visualization tools as support for programming

**Design****Automation solution**

The automation concept shown is an example of a gantry robot with 3 servo drives as well as one additional drive for the infeed conveyor. It is easy to see the advantage that direct coupling of the gantry robot with the infeed axis is possible thanks to integration of the handling functionality in the SIMOTION Motion Control System. Costly interfaces and separate control units for the robots can be omitted. It can be controlled by a machine HMI, in this case a SIMATIC TP177B Touch Panel.

**Standard kinematics integrated in the system**

The figure shows the kinematics already integrated into SIMOTION. Other kinematics can be linked to the control over a free transformation interface using the appropriate mathematical transformation equations.

**More information**

More information can be found on the Internet at [www.siemens.com/handling](http://www.siemens.com/handling)

# Sector-specific solutions

## Customer applications

### Optimized Packaging Line

#### Overview



This opens up many opportunities and presents industries such as food & beverages or pharmaceuticals with considerable challenges. In these industries, only those who act flexibly on the one hand and cost-consciously, efficiently and productively on the other hand, will be successful in the long term. With a holistic concept, we as your automation partner will support you in this. With the Optimized Packaging Line, we offer machine users and machine manufacturers integrated automation solutions for packaging lines and machines.

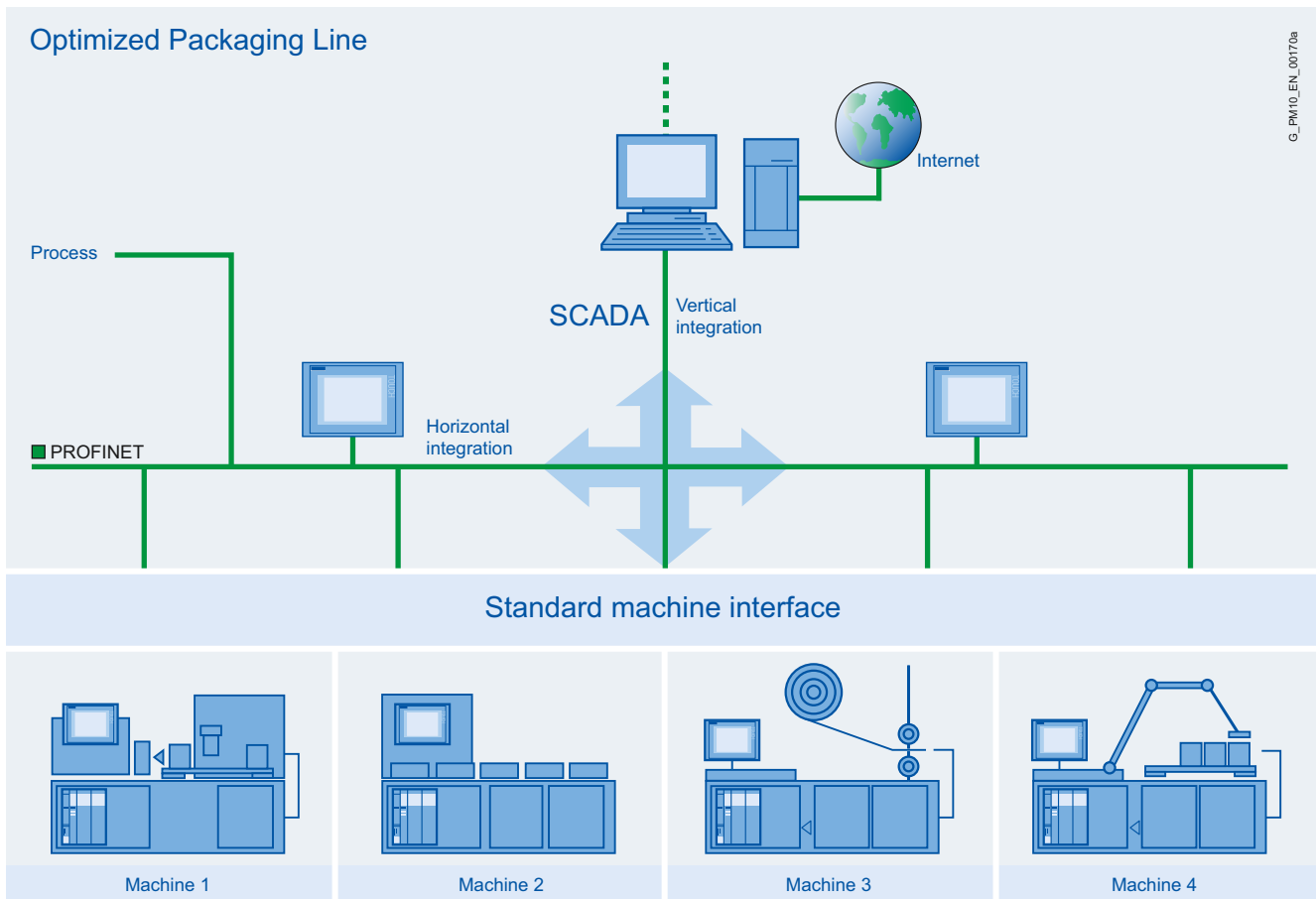
With components that can be freely selected to solve the specific task. These include SIMOTION, SIMATIC, SINAMICS and PROFINET – reliable standards which will support the implementation of any system solution. Automation of packaging lines from a single source. With components that can be freely selected to solve the specific task – and which do not limit the modularity of the packaging machine.

Automating packaging machines and lines uniformly and system-wide – this is the concept of the Optimized Packaging Line. As an automation partner, we have developed a concept that is based on Totally Integrated Automation (TIA), which offers maximum benefits for machine users and machine manufacturers through standardization of interfaces, software modules and hardware components. The automation architecture is horizontally and vertically standardized. Based on international standards – such as OMAC – solutions with a high potential for innovation can be implemented in this manner.

The technology comes from a company that masters everything – from initial consultation through engineering as far as the finished solution and servicing. An all-in-one solution.

#### Machine requirements

The packaging industry requires greater flexibility than almost any other industrial sector: new types and sizes of packaging, new markets and new drive technologies – requirements change quickly.



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#### Benefits

The uniform and system-wide integration of components on the basis of standards reduces their number. This reduces the integration overhead, engineering and fixed costs and increases productivity.

The standardization of components and interfaces reduces the number of different types and increases the line efficiency through:

- Reduced complexity
- Reduced spare parts inventories

Software blocks such as SIMOTION Technology Objects for technology functions lead to:

- Less engineering outlay for the application
- More reliable functioning due to pretested software

The OPL architecture optimizes energy consumption, taking all electrical loads into account. With this concept, the machine architectures and energy distribution network right up to the medium-voltage transformer are viewed as an integral system. The advantages of this approach are:

- Reduction in energy losses in the installation
- Reduction in carbon footprint of the installation

Interface data blocks simplify the acquisition and presentation of production data, resulting in:

- Less engineering outlay during line integration
- Greater cost-effectiveness due to the easy addition of machines
- Less risk on plant start-up

Increase in efficiency and reduction in downtimes due to:

- Uniform overview of the complete line or plant
- Integrated diagnostics and alarm concept
- Identical user interfaces for all machines

Higher productivity results in:

- Better availability of the filling line
- Less training

#### Design

##### Automation solution

The packaging world has become more transparent and simpler with the Optimized Packaging Line: The components are optimally tuned to each other and the software structures are standardized. A uniform operating concept with totally integrated diagnostics ensures high availability.

Due to consistent implementation of the specified components, high productivity and availability is ensured over the entire service life of the packaging plant.

##### The components

SIMOTION, SIMATIC, SINAMICS, PROFINET ... reliable standards which will support the implementation of any system solution. From the control of simple auxiliary units through to complex, high-velocity packaging machines.

#### The concept

Uniformity, integration, simplicity – due to identical design of the hardware, identical software modules and user interfaces, and due to using the same tools for simulation, configuration, programming, commissioning and diagnostics.

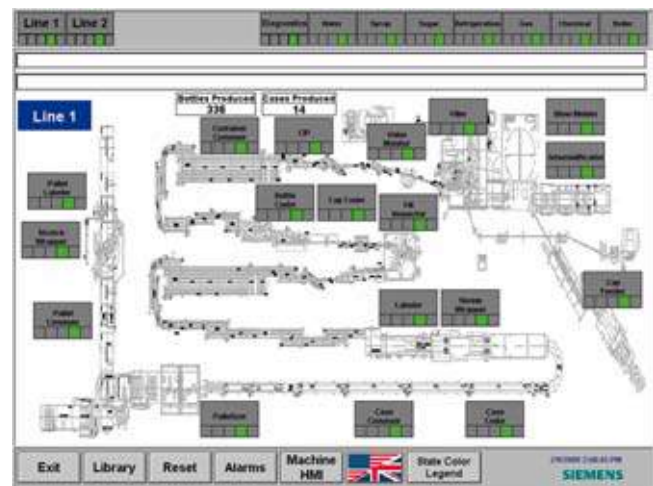
Machine manufacturers and operators benefit consistently from the synergy effects – starting with configuration, simulation and commissioning and continuing through staff training, maintenance and service.

#### Flexibility

Our customers are able, at any time, to introduce further modifications on the basis of these standards. The design of our technology is determined by the task, not vice-versa.

#### Our project service

Our solutions are building blocks integrated into a seamless system. This includes the planning phase with advice about system architecture, energy optimization and interfaces, as well as active support through the entire adjustment and commissioning process which continues into the operating phase – with training and application/commissioning support as key features of the service. This is why automation solutions from Siemens stand for maximum availability and productivity in packaging lines throughout the world.



Line overview with status indicator

#### More information

More information can be found on the Internet at [www.siemens.com/packaging](http://www.siemens.com/packaging)

# Sector-specific solutions

## Renewable energy

### Overview



Siemens is offering drive and automation solutions for the rapidly growing segment of the solar industry.

Solar cells can be manufactured by a variety of methods. The crystalline cell manufacturing process is the most common, but there is a growing trend in favor of thin-film solar modules. Siemens can provide optimized machine solutions for the entire production chain of both manufacturing processes. These include, for example, concepts and solutions for:

- Silicon ingot cutting, squarers, wire saws
- Wafer processing lines
- Antireflection coating machines
- Wafers, cells: Transport and sorting
- Machines for manufacturing solar cells and modules (e.g. tabbers, stringers, lay-up stations)
- Thin-film coating plants (TCO, CVD, PVD)
- Laser structuring
- Laminators, framing and test systems

The wafer, cell and module manufacturing process demands short cycle times in order to ensure a high throughput. Moreover, it employs complex kinematics. In this area as well, Siemens can provide suitable solutions based on the SIMOTION control system with preconfigured software elements. Handling kinematics, e.g. Cartesian gantry systems, roll pickers, Scara robots, Delta2 and Delta3 pickers with interpolation functionality, are included in the handling toolbox. Additional functions such as conveyor synchronization and camera integration are available.

### Example: Wire saw application

Wire saws are used to cut silicon ingots into razor-thin, round or square wafers for the photovoltaics and semiconductor industries. In this process, rollers guide a long spool of wire over a wire web. The wire is moved back and forth between the unwinder and rewinder at a speed of up to 20 m/sec (65 ft/s), a dancer control ensuring that the wire tension remains constant.

The silicon ingots are then lowered from above at a slow, constant speed onto the wire web and cut into razor-thin wafers in a process lasting several hours. In one of the more common techniques applied today, it is not the wire itself which cuts the silicon, but a continuous supply of an abrasive liquid known as "slurry". There is a growing trend to use ever thinner wires in order to minimize the width of cut and thus produce more wafers from a single ingot.

At the same time, machine builders are attempting to achieve faster cutting speeds and thus improved productivity. Their main focus is on avoiding wire breaks which would in most cases damage the expensive ingot.

### Benefits

#### *The highlights of the Siemens wire saw solution are:*

- High-precision Motion Control functionality guarantees high-quality manufacture of razor-thin wafers
- Smart Energy Management ensures reliable operation even during brief power supply failures
- Cost savings thanks to efficient engineering and technology functions integrated in the drive
- Safety functions in the drive, thus avoiding complex, conventional protective circuitry
- Less installation space required thanks to compact, flexible drive solutions with SINAMICS S120

### Application

#### *Smart Energy Management prevents wire breaks*

The automation and drive solution which has been specially optimized for wire saws includes a Smart Energy Management function which monitors and bridges supply fluctuations or brief supply failures. The combination of capacitor power modules and the SINAMICS Active Line Module ensures that the risk of wire breaks is effectively eliminated. The capacitor back-up is dimensioned to allow controlled shutdown of the machine, so that wire breaks are also avoided in the event of a Safe Operating Stop. The integrated safety functions are yet another advantage of the SINAMICS S120 converter system.

### Design

#### Automation solution

The compact converters in the SINAMICS S120 product range are used as a drive system for wire saws. Their modular design makes these converters scalable and flexible in terms of performance and functionality. As a result, they offer a technically and economically optimum solution to the requirements of wire-sawing processes.

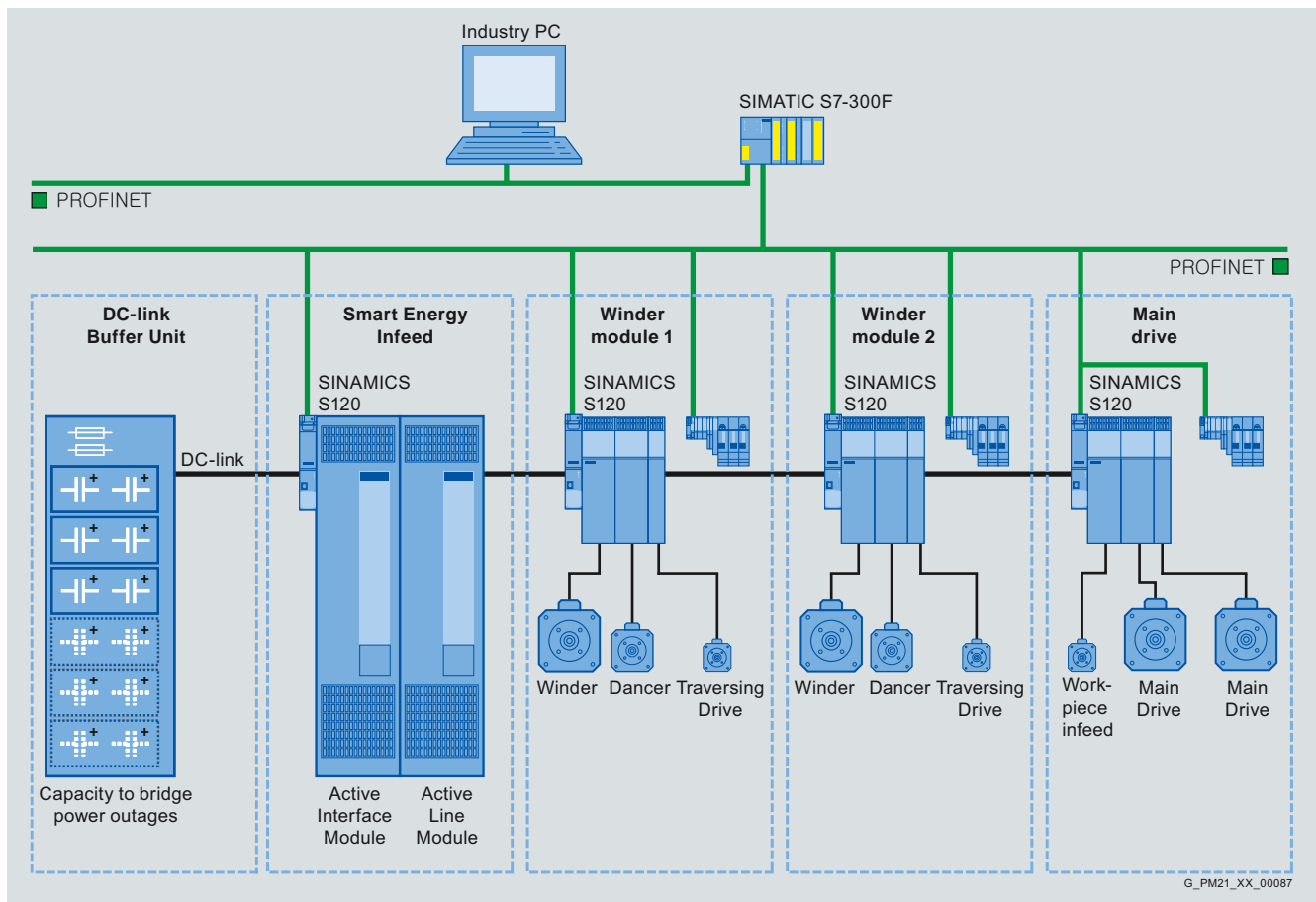
An Active Line Module is employed as the infeed for the multi-axis system. The entire drive intelligence (including interfaces to higher-level controls) is housed in the Control Unit.

The CU320-2 Control Unit provides high-speed control for a multi-axis system and contains a memory card on which the firmware and all parameters for the drive line-up are stored. The central diagnostics capability for closed-loop control, infeed, inverters, motors and encoders is also supplied by the Control

Unit (CU). The CU is linked to other components of the drive system via the digital system bus DRIVE-CLiQ.

The SIMOTICS M-1PH8 water-cooled motors are ideally suited to the role of winder motors, while the compact SIMOTICS S-1FK7 servomotors are employed for laying devices and dancers. The high-precision ingot feed function is provided by a high-performance SIMOTICS S-1FT7 motor.

A fail-safe SIMATIC S7 CPU is employed as the higher-level control system. This communicates with the drives or distributed SIMATIC ET200 I/O modules by means of PROFINET/PROFIsafe.



Automation configuration for saws

# Sector-specific solutions

## Renewable energy

### Function

#### *Efficient engineering (with Drive Control Chart DCC)*

Using DCC technology reduces engineering time and therefore cuts costs. DCC offers modern, scalable drive technology with simple, graphics-based programming procedures. A comprehensive library with preconfigured, multi-instance-capable Drive Control Blocks (DCB) is available, including closed-loop control/arithmetic and logic blocks. These are quick and easy to combine into individual drive solutions using a drag and drop process. The scope of functions needed for the wire saw application, for example, unwinder and rewinder functions, closed-loop dancer controls and laying devices, can be solved completely with DCC technology. Configurations can be expanded and modified easily with the graphical DCC editor. DCC technology offers a drive-oriented, high-speed closed-loop control, thereby relieving the load on the higher-level control system.

### More information

More information can be found on the Internet at [www.siemens.com/machinebuilding](http://www.siemens.com/machinebuilding)

## Appendix



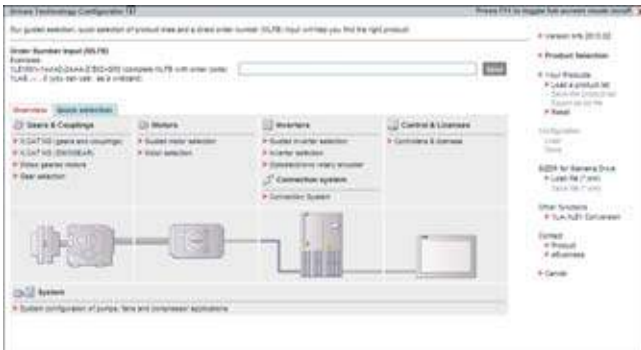
<b>16/2</b>	<b>DT Configurator selection guide</b>
<b>16/4</b>	<b>Approvals</b>
<b>16/5</b>	<b>Notes on software</b>
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# Appendix

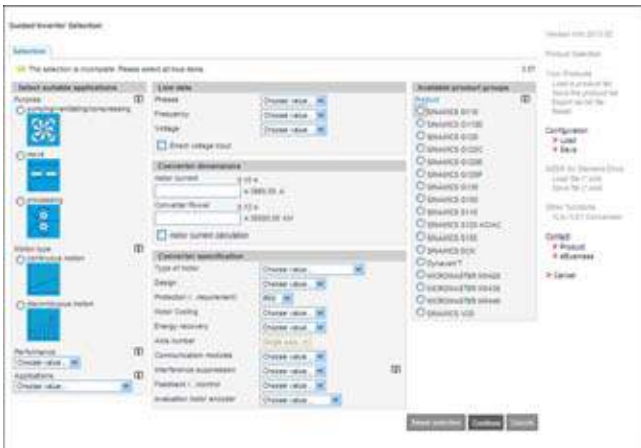
## DT Configurator selection guide

### Overview

#### Product description



The DT Configurator has been developed to support selection of drive train products from the product range. It is available as a selection guide offline within the interactive Catalog CA 01 (DVD-ROM), and online in the Industry Mall. The DT Configurator makes it easier to find the appropriate drive solution. The preselection helps you narrow down the product spectrum and determine the right product group. Motors and drives can be selected according to the specific application.



The DT Configurator supplies the correct order number as well as the associated documentation.

It can display operating instructions, factory test certificates, terminal box documentation, etc. and generates data sheets, dimension drawings and a start-up calculation for the relevant products. It can also be used to identify a suitable drive for the selected motor.

**Synchronservomotor**  
Synchronservomotor

**Bestellnummer / Order no.:** 1FK7064-4CF71-1FH1-Z  
**Ordering data:** MSB-N02

**Kunden-Auftrags-Nr. / Customer no.:** \_\_\_\_\_  
**Siemens-Auftrags-Nr. / Order no.:** \_\_\_\_\_  
**Angebote-Nr. / Offer no.:** \_\_\_\_\_  
**Benennung / Name:** \_\_\_\_\_

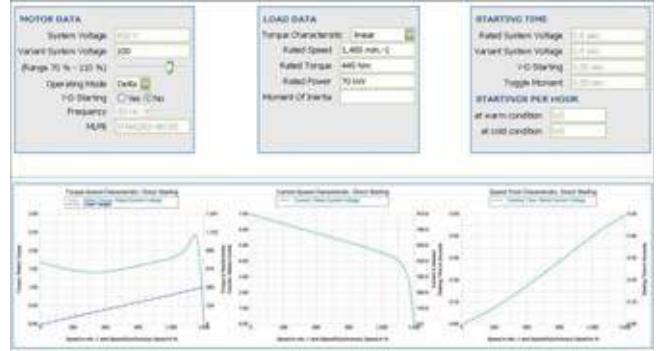
**Appl. Nr. / App. no.:** \_\_\_\_\_  
**Konfig. Nr. / Configuration no.:** \_\_\_\_\_  
**Projekt / Project:** \_\_\_\_\_

Projektierungsdaten / Engineering data:	Physikalische Konstanten / Physical constant:
Bestimmungsdrehzahl / Rated speed: 3000 1/min	Drehmomentkonstante / Torque constant: 1.11 Nm/A
Polzahl / Number of poles: 8	Spannungskonstante bei 20° C / Voltage constant at 20° C: 0.001175 V/Hz
Bestimmungsdrehmoment (100 K) / Rated torque (100 K): 8.0 Nm	Wicklungswiderstand bei 20° C / Winding resistance at 20° C: 0.49 Ω
Bestimmungsstrom / Rated motor current: 7.6 A	Drehfeldrückwärtsschlupf / Rotor field inductance: 12.0 mH
Stillstanddrehmoment (80 K) / Stall torque (80 K): 10.00 Nm	Elektrische Zeitkonstante / Electrical time constant: 24.50 ms
Stillstanddrehmoment (100 K) / Stall torque (100 K): 12.0 Nm	Mechanische Zeitkonstante / Mechanical time constant: 0.84 ms
Stillstandstrom (80 K) / Stall current (80 K): 8.7 A	Thermische Zeitkonstante / Thermal time constant: 55 min
Stillstandstrom (100 K) / Stall current (100 K): 10.8 A	Wälzlagerbelastbarkeit / Shaft bearing admissible load: 29500 N/mm²
Trägheitsmoment des Motors / Moment of inertia of motor: 0.000500 kgm²	Nenngewicht des Motors / Net weight of the motor: 15.8 kg

Grenzdaten / Limiting data:	Optimaler Betriebspunkt / Optimal operation point:
Maximal zul. Drehzahl (mech.) / Maximum speed (mech.): 7500 1/min	Optimale Drehzahl / Optimal speed: 3000 1/min
Maximal zul. Drehzahl (elektr.) / Maximum speed (electr.): 7500 1/min	Optimale Leistung / Optimal power: 0.5 kW
Max. Drehmoment bei 50% I <sub>N</sub> / Maximum torque at 50% I <sub>N</sub> : 32.0 Nm	
Maximalstrom / Maximum current: 33.0 A	

Empfohlenes Motor-Modul / Recommended motor	Sonderausführung / Special configurations
Bestimmungsdrehrichter / Rated motor current: 18 A	N02 Antriebs-Induktions-Überlagerung-Modul für den Motor (PT) / Non-saturated shaft inductor (oversampling) for IP-T motor
Maximalstrom / Maximum current: 36 A	M02 Ausführung für antriebsmechanische Details, Size 2 nach DIN 52034/502 52341-1 / Version for drive mechanical details according to DIN 52034/502 52341-1
Max. Drehmoment bei 50% I <sub>N</sub> / Maximum torque at 50% I <sub>N</sub> : 32.0 Nm	

Technische Änderungen vorbehalten / Technical and ordering data are subject to change. There may be discrepancies between individual web pages and data sheets.



### Overview (continued)

3D models in a wide variety of 3D formats are also available.



The comprehensive help system not only explains the program functions, but also provides access to detailed technical background knowledge.

### Product range

The DT Configurator encompasses the following:

- Product range for low-voltage motors
- MICROMASTER 4 inverters
- SINAMICS S120 drive system
- SINAMICS G110 standard inverters
- SINAMICS G120 standard inverters
- SINAMICS G110D distributed inverters
- SINAMICS G120D distributed inverters
- SINAMICS S110 servo drives

including:

- 2D/3D model generator for motors and drives
- Data sheet generator
- Start-up calculation
- Comprehensive product-specific documentation

### System requirements

- PC with 1.5 GHz CPU or faster
- Operating system:
  - Windows XP
  - Windows NT V4.0 (SP6 and higher)
  - Windows Vista
  - Windows 7
- At least 1 GB RAM (2 GB recommended)
- Screen resolution 1024 × 768, graphics with more than 256 colors, small fonts
- DVD drive for offline version (CA 01)
- Windows-compatible sound card
- Windows-compatible mouse

### Offline access in the interactive catalog CA 01

The interactive catalog CA 01 – the offline mall of Siemens Industry Automation & Drive Technologies – contains over 100000 products with approximately 5 million possible drive system product variants.

The CA 01 catalog can be installed as a light or full version from the DVD-ROM directly onto your hard disk or network. The DT Configurator can then be found in the main menu of the CA 01 under the "Selection guide" tab.

### Online access in the Siemens Mall

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

### More information

The electronic CA 01 catalog can be ordered from the relevant Siemens sales office or via the Internet:

[www.siemens.com/automation/CA01](http://www.siemens.com/automation/CA01)

Links to tips, tricks and downloads for functional or content updates can also be found at this address.

For technical advice, you can also contact our hotline for catalog CA 01:

E-Mail: [adsupport@siemens.com](mailto:adsupport@siemens.com)

# Appendix

## Approvals

### Overview



Many products in this catalog are in compliance with UL/CSA requirements and are labeled with the appropriate certification markings.

All certifications, certificates, declarations of conformance, test certificates, e.g. CE, UL, Safety Integrated have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose.

For cases that deviate from these conditions, the company or person marketing these products is responsible in having the certificates appropriately re-issued.

#### **UL: Underwriters Laboratories** *Independent public testing institution in North America*

Approval marks:

- **UL** for end products, tested by UL in accordance with UL standard
- **cUL** for end products, tested by UL in accordance with CSA standard
- **cULus** for end products, tested by UL in accordance with UL and CSA standards
- **UR** for mounting parts in end products, tested by UL in accordance with UL standard
- **cUR** for mounting parts in end products, tested by UL in accordance with CSA standard
- **cURus** for mounting parts in end-products, tested by UL in accordance with UL and CSA standards

Test standards:

- SINAMICS: Standard UL 508C
- Motors: Standard UL 547

Product category/File No.:

- SINAMICS: E192450
- Motors: E93429

#### **TUV: TUV Rheinland of North America Inc.** *Independent public testing institution in North America* *National recognized testing laboratory (NRTL)*

Approval mark:

- **cTUVus** tested by TUV in accordance with UL and CSA standards

#### **CSA: Canadian Standards Association** *Independent public testing institution in Canada*

Approval mark:

- **CSA** tested by CSA in accordance with CSA standard

Test standard:

- Standard CAN/CSA-C22.2/No. 0-M91/No. 14-05/No. 142-M1987



### Overview

#### Software types

Software requiring a license is categorized into types. The following software types have been defined:

- Engineering software
- Runtime software

#### Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

#### Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

#### License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

- Floating license
- Single license
- Rental license
- Rental floating license
- Trial license
- Demo license
- Demo floating license

#### Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started. A license is required for each concurrent user.

#### Single license

Unlike the floating license, a single license permits only one installation of the software per license.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per instance, per axis, per channel, etc.

One single license is required for each type of use defined.

#### Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific period of time (the operating hours do not have to be consecutive).

One license is required for each installation of the software.

#### Rental floating license

The rental floating license corresponds to the rental license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

#### Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

#### Demo license

The demo license support the "sporadic use" of engineering software in a non-productive context, for example, use for testing and evaluation purposes. It can be transferred to another license. After the installation of the license key, the software can be operated for a specific period of time, whereby usage can be interrupted as often as required.

One license is required per installation of the software.

#### Demo floating license

The demo floating license corresponds to the demo license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

#### Certificate of license (CoL)

The CoL is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

#### Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

#### Delivery versions

Software is constantly being updated. The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

#### PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.

A separate PowerPack must be purchased for each original license of the software to be replaced.

# Appendix

## Notes on software

### Software licenses

#### Overview

##### *Upgrade*

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.

The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.

A separate upgrade must be purchased for each original license of the software to be upgraded.

##### *ServicePack*

ServicePacks are used to debug existing products.

ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

##### *License key*

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

##### *Software Update Service (SUS)*

As part of the SUS contract, all software updates for the respective product are made available to you free of charge for a period of one year from the invoice date. The contract will automatically be extended for one year if it is not canceled three months before it expires.

The possession of the current version of the respective software is a basic condition for entering into an SUS contract.

You can download explanations concerning license conditions from [www.siemens.com/automation/salesmaterial-as/catalog/en/terms\\_of\\_trade\\_en.pdf](http://www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf)

IA/DT/BT Software licenses En 05.04.12

#### Overview

The "General License Conditions for Software Products for Automation and Drives" are applicable for supplies and deliveries of I DT software products.

#### *Legal notes during setup for new software products*

All software products feature a uniform reference to the license conditions. The license conditions are enclosed either with the documentation or in the software pack. When software is downloaded from the Internet, the license contract is displayed before the ordering procedure and must be accepted by the user before downloading can continue.

#### Notice:

This software is protected by German and/or US copyright laws and the regulations of international agreements. Unauthorized reproduction or sale of this software or parts of it is a criminal offense. This will lead to criminal and civil prosecution, and may result in significant fines and/or claims for damages. Prior to installing and using the software, please read the applicable license conditions for this software. You will find these in the documentation or packaging.

If you have received this software on a CD-ROM that is marked "Trial version", or accompanying software that is licensed for your use, the software is only permitted to be used for test and validation purposes in accordance with the accompanying conditions for the trial license. To this end, it is necessary for programs, software libraries, etc. are installed on your computer. We therefore urgently recommend that installation is performed on a single-user computer or on a computer that is not used in the production process or for storing important data, since it cannot be completely excluded that existing files will be modified or overwritten. We accept no liability whatsoever for damage and/or data losses that result from this installation or the non-observance of this warning. Every other type of use of this software is only permitted if you are in possession of a valid license from Siemens is obtained.

If you are not in possession of a valid license that can be proven by presenting an appropriate Certificate of License/software product certificate, please abort installation immediately and contact a Siemens office without delay to avoid claims for damages.

#### Overview (continued)

#### *Software update services*

##### **Order**

To order the software update service, an order number must be specified. The software update service can be ordered when the software products are ordered or at a later date. Subsequent orders require that the ordering party is in possession at least of a single license.

##### Note:

It is recommended that the software update service is ordered as early as possible. If a new software version of a software product is released for delivery by Siemens, only those customers will receive it automatically who are entered in the appropriate delivery list at Siemens at this time. Previous software versions, or the current software version are not supplied when the software update service is ordered. The software update service requires that the software product is up-to-date at the time of completion of the contract for the software update service.

##### **Delivery**

When a software update service is ordered, you will be sent the contractual conditions of this service and the price is due for payment. At the same time, you will be included in a delivery list for the software product to be updated. If Siemens releases a new software version for the corresponding software product for general sale (function version or product version), it will be delivered automatically to the goods recipient specified in the delivery address within the contract period.

#### More information

##### *Security note*

In the case of software for remote maintenance or connection to higher-level networks, suitable protection measures must be taken (including IT security, e.g. network segmentation) to guarantee safe operation of the system. Additional information about Industrial Security can be found in the Internet under

[www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity)

# Appendix Partners

## Partners at Industry Automation and Drive Technologies



At Siemens Industry Automation and Drive Technologies, more than 85 000 people are resolutely pursuing the same goal: long-term improvement of your competitive ability. We are committed to this goal. Thanks to our commitment, we continue to set new standards in automation and drive technology. In all industries – worldwide.

At your service locally, around the globe for consulting, sales, training, service, support, spare parts ... on the entire Industry Automation and Drive Technologies range.

Your personal contact can be found in our Contacts Database at: [www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

You start by selecting a

- Product group
- Country
- City
- Service



**Overview***Siemens Solution Partner Automation*Solution Partner: Highest quality - guaranteed

The products and systems from Siemens Industry Automation and Drive Technologies offer the ideal platform for all automation applications.

Under the name of Siemens Solution Partner Automation, selected system integrators around the world act as uniformly qualified solution providers for the Siemens range of products and services in the fields of automation and drives. Day after day, they utilize their qualified product and system know-how as well as their excellent industry expertise to your advantage – for all requirements.

The partner emblem is the guarantee and indicator of proven quality. The basis for this are defined quality features that identify Solution Partners as reliable and competent solution providers:

- Solution quality  
Always a good result with tried and tested solutions expertise.
- Expert quality  
Certified technical competence ensures maximum efficiency.
- Project quality  
With proven project experience straight to the target.
- Portfolio quality  
Comprehensive portfolio for state-of-the-art solutions from a single source.

*Solution Partner Finder*

 The screenshot shows the Siemens Solution Partner Finder web interface. At the top, there's a navigation bar with 'Solution Partner', 'Language', and 'Contact'. Below that, the main heading is 'Solution Partner Finder'. The text asks if the user is looking for a qualified Solution Partner and offers search criteria. There are two tabs: 'Partner search' (selected) and 'References and Partner search'. The search form includes dropdowns for Technology, Industry, Service (set to 'All'), Country (set to 'worldwide'), and Region (with a note to select a country first). There are also input fields for 'Company/ZIP code' with a 'Search word' and 'Zip code' sub-field. A 'Find' button is at the bottom right. A note states: 'Please note that the search criteria entered are linked with and.'

The Siemens Solution Partner Program helps you to find the optimum partner for your specific requirements.

Support is provided by the Solution Partner Finder, a comprehensive online platform that showcases the profiles of all our solution partners. You can convince yourself of the competence of the respective Solution Partner by means of the references provided. Various search criteria are available for this purpose.

Once you have located a partner, you are only one small step away from contacting them.

Find the right partner here for your specific task and convince yourself of the solution competence provided:

[www.siemens.com/automation/partnerfinder](http://www.siemens.com/automation/partnerfinder)

Additional information on the Siemens Solution Partner Program is available online at:

[www.siemens.com/automation/solutionpartner](http://www.siemens.com/automation/solutionpartner)

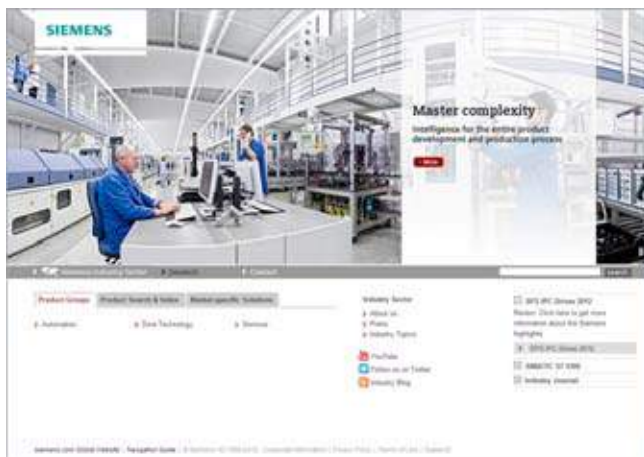
IA/DT/BT Solution Partner En 13.02.13

# Appendix

## Online services

### Information and ordering in the Internet and on DVD-ROM

#### Siemens Industry Automation and Drive Technologies in the WWW



A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

Siemens Industry Automation and Drive Technologies has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

[www.siemens.com/industry](http://www.siemens.com/industry)

you will find everything you need to know about products, systems and services.

#### Product Selection Using the Interactive Catalog CA 01 of Industry



Detailed information together with convenient interactive functions:

The interactive catalog CA 01 covers more than 80 000 products and thus provides a full summary of the Siemens Industry Automation and Drive Technologies product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives. All information is linked into a user interface which is easy to work with and intuitive.

After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the interactive catalog CA 01 can be found in the Internet under

[www.siemens.com/automation/ca01](http://www.siemens.com/automation/ca01)

or on DVD.

#### Easy Shopping with the Industry Mall



The Industry Mall is the virtual department store of Siemens AG on the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

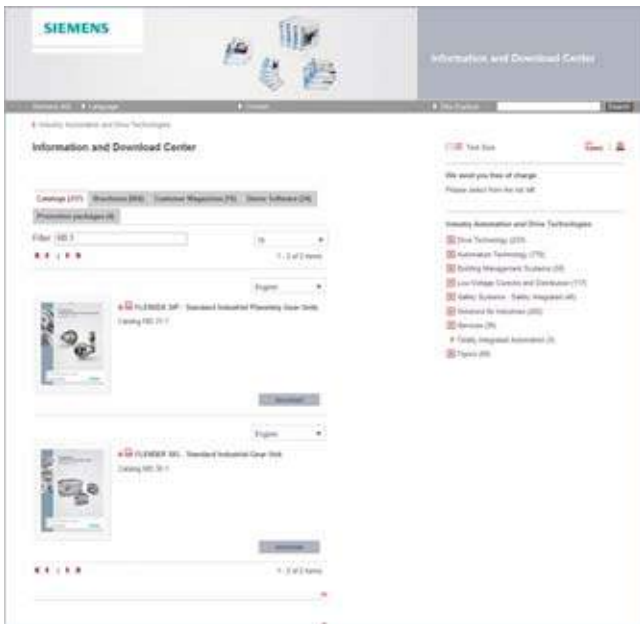
Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the Industry Mall on the Internet under:

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

## Downloading catalogs



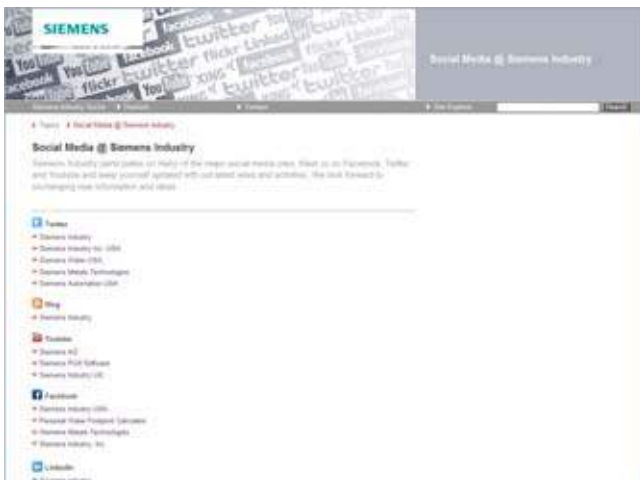
In addition to numerous other useful documents, you can also find the catalogs listed on the back inside cover of this catalog in the Information and download center. Without having to register, you can download these catalogs in PDF format or increasingly as digital page-turning e-books.

The filter dialog box above the first catalog displayed makes it possible to carry out targeted searches. If you enter "MD 3" for example, you will find both the MD 30.1 and MD 31.3 catalogs. If you enter "ST 70" both the ST 70 catalog and the associated news or add-ons are displayed.

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# Appendix

## Catalog improvement suggestions

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A small request on our part to you:  
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Is the information easy to find?

How would you assess the graphics and tables?

Can the texts be readily understood?

#### Did you find any printing errors? – Improvement suggestion?

**Rotary inertia** (to convert from A to B, multiply by entry in table)

A \ B	lb-in <sup>2</sup>	lb-ft <sup>2</sup>	lb-in-s <sup>2</sup>	lb-ft-s <sup>2</sup> slug-ft <sup>2</sup>	kg-cm <sup>2</sup>	kg-cm-s <sup>2</sup>	gm-cm <sup>2</sup>	gm-cm-s <sup>2</sup>	oz-in <sup>2</sup>	oz-in-s <sup>2</sup>
lb-in <sup>2</sup>	1	$6.94 \times 10^{-3}$	$2.59 \times 10^{-3}$	$2.15 \times 10^{-4}$	2.926	$2.98 \times 10^{-3}$	$2.92 \times 10^3$	2.984	16	$4.14 \times 10^{-2}$
lb-ft <sup>2</sup>	144	1	0.3729	$3.10 \times 10^{-2}$	421.40	0.4297	$4.21 \times 10^5$	429.71	2304	5.967
lb-in-s <sup>2</sup>	386.08	2.681	1	$8.33 \times 10^{-2}$	$1.129 \times 10^3$	1.152	$1.129 \times 10^6$	$1.152 \times 10^3$	$6.177 \times 10^3$	16
lb-ft-s <sup>2</sup> slug-ft <sup>2</sup>	$4.63 \times 10^3$	32.17	12	1	$1.35 \times 10^4$	13.825	$1.355 \times 10^7$	$1.38 \times 10^4$	$7.41 \times 10^4$	192
kg-cm <sup>2</sup>	0.3417	$2.37 \times 10^{-3}$	$8.85 \times 10^{-4}$	$7.37 \times 10^{-5}$	1	$1.019 \times 10^{-3}$	1000	1.019	5.46	$1.41 \times 10^{-2}$
kg-cm-s <sup>2</sup>	335.1	2.327	0.8679	$7.23 \times 10^{-2}$	980.66	1	$9.8 \times 10^5$	1000	$5.36 \times 10^3$	13.887
gm-cm <sup>2</sup>	$3.417 \times 10^{-4}$	$2.37 \times 10^{-6}$	$8.85 \times 10^{-7}$	$7.37 \times 10^{-8}$	$1 \times 10^{-3}$	$1.01 \times 10^{-6}$	1	$1.01 \times 10^{-3}$	$5.46 \times 10^{-3}$	$1.41 \times 10^{-5}$
gm-cm-s <sup>2</sup>	0.335	$2.32 \times 10^{-3}$	$8.67 \times 10^{-4}$	$7.23 \times 10^{-5}$	0.9806	$1 \times 10^{-3}$	980.6	1	5.36	$1.38 \times 10^{-2}$
oz-in <sup>2</sup>	0.0625	$4.34 \times 10^{-4}$	$1.61 \times 10^{-4}$	$1.34 \times 10^{-5}$	0.182	$1.86 \times 10^{-4}$	182.9	0.186	1	$2.59 \times 10^{-3}$
oz-in-s <sup>2</sup>	24.13	0.1675	$6.25 \times 10^{-2}$	$5.20 \times 10^{-3}$	70.615	$7.20 \times 10^{-2}$	$7.09 \times 10^4$	72.0	386.08	1

**Torque** (to convert from A to B, multiply by entry in table)

A \ B	lb-in	lb-ft	oz-in	N-m	kg-cm	kg-m	gm-cm	dyne-cm
lb-in	1	$8.333 \times 10^{-2}$	16	0.113	1.152	$1.152 \times 10^{-2}$	$1.152 \times 10^3$	$1.129 \times 10^6$
lb-ft	12	1	192	1.355	13.825	0.138	$1.382 \times 10^4$	$1.355 \times 10^7$
oz-in	$6.25 \times 10^{-2}$	$5.208 \times 10^{-3}$	1	$7.061 \times 10^{-3}$	$7.200 \times 10^{-2}$	$7.200 \times 10^{-4}$	72.007	$7.061 \times 10^4$
N-m	8.850	0.737	141.612	1	10.197	0.102	$1.019 \times 10^4$	$1 \times 10^7$
kg-cm	0.8679	$7.233 \times 10^{-2}$	13.877	$9.806 \times 10^{-2}$	1	$10^{-2}$	1000	$9.806 \times 10^5$
kg-m	86.796	7.233	$1.388 \times 10^3$	9.806	100	1	$1 \times 10^5$	$9.806 \times 10^7$
gm-cm	$8.679 \times 10^{-4}$	$7.233 \times 10^{-5}$	$1.388 \times 10^{-2}$	$9.806 \times 10^{-5}$	$1 \times 10^{-3}$	$1 \times 10^{-5}$	1	980.665
dyne-cm	$8.850 \times 10^{-7}$	$7.375 \times 10^{-8}$	$1.416 \times 10^{-5}$	$10^{-7}$	$1.0197 \times 10^{-6}$	$1.019 \times 10^{-8}$	$1.019 \times 10^{-3}$	1

**Length** (to convert from A to B, multiply by entry in table)

A \ B	inches	feet	cm	yd	mm	m
inches	1	0.0833	2.54	0.028	25.4	0.0254
feet	12	1	30.48	0.333	304.8	0.3048
cm	0.3937	0.03281	1	$1.09 \times 10^{-2}$	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	$1.09 \times 10^{-3}$	1	0.001
m	39.37	3.281	100	1.09	1000	1

**Force** (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	dyne	N
lb	1	16	453.6	$4.448 \times 10^5$	4.4482
oz	0.0625	1	28.35	$2.780 \times 10^4$	0.27801
gm	$2.205 \times 10^{-3}$	0.03527	1	$1.02 \times 10^{-3}$	N.A.
dyne	$2.248 \times 10^{-6}$	$3.59 \times 10^{-5}$	980.7	1	0.00001
N	0.22481	3.5967	N.A.	100000	1

**Mass** (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	kg	slug
lb	1	16	453.6	0.4536	0.0311
oz	$6.25 \times 10^{-2}$	1	28.35	0.02835	$1.93 \times 10^{-3}$
gm	$2.205 \times 10^{-3}$	$3.527 \times 10^{-2}$	1	$10^{-3}$	$6.852 \times 10^{-5}$
kg	2.205	35.27	$10^3$	1	$6.852 \times 10^{-2}$
slug	32.17	514.8	$1.459 \times 10^4$	14.59	1

**Power** (to convert from A to B, multiply by entry in table)

A \ B	HP	Watts
hp (English)	1	745.7
(lb-in) (deg./s)	$2.645 \times 10^{-6}$	$1.972 \times 10^{-3}$
(lb-in) (rpm)	$1.587 \times 10^{-5}$	$1.183 \times 10^{-2}$
(lb-ft) (deg./s)	$3.173 \times 10^{-5}$	$2.366 \times 10^{-2}$
(lb-ft) (rpm)	$1.904 \times 10^{-4}$	0.1420
Watts	$1.341 \times 10^{-3}$	1

**Rotation** (to convert from A to B, multiply by entry in table)

A \ B	rpm	rad/s	degrees/s
rpm	1	0.105	6.0
rad/s	9.55	1	57.30
degrees/s	0.167	$1.745 \times 10^{-2}$	1

# Appendix

## Conversion tables

### Temperature Conversion

°F	°C	°C	°F
0	-17.8	-10	14
32	0	0	32
50	10	10	50
70	21.1	20	68
90	32.2	30	86
98.4	37	37	98.4
212	100	100	212
subtract 32 and multiply by $\frac{5}{9}$		multiply by $\frac{9}{5}$ and add 32	

### Mechanism Efficiencies

Acme-screw with brass nut	~0.35–0.65
Acme-screw with plastic nut	~0.50–0.85
Ball-screw	~0.85–0.95
Chain and sprocket	~0.95–0.98
Preloaded ball-screw	~0.75–0.85
Spur or bevel-gears	~0.90
Timing belts	~0.96–0.98
Worm gears	~0.45–0.85
Helical gear (1 reduction)	~0.92

### Friction Coefficients

Materials	$\mu$
Steel on steel (greased)	~0.15
Plastic on steel	~0.15–0.25
Copper on steel	~0.30
Brass on steel	~0.35
Aluminum on steel	~0.45
Steel on steel	~0.58
Mechanism	$\mu$
Ball bushings	<0.001
Linear bearings	<0.001
Dove-tail slides	~0.2++
Gibb ways	~0.5++

### Material Densities

Material	lb-in <sup>3</sup>	gm-cm <sup>3</sup>
Aluminum	0.096	2.66
Brass	0.299	8.30
Bronze	0.295	8.17
Copper	0.322	8.91
Hard wood	0.029	0.80
Soft wood	0.018	0.48
Plastic	0.040	1.11
Glass	0.079–0.090	2.2–2.5
Titanium	0.163	4.51
Paper	0.025–0.043	0.7–1.2
Polyvinyl chloride	0.047–0.050	1.3–1.4
Rubber	0.033–0.036	0.92–0.99
Silicone rubber, without filler	0.043	1.2
Cast iron, gray	0.274	7.6
Steel	0.280	7.75

### Wire Gauges<sup>1)</sup>

Cross-section mm <sup>2</sup>	Standard Wire Gauge (SWG)	American Wire Gauge (AWG)
0.2	25	24
0.3	23	22
0.5	21	20
0.75	20	19
1.0	19	18
1.5	17	16
2.5	15	13
4	13	11
6	12	9
10	9	7
16	7	6
25	5	3
35	3	2
50	0	1/0
70	000	2/0
95	00000	3/0
120	0000000	4/0
150	–	6/0
185	–	7/0

<sup>1)</sup> The table shows approximate SWG/AWG sizes nearest to standard metric sizes; the cross-sections do not match exactly.

### Explanation of the raw material/metal surcharges<sup>1)</sup>

#### Surcharge calculation

To compensate for variations in the price of the raw materials silver, copper, aluminum, lead, gold, dysprosium<sup>2)</sup> and/or neodym<sup>2)</sup>, surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The surcharges are calculated in accordance with the following criteria:

- Basic official price of the raw material  
Basic official price from the day prior to receipt of the order or prior to release order (daily price) for<sup>3)</sup>
  - Silver (sales price, processed)
  - Gold (sales price, processed)
 and for<sup>4)</sup>
  - Copper (lower DEL notation + 1 %)
  - Aluminum (aluminum in cables)
  - Lead (lead in cables)
- Metal factor of the products  
Certain products are displayed with a metal factor. The metal factor determines the official price (for those raw materials concerned) as of which the metal surcharges are applied and the calculation method used (weight or percentage method). An exact explanation is given below.

#### Structure of the metal factor

The metal factor consists of several digits; the first digit indicates whether the percentage method of calculation refers to the list price or a possible discounted price (customer net price) (L = list price / N = customer net price).

The remaining digits indicate the method of calculation used for the respective raw material. If no surcharge is added for a raw material, a "-" is used.

1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG)
3rd digit	for copper (CU)
4th digit	for aluminum (AL)
5th digit	for lead (PB)
6th digit	for gold (AU)
7th digit	for dysprosium (Dy) <sup>2)</sup>
8th digit	for neodym (Nd) <sup>2)</sup>

#### Weight method

The weight method uses the basic official price, the daily price and the raw material weight. In order to calculate the surcharge, the basic official price must be subtracted from the daily price. The difference is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (1 to 9) of the respective digit of the metal factor. The raw material weight can be found in the respective product descriptions.

#### Percentage method

Use of the percentage method is indicated by the letters A-Z at the respective digit of the metal factor.

The surcharge is increased - dependent on the deviation of the daily price compared with the basic official price - using the percentage method in "steps" and consequently offers surcharges that remain constant within the framework of this "step range". A higher percentage rate is charged for each new step. The respective percentage level can be found in the table below.

#### Metal factor examples

<b>L E A - - - - -</b>	Basis for % surcharge: List price Silver Basis 150 €, Step 50 €, 0.5 % Copper Basis 150 €, Step 50 €, 0.1 % No surcharge for aluminum No surcharge for lead No surcharge for gold No surcharge for dysprosium No surcharge for neodym
<b>N - A 6 - - - - -</b>	Basis for % surcharge: Customer net price No surcharge for silver Copper Basis 150 €, Step 50 €, 0.1 % Aluminum acc. to weight, basic offic. price 225 € No surcharge for lead No surcharge for gold No surcharge for dysprosium No surcharge for neodym
<b>- - 3 - - - - -</b>	No basis necessary No surcharge for silver Copper acc. to weight, basic official price 150 € No surcharge for aluminum No surcharge for lead No surcharge for gold No surcharge for dysprosium No surcharge for neodym

<sup>1)</sup> Refer to the separate explanation on the next page regarding the raw materials dysprosium and neodym (= rare earths).

<sup>2)</sup> For a different method of calculation, refer to the separate explanation for these raw materials on the next page.

<sup>3)</sup> Source: Umicore, Hanau ([www.metalsmanagement.umicore.com](http://www.metalsmanagement.umicore.com)).

<sup>4)</sup> Source: German Trade Association for Cables and Conductors ([www.kabelverband.org](http://www.kabelverband.org)).

# Appendix

## Metal surcharges

### Explanation of the raw material/metal surcharges for dysprosium and neodym (rare earths)

#### Surcharge calculation

To compensate for variations in the price of the raw materials silver<sup>1)</sup>, copper<sup>1)</sup>, aluminum<sup>1)</sup>, lead<sup>1)</sup>, gold<sup>1)</sup>, dysprosium and/or neodym, surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. The surcharge for dysprosium and neodym is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The surcharge is calculated in accordance with the following criteria:

- Basic official price of the raw material<sup>2)</sup>  
Three-month basic average price (see below) in the period before the quarter in which the order was received or the release order took place (= average official price) for
  - dysprosium (Dy metal, 99 % min. FOB China; USD/kg)
  - neodym (Nd metal, 99 % min. FOB China; USD/kg)
- Metal factor of the products  
Certain products are displayed with a metal factor. The metal factor indicates (for those raw materials concerned) the basic official price as of which the surcharges for dysprosium and neodym are calculated using the weight method. An exact explanation of the metal factor is given below.

#### Three-month average price

The prices of rare earths vary according to the foreign currency, and there is no freely accessible stock exchange listing. This makes it more difficult for all parties involved to monitor changes in price. In order to avoid continuous adjustment of the surcharges, but to still ensure fair, transparent pricing, an average price is calculated over a three-month period using the average monthly foreign exchange rate from USD to EUR (source: European Central Bank). Since not all facts are immediately available at the start of each month, a one-month buffer is allowed before the new average price applies.

Examples of calculation of the average official price:

Period for calculation of the average price:	Period during which the order/release order is effected and the average price applies:
Sep 2012 - Nov 2012	Q1 in 2013 (Jan - Mar)
Dec 2012 - Feb 2013	Q2 in 2013 (Apr - Jun)
Mar 2013 - May 2013	Q3 in 2013 (Jul - Sep)
Jun 2013 - Aug 2013	Q4 in 2013 (Oct - Dec)

#### Structure of the metal factor

The metal factor consists of several digits; the first digit is not relevant to the calculation of dysprosium and neodym.

The remaining digits indicate the method of calculation used for the respective raw material. If no surcharge is added for a raw material, a "-" is used.

1st digit	List or customer net price using the percentage method
2nd digit	for silver (AG) <sup>1)</sup>
3rd digit	for copper (CU) <sup>1)</sup>
4th digit	for aluminum (AL) <sup>1)</sup>
5th digit	for lead (PB) <sup>1)</sup>
6th digit	for gold (AU) <sup>1)</sup>
7th digit	for dysprosium (Dy)
8th digit	for neodym (Nd)

#### Weight method

The weight method uses the basic official price, the average price and the raw material weight. In order to calculate the surcharge, the basic official price must be subtracted from the average price. The difference is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (1 to 9) of the respective digit of the metal factor. Your Sales contact can inform you of the raw material weight.

#### Metal factor examples

-----71	No basis necessary
↑	No surcharge for silver
↑	No surcharge for copper
↑	No surcharge for aluminum
↑	No surcharge for lead
↑	No surcharge for gold
↑	Dysprosium acc. to weight, basic official price 300 €
↑	Neodym acc. to weight, basic official price 50 €

<sup>1)</sup> For a different method of calculation, refer to the separate explanation for these raw materials on the previous page.

<sup>2)</sup> Source: Asian Metal Ltd ([www.asianmetal.com](http://www.asianmetal.com))



### Values of the metal factor

Percentage method	Basic official price in €	Step range in €	% surcharge 1st step	% surcharge 2nd step	% surcharge 3rd step	% surcharge 4th step	% surcharge per additional step	
			Price in € 150.01 - 200.00	Price in € 200.01 - 250.00	Price in € 250.01 - 300.00	Price in € 300.01 - 350.00		
A	150	50	0.1	0.2	0.3	0.4	0.1	
B	150	50	0.2	0.4	0.6	0.8	0.2	
C	150	50	0.3	0.6	0.9	1.2	0.3	
D	150	50	0.4	0.8	1.2	1.6	0.4	
E	150	50	0.5	1.0	1.5	2.0	0.5	
F	150	50	0.6	1.2	1.8	2.4	0.6	
G	150	50	1.0	2.0	3.0	4.0	1.0	
H	150	50	1.2	2.4	3.6	4.8	1.2	
I	150	50	1.6	3.2	4.8	6.4	1.6	
J	150	50	1.8	3.6	5.4	7.2	1.8	
			175.01 - 225.00	225.01 - 275.00	275.01 - 325.00	325.01 - 375.00		
O	175	50	0.1	0.2	0.3	0.4	0.1	
P	175	50	0.2	0.4	0.6	0.8	0.2	
R	175	50	0.5	1.0	1.5	2.0	0.5	
			225.01 - 275.00	275.01 - 325.00	325.01 - 375.00	375.01 - 425.00		
S	225	50	0.2	0.4	0.6	0.8	0.2	
U	225	50	1.0	2.0	3.0	4.0	1.0	
V	225	50	1.0	1.5	2.0	3.0	1.0	
W	225	50	1.2	2.5	3.5	4.5	1.0	
			150.01 - 175.00	175.01 - 200.00	200.01 - 225.00	225.01 - 250.00		
Y	150	25	0.3	0.6	0.9	1.2	0.3	
			400.01 - 425.00	425.01 - 450.00	450.01 - 475.00	475.01 - 500.00		
Z	400	25	0.1	0.2	0.3	0.4	0.1	
<b>Price basis (1st digit)</b>								
L	Calculation based on the list price							
N	Calculation based on the customer net price (discounted list price)							
<b>Weight method</b>	<b>Basic official price in €</b>							
1	50	Calculation based on raw material weight						
2	100							
3	150							
4	175							
5	200							
6	225							
7	300							
8	400							
9	555							
<b>Miscellaneous</b>								
-	No metal surcharge							

IA/DT/BT MZ En 05.07.12

# Appendix

## Conditions of sale and delivery/Export regulations

### 1. General Provisions

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following Terms and Conditions of Sale and Delivery (hereinafter referred to as "T&C"). Please note that the scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following T&C apply exclusively for orders placed with Siemens Aktiengesellschaft, Germany.

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For customers with a seat or registered office in Germany, the following applies subordinate to the T&C:

- the "General Terms of Payment"<sup>1)</sup> and,
- for software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or Registered Office in Germany"<sup>1)</sup> and,
- for other supplies and services, the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"<sup>1)</sup>.

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- the "General Terms of Payment"<sup>1)</sup> and,
- for software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or Registered Office outside of Germany"<sup>1)</sup> and
- for other supplies and/or services, the "General Conditions for Supplies of Siemens Industry for Customers with a Seat or Registered Office outside of Germany"<sup>1)</sup>.

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Prices are subject to change without prior notice. We will charge the prices valid at the time of delivery.

To compensate for variations in the price of raw materials (e.g. silver, copper, aluminum, lead, gold, dysprosium and neodym), surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The metal factor of a product indicates the basic official price (for those raw materials concerned) as of which the surcharges on the price of the product are applied, and with what method of calculation.

You will find a detailed explanation of the metal factor on the page headed "Metal surcharges".

To calculate the surcharge (except in the cases of dysprosium and neodym), the official price from the day prior to that on which the order was received or the release order was effected is used.

To calculate the surcharge applicable to dysprosium and neodym ("rare earths"), the corresponding three-month basic average price in the quarter prior to that in which the order was received or the release order was effected is used with a one-month buffer (details on the calculation can be found in the explanation of the metal factor).

### 3. Additional Terms and Conditions

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches apply only to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the individual pages of this catalog - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

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We shall not be obligated to fulfill any agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes and/or other sanctions.

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Order No. E86060-K4921-A101-A3-7600  
MQ.R2.PM.PM21.00.3.02 / Dispo 09405  
KG 0413 14. HO/KRD 1064 En  
Printed in Germany  
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