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SINAMICS and Motors for Single-Axis Drives

Catalog D 31 · 2012

Motion Control Drives

Answers for industry.

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In the CD-ROM that accompanies Catalog D 31 · 2012, you will find:

- Information about planning/configuring based on the technical documentation; additional technical documentation can be found at: www.siemens.com/automation/doconweb
- Dimensional drawings of our motors in PDF/ DXF format or via CAD CREATOR www.siemens.com/cadcreator
- Catalog D 31 · 2012 in electronic form (PDF format)

Hardware and software requirements:

- Intel Pentium 1 GHz or higher
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- Screen resolution 1024 x 768 pixels
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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

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Motion Control Drives
SINAMICS and Motors for Single-Axis Drives

Catalog D 31 · 2012

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System overview 1
Highlights 2
SINAMICS G110 standard inverters
0.12 kW to 3 kW (0.16 hp to 4.0 hp) 3
SINAMICS G120C compact inverters
0.55 kW to 18.5 kW (0.75 hp to 25 hp) 4
SINAMICS G120P pump, fan and compressor inverters
0.37 kW to 90 kW (0.5 hp to 125 hp) 5
SINAMICS G120 standard inverters
0.37 kW to 250 kW (0.5 hp to 400 hp) 6
SINAMICS G110D distributed inverters
0.75 kW to 7.5 kW (1.0 hp to 10 hp) 7
SINAMICS G120D distributed inverters
0.75 kW to 7.5 kW (1.0 hp to 10 hp) 8
SINAMICS S110 servo drives
0.12 kW to 90 kW (0.16 hp to 125 hp) 9
SINAMICS S120 drive system
0.12 kW to 250 kW (0.16 hp to 400 hp) 10
Motors 11
Measuring systems 12
Connection system MOTION-CONNECT 13
Engineering tools 14
Services and documentation 15
Appendix 16

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Overview

1 **System overview**
The SINAMICS drive family 1/2
Converter/inverter selection 1/6
The members of the SINAMICS family 1/10
Servomotors/main motors 1/14
Connection system MOTION-CONNECT 1/15

2 **Highlights**
Safety Integrated 2/2
Efficient Infeed Technology 2/11
Communication 2/13

3 **SINAMICS G110 standard inverters 0.12 kW to 3 kW (0.16 hp to 4.0 hp)**
Introduction 3/2
Controlled Power Modules 3/3
Starter kit 3/13
Line-side power components 3/14

4 **SINAMICS G120C compact inverters 0.55 kW to 18.5 kW (0.75 hp to 25 hp)**
Introduction 4/2
SINAMICS G120C compact inverters 4/3
Line-side components 4/20
DC link components 4/22
Supplementary system components 4/23
Spare parts 4/28

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5 **SINAMICS G120P pump, fan and compressor inverters 0.37 kW to 90 kW (0.5 hp to 125 hp)**
Introduction 5/2
SINAMICS G120P pump, fan and compressor inverters 5/3
CU230P-2 Control Units 5/10
PM230 Power Modules 5/17
Recommended line-side power components 5/31
Supplementary system components 5/32
Spare parts 5/37

6 **SINAMICS G120 standard inverters 0.37 kW to 250 kW (0.5 hp to 400 hp)**
Introduction 6/2
SINAMICS G120 standard inverters 6/3
Control Units 6/14
Power Modules 6/28
Line-side components 6/62
DC link components 6/72
Load-side power components 6/77
Supplementary system components 6/91
Spare parts 6/101

7 **SINAMICS G110D distributed inverters 0.75 kW to 7.5 kW (1.0 hp to 10 hp)**
Introduction 7/2
SINAMICS G110D distributed inverters 7/3
Recommended line-side power components 7/14
DC link components 7/15
Supplementary system components 7/16
Spare parts 7/21

8 **SINAMICS G120D distributed inverters 0.75 kW to 7.5 kW (1.0 hp to 10 hp)**
Introduction 8/2
SINAMICS G120D distributed inverters 8/3
CU240D Control Units 8/8
PM250D Power Modules 8/16
Recommended line-side power components 8/23
Supplementary system components 8/24
Spare parts 8/29

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Overview

9 **SINAMICS S110 servo drives 0.12 kW to 90 kW (0.16 hp to 125 hp)**

Introduction 9/2
SINAMICS S110 servo drives 9/3
CU305 Control Unit 9/9
PM340 Power Modules in blocksize format 9/12
Line-side components 9/24
DC link components 9/31
Load-side power components 9/33
Supplementary system components 9/36
Encoder system connection 9/39

10 **SINAMICS S120 drive system 0.12 kW to 250 kW (0.16 hp to 400 hp)**

Introduction 10/2
SINAMICS S120 drive system 10/3
Drive Control Chart (DCC) 10/5
CU310-2 Control Unit for single-axis drives 10/6
CompactFlash card for CU310-2 . . . . . 10/9

11 **Motors**

Overview 11/2
1FK7 servomotors for SINAMICS S110 . . . . . 11/4
1PH8 main motors for SINAMICS S110 . . . . . 11/10
Dimensional drawings 11/19

12 **Measuring systems**

Overview 12/2
Built-on optoelectronic rotary encoders 12/3
Incremental encoders 12/4
Absolute encoders 12/7

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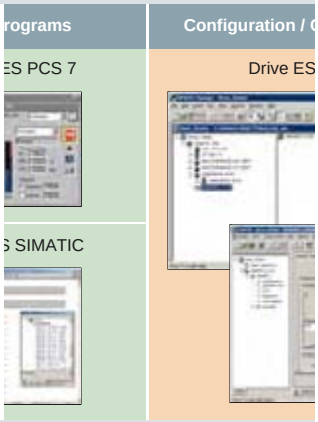
13 Connection system MOTION-CONNECT

Overview 13/2
Introduction 13/3
Power cables for SINAMICS S110 and S120 Power Modules 13/5
Signal cables for SINAMICS S110 and S120 Power Modules 13/10
Connection overviews 13/16
Length code 13/18

14 Engineering tools

DT Configurator selection guide 14/2
SIZER for Siemens Drives engineering tool 14/4
STARTER commissioning tool 14/5
SINAMICS StartDrive commissioning tool 14/7
Drive ES engineering software 14/8
SinaSave energy-saving program 14/10
CAD CREATOR 14/11



15 Services and documentation

Applications 15/2
Training 15/3
Control cabinets 15/6
Repair service contract RSC 15/8
Service & Support 15/10
Mechatronic Support 15/13
SparesOnWeb 15/14
My Documentation Manager 15/15
Documentation 15/16

16 Appendix

Approvals 16/2
Partner at Industry Automation and Drive Technologies 16/3
Online services 16/4
Notes on software 16/5
Indexes 16/7
Catalog improvement suggestions 16/15
Conversion tables 16/16
Metal surcharges 16/18
Conditions of sale and delivery/Export regulations 16/20

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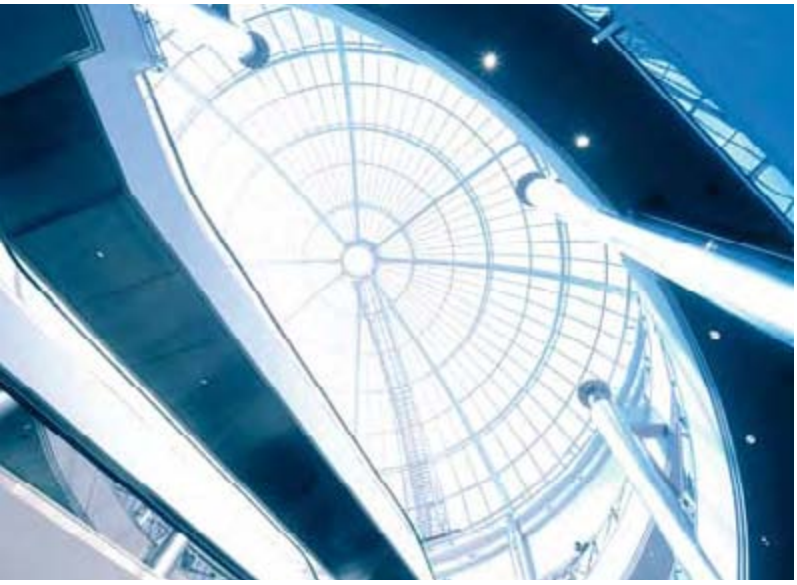

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Answers for industry.

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.

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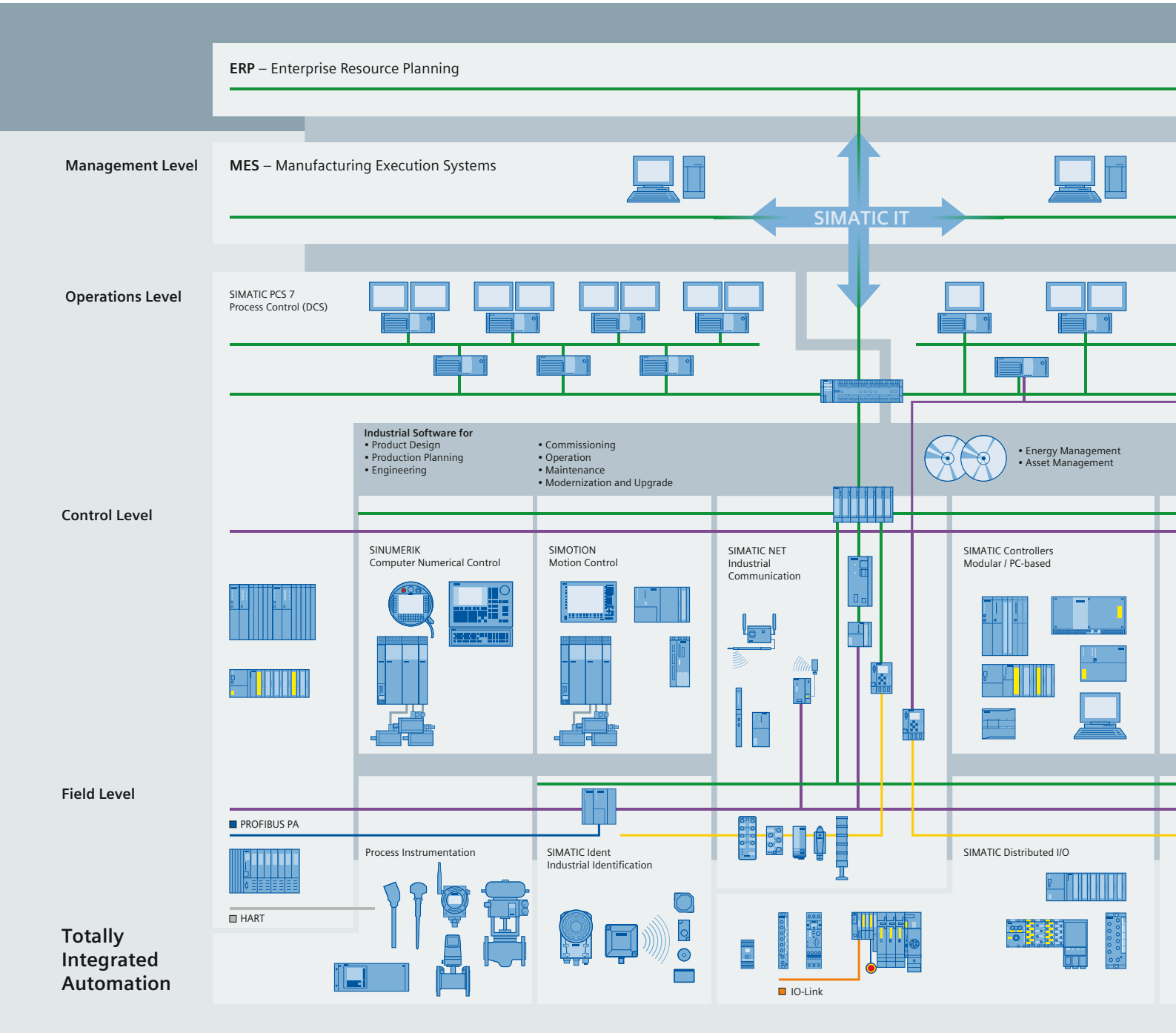

Setting standards in productivity and competitiveness.

Totally Integrated Automation.

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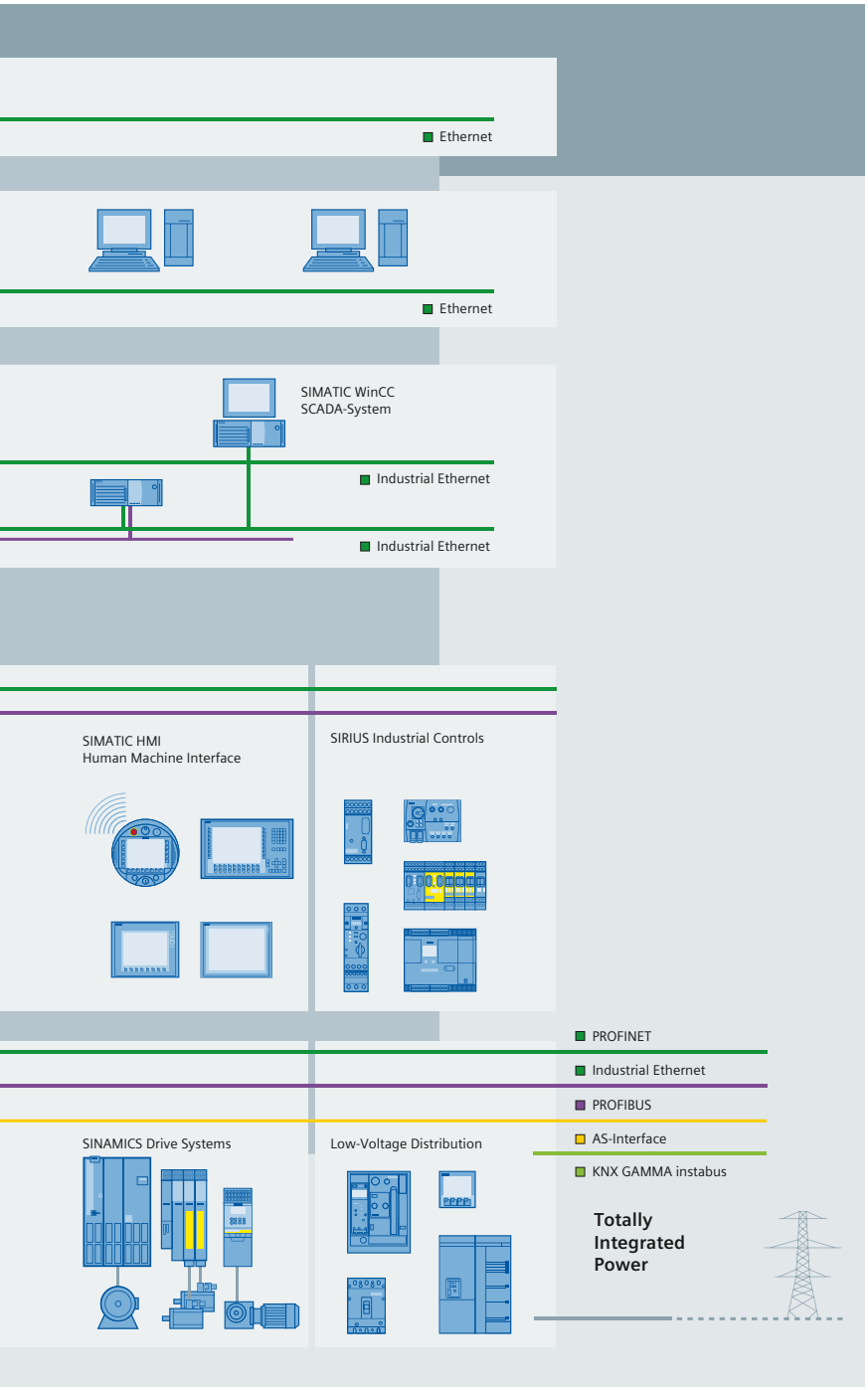

TIA is characterized by its unique continuity.

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 18.08.11

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

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Integrated power distribution from one source.

Totally Integrated Power.

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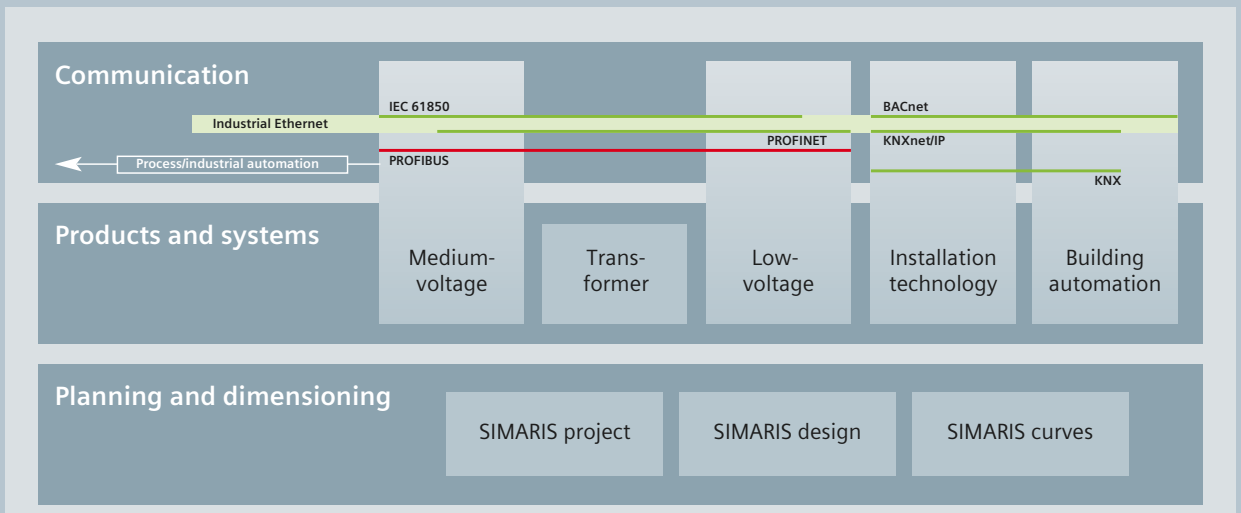

Electrical power distribution requires integrated solutions. Our answer: Totally Integrated Power (TIP). This includes tools and support for planning and configuration and a complete, optimally harmonized product and system portfolio for integrated power distribution from medium-voltage switchgear right to socket outlets.

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

Thanks to a comprehensive energy management system, power flows can be made transparent and the energy consumption of individual loads can be calculated and allocated. Building operators can thus identify power-intensive loads and implement effective optimization measures. With its products and systems, Totally Integrated Power forms the basis for this functionality and guarantees greater cost-efficiency in industrial applications, infrastructure and buildings.

IA/DT TIP En 31.03.11

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You have a catalog in your hands that will serve you well for selecting and ordering your products. But have you heard of the electronic online catalog (the Industry Mall) and all its benefits? Take a look around it sometime:

www.siemens.com/industrymall

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Also available are FAQs, software downloads, certificates and technical data sheets as well as our training programs. In the image database you will find, depending on the product, 2D/3D graphics, dimension drawings and exploded drawings, characteristic curves or circuit diagrams which you can download.

Convinced? We look forward to your visit!

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System overview

1/2	**The SINAMICS drive family**
1/2	Integration in automation
1/2	Applications
1/3	Innovative, energy-efficient and reliable drive systems and applications as well as services for the entire drive train
1/4	Energy efficiency
1/5	Variants
1/5	Platform concept
1/5	Quality management according to DIN EN ISO 9001
1/6	**Converter/inverter selection**
1/6	SINAMICS selection guide – typical applications
1/8	Application examples
1/10	**The members of the SINAMICS family**
1/10	SINAMICS G – The efficient drives
1/12	SINAMICS S – The flexible drives
1/13	SINAMICS medium-voltage converters and DC drives
1/14	**Servomotors/main motors**
1/15	**Connection system MOTION-CONNECT**

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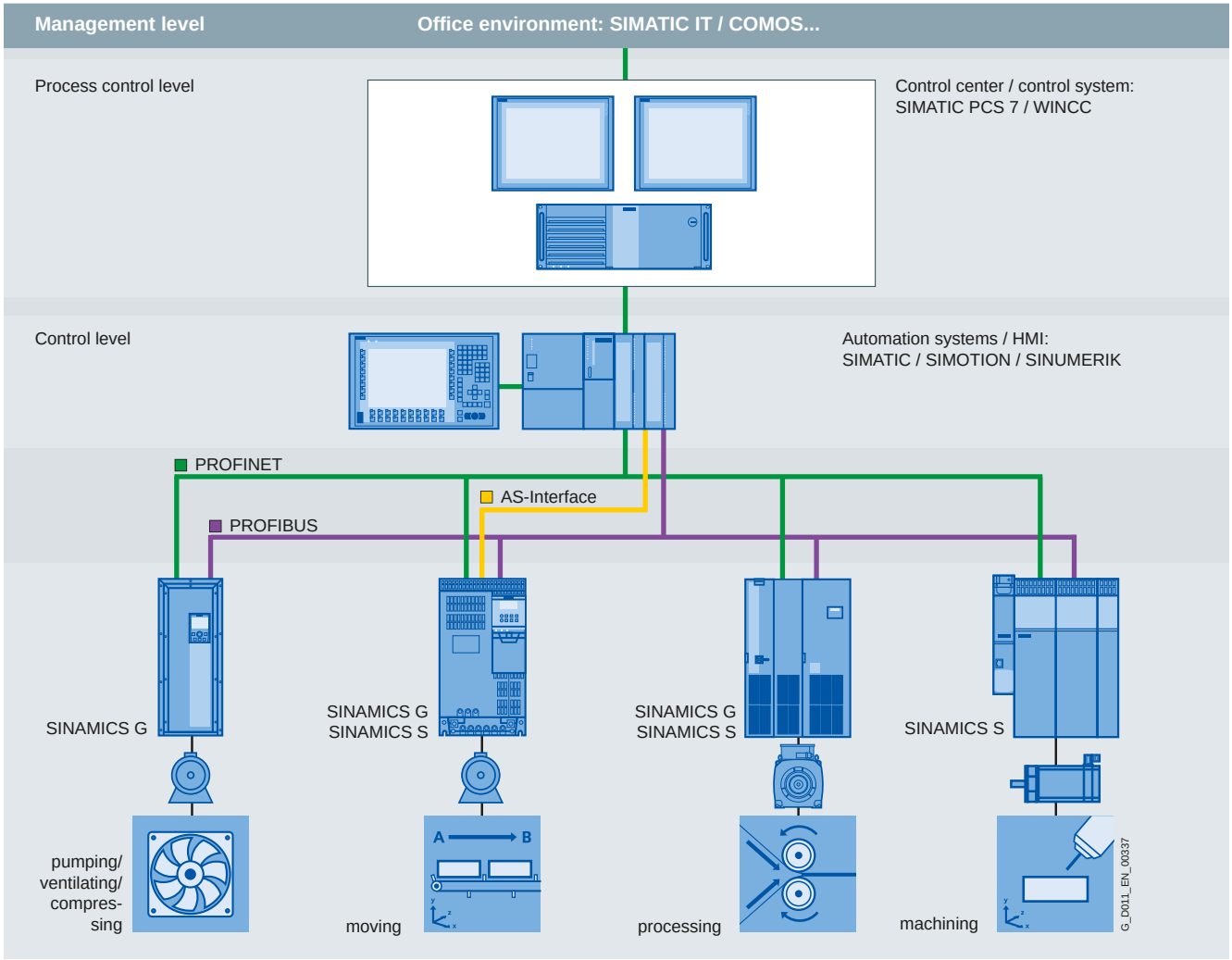
The SINAMICS drive family

Overview

Integration in automation



SINAMICS in automation

Totally Integrated Automation and communication

SINAMICS is an integral component of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering configuration, data storage, and communication at automation level ensure low-maintenance solutions with the SIMATIC, SIMOTION and SINUMERIK control systems.

Depending on the application, the appropriate variable frequency drives can be selected and incorporated in the automation concept. With this in mind, the converters and inverters are clearly subdivided into their different applications. A wide range of buses are available as a communications interface – depending on the drive type:

- PROFINET
- PROFIBUS
- AS-Interface
- USS
- CANopen
- Modbus RTU
- BACnet MS/TP

Applications

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

- Simple pump and fan applications in the process industry
- Demanding single 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.
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines

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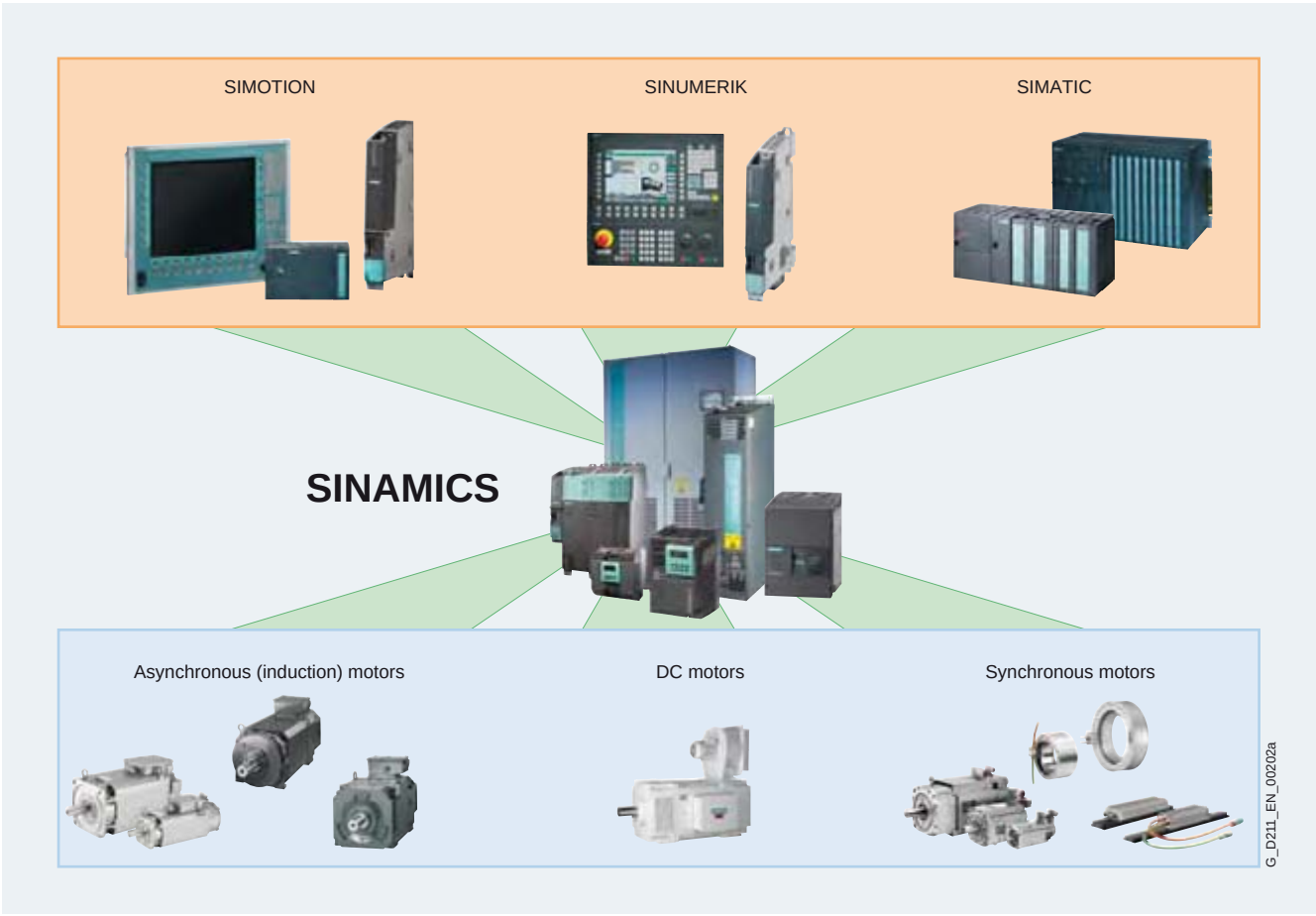
Overview



SINAMICS as part of the Siemens modular automation system

Innovative, energy-efficient and reliable drive systems and applications as well as services for the entire drive train

The solutions for drive technology place great emphasis on the highest productivity, energy efficiency and reliability for all torque ranges, performance and voltage classes.

Siemens offers not only the right innovative variable frequency drive for every drive application, but also a wide range of energy-efficient low voltage motors, geared motors, explosion-protected motors and high-voltage motors for combination with SINAMICS.

Furthermore, Siemens supports its customers with global presales and after-sales services, with over 295 service points in 130 countries – and with special services e.g. application consulting or motion control solutions.

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The SINAMICS drive family

Overview

Energy efficiency

Energy management process

Efficient energy management consultancy identifies the energy flows, determines the potential for making savings and implements them with focused activities.

Almost two thirds of the industrial power requirement is from electric motors. This makes it all the more important to use drive technology permitting energy consumption to be reduced effectively even in the configuration phase, and consequently to optimize plant availability and process stability. With SINAMICS, Siemens offers powerful energy efficient solutions which, depending on the application, enable a significant reduction in electricity costs.

Up to 70 % potential for savings using variable speed operation

SINAMICS enables great potential for savings to be realized by controlling the motor speed. In particular, huge potential savings can be recovered from pumps, fans and compressors which are operated with mechanical throttles and valves. Here, changing to variable-speed drives brings enormous economic advantages. In contrast to mechanical control systems, the power consumption at partial load operation is always immediately adjusted to the demand at that time. So energy is no longer wasted, permitting savings of up to 60 % – in exceptional cases even up to 70 %. Variable-speed drives also offer clear advantages over mechanical control systems when it comes to maintenance and repair. Current spikes when powering up the motor and strong torque surges become things of the past – and the same goes for pressure waves in pipelines, cavitation or vibrations which cause sustainable damage to the plant. Smooth starting and ramp-down relieve the load on the mechanical system, ensuring a significantly longer service life of the entire drive train.

Regenerative feedback of braking energy

In conventional drive systems, the braking energy occurring is converted to heat using braking resistors. SINAMICS G inverters and SINAMICS S converters with regenerative feedback capability need no braking resistor, and supply the resulting braking energy back into the line. This permits up to 60 % of the energy requirement to be saved, e.g. in lifting applications. Energy which can be reused at other locations on a machine. Furthermore, this reduced power loss simplifies the cooling of the system, enabling a more compact design.

Energy transparency in all configuration phases

Early on, in the configuration phase, the SIZER for Siemens Drives engineering tool provides information on the specific energy requirement. The energy consumption across the entire drive train is visualized and compared with different plant concepts.

SINAMICS in combination with energy-saving motors

Engineering integration stretches beyond the SINAMICS drive family to higher-level automation systems, and to a broad spectrum of energy-efficient motors with a wide range of performance classes, which, compared to previous motors, are able to demonstrate up to 10 % greater efficiency.

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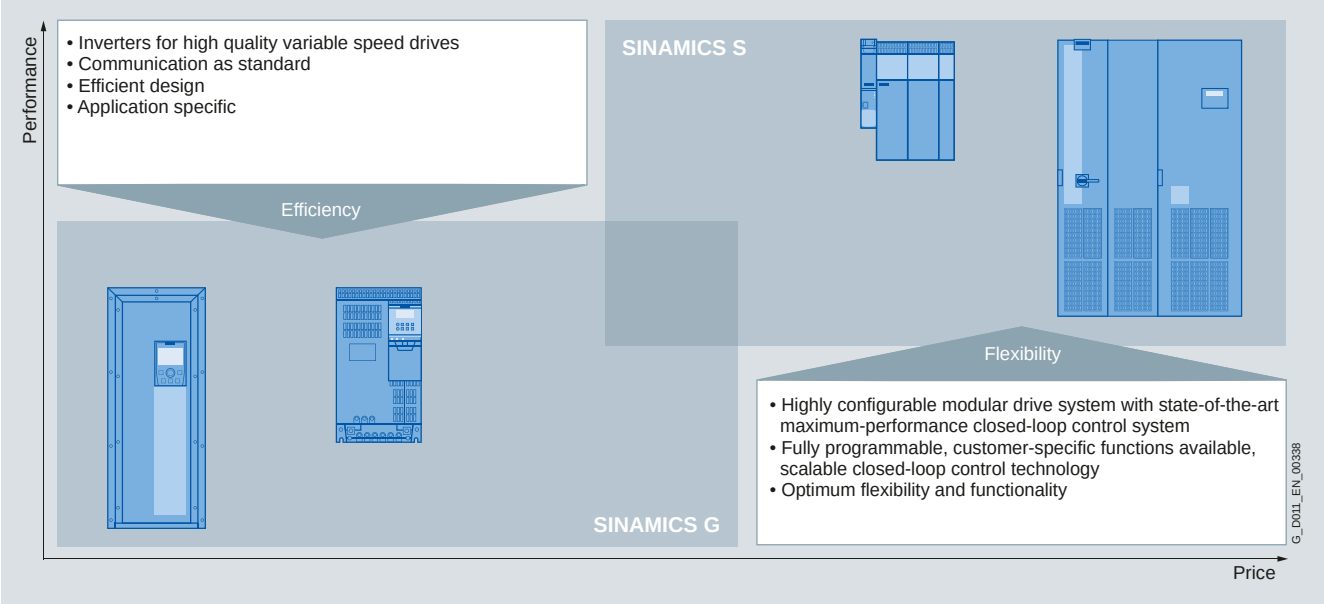
Overview

Variants



SINAMICS S and SINAMICS G variants

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

- For SINAMICS G, efficiency is the prime concern. The inverters are designed for standard applications with asynchronous (induction) motors. The control variants range from *V/f* to Vector Control.
- For SINAMICS S, flexibility is the priority. The converters handle demanding drive tasks with synchronous/asynchronous (induction) motors and fulfill stringent requirements with regard to
  - the dynamic performance and accuracy
  - the integration of extensive technology functions in the drive control system
- SINAMICS DCM is the DC drive belonging to the SINAMICS family. As a result of its uniform expandability, it can handle both basic and demanding requirements for drive applications and complementary markets.

Platform concept

All SINAMICS variants are based on a platform concept. Joint hardware and software components, as well as standardized tools for dimensioning, configuration, and commissioning tasks ensure high-level integration across all components. SINAMICS handles a wide variety of drive tasks with no system gaps. The different SINAMICS variants can be easily combined with each other.

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.

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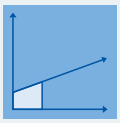
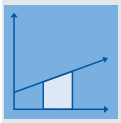
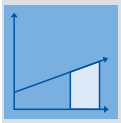
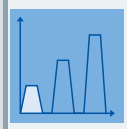
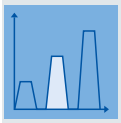
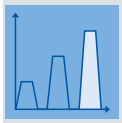
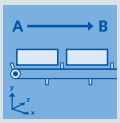
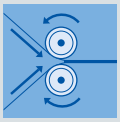
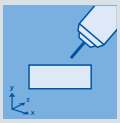
Converter/inverter selection

Overview

SINAMICS selection guide – typical applications

Application	Continuous motion			Non-continuous motion		
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality			Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality		
	Basic 	Medium 	High 	Basic 	Medium 	High 
Pumping, ventilating, compress-ing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	G110, G120C (G130, G150, GM150, GL150)	**G120P, G120C, G120** (G130, G150, GM150, GL150)	**S120**	**S110**	**S110, S120**	**S120** (GM150)
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	G110, G110D, G120C (G130, G150, GM150)	**G120D, G120C, G120, S120** (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	**S120** (S150, SM150, SL150, GM150, DCM)	**S110**	**S110, S120** (DCM)	**S120** (DCM)
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders and unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	G120C (G130, G150, GM150)	**G120C, G120** (G130, G150, S150, GM150, GL150, DCM)	**S120** (S150, DCM)	**S110**	**S110, S120**	**S120** (SM150, SL150, DCM)
Machining 	Main drives for • Turning • Drilling • Milling	Main drives for • Drilling • Sawing	Main drives for • Turning • Drilling • Milling • Gear cutting • Grinding	Axle drives for • Turning • Drilling • Milling	Axle drives for • Drilling • Sawing	Axle drives for • Turning • Drilling • Milling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	**S110, S120**	**S120**	**S110**	**S110, S120**	**S120**

(Devices in brackets are not included in Catalog D 31)

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Overview

Using the SINAMICS selection guide

The varying range of demands on modern variable frequency drives requires a large number of different types. This means that the individual types are highly efficient, but the selection of the right drive becomes significantly more complex. The application matrix shown simplifies this selection process considerably, by suggesting the ideal SINAMICS drive for examples of typical applications and requirements.

- The relevant type of use can be found on the vertical axis (supply, movement, processing or machining).
- What type of movement should be realized with what level of quality (basic, medium, high)? Find this using the relevant fields on the horizontal axis.

To make orientation easier, an example selection of typical applications is shown.

SINAMICS drives can be used to implement all types of applications. Just a part of the SINAMICS family is described here:

- SINAMICS G110
- SINAMICS G120C
- SINAMICS G120P
- SINAMICS G120
- SINAMICS G110D
- SINAMICS G120D
- SINAMICS S110
- SINAMICS S120 (single-axis AC drive)

The SINAMICS drives family contains numerous other converters which can be found in the following catalogs if required:

- Motion Control low-voltage converters:
  SINAMICS S120 and SIMOTION ⇒ Catalog PM 21
- Low-voltage converters with powers > 250 kW (400 hp):
  SINAMICS G130, SINAMICS G150 ⇒ Catalog D 11
  SINAMICS S150 ⇒ Catalog D 21.3
- Medium-voltage converters:
  SINAMICS GM150, SINAMICS SM150 ⇒ Catalog D 12
- SINAMICS DC drives ⇒ Catalog D 23.1
- Solutions for machine tools:
  SINUMERIK & SINAMICS ⇒ Catalog NC 61

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Converter/inverter selection

Application examples

Pumping, ventilating, compressing

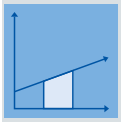
Wherever continuous or highly dynamic pumps, fans and compressors need to be driven, SINAMICS will provide you with a solution using a simple or comprehensive variant. An example from the broad range of applications are centrifugal pumps.

Centrifugal pumps

In a power range from 0.12 kW to 250 kW (0.16 hp to 400 hp), SINAMICS G110 and SINAMICS G120 inverters permit the implementation of any conceivable centrifugal pump for building technology, water supply or the process industry.

Additional advantages:

- Energy savings up to 70 %
- More precise flow control thanks to shorter response times
- No pressure waves in pipelines
- Prevention of harmful vibrations and cavitation
- Integrated pump-specific functions

Application	Continuous motion	
	Requirements for torque accuracy/speed accuracy/ functionality	
	Basic	Medium 
Pumping, ventilating, compressing	Centrifugal pumps	
Supply voltages	200 ... 240 V 1 AC 380 ... 690 V 3 AC	
Power	0.12 ... 250 kW (0.16 ... 400 hp)	
Degree of protection	IP00 ... IP55	
SINAMICS platform	**SINAMICS G110** **SINAMICS G120C**	**SINAMICS G120P** **SINAMICS G120C** **SINAMICS G120**

Moving

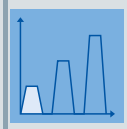
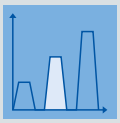
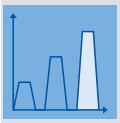
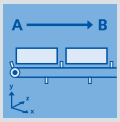
SINAMICS moves continuous or highly dynamic elevators, roll feeds, and many other applications from simple to high-performance versions, for conveyor technology, handling technology and many other areas. The solution suggested here for storage and retrieval machines is an example from the broad range of applications.

Storage and retrieval machines

SINAMICS S110 and SINAMICS S120, with power ratings from 0.12 kW to 90 kW (0.16 hp to 125 hp), are ideally suited to motion control for synchronous and asynchronous (induction) motors in storage and retrieval machines. Depending on the application, there is a solution based on the drive-integrated positioning function Epos, a solution using the SIMOTION Motion Control system and a SIMATIC-based motion control solution.

Additional advantages:

- Precise positioning functions
- A high degree of flexibility, even for multi-axis groups and for three-dimensional movement sequences
- Energy-efficient thanks to regenerative feedback capability
- Can be controlled with SIMATIC or SIMOTION

Application	Non-continuous motion		
	Requirements for torque accuracy/speed accuracy/ position accuracy/coordination of axes/functionality		
	Basic 	Medium 	High 
Moving 	Traction drive, lifting/lowering drive, telescopic conveyor		
Supply voltage	380 ... 480 V 3 AC		
Power	0.12 ... 90 kW (0.16 ... 125 hp)		
Degree of protection	IP20		
SINAMICS platform	**SINAMICS S110**	**SINAMICS S110** **SINAMICS S120**	**SINAMICS S120**

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Application examples

Processing

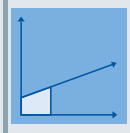
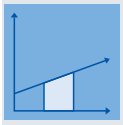
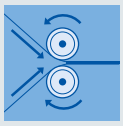
For continuous or highly-dynamic extruders, centrifuges, agitators or production machines, drive solutions can be implemented with a basic or comprehensive variant. The pre-assembled function modules help to save a significant amount of time and cost. An example of this are centrifuges.

Centrifuges

The SINAMICS G120 and SINAMICS G120C functionalities provide the highest level of flexibility both for output selection and control performance.

Additional advantages:

- High motor torque due to vector control
- Adjustable ramp-up and ramp-down
- Control and limitation of torque
- Individually customizable application solutions

Application	Continuous motion	
	Requirements for torque accuracy/speed accuracy/ position accuracy/coordination of axes/functionality	
	Basic 	Medium 
Processing 	Centrifuges	
Supply voltage	380 ... 480 V 3 AC	
Power	0.37 ... 250 kW (0.5 ... 400 hp)	
Degree of protection	IP20	
SINAMICS platform	**SINAMICS G120C**	**SINAMICS G120C SINAMICS G120**

Machining

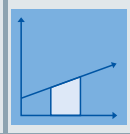
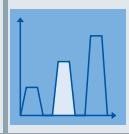
SINAMICS offers the right drive for all material processing applications. Whether it be for continuously running or highly dynamic spindles, for feed axes and auxiliary axes in machine tools for turning, milling, drilling and sawing. From basic or performance variants to special machines, such as, for example, bending or deburring machines.

Drills for metal processing

With power ratings from 0.12 kW to 90 kW (0.16 hp to 125 hp), SINAMICS S110 is able to offer a high degree of consistency at higher and lower drive speeds. Thanks to its modular design, different output requirements are easy to implement.

Additional advantages:

- Higher productivity thanks to faster changeover
- Programs can be changed quickly and are easy to manage
- Simple automation thanks to Totally Integrated Automation
- Can be controlled with SIMATIC

Application	Continuous motion	Non-continuous motion
	Requirements for torque accuracy/speed accuracy/ position accuracy/coordination of axes/functionality	
	Medium 	Medium 
Machining	Drill spindle	Spindle feed
Supply voltage	380 ... 480 V 3 AC	380 ... 480 V 3 AC
Power	0.12 ... 90 kW (0.16 ... 125 hp)	0.12 ... 90 kW (0.16 ... 125 hp)
Degree of protection	IP20	IP20
SINAMICS platform	**SINAMICS S110**	**SINAMICS S110**

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The members of the SINAMICS family

Overview

SINAMICS G – The efficient drives

SINAMICS G110	SINAMICS G120C	SINAMICS G120P	SINAMICS G120
The versatile single drive for low power ratings	*The compact drive with high power density*	*The specialist for pumps, fans, and compressors*	*The modular single drive for low to medium power ratings*
Main applications			
Machines and plants in industrial and commercial applications	For machine manufacturers and distributors in industrial and commercial applications (secondary drive in production machines or generally for water/waste water, automotive)	Machines and plants in industrial and commercial applications (heating, air conditioning, ventilation, water/waste water, process industry, food and beverage industry)	Machines and plants in industrial and commercial applications (machinery construction, automotive, textiles, chemical industry, printing, steel)
Application examples			
• Simple pumps and fans • Auxiliary drives • Conveyor systems • Billboards • Door/gate operating mechanisms	• Mixers • Extruders • Simple pumps, fans, compressors • Vibrator motors • Simple wire drawing machines	• Pumps and fans • Compressors	• Pumps and fans • Compressors • Centrifuges • Conveyor systems
Highlights			
• Compact • Can be flexibly adapted to different applications • Simple and fast commissioning • Clear terminal layout • Optimum interaction with SIMATIC and LOGO!	• Compact • High power density • Simple and fast commissioning • USB port • Plug-in terminal strips • Standard commissioning with SD card • Optimum interaction with SIMOTION and SIMATIC	• High degree of protection IP54 • Integrated pumping, ventilation, compressing functions • Reduced line harmonic distortions • Optimum energy management through innovative technology • Easy-to-use application wizards • Flexible and modular	• Modular • Can be flexibly expanded • Simple and fast commissioning • Regenerative feedback • Innovative cooling concept • Optimum interaction with SIMOTION and SIMATIC
Regenerative feedback capability			
No	No	No	Yes
Minimal low-frequency line harmonic distortions			
No	No	Yes	Yes
Integrated safety functions			
None	STO	None	STO, SS1, SLS, SBC, SDI, SSM
Catalog			
D 31, chapter 3	D 31, chapter 4	D 31, chapter 5	D 31, chapter 6

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Overview

SINAMICS G – The efficient drives

SINAMICS G110D	SINAMICS G120D	SINAMICS G130, SINAMICS G150
The distributed single drive for basic solutions	*The distributed single drive for high-performance solutions*	*The universal drive solution for single drives with high output ratings*
Main applications		
Horizontal conveyor applications in industrial environments, main focus on distribution and logistics in airports; generally suitable for basic conveyor-related tasks with local control or connected to a bus via AS-Interface	Conveyor drive applications in industrial environments, main focus on the automotive industry; also suitable for high-performance applications e.g. at airports and in the food, beverage and tobacco industry (without surfactants)	Machines and plants in the process and production industry, water/waste, power stations, oil and gas, petrochemicals, chemical raw materials, paper, cement, stone, steel
Application examples		
• Conveyor systems • Airports • Distribution logistics	• Conveyor systems • Electric monorail system in distribution logistics	• Pumps and fans • Compressors • Extruders and mixers • Mills
Highlights		
• Low profile design with standard drilling dimensions (standard footprint) in IP65 degree of protection • Simple and fast commissioning • Versions with and without a maintenance switch • Optional key-operated switch • AS-Interface with bus parameterization • Quick stop function • Integrated brake control, 180 V DC • Optimum interaction with SIMATIC and LOGO!	• Low profile design with standard drilling dimensions (standard footprint) in IP65 degree of protection • Modular • Can be flexibly expanded • Simple and fast commissioning • Regenerative feedback • Optimum interaction with SIMOTION and SIMATIC	• Space-saving • Low noise • Simple and fast commissioning • SINAMICS G130: Modular components • SINAMICS G150: Ready-to-connect cabinet unit • Optimum interaction with SIMATIC
Regenerative feedback capability		
No	Yes	No
Minimal low-frequency line harmonic distortions		
No	Yes	No (G130), Yes (G150)
Integrated safety functions		
STO (Through safety-related switching off of the black AS-Interface cable (U_{AUX}, 24 V DC)	STO, SS1, SLS	STO, SS1
Catalog		
D 31, chapter 7	D 31, chapter 8	D 11

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The members of the SINAMICS family

Overview

SINAMICS S – The flexible drives

SINAMICS S110	SINAMICS S120	SINAMICS S150
The specialist for simple positioning tasks	*The flexible, modular drive system for demanding drive tasks*	*The drive solution for sophisticated single drives with high output ratings*
Main applications		
Machines and plants in industrial applications, where machine axes should be quickly and precisely positioned in the simplest possible way.	Machines and plants in industrial applications (packaging, plastics, textile, printing, wood, glass, ceramics, presses, paper, lifting equipment, semiconductors, automated assembly and testing equipment, handling, machine tools)	Machines and plants in the process and production industry, food, beverages and tobacco, automotive and steel industry, mining/open-cast mining, shipbuilding, lifting equipment, conveyors
Application examples		
• Handling equipment • Feed and withdrawal devices • Stacking units • Automatic assembly machines • Laboratory automation • Metalworking • Woodworking, glass and ceramic industries • Plastics processing machines • Tracking systems for solar technology	• Motion control applications (positioning, synchronous operation) • Numerical control, interpolating motion control • Converting • Technological applications	• Test stand drives • Centrifuges • Elevators and cranes • Cross cutters and shears • Conveyor belts • Presses • Cable winches
Highlights		
• For universal use • Flexible and modular • Scalable in terms of power rating, functionality • Simple and fast commissioning, auto-configuration • Wide range of motors • Optimum interaction with SIMATIC	• For universal use • Flexible and modular • Scalable in terms of power rating, functionality, number of axes, performance • Simple and fast commissioning, auto-configuration • Wide range of motors • Optimum interaction with SIMOTION, SINUMERIK and SIMATIC	• Four-quadrant operation as standard • High control accuracy and dynamic response • Minimum harmonic effects on the supply system, considerably lower than the limits specified in IEEE 519 THD • Tolerant to line voltage fluctuations • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC
Regenerative feedback capability		
No	Yes	Yes
Minimal low-frequency line harmonic distortions		
No	Yes	Yes
Integrated safety functions		
STO, SS1, SS2, SOS, SLS, SDI, SBC, SSM	STO, SS1, SS2, SOS, SLS, SDI, SBC, SBT, SSM	STO, SS1
Catalog		
D 31, chapter 9	PM 21, D 21.3, D 31 chapter 10, and NC 61	D 21.3

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Overview

SINAMICS medium-voltage converters and DC drives

SINAMICS GM150, SINAMICS SM150, SINAMICS GL150, SINAMICS SL150	SINAMICS DCM
The drive solution for single-motor and multi-motor drives in the medium-voltage range	*The scalable drive system for basic and demanding applications*
Main applications	
Machines and plants up to 120 MW, e.g. in the process, steel and mining industries	Machines and plants in the industrial environment (steel/aluminum, plastics, printing, paper, cranes, mining/open-cast mining, oil and gas, excitation equipment) in the new plant and retrofit businesses
Application examples	
• Pumps and fans • Compressors • Extruders, kneaders and mixers • Mills • Marine drives • Blast furnace blowers • Rolling mills • Hoisting bucket • Test stand drives • Conveyor belts	• Rolling mills • Cross cutters and shears • Wire-drawing machines • Extruders and kneaders • Presses • Elevators and cranes • Cableways and lifts • Mine hoists • Test stand drives
Highlights	
• Space-saving • Simple and fast commissioning • Ready-to-connect cabinet units • Optimum interaction with SIMATIC • High efficiency and minimum load on the motor • High control accuracy and dynamic response • Four-quadrant operation as standard for SINAMICS SM150 and SINAMICS SL150	• PROFIBUS as standard, PROFINET optional • Variance of the Control Units • 24 V DC electronics power supply • Power unit isolated with respect to ground • Free function blocks and Drive Control Chart • Expandable functionality using SINAMICS components • Single-phase connection possible • Coated modules and nickel-plated copper busbars • Wide temperature range
Regenerative feedback capability	
Yes	Yes
Minimal low-frequency line harmonic distortions	
Yes	Yes
Integrated safety functions	
STO	None
Catalog	
D 12 (SINAMICS GM150 and SINAMICS SM150)	D 23.1

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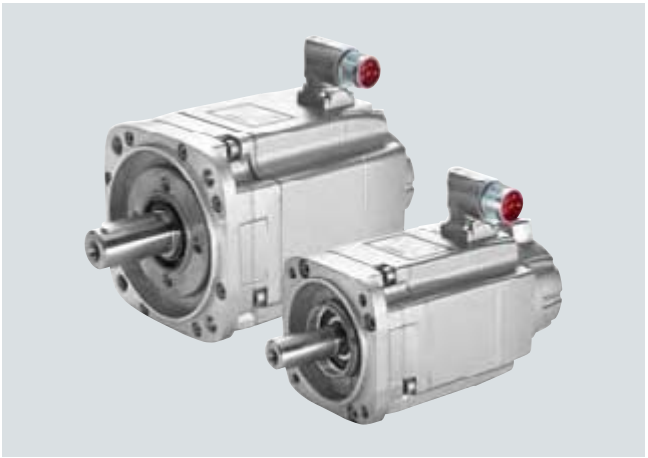
Servomotors/main motors

Overview

Servomotors

1FK7 synchronous motors

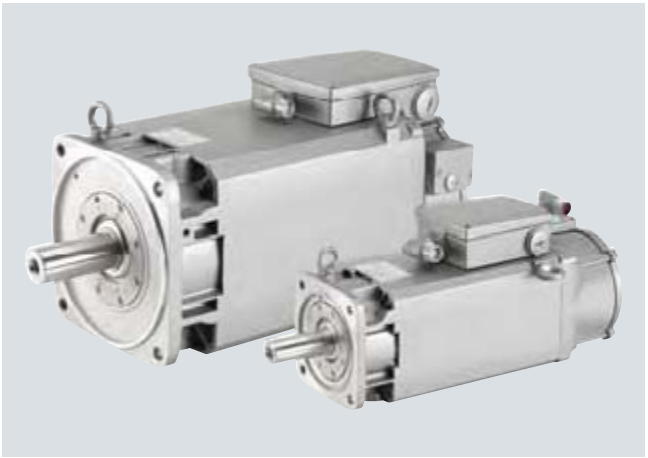
Application areas are e.g. robots and handling systems, wood, glass, ceramics and stone working, packaging, plastics and textile machines



Main motors

1PH8 asynchronous (induction) motors

Application areas are e.g. main drives in presses and extruders, converting applications, paper and printing industries, crane applications



The ideal 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 broad spectrum of servomotors and main motors to satisfy these demands.

Uniform integrated system solutions

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.

So with our motors, the SINAMICS drive system and MOTION-CONNECT pre-assembled signal and power cables, we are able to offer you a perfectly harmonized overall system.

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.

- Engineering tool SIZER for Siemens Drives
  - User-friendly support when dimensioning the motor and gear unit
    www.siemens.com/sizer
- CAD CREATOR
  - Dimension drawing and 2D/3D CAD generator
    www.siemens.com/cadcreator

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Overview

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.

MOTION-CONNECT 500 – the solution for predominantly fixed installation

MOTION-CONNECT cables are available as power cables or signal cables, pre-assembled or by the meter depending on the application. The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

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Notes

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Highlights

2/2 **Safety Integrated**
2/2 Overview
2/3 Function

2/11 **Efficient Infeed Technology**
2/11 Overview
2/11 Benefits
2/12 Application
2/12 More information

2/13 **Communication**
2/13 Overview

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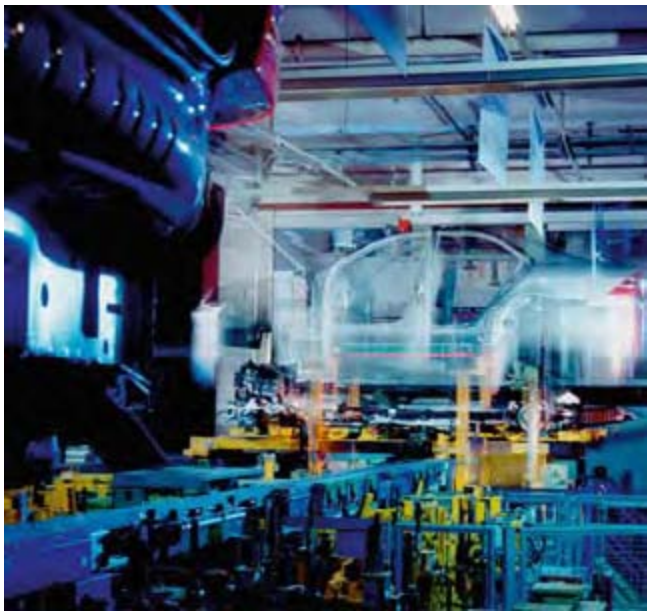
Safety Integrated

Overview



Legal framework

Machine manufacturers and manufacturing plants must ensure that their machines or plants cannot cause danger due to malfunctions in addition to 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 compliance with this directive, it is recommended that the corresponding harmonized European standards are applied. This triggers the "assumption of conformity" and gives manufacturers and operators the legal security in terms of compliance with both national regulations and EU directives. The machine manufacturer uses the CE marking to document the compliance with all relevant directives and regulations in the free movement of goods.

Safety-related standards

Functional safety is specified in various standards.
EN ISO 12100 and EN 1050, for example, are concerned with the construction and risk assessment of machines. EN 62061 (only applicable for electrical and electronic control systems) and EN ISO 13849-1, which will replace the previously used EN 954-1 as of 2012, 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 954-1: Categories B, 1 … 4
- 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 more encompassing and increasing modularity of machines has seen a shift in safety functions away from the classical central safety functions (for example, shutdown of all drives by a line contactor) and into the machine control system and the drives. One advantage of this development is that some safety-related circuitry involving extensive hardware is now no longer necessary.

Integrated safety functions act much faster than those of a conventional design. The safety of a machine is increased further with Safety Integrated. Furthermore, thanks to the faster method of operation, safety measures controlled by integrated safety systems are perceived as less of a hindrance by the machine operator. This significantly reduces the motivation to consciously bypass safety functions.

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Function

Safety functions integral to the SINAMICS G120, SINAMICS G120D, SINAMICS S110 and SINAMICS S120 drive systems

SINAMICS G120, SINAMICS G120D, SINAMICS S110 and SINAMICS S120 are characterized by a full range of integrated safety functions.

The drives fulfill the following equipment requirements of

- Category 3 according to EN 954-1
- Safety Integrity Level (SIL) 2 according to EN 61508
- PL d according to EN ISO 13849-1

The Safety Integrated functions provided by SINAMICS G120, SINAMICS G120D, SINAMICS S110 and SINAMICS S120 have been certified by independent institutes. You can obtain the corresponding external test certificates and manufacturer's declarations from your Siemens contact person.

The most important integrated safety functions available for Siemens drives are described in the following. The functional safety of all of the functions satisfies the requirements defined in the international standard IEC 61800-5-2 for variable-speed drive systems.

The integrated drive safety functions can be roughly divided into two categories:

- Functions for safely stopping a drive:
  - **Safe Torque Off (STO)**
    This function ensures that torque is no longer output at the motor shaft.
  - **Safe Stop 1 (SS1)**
    This function actively brakes a drive before the STO function is activated. In the event of danger, drives with a high kinetic energy can be brought to a standstill extremely quickly using this function.
  - **Safe Stop 2 (SS2)**
    Like the SS1 function, the SS2 function actively brakes the drive. At standstill, however, the SOS function is used instead of STO. Just as with SS1, drives with a high kinetic energy can be brought to a standstill extremely quickly in a hazardous situation.
  - **Safe Operating Stop (SOS)**
    The SOS function can be used as an alternative to STO. In contrast to STO, the motor is not released from all torque. Instead, the drive remains in position control, holds its position, and it is monitored to detect zero speed.
  - **Safe Brake Control (SBC)**
    This function safely applies a holding brake after STO has been activated, meaning that the drive can no longer move, e.g. due to gravity.
- Functions for safely monitoring the speed of a drive:
  - **Safely Limited Speed (SLS)**
    The SLS function ensures that the drive does not exceed a preset speed limit.
  - **Safe Speed Monitor (SSM)**
    This function signals if the speed falls below a specified value. No drive-integrated response occurs.
  - **Safe Direction (SDI)**
    This function monitors whether the selected direction of rotation is being adhered to.

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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.

Activation

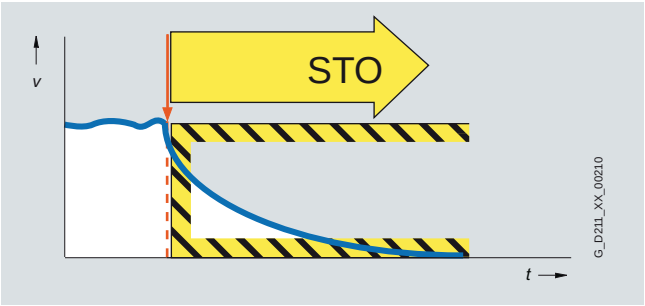
This function is a mechanism that prevents the drive from restarting unexpectedly, in accordance with EN 60204-1, Section 5.4. Safe Torque Off suppresses the drive pulses (corresponds to Stop Category 0 of EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

Applications

STO has the immediate effect that the drive cannot supply any torque-generating energy. STO can be used wherever the drive will naturally reach a standstill due to load torque or friction in a sufficiently short time 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 switchgear is the elimination of separate components and the effort that would be required to wire and service them. Because of the fast electronic switching times, the function has a shorter switching time than the electromechanical components in a conventional solution.



Safe Stop 1 (SS1)

The SS1 function causes a motor to stop rapidly and safely and switches the motor to torque-free mode after coming to a standstill, i.e. STO is activated.

Activation

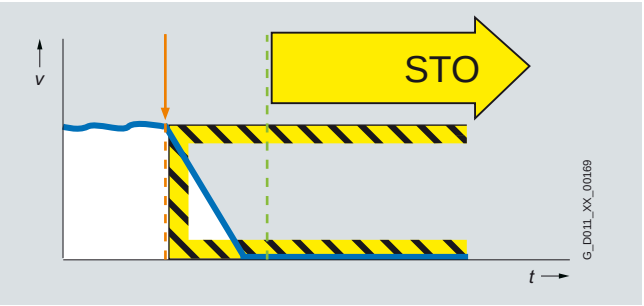
The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes autonomously along a quick stop ramp. The Safe Torque Off and Safe Brake Control functions (if activated) are then activated automatically depending on the setting – either after a delay time has elapsed or after the frequency drops below a minimum value (monitored brake ramp).

Applications

The SS1 function is used when, in the event of a safety-relevant incident, the motor 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 operating personnel, or to brake motors at high speeds as quickly as possible. Examples of typical applications are saws, grinding machine spindles, centrifuges, storage and retrieval machines.

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 the safety clearances in a machine to be reduced. The principle is to bring the drive actively to a standstill, compared with just using the STO function. Elaborate, wear-prone mechanical brakes are no longer required to brake the motor as quickly as possible.



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Function

Safe Operating Stop (SOS)

With the SOS function, the stopped motor is brought into position and monitored by the drive.

Activation

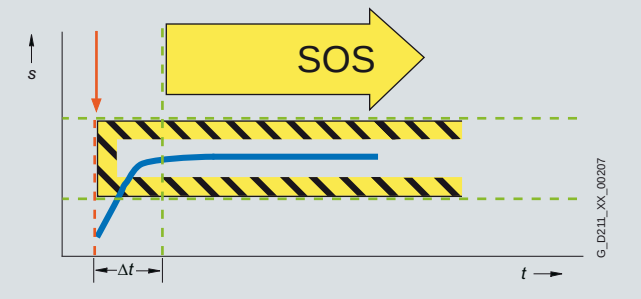
The Safe Operating Stop function constitutes safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is not influenced autonomously. After SOS has been activated, the higher-level control must bring the drive to a standstill within a parameterized time and then hold the position setpoint.

Applications

SOS is an ideal solution for all those applications for which the machine or parts of the machine must be at a safe standstill for certain machining steps, but where the drive must also supply a holding torque. It is ensured that despite counter torque the drive remains in its current position. In contrast to SS1 and SS2, the drive does not brake autonomously in this case. It expects the higher-level controller to ramp down the relevant axes as a coordinated group within an adjustable delay time. 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 may occur. Due to the short switching times and the fact that the position 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.



Safe Stop 2 (SS2)

The SS2 function brings the motor to a standstill quickly and safely and then monitors the standstill position.

Activation

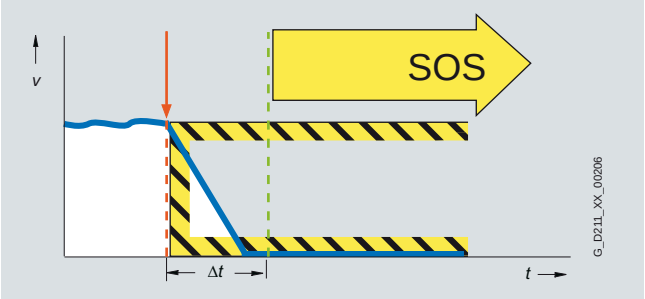
The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick stop ramp. In contrast to SS1, the drive control remains operational afterwards, i.e. the motor can supply the full torque required to maintain zero speed. Standstill is safely monitored (Safe Operating Stop function).

Applications

As with SS1, the SS2 function ensures the quickest possible deceleration of the motor. However, the motor power is not switched off. Instead, a control system prevents it from leaving the standstill position – even if it is 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.



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Safety Integrated

Function

Safe Brake Control (SBC)

The SBC function permits the safe control of a holding brake. SBC is always activated in parallel with STO.

Activation

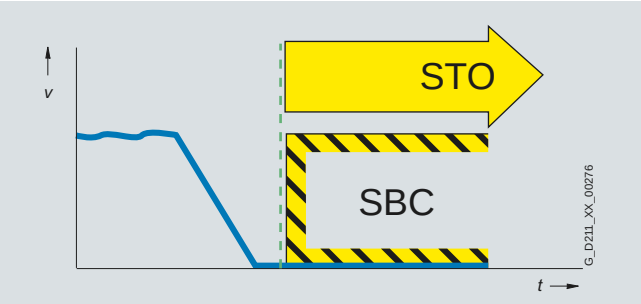
A holding brake which is active in a de-energized state is controlled and monitored using safe two-channel technology. Due to the two-channel control, the brake may still be activated in the event of an insulation fault in the control cable. Errors of this kind are detected early by means of test pulses.

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.



Safely Limited Speed (SLS)

The SLS function ensures that the drive does not exceed a preset speed limit.

Activation

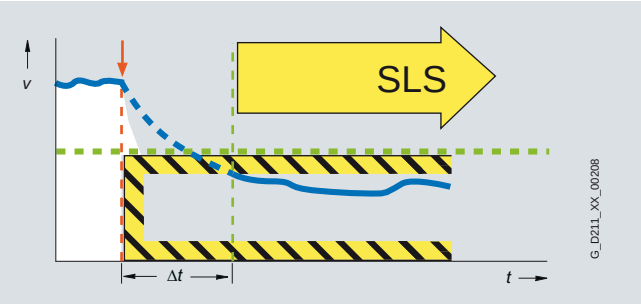
If the preset speed limit is exceeded, this is detected reliably. If the limit is exceeded, a customizable drive-integrated fault reaction occurs.

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. First, therefore, the speed is reduced, then safe monitoring is activated using the SLS function so that accidental exceeding of the set speed limit is prevented. Typical examples are cases in which an operator must enter the danger zone of the machine for maintenance or setup. A typical use of SLS is a winder, in which the material is manually threaded by the operator. To prevent injury to the operator, the roller may only spin at a safely 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 condition exists where 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 plant. Moreover, external components such as speed monitors can be omitted.



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Function

Safe Speed Monitor (SSM)

The SSM function warns when a drive is working below a specified speed/feed speed. As long as it remains below the threshold, the function issues a safety-related signal.

Activation

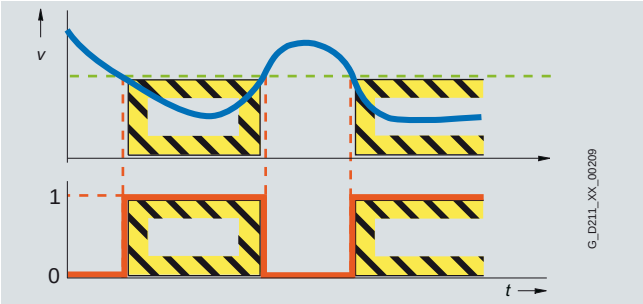
If a speed/velocity value drops below a parameterized level, a safety-related signal is generated. This can, for example, be processed in a safety controller to respond to the event by programming, depending on the situation.

Application

With the SSM function, in the simplest case, a safety door can be unlocked if the speed drops below a non-critical level.

Customer benefits

Unlike SLS, there is no drive-integrated 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 motor can only rotate in the selected direction.

Activation

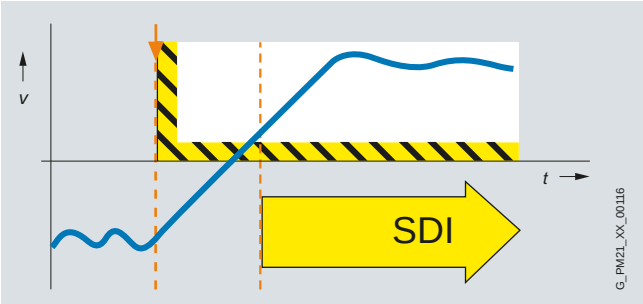
Deviation from the direction of rotation currently being monitored is detected reliably and the configured drive-integrated fault reaction is initiated. It is possible to select which direction of rotation is to be monitored.

Application

The SDI function is used when the drive may only move in one direction. A typical application is to permit the operator access to a danger zone, as long as the machine is rotating in the safe direction, i.e. away from the operator. In this state, the operator can feed material into the work zone / remove material from the work zone without danger.

Customer benefits

The function saves the use of external components e.g. speed monitors and the associated wiring. The release of a danger zone while the machine is moving away from the operator increases productivity. Without the SDI function, the machine must be safely stopped during material loading and removal.



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Safety Integrated

Function

SINAMICS G120, SINAMICS G120C, SINAMICS G110D and SINAMICS G120D

The Safety Integrated functions do not require a license.

The availability of Safety Integrated functions depends on the type of Control Unit, i.e. whether it is a standard Control Unit or a fail-safe Control Unit.

An overview of the Safety Integrated functions of SINAMICS G120 and SINAMICS G120D plus their boundary conditions is shown in the following table:

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required	Available in
STO	• F-DI [1] • PROFIsafe	–	–	No	No	No	G120 - CU240E-2 - CU240E-2 DP - CU240E-2 F - CU240E-2 DP-F G120C G110D [2] G120D - CU240D DP-F - CU240D PN-F
SS1	• F-DI [1] • PROFIsafe	STO, following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	Activation of STO	No	No	No	G120 - CU240E-2 F - CU240E-2 DP-F G120D - CU240D DP-F - CU240D PN-F
SLS	• F-DI [1] • PROFIsafe	–	Activation of STO or SS1	Yes	No	No	G120 - CU240E-2 F - CU240E-2 DP-F G120D - CU240D DP-F - CU240D PN-F
SDI	• F-DI [1] • PROFIsafe	–	Activation of STO or SS1	Yes	No	No	G120 - CU240E-2 F - CU240E-2 DP-F
SSM	Always active	–	Signals that the speed has fallen below a specified value	–	No	No	G120 - CU240E-2 DP-F

[1] Not for SINAMICS G110D and SINAMICS G120D.

[2] Through safety-related switching off of the black AS-Interface cable.

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Function

SINAMICS S110

The Safety Integrated Basic Functions do not require a license.

However, the Extended Functions of Safety Integrated do require a license. It is irrelevant which extended safety functions are used and how many.

The license can be ordered separately or as an option with the memory card (order no. of the memory card plus order code F01). For memory card order numbers, please refer to the selection and ordering data.

An overview of the Safety Integrated functions of SINAMICS S110 plus their boundary conditions is shown in the following table:

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required
Basic Functions						
STO	• F-DI0 on CU305 • PROFIsafe	SBC (if activated)	–	No	No	No
SBC	• With STO (immediately or following expiry of the delay time with SS1)	–	–	–	No	No
SS1	• F-DI0 on CU305	STO following expiry of the parameterized delay time, followed by SBC (if activated)	–	No	No	No
Extended Functions						
SS1 with SBR	• F-DI0-2 on CU305 • PROFIsafe	Safe acceleration monitoring (SBR) during braking. STO and SBC (if activated) following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	STO	No	No	Yes
SS2 with SBR	• F-DI0-2 on CU305 • PROFIsafe	Safe acceleration monitoring during braking. Following expiry of the parameterized delay time SOS	STO	No	Yes	Yes
SOS	• F-DI0-2 on CU305 • PROFIsafe	–	SS1	Yes	Yes	Yes
SLS	• F-DI0-2 on CU305 • PROFIsafe	–	SS1, STO, or SOS (parameterizable)	Yes	No	Yes
SSM	Always active	–	Message only	Yes	No	Yes
SDI	• F-DI0-2 on CU305 • PROFIsafe	–	SS1, STO, or SOS (parameterizable)	Yes	No	Yes

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Safety Integrated

Function

SINAMICS S120

The Safety Integrated Basic Functions do not require a license.

A license is, however, required for each axis with safety functions in the case of Safety Integrated Extended Functions. It is irrelevant which safety functions are used and how many.

The required licenses can be ordered separately or as an option with the CompactFlash card (order no. of the memory card plus order code F01).
For the order numbers of the CompactFlash cards, see chapter SINAMICS S120 drive system.

The CU310-2 Control Units are intended for the control of single axes only. This means only one license is required for the Extended safety functions.

An overview of the Safety Integrated functions of SINAMICS S120 plus their boundary conditions is shown in the following table:

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required	License required
Basic Functions						
STO	• EP terminals on the device and on the CU3xx • Terminals on the TM54F • PROFIsafe	SBC (if activated)	–	No	No [1]	No [2]
SBC	• With STO (immediately or following expiry of the delay time with SS1)	–	–	–	No	No [2]
SS1	• EP terminals on the device and on the CU3xx • PROFIsafe	STO following expiry of the parameterized delay time, SBC (if activated)	–	No	No	No [2]
Extended Functions						
SS1 with SBR	• Terminals on the TM54F • PROFIsafe	Safe acceleration monitoring (SBR) during braking. STO and SBC (if activated) following expiry of the parameterized delay time or if the speed falls below the minimum speed limit	STO	No	No [3]	Yes
SS2	• Terminals on the TM54F • PROFIsafe	Safe acceleration monitoring (SBR) during braking. Following expiry of the parameterized delay time SOS	STO	No	Yes	Yes
SLS	• Terminals on the TM54F • PROFIsafe	–	SS1, STO or SOS (parameterizable)	Yes	No [3]	Yes
SOS	• Terminals on the TM54F • PROFIsafe	–	SS1/STO	Yes	Yes	Yes
SSM	Always active	–	Display only	Yes	Yes	Yes
SDI	• Terminals on the TM54F • PROFIsafe	–	SS1, STO or SOS (parameterizable)	Yes	No [3]	Yes

[1] Activation using terminals on the TM54F currently requires an encoder.
[2] Activation using terminals on the TM54F currently requires a license.
[3] Not available for CU310 (SINAMICS Firmware V2.x)

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Overview

Energy recovery for SINAMICS G120, SINAMICS G120D and SIMATIC ET200 drives

Siemens is setting a completely unique new standard in the field of compact end efficient drives: The technology applied is a world first and provides regenerative feedback capability in smaller, lighter and much lower-cost inverter units.

Available drives with Efficient Infeed Technology

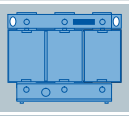
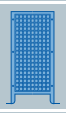
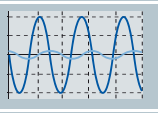
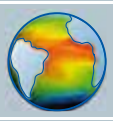
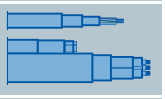
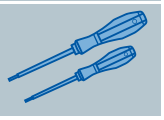
The following drives are equipped with Efficient Infeed Technology:

- SINAMICS G120 (integrated in PM250 and PM260 Power Modules)
- SINAMICS G120D
- SIMATIC ET 200S FC
- SIMATIC ET 200pro FC

The catalog IK PI contains information on SIMATIC ET 200.

Potential savings thanks to Efficient Infeed Technology

The table below shows the advantages of the technology as compared to conventional 2-quadrant inverters.

	Standard Technology	Efficient Infeed Technology
Line reactor 	Required	**Not required**
Braking resistor 	Required	**Not required**
Configuration overhead	Standard	**Low**
Generated harmonics 	Standard	**Minimal**
Heat generated when braking 	Yes	**No**
Power infeed 	Standard	**Approx. 22% less**
Power consumption	Standard	**Approx. 22% less**
Energy efficiency	Standard	**Good**
Reactive power compensation	No	**Yes**
Installation outlay 	Standard	**Low**

G_D011_EN_00182

Three technical criteria are of particular significance:

- Regenerative feedback
  - 100 % braking power is fed back, allowing continuous braking. This is not possible in practice using braking resistors.
  - A braking resistor does not need to be configured.
  - No need for installation, cooling monitoring, etc. for external components.
- Minimal reactive power distortion
  - The current consumption does not manifest any spikes but is almost a sine-wave; therefore a minimum transformer throughput rating is required and reactive power distortion is reduced.
  - In order to achieve such a low harmonic content (line harmonics) for an inverter with a conventional DC link, a line reactor with a u_K = 6 % is required.
  - This results in approx. 22 % lower current consumption which corresponds to approximately 40 % lower losses in the supply system.
  - The load on the power supply system is therefore reduced.
- Reactive power compensation, improved cos φ
  - Slightly capacitive at input ≅ 0.94.
  - Compensates the reactive power of motors and other inductive loads on the same supply.
  - The power draw of the entire system is reduced. In a system comprising one inverter with motor and another motor on the same supply, the total power draw is reduced by up to 12 %.

Line supply conditions

Inverters with Efficient Infeed Technology have a much lower harmonic content (and therefore lower reactive current component) than a standard inverter. The harmonics up to and including the 11th are significantly lower than specified in the relevant standard. These relevant harmonics are less than half the magnitude stipulated by the relevant standard (EN 61000-3-12).

Experience has proven that this technology can be applied worldwide. Sole exception: In "island networks" with a separate generator (without line connection), an external capacitor must be used to reduce resonance. This must be dimensioned according to the particular system.

Permissible ratio between network short-circuit power S_{K_line} and inverter apparent power $S_{inverter}$:

$S_{K_line} \geq 100 \times S_{inverter}$ according to $u_K \leq 1$ %

Benefits

- Continuous braking with 100 % braking power
- Energy savings through regenerative feedback with motor operating in generator mode
- Omission of braking resistor, line reactor and brake chopper
- No costly configuration of the braking resistors and no time-consuming cabling
- Requires considerably less space than a conventional compact inverter
- Up to 22 % less power infeed
- No additional heat generated during braking
- Cost savings
- Space savings

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Efficient Infeed Technology

Application

Whenever an application involves movements with frequent changes in speed or rotational direction or requires masses to be electrically braked, inverters with regenerative feedback capability are an attractive drive solution for both operating companies and machine manufacturers.

This is also true for applications with vertical motion generally, or for driven loads with a high moment of inertia:

- Drives for conveyor vehicles
- Stage machinery in theaters
- Cranes
- Heavy load transport systems/conveyors
- Storage and retrieval machines
- Centrifuges
- Renewable energy sources (hydro-electric power, wind power)
- Brake testing systems
- Drum-type crushers/revolving screens
- Vertical load hoists
- Industrial washing machines
- Shuttles/elevator systems/endless bucket belts
- Rolling mills/conveyor belts
- Winding machines

Generally, for applications with a high braking power over long periods of time, in many cases it makes sense to use Efficient Infeed Technology – this reduces the costs and the amount of space required.

Integration

SINAMICS infeed concepts

SINAMICS offers four design concepts for the converter/inverter infeed circuit.

Concept	Characteristic features
Basic Infeed	• Automatic energy exchange via the common DC link during infeed with Basic Line Module infeed unit • No regenerative feedback capability • Braking resistor required for braking operation • High harmonic content (reactor available as option) • Efficiency approx. 99 %
Smart Infeed	• Automatic energy exchange via the common DC link • Regenerative feedback capability • Line reactor is required • Efficiency approx. 98 % to 99 %
Efficient Infeed	• **Regenerative feedback capability** • **Line reactor not required/not permitted** • **Low harmonic component** • **Efficiency approx. 98 %** • **High energy efficiency and high active current component**
Active Infeed	• **Automatic energy exchange via the common DC link** • **Regenerative feedback capability** • **Low harmonics in motor and generator operation** • **Efficiency approx. 97 % to 98 %** • **Operation on island networks possible** • **Operation on weak networks possible ($u_K \leq 5$ %)** • **Boosting DC link voltage permits smaller power units** • **Decoupling from line voltage fluctuations due to constantly controlled DC link voltage**

The following drives are equipped with a **Basic Infeed**:

- SINAMICS G110
- SINAMICS G120 (integrated in PM240 Power Modules)
- SINAMICS G110D
- SINAMICS S110 and SINAMICS S120 (integrated in PM340 Power Module and in the Basic Line Module infeed unit)

For information on SINAMICS products with **Smart Infeed**, **Active Infeed**, and on Basic Line Modules, refer to Catalogs D 11, PM 21 and NC 61.

More information

Capacitive reactive currents

For the PM250 Power Modules that are capable of energy recovery with integrated class A EMC filter and PM250D, due to the topology, the capacitance effective at the inverter input is greater than for conventional PM240 Power Modules. This results in higher capacitive reactive currents as soon as voltage is connected to the Power Module.

The capacitive reactive current only has to be taken into consideration when determining the cable cross-section and infeed point for group drives with a low coincidence factor.

Rated power of the PM250 Power Module for low overload LO		Filter capacitance	50 Hz impedance	Current at 400 V	60 Hz impedance	Current at 480 V
		Values apply to PM250 Power Modules with integrated line filter class A				
kW	hp	µF	Ω	A	Ω	A
7.5	10	42.4	75.1	3.08	62.6	4.43
11	15	42.4	75.1	3.08	62.6	4.43
15	20	42.4	75.1	3.08	62.6	4.43

Rated power of the PM250D Power Module for high overload HO		Filter capacitance	50 Hz impedance	Current at 400 V	60 Hz impedance	Current at 480 V
kW	hp	µF	Ω	A	Ω	A
0.75	1.0	8.9	357.7	0.65	298.0	0.93
1.5	2.0	8.9	357.7	0.65	298.0	0.93
3.0	4.0	32.4	98.2	2.35	81.9	3.38
4.0	5.0	32.4	98.2	2.35	81.9	3.38
5.5	7.5	42.4	75.1	3.08	62.6	4.43
7.5	10	42.4	75.1	3.08	62.6	4.43

For further information, please refer to:
www.siemens.com/automation/service&support

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Overview

Digital bus systems are commonly used in industrial automation today. These handle communication between the control level, the machine control, the sensors and actuators. The SINAMICS product family offers integrated communication interfaces in all product groups – which can be used to connect the most important fieldbus systems in the simplest possible way.

The properties and special application areas of the different bus systems are described briefly below.

Introduction

Some protocols have been developed for special applications and demonstrate their strengths there. They are however hardly suitable for other applications, as the corresponding user requirements cannot, or can only partially, be implemented with the protocol. Examples of application-specific protocols are BACnet (specialized bus for building automation) or the AS-Interface (for simplest connection of actuators and sensors). Other protocols are well rounded and are used successfully throughout the world in a wide range of applications, both in factory automation and in process automation. PROFIBUS and PROFINET are examples of these protocols. PROFINET in particular – with its openness and flexibility – is suitable for implementing the simplest and also highly complex automation structures with standard or with Motion Control drive technology. This is why PROFINET is the choice today for new machines or expansions. PROFINET ensures the plant is future-proof and offers advantages for commissioning, operation and maintenance.

USS and Modbus RTU

As simple fieldbus protocols, USS (Universal Serial Interface protocol of Siemens AG, 1992) and Modbus RTU can be used both cyclically and acyclically. Based on RS485 physical bus characteristics, up to 32 nodes can be networked to one bus segment and connected to a higher-level controller. These protocols are used when there are limited demands on data throughput.

AS-Interface

AS-Interface serves as a cost-effective system for the lower field level of automation. AS-Interface was specially developed to meet the demands of connecting binary sensors and actuators as well as interfacing to the higher control level. A straightforward, cost-effective installation with minimal connection costs was of paramount importance to the developers. The AS-Interface is often used in systems where numerous actuators and sensors installed across a wide area need to be networked, while incurring minimal costs. Examples include conveying and handling systems in airports, automated postal sorting, and the food and beverages industries.

BACnet MS/TP

BACnet MS/TP (**B**uilding **A**utomation and **C**ontrol **Net**works **M**aster-**S**lave/**T**oken **P**assing) is another fieldbus system based on RS485 physical characteristics, which is mainly used in the field of building automation. BACnet MS/TP defines a variety of services including data utilization, alarm processing, event handling, processing of value changes, device and network management as well as various types of objects. Interoperability is ensured by means of a uniform approach to services and procedures, which is laid down in so-called application profiles. These profiles are available for a wide range of applications. The SINAMICS G120P / SINAMICS G120 inverters, especially developed for turbo-machines (such as pumps, fans and compressor drives), use the application profile "BACnet Application specific controller" for use in building automation.

CANopen

CANopen is a communication protocol based on CAN physical characteristics, which is predominantly used in the automation industry and for networking within complex devices. Originally conceived as a fieldbus for networking devices in motion control applications such as handling systems, CANopen has since established itself in the field of medical engineering, vehicle automation, rail and ship networking as well as building automation. Interoperability of CANopen is ensured through the use of application and device profiles, whereby the wide range of options offered by the bus specification enables an appropriate, precise selection to be made for the application or device in question. Drives with the CU230P-2 CAN Control Unit support the "CiA 402 electrical drives" device profile.

PROFIBUS

PROFIBUS, with more than 35 million nodes the world's most widely available fieldbus system, defines the technical and functional features of a serial fieldbus system with which distributed field controllers installed in the low-end (sensor/actuator level) to mid performance range (cell level) can be networked. The PROFIBUS DP (distributed I/O) version tends to be used in production technology. This version, which is optimized for speed, is tailored especially to the communication of automation systems with distributed I/O stations and drives. PROFIBUS DP excels thanks to its swift response times and high degree of interference immunity.

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Communication

Overview

PROFINET

PROFINET is the innovative, open Industrial Ethernet standard for the industrial automation industry. PROFINET combines IT communication, data communication and cyclic process communication in a single communication medium. PROFINET thus permits uniform communication from the control level down through to the field level, offers plant-wide engineering and uses well-proven standards from the IT world for communication into the field level, such as TCP/IP and UDP. PROFINET satisfies all the main requirements of industrial automation, such as:

- Industry-standard installation technology
- Real-time capability
- Deterministic behavior
- Integration of distributed field devices
- Simple network administration and diagnostics
- Protection against unauthorized access
- Efficient, cross-vendor engineering
- Isochronous motion control applications

PROFINET uses standard TCP/IP for non-time-critical communication, e.g. for parameter assignment, configuration, commissioning and diagnostics. PROFINET offers the following performance levels for real-time communication when transferring process data:

- Real Time (RT)
  RT uses the option of prioritizing the communication stack of the bus nodes. This permits high-performance data transmission with standard network components.
- Isochronous Real-Time (IRT)
  IRT permits strict deterministic, cyclic data transmission with extremely short cycle times and minimum jitter for high-performance motion control applications.

The PROFINET ports are integrated in the drives and so permit the optimum design and wiring for the application at hand. You can find the corresponding modules in all product families of the SINAMICS product range which can be connected with PROFINET for automation solutions with SIMOTION or SIMATIC S7 CPU.

Overview of the types of communication

Protocols	SINAMICS G							SINAMICS S	
	G110	G120C	G120P/G120	G120		G110D	G120D	S110	S120
			CU230P-2 Control Unit	CU240B-2 Control Unit	CU240E-2 Control Unit		CU240D Control Unit	CU305 Control Unit	CU310-2 Control Unit
USS	✓	✓	✓	✓	✓	–	–	✓	✓
Modbus RTU	–	✓	✓	✓	✓	–	–	–	–
BACnet MS/TP	–	–	✓	–	–	–	–	–	–
CANopen	–	✓	✓	–	–	–	–	✓	–
AS-Interface	–	–	–	–	–	✓	–	–	–
PROFIBUS DP	–	✓	✓	✓	✓	–	✓	✓	✓
PROFINET	–	–	–	–	–	–	✓	✓	✓

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Motors

11/2 **Overview**

11/4 **Servomotors for SINAMICS S110**
11/4 1FK7 synchronous motors

11/10 **Main motors for SINAMICS S110**
11/10 1PH8 asynchronous (induction) motors
11/12 Forced ventilation, IP55 degree of protection
11/14 Water cooling, IP65 degree of protection
11/16 Selection guides

11/19 **Dimensional drawings**
11/19 1FK7 synchronous motors
11/22 1PH8 asynchronous (induction) motors Forced ventilation
11/28 1PH8 asynchronous (induction) motors Water cooling

CAD CREATOR

For dimension drawing and 2D/3D CAD generator, see chapter 14, and www.siemens.com/cadcreator

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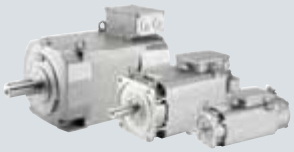
Motor type	Features	Degree of protection	Cooling method
1FK7 synchronous motor	Permanent-magnet synchronous servomotor	IP64	Natural cooling
1PH8 asynchronous (induction) motor 	Three-phase squirrel-cage motor without housing High power density with small motor dimensions	IP55 IP65	Forced ventilation Water cooling

The SINAMICS S110 PM340 Power Modules in blocksize format have been used as an example for the selection and ordering data for the motors.

Low-voltage motors

Low-voltage motors are available for the widest range of requirements and applications. With an output range from 0.06 to 1250 kW (0.08 to 1676 hp), they are designed to operate with the SINAMICS drive system. You will find the available product range in Catalog D 81.1 IEC Squirrel-Cage Motors, Frame Sizes 56 to 450, and on the Internet at:
www.siemens.com/drives/infocenter

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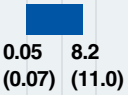
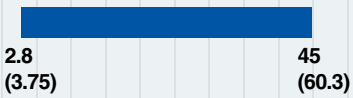
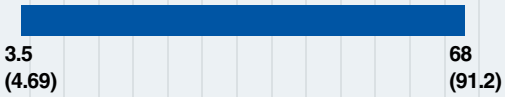
Shaft height	Rated power P_{rated} for S1 duty kW (hp)	Rated torque M_{rated}	Page
SH 20/SH 28/ SH 36/ SH 48 SH 63/SH 80/ SH 100		0.08 ... 37 Nm (0.06 ... 27.3 lb_f-ft)	**11/6**
SH 80/SH 100/ SH 132/SH 160		18 ... 310 Nm (13.3 ... 229 lb_f-ft)	**11/12**
SH 80/SH 100/ SH 132/SH 160		22 ... 331 Nm (16.2 ... 244 lb_f-ft)	**11/14**

11

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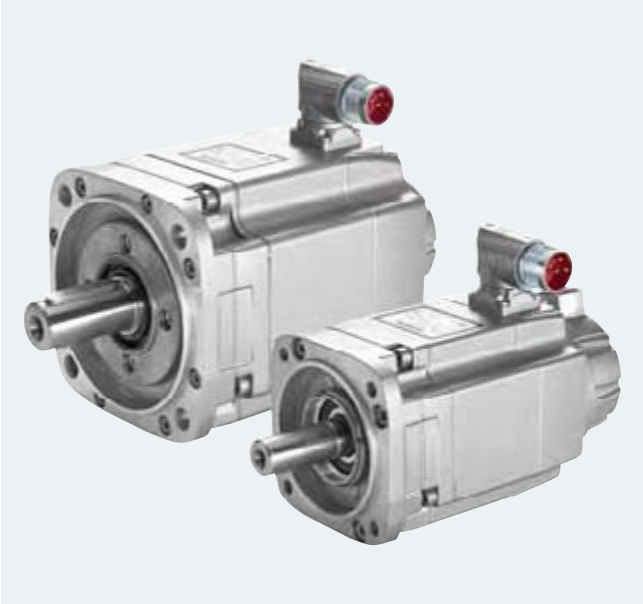
1FK7 synchronous motors

Overview



1FK7 motors

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 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

1FK7 Compact motors offer:

- Space-saving installation due to extremely high power density
- Can be used for universal applications
- Wide range of motors

Application

- Handling equipment
- Feed and withdrawal devices
- Stacking units
- Automatic assembly machines
- Laboratory automation
- Metalworking
- Wood, glass and ceramic industries
- Printing machines
- Plastics processing machines

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Technical specifications

1FK7 Compact motors	
Motor type	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 in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of ΔT = 100 K at an ambient temperature of 40 °C (104 °F)
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	
• 1FK701	IP54
• 1FK702 ... 1FK710	IP64
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1)]	Tolerance N
Vibration magnitude in accordance with 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	55 dB
• 1FK706	65 dB
• 1FK708/1FK710	70 dB
Connection	Connectors for signals and power, can be rotated
Paint finish	Anthracite (RAL 7016)
2nd rating plate	Enclosed separately
Holding brake	Without play 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_{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
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 (resolution 4194304, internal 2048 S/R) + commutation position 11 bit
Absolute encoder, single-turn	
AS20DQI encoder	Absolute encoder, 20 bit single-turn (resolution 1048576, internal 512 S/R)
Absolute encoder, multi-turn	
AM20DQI/ AM20DQ encoder	Absolute encoder 20 bit (resolution 1048576, internal 512 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)
Resolver	
R15DQ resolver	Resolver 15 bit (resolution 32768, internal, multi-pole)
R14DQ resolver	Resolver 14 bit (resolution 16384, internal, 2-pole)

S/R = signals/revolution

1) Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

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1FK7 synchronous motors

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FK7 Compact synchronous motor Natural cooling	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (hp)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lbf-in-s^2)	kg (lb)
1FK7 Compact motors for DC link voltage 720 V DC									
6000	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.85	**1FK7011-5AK71-1■■3**	4	0.064 (0.06)	0.9 (2.0)
		0.10 (0.13)	0.35 (0.26)	0.16 (0.12)	0.85	**1FK7015-5AK71-1■■3**	4	0.083 (0.08)	1.1 (2.4)
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	**1FK7022-5AK71-1■■3**	3	0.28 (0.25)	1.8 (4.0)
1FK7 Compact motors for DC link voltage 270 ... 325 V DC									
6000	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.5	**1FK7011-5AK21-1■■3**	4	0.064 (0.06)	0.9 (2.0)
		0.10 (0.13)	0.35 (0.26)	0.16 (0.12)	0.5	**1FK7015-5AK21-1■■3**	4	0.083 (0.08)	1.1 (2.4)
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	**1FK7022-5AK21-1■■3**	3	0.28 (0.25)	1.8 (4.0)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder	**A**
	AM512S/R encoder (only for 1FK702) AM16S/R encoder	**H** **J**
	Multi-pole resolver	**S**
	2-pole resolver	**T**
Encoder systems for motors with DRIVE-CLiQ interface:	IC22DQ encoder (only for 1FK702)	**D**
	AM20DQ encoder (only for 1FK702) AM15DQ encoder (only for 1FK702)	**L** **V**
	R15DQ resolver (only for 1FK702) R14DQ resolver (only for 1FK702)	**U** **P**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

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Motor type (repeated)	Efficiency[1]	Static current	Calculated power	SINAMICS S110 blocksize format		Pre-assembled power cable with complete shield Motor and brake connection via SPEED-CONNECT power connector		
				Rated output current[2]	PM340 Power Module Air cooling			
	η	I_0 at M_0 ΔT=100 K	P_{calc} at M_0 ΔT=100 K	I_{rated}		Power connector	Cable cross-section[3]	
	%	A	kW (hp)	A	Order No.	Size	mm²	Order No.
				Line voltage 380 ... 480 V 3 AC				
1FK7011-5AK71...	62	1.5	0.1 (0.13)	1.7	**6SL3210-1SE11-7UA0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7015-5AK71...	68	1.5	0.2 (0.27)	1.7	**6SL3210-1SE11-7UA0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7022-5AK71...	86	1.8	0.5 (0.67)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
				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	**6FX■002-5DN30-....**
1FK7015-5AK21...	68	0.85	0.2 (0.27)	0.9	**6SL3210-1SB11-0■A0**	0.5	4 × 1.5	**6FX■002-5DN30-....**
1FK7022-5AK21...	85	1.8	0.5 (0.67)	2.3	**6SL3210-1SB12-3■A0**	1	4 × 1.5	**6FX■002-5■G10-....**

Line filter:
Without **U**
Integrated **A**

You can find further versions and components in SINAMICS S110 servo drives.

Power cable:
MOTION-CONNECT 800PLUS **8**
MOTION-CONNECT 500 **5**

Without brake cores **C**
With brake cores **D**

Length code **....**

Information about the cables can be found in Connection system MOTION-CONNECT.

11

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 mm².

4) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \cdot n_{rated}}{9550}$ $\quad P_{calc}\,[hp] = \frac{M_0\,[lb_f\text{-}ft] \cdot n_{rated}}{5250}$

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1FK7 synchronous motors

Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	1FK7 Compact synchronous motor Natural cooling	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (hp)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lbf-in-s^2)	kg (lb)
1FK7 Compact motors for DC link voltage 720 V DC									
2000	48	0.6 (0.80)	3 (2.21)	2.8 (2.07)	1.55	**1FK7042-2AC71-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)
	63	1.1 (1.5)	6 (4.43)	5.3 (3.91)	2.95	**1FK7060-2AC71-1■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		1.5 (2.0)	8.5 (6.27)	7 (5.16)	2.65	**1FK7062-2AC71-1■ ■0**	4	11.2 (9.91)	9.1 (20.1)
		1.9 (2.55)	11 (8.11)	8.9 (6.56)	4.4	**1FK7063-2AC71-1■ ■0**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	12 (8.85)	10 (7.38)	4.4	**1FK7081-2AC71-1■ ■0**	4	20 (17.7)	12.9 (28.4)
		2.6 (3.49)	16 (11.8)	12.5 (9.22)	6.3	**1FK7083-2AC71-1■ ■0**	4	26 (23.0)	15.6 (34.4)
		3.1 (4.16)	20 (14.7)	15 (11.1)	6.7	**1FK7084-2AC71-1■ ■0**	4	32.5 (28.8)	18.3 (40.4)
	100	3 (4.02)	18 (13.3)	14.5 (10.7)	7.1	**1FK7100-2AC71-1■ ■0**	4	54 (47.8)	17.6 (38.8)
		4.3 (5.77)	27 (19.9)	20.5 (15.1)	9.7	**1FK7101-2AC71-1■ ■0**	4	79 (69.9)	23 (50.7)
		5.2 (6.97)	36 (26.6)	25 (18.4)	11	**1FK7103-2AC71-1■ ■0**	4	104 (92.1)	28.5 (62.8)
		7.7 (10.33)	48 (35.4)	37 (27.3)	16	**1FK7105-2AC71-1■ ■0**	4	154 (136)	39 (86.0)
3000	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	2	**1FK7042-2AF71-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)
	63	1.5 (2.01)	6 (4.43)	4.7 (3.47)	3.7	**1FK7060-2AF71-1■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		1.9 (2.55)	8.5 (6.27)	6 (4.43)	4	**1FK7062-2AF71-1■ ■0**	4	11.2 (9.91)	9.1 (20.1)
		2.3 (3.08)	11 (8.11)	7.3 (5.38)	5.6	**1FK7063-2AF71-1■ ■0**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	8 (5.90)	6.8 (5.02)	4.4	**1FK7080-2AF71-1■ ■0**	4	14.2 (12.6)	10.3 (22.7)
		2.7 (3.62)	12 (8.85)	8.7 (6.42)	6.8	**1FK7081-2AF71-1■ ■0**	4	20 (17.7)	12.9 (28.4)
		3.3 (4.43)	16 (11.8)	10.5 (7.74)	7.2	**1FK7083-2AF71-1■ ■0**	4	26 (23.0)	15.6 (34.4)
		3.1 (4.16)	20 (14.7)	10 (7.38)	6.5	**1FK7084-2AF71-1■ ■0**	4	32.5 (28.8)	18.3 (40.4)
	100	3.8 (5.10)	18 (13.3)	12 (8.85)	8	**1FK7100-2AF71-1■ ■0**	4	54 (47.8)	17.6 (38.8)
		4.9 (6.57)	27 (19.9)	15.5 (11.4)	11.6	**1FK7101-2AF71-1■ ■0**	4	79 (69.9)	23 (50.7)
		4.4 (5.90)	36 (26.6)	14 (10.3)	11.5	**1FK7103-2AF71-1■ ■0**	4	104 (92.1)	28.5 (62.8)
		8.2 (11.0)	48 (35.4)	26 (19.2)	18	**1FK7105-2AF71-1■ ■0**	4	154 (136)	39 (86.0)
4500	63	1.7 (2.28)	6 (4.43)	3.7 (2.73)	4.3	**1FK7060-2AH71-1■ ■0**	4	7.7 (6.82)	7.1 (15.7)
		1.4 (1.88)	8.5 (6.27)	3 (2.21)	3.3	**1FK7062-2AH71-1■ ■0**	4	11.2 (9.91)	9.1 (20.1)
		1.4 (1.88)	11 (8.11)	3 (2.21)	3.8	**1FK7063-2AH71-1■ ■0**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	8 (5.90)	4.5 (3.32)	4.8	**1FK7080-2AH71-1■ ■0**	4	14.2 (12.6)	10.3 (22.7)
		1.8 (2.41)	12 (8.85)	3.8 (2.80)	4.9	**1FK7081-2AH71-1■ ■0**	4	20 (17.7)	12.9 (28.4)
		1.4 (1.88)	16 (11.8)	3 (2.21)	3.6	**1FK7083-2AH71-1■ ■0**	4	26 (23.0)	15.6 (34.4)
6000	36	0.5 (0.67)	1.15 (0.85)	0.8 (0.59)	1.3	**1FK7032-2AK71-1■ ■0**	3	0.65 (0.58)	2.7 (5.95)
		0.6 (0.80)	1.6 (1.18)	1 (0.74)	1.3	**1FK7034-2AK71-1■ ■0**	3	0.9 (0.80)	3.5 (7.72)
	48	0.7 (0.94)	1.6 (1.18)	1.1 (0.81)	1.85	**1FK7040-2AK71-1■ ■0**	4	1.6 (1.42)	3.2 (7.06)
		0.9 (1.21)	3 (2.21)	1.5 (1.11)	2.5	**1FK7042-2AK71-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)
1FK7 Compact motors for DC link voltage 270 ... 325 V DC									
3000	36	0.3 (0.40)	1.15 (0.85)	1 (0.74)	1.6	**1FK7032-2AF21-1■ ■0**	3	0.65 (0.58)	2.7 (5.95)
		0.5 (0.67)	1.6 (1.18)	1.45 (1.07)	1.8	**1FK7034-2AF21-1■ ■0**	3	0.9 (0.80)	3.5 (7.72)
	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	3.5	**1FK7042-2AF21-1■ ■0**	4	2.9 (2.57)	4.6 (10.1)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver	**A** **E** **S** **T**
Encoder systems for motors with DRIVE-CLiQ interface:	AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver	**Q** **R** **U** **P**

Shaft extension:	Shaft and flange accuracy:	Holding brake:	
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**

11

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Motor type (repeated)	Efficiency[1]	Static current	Calculated power	SINAMICS S110 blocksize format		Pre-assembled power cable with complete shield Motor and brake connection via SPEED-CONNECT power connector		
				Rated output current[2]	PM340 Power Module Air cooling	Power connector	Cable cross-section[3]	
	η	I_0 at M_0 ΔT=100 K	P_{calc} at M_0 ΔT=100 K	I_{rated}				
	%	A	kW (hp)	A	Order No.	Size	mm²	Order No.
				Line voltage 380 ... 480 V 3 AC				
1FK7042-2AC71...	88	1.6	0.6 (0.80)	1.7	**6SL3210-1SE11-7UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7060-2AC71...	90	3.15	1.3 (1.74)	4.1	**6SL3210-1SE14-1UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7062-2AC71...	91	3	1.8 (2.41)	3.1	**6SL3210-1SE13-1UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7063-2AC71...	91	5.3	2.3 (3.08)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7081-2AC71...	93	5	2.5 (3.35)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7083-2AC71...	93	7.5	3.4 (4.56)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7084-2AC71...	93	8.5	4.2 (5.63)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7100-2AC71...	92	8.4	3.8 (5.10)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7101-2AC71...	93	12.3	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1.5	4 × 1.5	**6FX■002-5■G22-....**
1FK7103-2AC71...	93	14.4	7.5 (10.1)	18	**6SL3210-1SE21-8■A0**	1.5	4 × 1.5	**6FX■002-5■G22-....**
1FK7105-2AC71...	93	20	10.1 (13.5)	25	**6SL3210-1SE22-5■A0**	1.5	4 × 2.5	**6FX■002-5■G32-....**
1FK7042-2AF71...	89	2.2	0.9 (1.21)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7060-2AF71...	90	4.45	1.9 (2.55)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7062-2AF71...	91	5.3	2.7 (3.62)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7063-2AF71...	91	8	3.5 (4.69)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7080-2AF71...	92	4.9	2.5 (3.35)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7081-2AF71...	93	8.7	3.8 (5.10)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7083-2AF71...	93	10.1	5 (6.71)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7084-2AF71...	93	12.1	6.3 (8.45)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7100-2AF71...	92	11.1	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7101-2AF71...	93	18.8	8.5 (11.4)	25	**6SL3210-1SE22-5■A0**	1.5	4 × 2.5	**6FX■002-5■G32-....**
1FK7103-2AF71...	93	26	11.3 (15.1)	32	**6SL3210-1SE23-2■A0**	1.5	4 × 4	**6FX■002-5■G42-....**
1FK7105-2AF71...	94	31	15.1 (20.2)	32	**6SL3210-1SE23-2■A0**	1.5	4 × 6	**6FX■002-5■G52-....**
1FK7060-2AH71...	90	6.3	2.8 (3.75)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7062-2AH71...	91	8	4 (5.36)	10.2	**6SL3210-1SE21-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7063-2AH71...	90	12	5.2 (6.97)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7080-2AH71...	92	7.4	3.8 (5.10)	7.7	**6SL3210-1SE17-7■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7081-2AH71...	93	13.1	5.7 (7.64)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7083-2AH71...	93	15	7.5 (10.1)	18	**6SL3210-1SE21-8■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7032-2AK71...	88	1.7	0.7 (0.94)	1.7	**6SL3210-1SE11-7UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7034-2AK71...	88	1.9	1 (1.34)	2.2	**6SL3210-1SE12-2UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7040-2AK71...	88	2.35	1 (1.34)	3.1	**6SL3210-1SE13-1UA0**	1	4 × 1.5	**6FX■002-5■G10-....**
1FK7042-2AK71...	89	4.4	1.9 (2.55)	5.9	**6SL3210-1SE16-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**
				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...	89	3.95	0.9 (1.21)	3.9	**6SL3210-1SB14-0■A0**	1	4 × 1.5	**6FX■002-5■G10-....**

Line filter:	
Without	**U**
Integrated	**A**

You can find further versions and components in SINAMICS S110 servo drives.

Power cable:		
MOTION-CONNECT 800PLUS	**8**	
MOTION-CONNECT 500	**5**	
Without brake cores		**C**
With brake cores		**D**
Length code		**....**

Information about the cables can be found in Connection system MOTION-CONNECT.

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 mm².

4) $P_{calc}\,[kW] = \frac{M_0\,[Nm] \cdot n_{rated}}{9550}$ $\quad P_{calc}\,[hp] = \frac{M_0\,[lb_f\text{-}ft] \cdot n_{rated}}{5250}$

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1PH8 asynchronous (induction) motors

Overview

1PH8 motors, forced ventilation, shaft heights 80 to 160

1PH8 motors, water cooling, shaft heights 80 to 160

The 1PH8 motor series is a new motor generation for universal implementation in plants and machines that have been developed with Motion Control applications. Based on a flexible building block principle, the asynchronous (induction) motors are available either with forced ventilation or water cooling. Comprehensive function expansions such as different bearing concepts expand the application range.

Because the 1PH8 motors are often used as the largest and the central drive in the machine, they are known as "main motors".

Main motor = High performance +
Highly dynamic response +
High degree of precision

When developing the new 1PH8 motor series, we took special care to ensure maximum compatibility with the SINAMICS drive system.

Benefits

- High power density with small motor dimensions
- Wide speed control ranges
- High degree of flexibility due to the choice of
  - 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 drive system

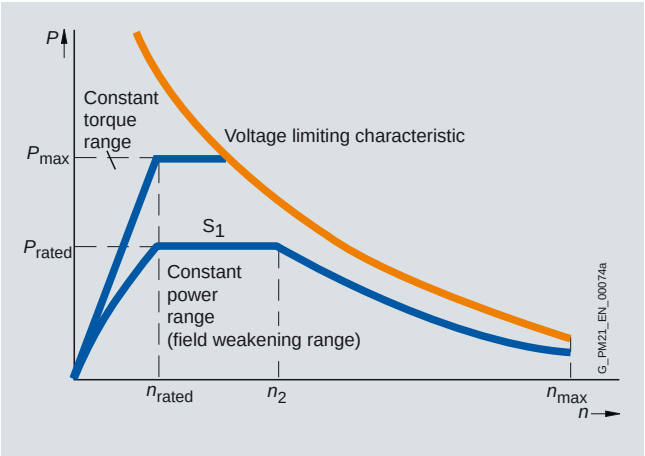
Application

The application spectrum reaches across all sectors and comprises, for example:

- Converting applications
- Rotary axes in the paper and printing industry

The 1PH8 motors are suitable for installation in dry indoor areas without corrosive atmospheres.

Characteristic curves



Typical speed/power characteristic for 1PH8 asynchronous (induction) 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.

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Technical specifications

1PH8 motor, forced ventilation	
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	For an ambient temperature of up to 40 °C (104 °F) Temperature class 180 (H)
Cooling in accordance with EN 60034-6 (IEC 60034-6)	Forced ventilation Fan mounted axially at NDE
Temperature monitoring	KTY84 temperature sensor in the stator winding
Motor fan ratings • 1PH808 • 1PH810 ... 1PH816	 230 V 1 AC 50 Hz 265 V 1 AC 60 Hz 400 V 3 AC 50 Hz 480 V 3 AC 60 Hz
Type of construction in accordance with EN 60034-7 (IEC 60034-7) • 1PH808 • 1PH810 ... 1PH816	 IM B3, IM B5 IM B3, IM B5, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP55
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft or fitted key half-key balancing for fitted key
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance R (reduced)
Vibration magnitude in accordance with Siemens/ EN 60034-14 (IEC 60034-14)[1]	Grade R/A
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance +3 dB, external fan 50 Hz • 1PH808 ... 1PH813 • 1PH816	 70 dB[2] 73 dB[2]
Connection	Connector for signals (mating connector is not included in the scope of delivery) Terminal box NDE top
Paint finish	Anthracite RAL 7016

1PH8 motor, water cooling	
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	For a cooling water inlet temperature of up to 30 °C (86 °F) Temperature class 180 (H)[3]
Cooling in accordance with EN 60034-6 (IEC 60034-6)	Water cooling Max. cooling water pressure at inlet: 6 bar Connecting thread at NDE
Temperature monitoring	KTY84 temperature sensor in the stator winding
Type of construction in accordance with EN 60034-7 (IEC 60034-7) • 1PH808 • 1PH810 ... 1PH816	 IM B3, IM B5 IM B3, IM B5, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP65
Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft or fitted key half-key balancing for fitted key
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1]	Tolerance R (reduced)
Vibration magnitude in accordance with Siemens/ EN 60034-14 (IEC 60034-14)[1]	Grade R/A
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance +3 dB • 1PH808 ... 1PH813 • 1PH816	 68 dB[2] 69 dB[2]
Connection	Connector for signals (mating connector is not included in the scope of delivery) Terminal box NDE top
Paint finish	Anthracite RAL 7016

Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
HTL2048S/R encoder	Incremental encoder HTL 2048 S/R
HTL1024S/R encoder	Incremental encoder HTL 1024 S/R

S/R = signals/revolution

[1] Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

[2] For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.

[3] The following motors are designed to conform to temperature class 155 (F): 1PH8107-1.F2/1PH8138-2.F2/1PH8138-2.G2/1PH8166

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1PH8 asynchronous (induction) 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.[1]	Speed, max.[2]	1PH8 asynchronous (induction) motor Forced ventilation NDE → DE
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (hp)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC									
400	160	9.5 (12.74)	227 (167)	30	260	14.3	2150	6500	**1PH8163-1■B 1■-■■■1**
		13 (17.43)	310 (229)	36	300	14.1	1750	6500	**1PH8165-1■B 1■-■■■1**
1000	100	3.7 (4.96)	35 (25.8)	10	333	35.8	2550	9000	**1PH8103-1■D 1■-■■■1**
		6.3 (8.45)	60 (44.3)	17.5	307	35.5	4300	9000	**1PH8107-1■D 1■-■■■1**
	132	12 (16.1)	115 (84.8)	30	319	35.0	3000	8000	**1PH8133-1■D 1■-■■■1**
		17 (22.8)	162 (119)	43	307	34.8	4300	8000	**1PH8137-1■D 1■-■■■1**
	160	22 (29.5)	210 (155)	55	300	34.2	2800	6500	**1PH8163-1■D 1■-■■■1**
		28 (37.55)	267 (197)	71	292	34.2	4600	6500	**1PH8165-1■D 1■-■■■1**
1500	80	2.8 (3.75)	18 (13.3)	7.5	346	53.3	4700	10000	**1PH8083-1■F 1■-■■■1**
		3.7 (4.96)	24 (17.7)	10	336	53.2	5200	10000	**1PH8087-1■F 1■-■■■1**
	100	3.7 (4.96)	24 (17.7)	12.5	265	52.4	5000	9000	**1PH8101-1■F 1■-■■■1**
		5.5 (7.38)	35 (25.8)	13.5	368	52.4	4200	9000	**1PH8103-1■F 1■-■■■1**
		7.0 (9.39)	45 (33.2)	17.5	348	51.9	5250	9000	**1PH8105-1■F 1■-■■■1**
		9.0 (12.1)	57 (42)	23.5	330	52.2	4500	9000	**1PH8107-1■F 1■-■■■1**
	132	11 (14.75)	70 (51.6)	24	360	51.4	4800	8000	**1PH8131-1■F 1■-■■■1**
		15 (20.12)	96 (70.8)	34	342	51.3	5500	8000	**1PH8133-1■F 1■-■■■1**
		18.5 (24.81)	118 (87)	43	330	51.3	6150	8000	**1PH8135-1■F 1■-■■■1**
		22 (29.5)	140 (103)	56	308	51.3	4300	8000	**1PH8137-1■F 1■-■■■1**
	160	30 (40.23)	191 (141)	71	319	50.8	3500	6500	**1PH8163-1■F 1■-■■■1**
		37 (49.62)	236 (174)	78	350	50.8	2800	6500	**1PH8165-1■F 1■-■■■1**
Line voltage 480 V 3 AC									
600	160	14.5 (19.4)	231 (170)	30	370	21.0	2150	6500	**1PH8163-1■B 1■-■■■1**
		19 (25,5)	302 (223)	35	420	20.8	1800	6500	**1PH8165-1■B 1■-■■■1**
1350	100	4.7 (6.30)	33 (24.3)	9.7	423	47.3	3500	9000	**1PH8103-1■D 1■-■■■1**
		8.0 (10.7)	57 (42.0)	17	400	47.1	5045	9000	**1PH8107-1■D 1■-■■■1**
	132	15 (20.1)	106 (78.2)	28	417	46.5	3500	8000	**1PH8133-1■D 1■-■■■1**
		22 (29.5)	156 (115)	42	404	46.4	4000	8000	**1PH8137-1■D 1■-■■■1**
	160	28 (37.6)	198 (146)	52	400	45.8	4000	6500	**1PH8163-1■D 1■-■■■1**
		34 (45.6)	241 (178)	66	387	45.8	5600	6500	**1PH8165-1■D 1■-■■■1**
2000	80	3.7 (4.96)	18 (13.3)	7.6	447	70.0	5550	10000	**1PH8083-1■F 1■-■■■1**
		4.9 (6.57)	23 (17.0)	10	435	69.9	6100	10000	**1PH8087-1■F 1■-■■■1**
	100	4.7 (6.30)	22 (16.2)	12.5	343	69.0	7500	9000	**1PH8101-1■F 1■-■■■1**
		7 (9.39)	33 (24.3)	12.7	460	69.1	4100	9000	**1PH8103-1■F 1■-■■■1**
		9 (12.1)	43 (31.7)	17	453	68.5	6180	9000	**1PH8105-1■F 1■-■■■1**
		11 (14.8)	53 (39.1)	21.5	428	68.6	5500	9000	**1PH8107-1■F 1■-■■■1**
	132	15 (20.1)	72 (53.1)	24	460	68.2	5300	8000	**1PH8131-1■F 1■-■■■1**
		20 (26.8)	96 (70.8)	34	445	68.0	6200	8000	**1PH8133-1■F 1■-■■■1**
		24 (32.2)	115 (84.8)	43	434	67.9	7100	8000	**1PH8135-1■F 1■-■■■1**
		28 (37.6)	134 (98.8)	55	401	67.9	4000	8000	**1PH8137-1■F 1■-■■■1**
	160	37 (49.6)	177 (131)	68	416	67.4	3550	6500	**1PH8163-1■F 1■-■■■1**
		45 (60.4)	215 (159)	75	440	67.5	3300	6500	**1PH8165-1■F 1■-■■■1**

For versions, see Order No. supplements on Page 11/16.

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1PH8 asynchronous (induction) motors
Forced ventilation, IP55 degree of protection

Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S110 blocksize format	
							Rated output current[3]	PM340 Power Module Air cooling
	cos φ	I_μ	η	J			I_{rated}	
		A		kgm² (lb_f-in-s²)	kg (lb)	Type	A	Order No.
							Line voltage 380 ... 480 V 3 AC	
1PH8163-1. B ...	0.91	8.1	0.823	0.2160 (1.912)	196 (432)	gk863	32	6SL3210-1SE23-2■A0
1PH8165-1. B ...	0.86	14.9	0.826	0.2320 (2.053)	230 (507)	gk863	38	6SL3210-1SE23-8■A0
1PH8103-1. D ...	0.82	4.6	0.814	0.0172 (0.152)	51 (112)	gk813	10.2	6SL3210-1SE21-0■A0
1PH8107-1. D ...	0.82	8.2	0.834	0.0289 (0.256)	73 (161)	gk813	18	6SL3210-1SE21-8■A0
1PH8133-1. D ...	0.88	10.1	0.871	0.0760 (0.673)	106 (234)	gk833	32	6SL3210-1SE23-2■A0
1PH8137-1. D ...	0.88	15.1	0.881	0.1090 (0.965)	141 (311)	gk833	45	6SL3210-1SE24-5■A0
1PH8163-1. D ...	0.89	17.3	0.909	0.2160 (1.912)	196 (432)	gk863	60	6SL3210-1SE26-0■A0
1PH8165-1. D ...	0.89	22.2	0.914	0.2320 (2.053)	230 (507)	gk863	75	6SL3210-1SE27-5■A0
1PH8083-1. F ...	0.80	3.8	0.809	0.0064 (0.057)	32 (70.6)	gk803	7.7	6SL3210-1SE17-7■A0
1PH8087-1. F ...	0.81	4.9	0.817	0.0089 (0.079)	39 (86.0)	gk803	10.2	6SL3210-1SE21-0■A0
1PH8101-1. F ...	0.80	6.0	0.835	0.0138 (0.122)	42 (92.6)	gk813	18	6SL3210-1SE21-8■A0
1PH8103-1. F ...	0.80	6.5	0.852	0.0172 (0.152)	51 (112)	gk813	18	6SL3210-1SE21-8■A0
1PH8105-1. F ...	0.79	8.8	0.867	0.0252 (0.223)	65 (143)	gk813	18	6SL3210-1SE21-8■A0
1PH8107-1. F ...	0.81	10.8	0.869	0.0289 (0.256)	73 (161)	gk813	25	6SL3210-1SE22-5■A0
1PH8131-1. F ...	0.84	10.4	0.899	0.0590 (0.522)	89 (196)	gk833	25	6SL3210-1SE22-5■A0
1PH8133-1. F ...	0.85	14.2	0.899	0.0760 (0.673)	106 (234)	gk833	38	6SL3210-1SE23-8■A0
1PH8135-1. F ...	0.85	18.1	0.898	0.0940 (0.832)	125 (276)	gk833	45	6SL3210-1SE24-5■A0
1PH8137-1. F ...	0.84	24.2	0.904	0.1090 (0.965)	141 (311)	gk833	60	6SL3210-1SE26-0■A0
1PH8163-1. F ...	0.87	25.6	0.923	0.2160 (1.912)	196 (432)	gk863	75	6SL3210-1SE27-5■A0
1PH8165-1. F ...	0.88	27.0	0.926	0.2320 (2.053)	230 (507)	gk863	90	6SL3210-1SE31-0■A0
							Line voltage 380 ... 480 V 3 AC	
1PH8163-1. B ...	0.90	8.1	0.851	0.2160 (1.912)	196 (432)	gk863	32	6SL3210-1SE23-2■A0
1PH8165-1. B ...	0.88	12.0	0.850	0.2320 (2.053)	230 (507)	gk863	38	6SL3210-1SE23-8■A0
1PH8103-1. D ...	0.82	4.4	0.848	0.0172 (0.152)	51 (112)	gk813	10.2	6SL3210-1SE21-0■A0
1PH8107-1. D ...	0.80	8.2	0.867	0.0289 (0.256)	73 (161)	gk813	18	6SL3210-1SE21-8■A0
1PH8133-1. D ...	0.86	10.7	0.904	0.0760 (0.673)	106 (234)	gk833	32	6SL3210-1SE23-2■A0
1PH8137-1. D ...	0.86	15.9	0.902	0.1090 (0.965)	141 (311)	gk833	45	6SL3210-1SE24-5■A0
1PH8163-1. D ...	0.88	17.7	0.924	0.2160 (1.912)	196 (432)	gk863	60	6SL3210-1SE26-0■A0
1PH8165-1. D ...	0.86	22.5	0.928	0.2320 (2.053)	230 (507)	gk863	75	6SL3210-1SE27-5■A0
1PH8083-1. F ...	0.79	3.7	0.850	0.0064 (0.057)	32 (70.6)	gk803	7.7	6SL3210-1SE17-7■A0
1PH8087-1. F ...	0.80	4.9	0.864	0.0089 (0.079)	39 (86.0)	gk803	10.2	6SL3210-1SE21-0■A0
1PH8101-1. F ...	0.79	6.0	0.871	0.0138 (0.122)	42 (92.6)	gk813	18	6SL3210-1SE21-8■A0
1PH8103-1. F ...	0.81	5.8	0.894	0.0172 (0.152)	51 (112)	gk813	18	6SL3210-1SE21-8■A0
1PH8105-1. F ...	0.78	8.7	0.911	0.0252 (0.223)	65 (143)	gk813	18	6SL3210-1SE21-8■A0
1PH8107-1. F ...	0.79	10.8	0.901	0.0289 (0.256)	73 (161)	gk813	25	6SL3210-1SE22-5■A0
1PH8131-1. F ...	0.86	9.2	0.931	0.0590 (0.522)	89 (196)	gk833	25	6SL3210-1SE22-5■A0
1PH8133-1. F ...	0.85	13.5	0.933	0.0760 (0.673)	106 (234)	gk833	38	6SL3210-1SE23-8■A0
1PH8135-1. F ...	0.84	18.1	0.929	0.0940 (0.832)	125 (276)	gk833	45	6SL3210-1SE24-5■A0
1PH8137-1. F ...	0.84	23.1	0.931	0.1090 (0.965)	141 (311)	gk833	60	6SL3210-1SE26-0■A0
1PH8163-1. F ...	0.86	24.6	0.932	0.2160 (1.912)	196 (432)	gk863	75	6SL3210-1SE27-5■A0
1PH8165-1. F ...	0.89	23.6	0.936	0.2320 (2.053)	230 (507)	gk863	90	6SL3210-1SE31-0■A0

Line filter:	
Without	**U**
Integrated	**A**

You can find further versions and components in SINAMICS S110 servo drives.

1) n_2: Max. permissible thermal speed at constant power or speed, which is at the voltage limit when $P = P_{rated}$.
2) n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14th data position B to C).
3) The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

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1PH8 asynchronous (induction) 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.[1]	Speed, max.[2]	1PH8 asynchronous (induction) motor Water cooling
n_{rated}	SH	P_{rated}	M_{rated}	I_{rated}	U_{rated}	f_{rated}	n_2	n_{max}	
rpm		kW (hp)	Nm (lb_f-ft)	A	V	Hz	rpm	rpm	Order No.
Line voltage 400 V 3 AC									
1500	80	3.5 (4.69)	22 (16.2)	8.9	357	54.5	3550	10000	**1PH8083-1■F2■-■■■1**
		4.6 (6.17)	29 (21.4)	13.7	316	53.3	6000	10000	**1PH8087-1■F2■-■■■1**
	100	5 (6.71)	32 (23.6)	12.8	357	53.1	2500	9000	**1PH8101-1■F2■-■■■1**
		7.1 (9.52)	45 (33.2)	19.7	317	53.0	4000	9000	**1PH8103-1■F2■-■■■1**
		11 (14.8)	70 (51.6)	28.5	340	52.8	3500	9000	**1PH8105-1■F2■-■■■1**
		14 (18.8)	89 (65.6)	43.7	277	53.3	5600	9000	**1PH8107-1■F2■-■■■1**
	132	15 (20.1)	96 (70.8)	30	380	52.3	2500	8000	**1PH8131-1■F2■-■■■1**
		17 (22.8)	108 (79.7)	38	345	51.5	3500	8000	**1PH8133-1■F2■-■■■1**
		22 (29.5)	140 (103)	51	342	51.5	4000	8000	**1PH8135-1■F2■-■■■1**
		27 (36.2)	172 (127)	67	315	51.6	4000	8000	**1PH8137-1■F2■-■■■1**
		30 (40.2)	191 (141)	80	289	51.9	5000	8000	**1PH8138-1■F2■-■■■1**
	160	37 (49.62)	236 (174)	84	328	51.1	3000	6500	**1PH8163-1■F2■-■■■1**
		46 (61.7)	293 (216)	104	330	50.9	3050	6500	**1PH8165-1■F2■-■■■1**
		52 (69.7)	331 (224)	116	332	51.2	3050	6500	**1PH8166-1■F2■-■■■1**
Line voltage 480 V 3 AC									
2000	80	4.6 (6.2)	22 (16.2)	8.7	457	71.0	4250	10000	**1PH8083-1■F2■-■■■1**
		6.1 (8.2)	29 (21.4)	13.7	402	70.0	6950	10000	**1PH8087-1■F2■-■■■1**
	100	6.6 (8.9)	32 (23.6)	12.5	450	69.9	2500	9000	**1PH8101-1■F2■-■■■1**
		9.4 (12.6)	45 (33.2)	19.7	411	69.7	5000	9000	**1PH8103-1■F2■-■■■1**
		14 (18.8)	67 (49.4)	27.5	426	69.5	3000	9000	**1PH8105-1■F2■-■■■1**
		18 (24.1)	86 (63.4)	42.6	363	69.7	3000	9000	**1PH8107-1■F2■-■■■1**
	132	18.5 (24.8)	88 (64.9)	30	460	68.7	2500	8000	**1PH8131-1■F2■-■■■1**
		22.5 (30.2)	107 (78.9)	38	452	68.2	4000	8000	**1PH8133-1■F2■-■■■1**
		29 (38.9)	138 (102)	52	448	68.2	4500	8000	**1PH8135-1■F2■-■■■1**
		36 (48.3)	172 (127)	67	415	68.3	4000	8000	**1PH8137-1■F2■-■■■1**
		37 (49.6)	177 (131)	76	380	68.4	6000	8000	**1PH8138-1■F2■-■■■1**
	160	49 (65.7)	234 (173)	84	430	67.7	3500	6500	**1PH8163-1■F2■-■■■1**
		60 (80.5)	287 (212)	103	426	67.6	3050	6500	**1PH8165-1■F2■-■■■1**
		68 (91.2)	325 (240)	116	426	67.9	3050	6500	**1PH8166-1■F2■-■■■1**

For versions, see Order No. supplements on Page 11/16.

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Motor type (repeated)	Power factor	Magnetizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S110 blocksize format	
							Rated output current[3]	PM340 Power Module Air cooling
	cos φ	$I_μ$	η	J			I_{rated}	
		A		kgm² (lb$_f$-in-s²)	kg (lb)	Type	A	Order No.
Line voltage 400 V 3 AC							**Line voltage 380 ... 480 V 3 AC**	
1PH8083-1.F2...	0.84	3.6	0.784	0.0064 (0.057)	36 (79.4)	gk803	10.2	**6SL3210-1SE21-0■A0**
1PH8087-1.F2...	0.78	7.2	0.814	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL3210-1SE21-8■A0**
1PH8101-1.F2...	0.81	6.0	0.813	0.0138 (0.122)	51 (112)	gk823	18	**6SL3210-1SE21-8■A0**
1PH8103-1.F2...	0.82	8.6	0.827	0.0172 (0.152)	60 (132)	gk823	25	**6SL3210-1SE22-5■A0**
1PH8105-1.F2...	0.81	13.3	0.843	0.0252 (0.223)	74 (163)	gk823	32	**6SL3210-1SE23-2■A0**
1PH8107-1.F2...	0.83	17.8	0.829	0.0289 (0.256)	83 (183)	gk823	45	**6SL3210-1SE24-5■A0**
1PH8131-1.F2...	0.89	9.2	0.883	0.0590 (0.522)	105 (232)	gk843	32	**6SL3210-1SE23-2■A0**
1PH8133-1.F2...	0.86	14.2	0.897	0.0760 (0.673)	123 (271)	gk843	38	**6SL3210-1SE23-8■A0**
1PH8135-1.F2...	0.85	20.3	0.901	0.0940 (0.832)	141 (311)	gk843	60	**6SL3210-1SE26-0■A0**
1PH8137-1.F2...	0.86	25.3	0.900	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8138-1.F2...	0.88	27.1	0.882	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8163-1.F2...	0.88	27.4	0.916	0.2160 (1.912)	229 (505)	gk873	90	**6SL3210-1SE31-0■A0**
1PH8165-1.F2...	0.87	37.2	0.930	0.2320 (2.053)	264 (582)	gk873	110	**6SL3210-1SE31-1■A0**
1PH8166-1.F2...	0.88	36.7	0.936	0.2320 (2.053)	269 (593)	gk873	145	**6SL3210-1SE31-5■A0**
Line voltage 480 V 3 AC							**Line voltage 380 ... 480 V 3 AC**	
1PH8083-1.F2...	0.83	3.8	0.839	0.0064 (0.057)	36 (79.4)	gk803	10.2	**6SL3210-1SE21-0■A0**
1PH8087-1.F2...	0.79	6.8	0.868	0.0089 (0.079)	44 (97.0)	gk803	18	**6SL3210-1SE21-8■A0**
1PH8101-1.F2...	0.82	4.4	0.858	0.0138 (0.122)	51 (112)	gk823	18	**6SL3210-1SE21-8■A0**
1PH8103-1.F2...	0.82	8.5	0.869	0.0172 (0.152)	60 (132)	gk823	25	**6SL3210-1SE22-5■A0**
1PH8105-1.F2...	0.82	11.7	0.894	0.0252 (0.223)	74 (163)	gk823	32	**6SL3210-1SE23-2■A0**
1PH8107-1.F2...	0.81	19.1	0.873	0.0289 (0.256)	83 (183)	gk823	45	**6SL3210-1SE24-5■A0**
1PH8131-1.F2...	0.90	7.2	0.912	0.0590 (0.522)	105 (232)	gk843	32	**6SL3210-1SE23-2■A0**
1PH8133-1.F2...	0.86	14.4	0.938	0.0760 (0.673)	123 (271)	gk843	38	**6SL3210-1SE23-8■A0**
1PH8135-1.F2...	0.85	19.9	0.931	0.0940 (0.832)	141 (311)	gk843	60	**6SL3210-1SE26-0■A0**
1PH8137-1.F2...	0.86	25.4	0.928	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8138-1.F2...	0.86	28.4	0.920	0.1090 (0.965)	157 (346)	gk843	75	**6SL3210-1SE27-5■A0**
1PH8163-1.F2...	0.88	26.9	0.925	0.2160 (1.912)	229 (505)	gk873	90	**6SL3210-1SE31-0■A0**
1PH8165-1.F2...	0.88	34.0	0.940	0.2320 (2.053)	264 (582)	gk873	110	**6SL3210-1SE31-1■A0**
1PH8166-1.F2...	0.89	32.8	0.941	0.2320 (2.053)	269 (593)	gk873	145	**6SL3210-1SE31-5■A0**

Line filter:	
Without	**U**
Integrated	**A**

You can find further versions and components in SINAMICS S110 servo drives.

11

[1] n_2: Max. permissible thermal speed at constant power or speed, which is at the voltage limit when $P = P_{rated}$.
[2] n_{max}: Maximum speed that must not be exceeded (applicable to Standard: 14. data position B to C).
[3] The rated pulse frequencies must be taken into account. The rated motor data is valid for 4 kHz.

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Order No. supplements for 1PH808/1PH810/1PH813/1PH816 motors

Data position of the Order No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Shaft height 80	**1**	**P**	**H**	**8**	**0**	**8**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Shaft height 100	**1**	**P**	**H**	**8**	**1**	**0**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Shaft height 132	**1**	**P**	**H**	**8**	**1**	**3**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Shaft height 160	**1**	**P**	**H**	**8**	**1**	**6**	**.**	**–**	**1**	■	**.**	■	■	**–**	■	■	■	**1**
Overall length[1]							**.**											
Asynchronous variant									**1**									
Encoder systems for motors without DRIVE-CLiQ interface																		
Without encoder										**A**								
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)[2]										**H**								
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)[3]										**J**								
Rated speeds at 400 V to 480 V 3 AC (winding design)																		
400 rpm/600 rpm											**B**							
1000 rpm/1350 rpm											**D**							
1500 rpm/2000 rpm											**F**							

Cooling	**Degree of protection**	
Forced ventilation NDE → DE	IP55	**1**
Water cooling	IP65	**2**

Type of construction	
IM B3 (IM V5, IM V6)	**0**
IM B5 (IM V1, IM V3)	**2**
IM B35 (IM V15, IM V35)[4]	**3**

Shaft extension DE	**Balancing**	
Plain shaft	–	**0**
Fitted key	Half-key	**2**

Bearing	**Vibration magnitude acc. to Siemens/EN 60034-14**[5]	**Shaft and flange accuracy**[5]	
Standard	R/A	R	**B**
Standard	S/A	R	**C**

Cable connection (view of DE) Terminal box	Cable entry	Signal connection	
Top	Right	DE	**A**
Top	Left	DE	**B**
Top	NDE	Left	**C**

Version status	**1**

Ordering example

Selection criteria	Design	Structure of the Order No.
1PH8 motor	Asynchronous variant, water cooling Shaft height 132 Version status 1	**1PH8131-1..2.-...1**
Encoder system	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)	**1PH8131-1H.2.-...1**
Rated operating point	1500 rpm, 15 kW (20.1 hp), 96 Nm (70.8 lb_f-ft)	**1PH8131-1HF2.-...1**
Type of construction	IM B3 (IM V5, IM V6)	**1PH8131-1HF20-...1**
Shaft extension DE	Plain shaft	**1PH8131-1HF20-0..1**
Bearing version	Standard Vibration magnitude R/A Shaft and flange accuracy R	**1PH8131-1HF20-0B.1**
Connection	Cable connection terminal box top Cable entry on the right, signal connection DE	**1PH8131-1HF20-0BA1**

[1] Not selectable. Determined by the choice of rated power.
[2] Limited to n_{max} = 9000 rpm.
[3] Limited to n_{max} = 4600 rpm.
[4] Only possible with 1PH810 to 1PH816.
[5] For definition, see 1PH8 Configuration Manual.

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Technical specifications

Terminal box

Terminal box type (see selection and ordering data for assignment)	Cable entry Power	External signals	Max. outer cable diameter[2]	Number of main terminals	Max. cross-section per terminal	Max. rated current[3]
			mm (in)		mm²	A
gk803	1 × M25 × 1.5	1 × M16 × 1.5[1]	20 (0.79)	Phases: 3 × M5 Grounding: 2 × M5	1 × 10	52
gk813	1 × M32 × 1.5	1 × M16 × 1.5[1]	24.2 (0.95)	Phases: 3 × M5 Grounding: 2 × M5	1 × 16	70
gk823	1 × M32 × 1.5	1 × M16 × 1.5[1]	24.2 (0.95)	Phases: 3 × M5 Grounding: 2 × M5	1 × 16	70
gk833	1 × M40 × 1.5	1 × M16 × 1.5[1]	32 (1.26)	Phases: 3 × M6 Grounding: 2 × M6	1 × 35	110
gk843	1 × M50 × 1.5	1 × M16 × 1.5[1]	38 (1.50)	Phases: 3 × M6 Grounding: 2 × M6	1 × 50	133
gk863	1 × M50 × 1.5	1 × M16 × 1.5[1]	38 (1.50)	Phases: 3 × M6 Grounding: 2 × M6	1 × 50	133
gk873	1 × M63 × 1.5	1 × M16 × 1.5[1]	42.6 (1.68)	Phases: 3 × M6 Grounding: 2 × M6	1 × 50	133

Ventilation data/Sound pressure levels

Motor type	Direction of air flow	Fan motor max. current consumption at			Volume of air, min.	Sound pressure level L_{pA} (1 m)[4] Motor + external fan operation at 50 Hz Tolerance + 3 dB
		A	A	A	m^3/s (ft^3/s)	dB
Forced ventilation		**230 V 50 Hz (± 10 %)**	**230 V 60 Hz (± 10 %)**	**265 V 60 Hz (± 10 %)**		
1PH808	NDE → DE	0.33	0.25	0.32	0.02 (0.71)	70
Forced ventilation		**400 V 50 Hz (± 10 %)**	**400 V 60 Hz (± 10 %)**	**480 V 60 Hz (± 10 %)**		
1PH810	NDE → DE	0.12	0.09	0.12	0.04 (1.41)	70
1PH813	NDE → DE	0.13	0.16	0.17	0.09 (3.18)	70
1PH816	NDE → DE	0.17	0.22	0.22	0.16 (5.65)	73

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)[4] Motor Tolerance + 3 dB
	l/min (US gal./min)	bar	Inch	dB
Water cooling				
1PH808	6 (1.58)	0.6	G 1/8	68
1PH810	8 (2.11)	0.4	G 1/4	68
1PH813	12 (3.17)	0.9	G 3/8	68
1PH816	15 (3.96)	0.2	G 1/2	69

[1] Thread M16 × 1.5 arranged with 90° to signal connection; thread only for 9th data position "A" (without encoder).
[2] Dependent on the design of the metric cable gland.
[3] Current-carrying capacity based on EN 60204-1/IEC 60364-5-52 with installation type C.
[4] For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.

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Technical specifications (continued)

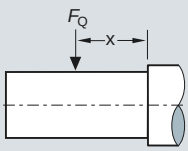
Cooling water specification

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 must be at least 100 µm.

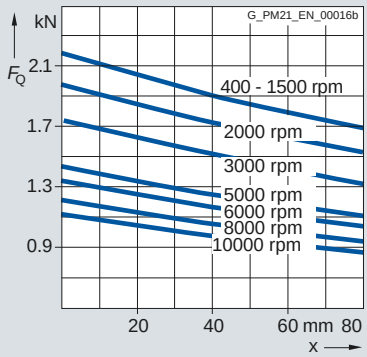
Cooling water specifications	
pH value	6.0 ... 9.0
Total hardness	< 170 ppm
Conductivity	< 500 µS/cm
Operating pressure, max.	< 6 bar
Pressure drop at V(N)	< 1 bar
Cooling water inlet temperature, max.	< 30 °C (86 °F)
Cooling water temperature, min.	$T_{cooling\ water} > T_{ambient}$ - 5 K
Anti-freeze protection / corrosion protection	20 ... 30 %
NALCO 00GE056 inhibitor	0.2 ... 0.25 %
Components	
Dissolved substances	< 340 ppm
Max. grain size	< 100 µm
Chloride ions	< 40 ppm
Sulfate ions	< 50 ppm
Nitrate ions	< 50 ppm

Characteristic curves

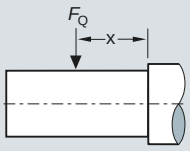
Permissible radial forces
1PH8 motors
Shaft height 80
Standard



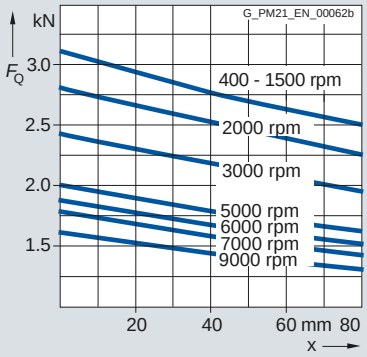
L_{10h} = 20000 h



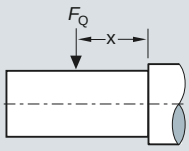
Permissible radial forces
1PH8 motors
Shaft height 100
Standard



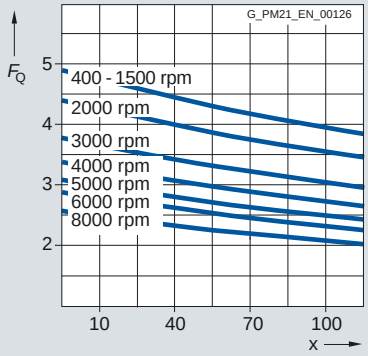
L_{10h} = 20000 h



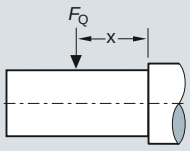
Permissible radial forces
1PH8 motors
Shaft height 132
Standard



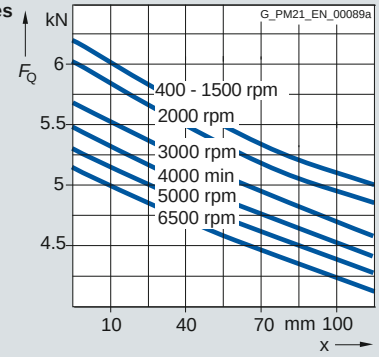
L_{10h} = 20000 h



Permissible radial forces
1PH8 motors
Shaft height 160
Standard



L_{10h} = 20000 h



11

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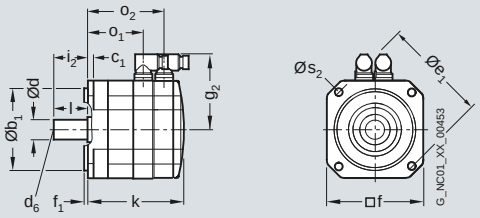
Dimensional drawings

For motor		Dimensions in mm (inches)									Shaft extension DE		
Shaft height	Type	DIN IEC	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	g_2 –	i_2 –	s_2 S	**d** **D**	d_6 –	l E
1FT7 Compact – Natural cooling													
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)	**8** **(0.31)**	–	18 (0.71)
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)	**9** **(0.35)**	M3	20 (0.79)

		Encoder system: Resolver Absolute encoder AM16S/R / AM15DQ						Encoder system: Incremental encoder IC2048S/R / IC22DQ Absolute encoder AM2048S/R / AM22DQ AM512S/R / AM20DQ AM32S/R / AM16DQ					
		without brake			with brake			without brake			with brake		
Shaft height	Type	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –	k LB	o_1 –	o_2 –
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 (4.49)	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
1FK702



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1FK7 synchronous motors with/without DRIVE-CLiQ – Natural cooling

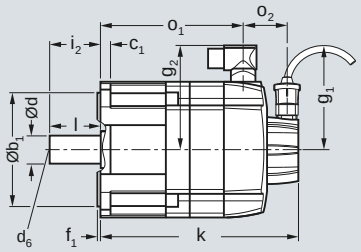
Dimensional drawings

For motor		Dimensions in mm (inches)											
											Shaft extension DE		
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	i_2 –	s_2 S	**d** **D**	d_6 –	l E
1FK7 Compact motors – Natural cooling													
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)	**14** **(0.55)**	M5	30 (1.18)
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)	**19** **(0.75)**	M6	40 (1.57)
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)	**24** **(0.94)**	M8	50 (1.97)
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)	**32** **(1.26)**	M12	58 (2.28)
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)	**38** **(1.50)**	M12	80 (3.15)

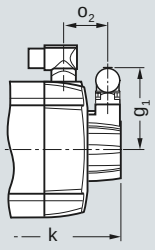
		DQI encoder with DRIVE-CLiQ interface							Encoder system (without resolver) without DRIVE-CLiQ interface						
					without brake		with brake					without brake		with brake	
Shaft height	Type	g_1 –	g_2 –	o_2 –	k LB	o_1 –	k LB	o_1 –	g_1 –	g_2 –	o_2 –	k LB	o_1 –	k LB	o_1 –
1FK7 Compact motors – Natural cooling															
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)	78 (3.07)	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)	163 (6.42)				198 (7.80)	136 (5.35)	225 (8.86)	163 (6.42)
48	1FK7040-2A	104.5 (4.11)	90 (3.54)	50 (1.97)	147 (5.79)	85 (3.35)	179 (7.05)	117 (4.61)	94 (3.70)	90 (3.54)	52 (2.05)	152 (5.98)	85 (3.35)	184 (7.24)	117 (4.61)
	1FK7042-2A				174 (6.85)	112 (4.41)	206 (8.11)	144 (5.67)				179 (7.05)	112 (4.41)	211 (8.31)	144 (5.67)
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)	102 (4.02)	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)	94 (3.70)	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)				195 (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)	94 (3.70)	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)

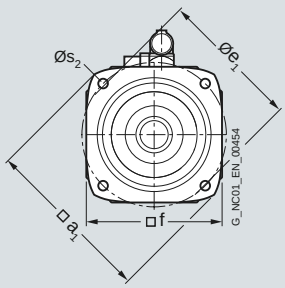
1FK703
1FK704
1FK706
1FK708
1FK710

Version
with DRIVE-CLiQ interface



Version
without DRIVE-CLiQ interface





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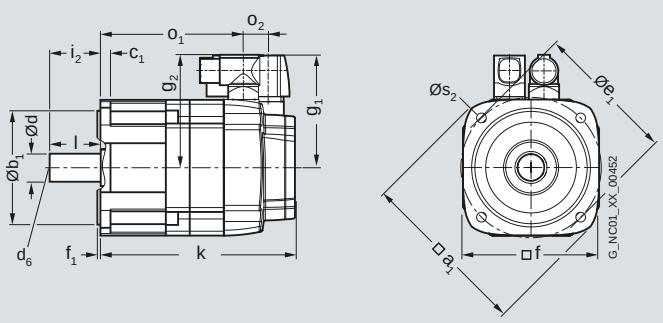
Dimensional drawings

For motor		Dimensions in mm (inches)									Shaft extension DE		
Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	i_2 –	s_2 S	**d** **D**	d_6 –	l E
1FK7 Compact motors – Natural cooling													
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)	**14** **(0.55)**	M5	30 (1.18)
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)	**19** **(0.75)**	M6	40 (1.57)
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)	**24** **(0.94)**	M8	50 (1.97)
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)	**32** **(1.26)**	M12	58 (2.28)
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)	**38** **(1.50)**	M12	80 (3.15)

		Encoder system with resolver with/without DRIVE-CLiQ interface						
					without brake		with brake	
Shaft height	Type	g_1 –	g_2 –	o_2 –	k LB	o_1 –	k LB	o_1 –
1FK7 Compact motors – Natural cooling								
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 (7.32)
	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)

1FK703
1FK704
1FK706
1FK708
1FK710



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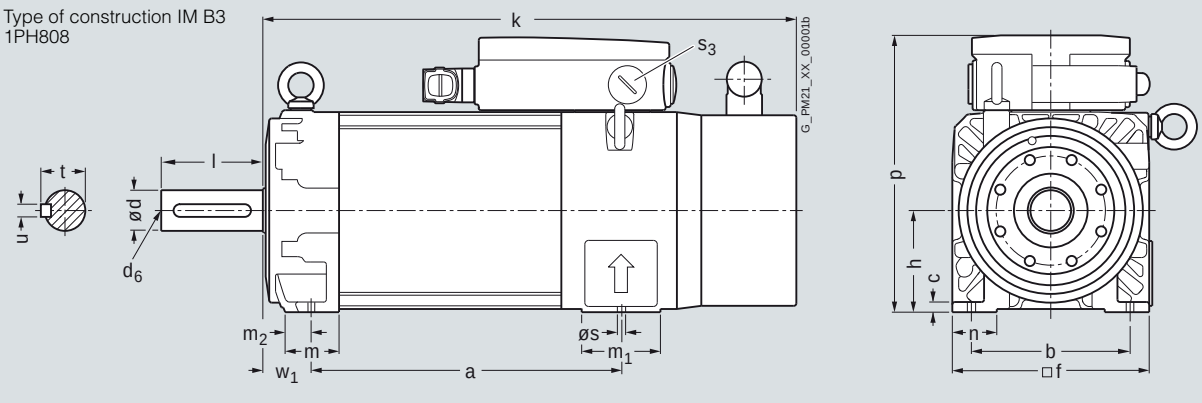
1PH8 asynchronous (induction) motors
Forced ventilation – Shaft height 80

Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN a IEC B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	s K	s_3 –	w_1 C
1PH8 motor, type of construction IM B3, forced ventilation															
80	1PH8083	194 (7.64)	125 (4.92)	8 (0.31)	155 (6.10)	80 (3.15)	375 (14.76)	42 (1.65)	62 (2.44)	20 (0.79)	35 (1.38)	216 (8.50)	10 (0.39)	M25 × 1.5	38 (1.50)
	1PH8087	244 (9.61)					425 (16.73)								

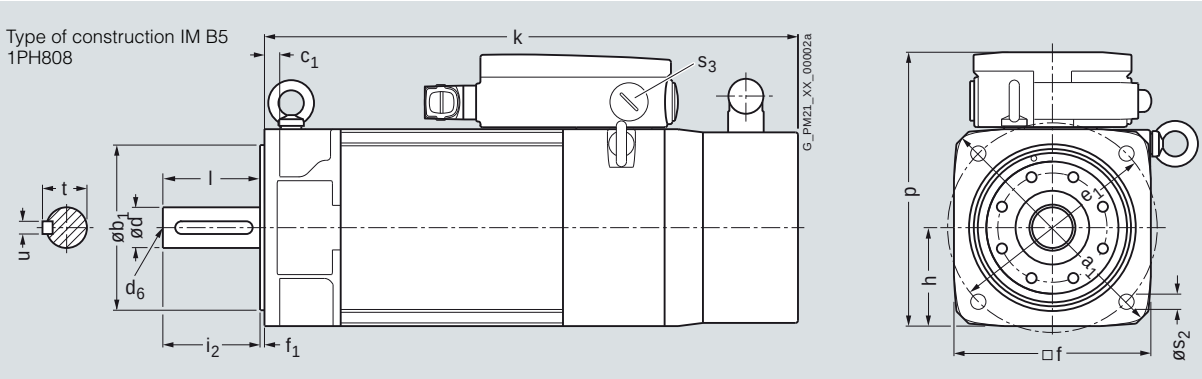
Type of construction IM B3
1PH808



For motor — Dimensions in mm (inches)

Shaft height	Type	DIN a_1 IEC P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	s_2 –	s_3 –
1PH8 motor, type of construction IM B5, forced ventilation												
80	1PH8083	200 (7.87)	130 (5.12)	12 (0.47)	165 (6.50)	155 (6.10)	3.5 (0.14)	77.5 (3.05)	375 (14.76)	213.5 (8.41)	12 (0.47)	M25 × 1.5
	1PH8087								425 (16.73)			

Type of construction IM B5
1PH808



Shaft extension DE

Shaft height	Type	DIN **d** IEC **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of construction IM B3/IM B5, forced ventilation							
80	1PH8083	**32** **(1.26)**	M12	80 (3.15)	80 (3.15)	35 (1.38)	10 (0.39)
	1PH8087						

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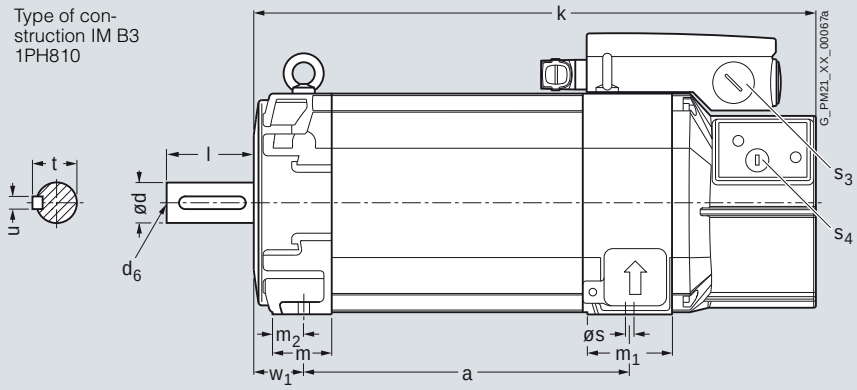
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_2 –	p_3 –	s K	s_3 –	s_4 –	w_1 C
1PH8 motor, type of construction IM B3, forced ventilation																			
100	1PH8101		167 (6.57)	160 (6.30)	11 (0.43)	196 (7.72)	100 (3.94)	369.5 (14.55)	49 (1.93)	74 (2.91)	24 (0.94)	40 (1.57)	252 (9.92)	198 (7.80)	276.5 (10.89)	12 (0.47)	M32 × 1.5	M20 × 1.5	43 (1.69)
	1PH8103		202.5 (7.97)					405 (15.94)											
	1PH8105		262 (10.31)					464.5 (18.29)											
	1PH8107		297.5 (11.71)					500 (19.69)											

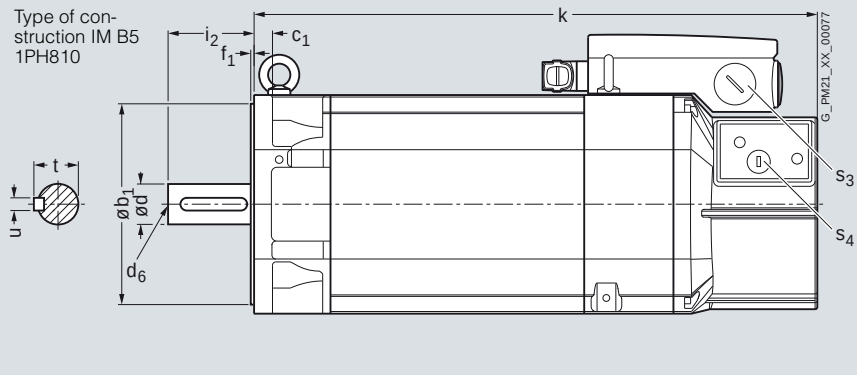
Type of construction IM B3
1PH810



For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	s_2 –	s_3 –	s_4 –
1PH8 motor, type of construction IM B5, forced ventilation														
100	1PH8101		250 (9.84)	180 (7.09)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	98 (3.86)	369.5 (14.55)	250 (9.84)	14 (0.55)	M32 × 1.5	M20 × 1.5
	1PH8103									405 (15.94)				
	1PH8105									464.5 (18.29)				
	1PH8107									500 (19.69)				

Type of construction IM B5
1PH810



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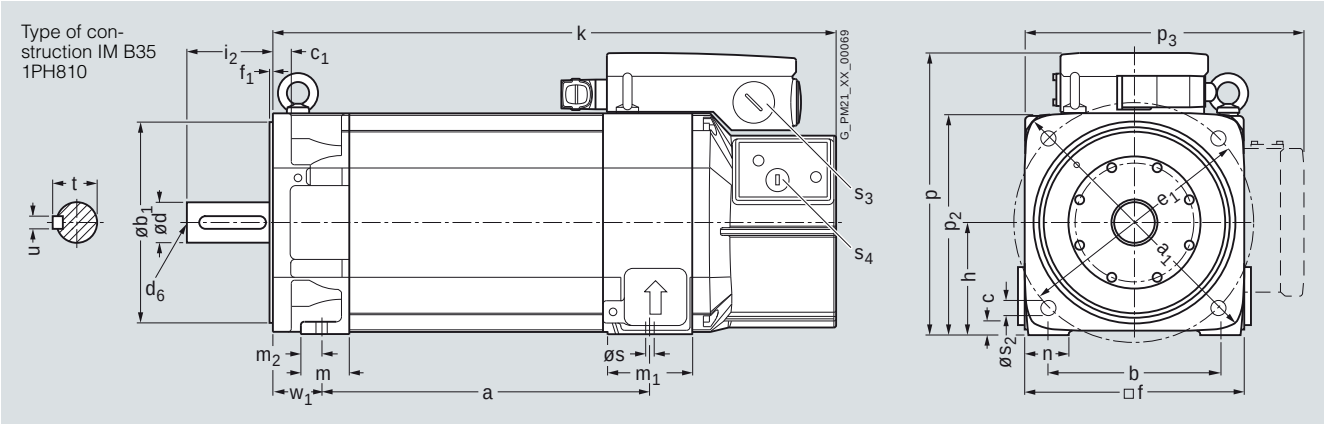
1PH8 asynchronous (induction) motors
Forced ventilation – Shaft height 100

Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8 motor, type of construction IM B35, forced ventilation																	
100	1PH8101		167 (6.57)	250 (9.84)	160 (6.30)	180 (7.09)	11 (0.43)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	100 (3.94)	369.5 (14.55)	44 (1.73)	74 (2.91)	19 (0.75)	40 (1.57)
	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	DIN IEC	p HD	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C
1PH8 motor, type of construction IM B35, forced ventilation										
100	1PH8101		252 (9.92)	198 (7.80)	276.5 (10.89)	12 (0.47)	14 (0.55)	M32 × 1.5	M20 × 1.5	43 (1.69)
	1PH8103									
	1PH8105									
	1PH8107									



Shaft extension DE

Shaft height	Type	DIN IEC	d D	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of construction IM B3/IM B5/IM B35, forced ventilation								
100	1PH8101		**38 (1.50)**	M12	80 (3.15)	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103							
	1PH8105							
	1PH8107							

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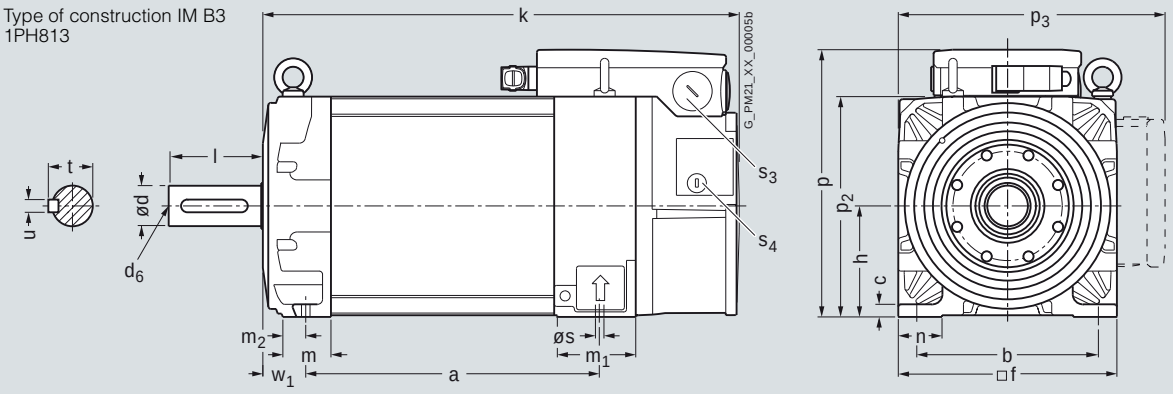
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_2 –	p_3 –	s K	s_3 –	s_4 –	w_1 C
1PH8 motor, type of construction IM B3, forced ventilation																			
132	1PH8131		220.5 (8.68)	216 (8.50)	15 (0.59)	260 (10.24)	132 (5.20)	439 (17.28)	57 (2.24)	93 (3.66)	27 (1.06)	52 (2.05)	317.5 (12.50)	262 (10.31)	357.5 (14.07)	12 (0.47)	M40 × 1.5	M20 × 1.5	53 (2.09)
	1PH8133		265.5 (10.45)					484 (19.06)											
	1PH8135		310.5 (12.22)					529 (20.83)											
	1PH8137		350.5 (13.80)					569 (22.40)											

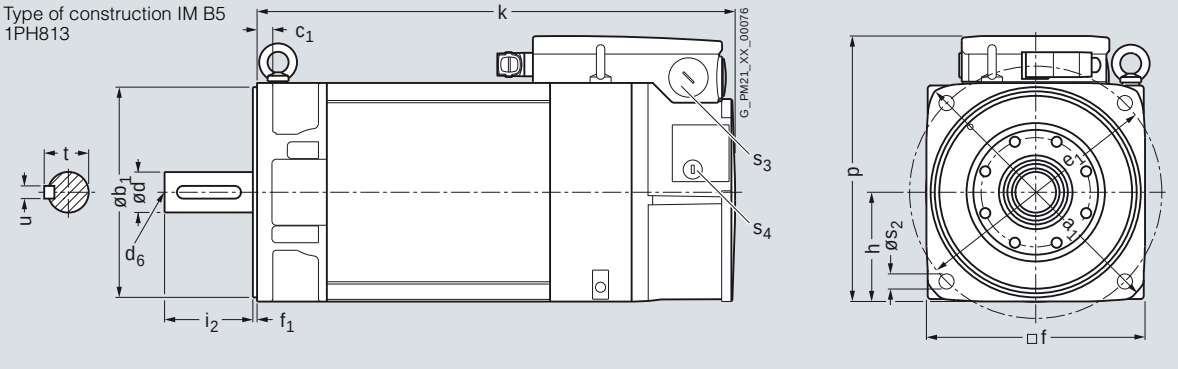
Type of construction IM B3
1PH813



For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	s_2 –	s_3 –	s_4 –
1PH8 motor, type of construction IM B5, forced ventilation														
132	1PH8131		340 (13.39)	250 (9.84)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	130 (5.12)	439 (17.28)	315.5 (12.42)	18 (0.71)	M40 × 1.5	M20 × 1.5
	1PH8133									484 (19.06)				
	1PH8135									529 (20.83)				
	1PH8137									569 (22.40)				

Type of construction IM B5
1PH813



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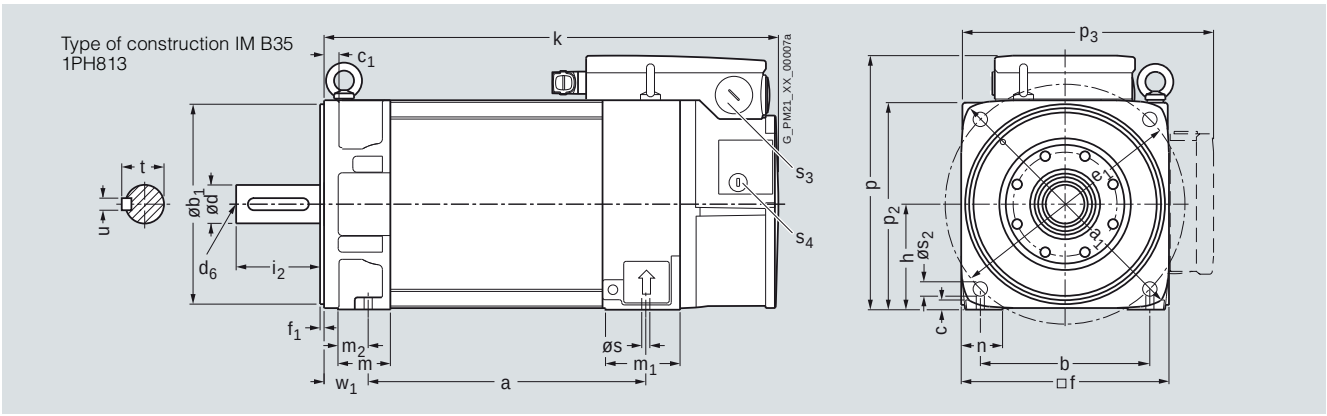
1PH8 asynchronous (induction) motors
Forced ventilation – Shaft height 132

Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8 motor, type of construction IM B35, forced ventilation																	
132	1PH8131		220.5 (8.68)	340 (13.39)	216 (8.50)	250 (9.84)	15 (0.59)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	132 (5.20)	439 (17.28)	65 (2.56)	93 (3.66)	35 (1.38)	52 (2.05)
	1PH8133		265.5 (10.45)										484 (19.06)				
	1PH8135		310.5 (12.22)										529 (20.83)				
	1PH8137		350.5 (13.80)										569 (22.40)				

Shaft height	Type	DIN IEC	p HD	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C
1PH8 motor, type of construction IM B35, forced ventilation										
132	1PH8131		317.5 (12.50)	262 (10.31)	357.5 (14.07)	12 (0.47)	18 (0.71)	M40 × 1.5	M20 × 1.5	53 (2.09)
	1PH8133									
	1PH8135									
	1PH8137									



Shaft height	Type	Shaft extension DE **d** **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of construction IM B3/IM B5/IM B35, forced ventilation							
132	1PH8131	**48** **(1.89)**	M16	110 (4.33)	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133						
	1PH8135						
	1PH8137						

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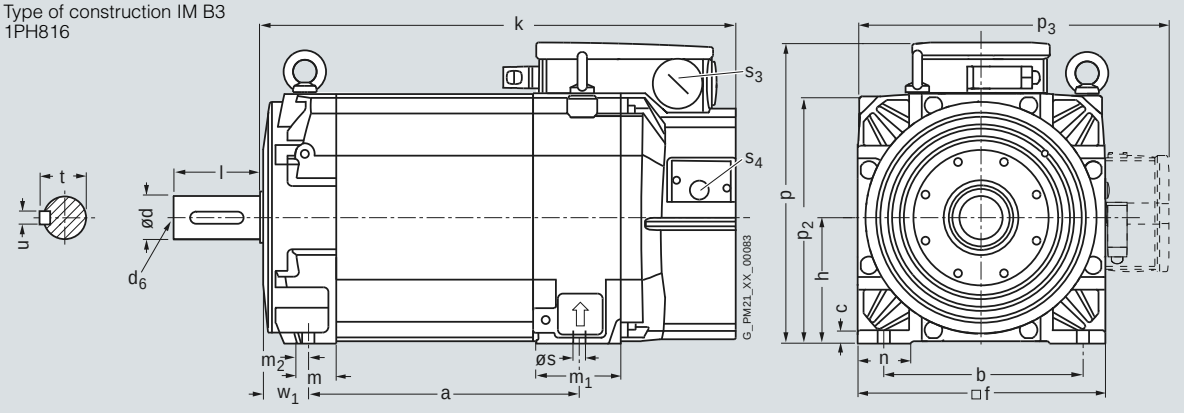
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	c_1 LA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_2 –	p_3 –	s K	s_3 –	s_4 –	w_1 C
1PH8 motor, type of construction IM B3, forced ventilation																				
160	1PH8163		346.5 (13.64)	254 (10.00)	17 (0.67)	23 (0.91)	314 (12.36)	160 (6.30)	610.5 (24.04)	64 (2.52)	99.5 (3.92)	28 (1.10)	70 (2.76)	382.5 (15.06)	317 (12.48)	412.5 (16.24)	14 (0.55)	M50 × 1.5	M20 × 1.5	61 (2.40)
	1PH8165		406.5 (16.00)						670.5 (26.40)											

Type of construction IM B3
1PH816



For motor — Dimensions in mm (inches)

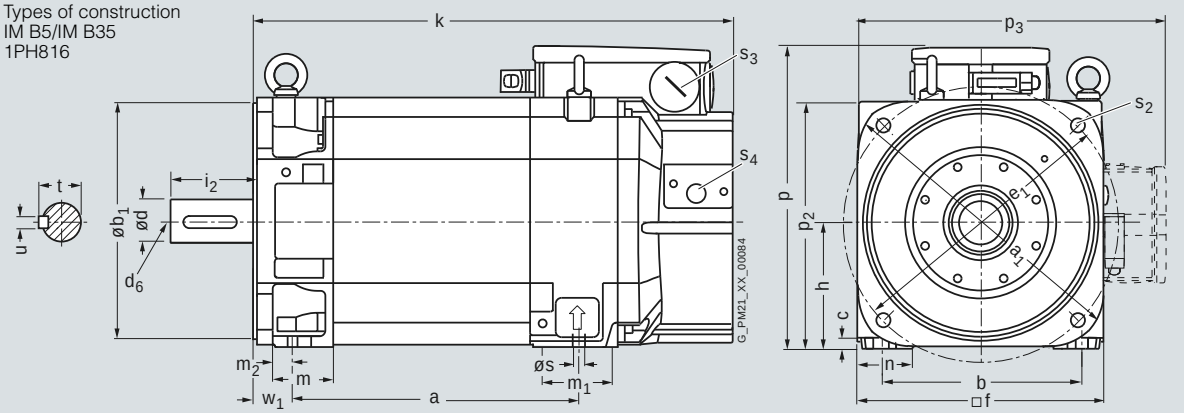
Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8 motor, types of construction IM B5/IM B35, forced ventilation																
160	1PH8163		346.5 (13.64)	393 (15.47)	254 (10.00)	300 (11.81)	17 (0.67)	350 (13.78)	314 (12.36)	5 (0.20)	160 (6.30)	610.5 (24.04)	55 (2.17)	99.5 (3.92)	19 (0.75)	70 (2.76)
	1PH8165		406.5 (16.00)									670.5 (26.40)				

Shaft height	Type	DIN IEC	p HD	p_2 –	p_3 –	s K	s_2 –	s_3 –	s_4 –	w_1 C
1PH8 motor, types of construction IM B5/IM B35, forced ventilation										
160	1PH8163		382.5 (15.06)	317 (12.48)	412.5 (16.24)	14 (0.55)	18 (0.71)	M50 × 1.5	M20 × 1.5	61 (2.40)
	1PH8165									

Shaft extension DE

d **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of constr. IM B3/IM B5/IM B35, forced ventil.					
55 **(2.17)**	M20	110 (4.33)	110 (4.33)	59 (2.32)	16 (0.63)

Types of construction
IM B5/IM B35
1PH816



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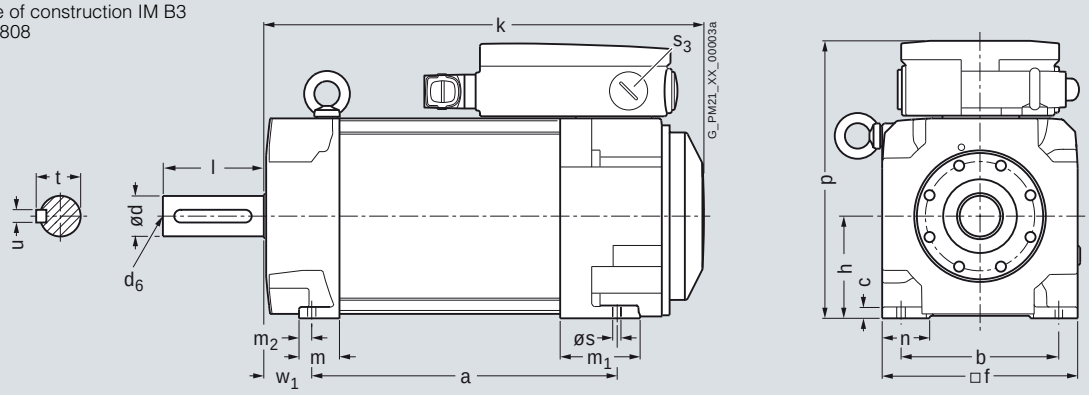
1PH8 asynchronous (induction) motors
Water cooling – Shaft height 80

Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	s K	s_3 –	w_1 C
1PH8 motor, type of construction IM B3, water cooling																
80	1PH8083		194 (7.64)	125 (4.92)	8 (0.31)	155 (6.10)	80 (3.15)	301.5 (11.87)	37 (1.46)	63.5 (2.50)	15 (0.59)	35 (1.38)	216 (8.50)	10 (0.39)	M25 × 1.5	38 (1.50)
	1PH8087		244 (9.61)					351.5 (13.84)								

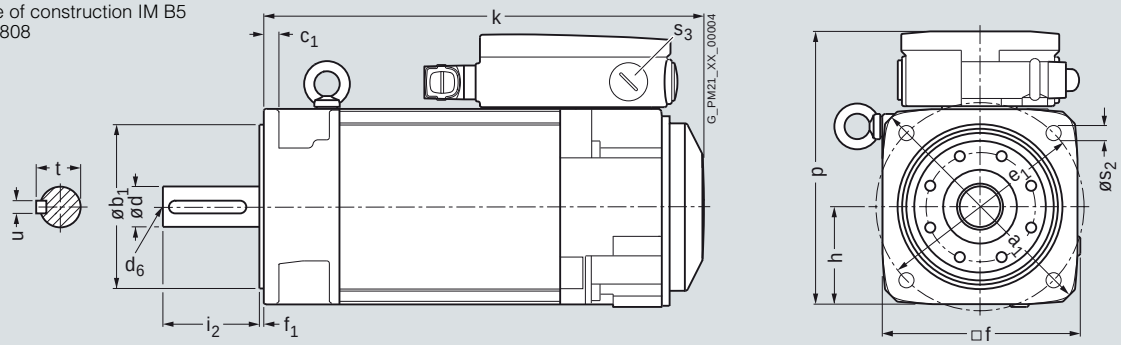
Type of construction IM B3
1PH808



For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	s_2 –	s_3 –
1PH8 motor, type of construction IM B5, water cooling													
80	1PH8083		200 (7.87)	130 (5.12)	12 (0.47)	165 (6.50)	155 (6.10)	3.5 (0.14)	77.5 (3.05)	301.5 (11.87)	213.5 (8.41)	12 (0.47)	M25 × 1.5
	1PH8087									351.5 (13.84)			

Type of construction IM B5
1PH808



Shaft extension DE

Shaft height	Type	DIN IEC	**d** **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of construction IM B3/IM B5, water cooling								
80	1PH8083		**32 (1.26)**	M12	80 (3.15)	80 (3.15)	35 (1.38)	10 (0.39)
	1PH8087							

11

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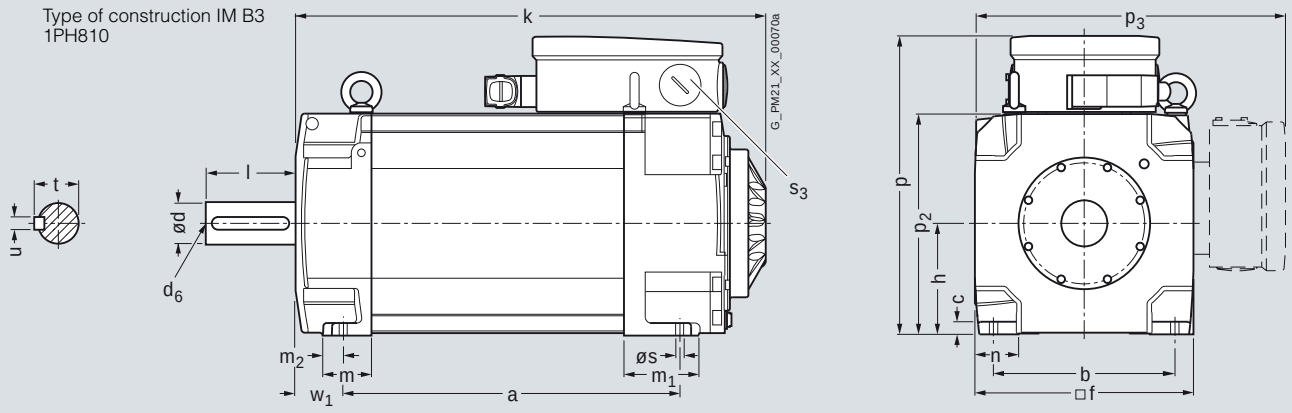
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_2 –	p_3 –	s K	s_3 –	w_1 C
1PH8 motor, type of construction IM B3, water cooling																		
100	1PH8101		167 (6.57)	160 (6.30)	11 (0.43)	196 (7.72)	100 (3.94)	289.5 (11.40)	44 (1.73)	68 (2.68)	19 (0.75)	43 (1.69)	266.5 (10.49)	198 (7.80)	276.5 (10.89)	12 (0.47)	M32 × 1.5	43 (1.69)
	1PH8103		202.5 (7.97)					325 (12.80)										
	1PH8105		262 (10.31)					384.5 (15.14)										
	1PH8107		297.5 (11.71)					420 (16.54)										

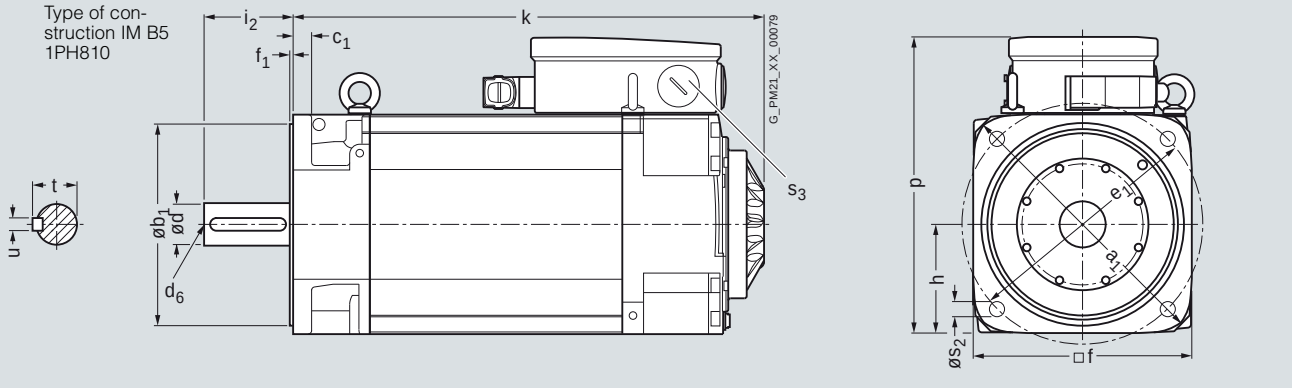
Type of construction IM B3
1PH810



For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	s_2 –	s_3 –
1PH8 motor, type of construction IM B5, water cooling													
100	1PH8101		250 (9.84)	180 (7.09)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	98 (3.86)	289.5 (11.40)	264.5 (10.41)	14 (0.55)	M32 × 1.5
	1PH8103									325 (12.80)			
	1PH8105									384.5 (15.14)			
	1PH8107									420 (16.54)			

Type of construction IM B5
1PH810



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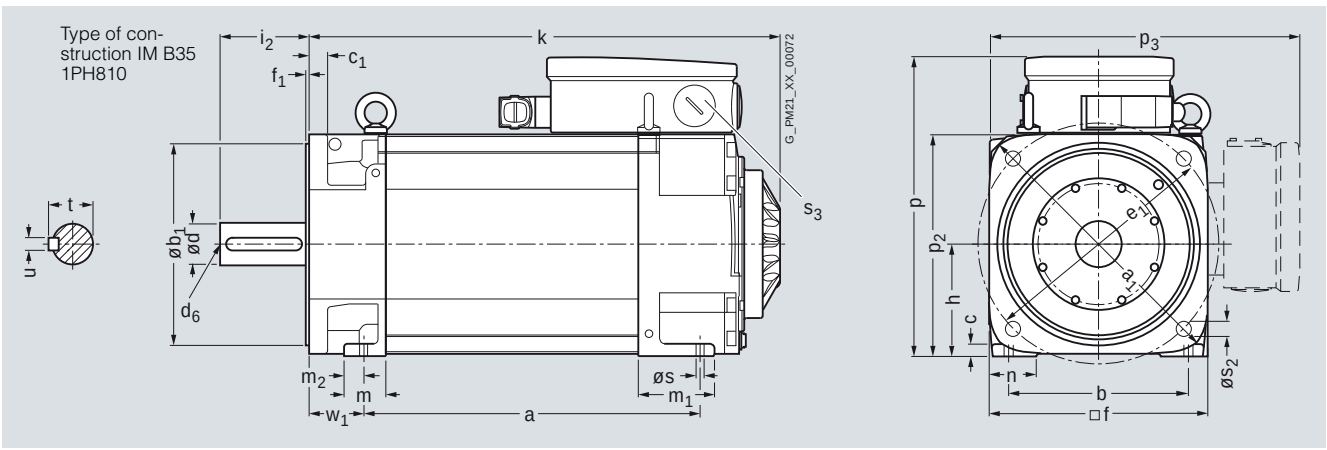
1PH8 asynchronous (induction) motors
Water cooling – Shaft height 100

Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8 motor, type of construction IM B35, water cooling																	
100	1PH8101		167 (6.57)	250 (9.84)	160 (6.30)	180 (7.09)	11 (0.43)	16 (0.63)	215 (8.46)	196 (7.72)	4 (0.16)	100 (3.94)	289.5 (11.40)	37 (1.46)	68 (2.68)	12 (0.47)	43 (1.69)
	1PH8103		202.5 (7.97)										325 (12.80)				
	1PH8105		262 (10.31)										384.5 (15.14)				
	1PH8107		297.5 (11.71)										420 (16.54)				

Shaft height	Type	DIN IEC	p HD	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C
1PH8 motor, type of construction IM B35, water cooling									
100	1PH8101		266.5 (10.49)	198 (7.80)	276.5 (10.89)	12 (0.47)	14 (0.55)	M32 × 1.5	43 (1.69)
	1PH8103								
	1PH8105								
	1PH8107								



Shaft extension DE

Shaft height	Type	DIN IEC	**d** **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of construction IM B3/IM B5/IM B35, water cooling								
100	1PH8101		**38** **(1.50)**	M12	80 (3.15)	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103							
	1PH8105							
	1PH8107							

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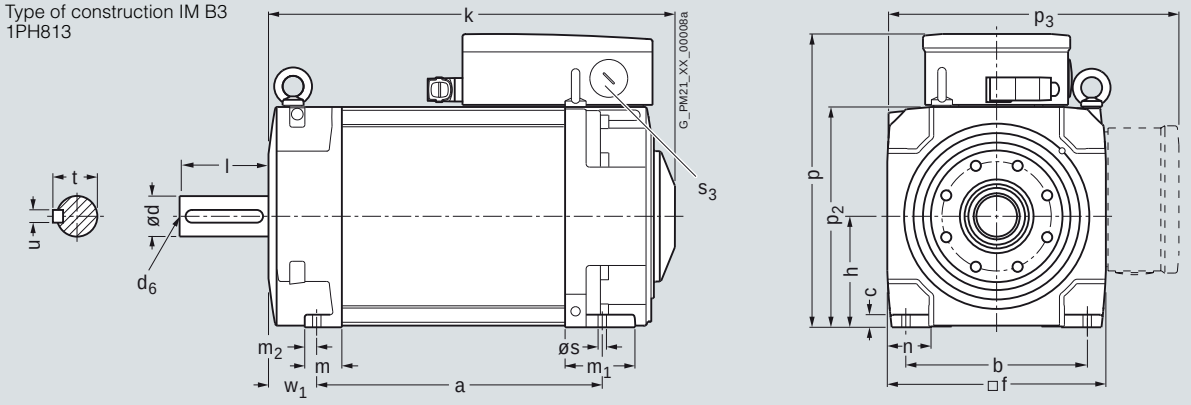
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_2 –	p_3 –	s K	s_3 –	w_1 C
1PH8 motor, type of construction IM B3, water cooling																		
132	1PH8131		220.5 (8.68)	216 (8.50)	15 (0.59)	260 (10.24)	132 (5.20)	347.5 (13.68)	42 (1.65)	81 (3.19)	12 (0.47)	43 (1.69)	347.5 (13.68)	262 (10.31)	357.5 (14.07)	12 (0.47)	M50 × 1.5	53 (2.09)
	1PH8133		265.5 (10.45)					392.5 (15.45)										
	1PH8135		310.5 (12.22)					437.5 (17.22)										
	1PH8137		350.5 (13.80)					477.5 (18.80)										

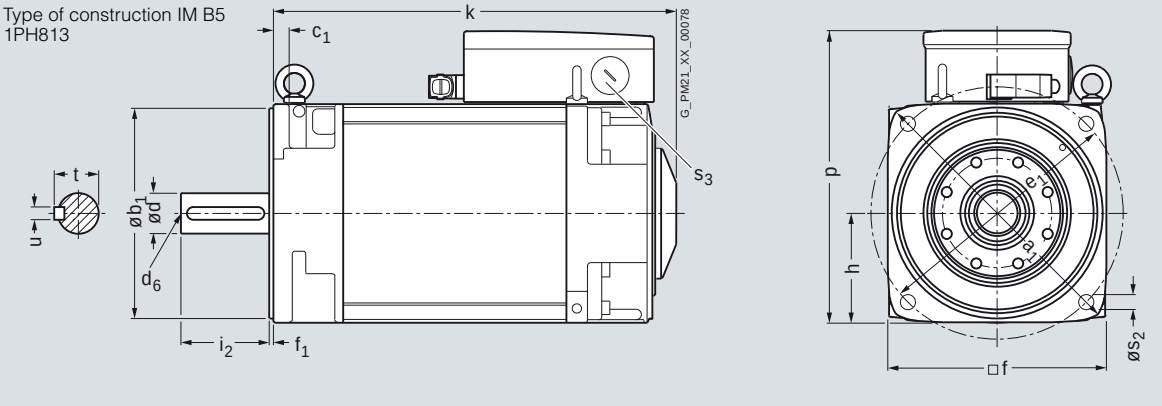
Type of construction IM B3
1PH813



For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a_1 P	b_1 N	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	p HD	s_2 –	s_3 –
1PH8 motor, type of construction IM B5, water cooling													
132	1PH8131		340 (13.39)	250 (9.84)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	132 (5.20)	347.5 (13.68)	345.5 (13.60)	18 (0.71)	M50 × 1.5
	1PH8133									392.5 (15.45)			
	1PH8135									437.5 (17.22)			
	1PH8137									477.5 (18.80)			

Type of construction IM B5
1PH813



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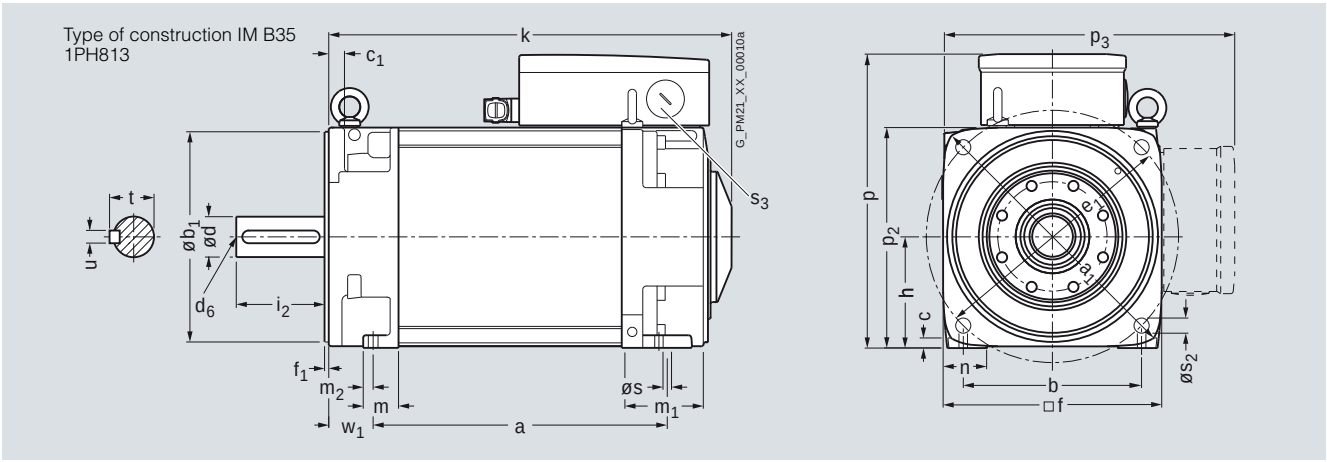
1PH8 asynchronous (induction) motors
Water cooling – Shaft height 132

Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	c_1 LA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8 motor, type of construction IM B35, water cooling																	
132	1PH8131		220.5 (8.68)	340 (13.39)	216 (8.50)	250 (9.84)	15 (0.59)	18 (0.71)	300 (11.81)	260 (10.24)	5 (0.20)	132 (5.20)	347.5 (13.68)	42 (1.65)	81 (3.19)	12 (0.47)	43 (1.69)
	1PH8133		265.5 (10.45)										392.5 (15.45)				
	1PH8135		310.5 (12.22)										437.5 (17.22)				
	1PH8137		350.5 (13.80)										477.5 (18.80)				

Shaft height	Type	DIN IEC	p HD	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C
1PH8 motor, type of construction IM B35, water cooling									
132	1PH8131		347.5 (13.68)	262 (10.31)	357.5 (14.07)	12 (0.47)	18 (0.71)	M50 × 1.5	53 (2.09)
	1PH8133								
	1PH8135								
	1PH8137								



Shaft height	Type	Shaft extension DE **d** **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8 motor, types of construction IM B3/IM B5/IM B35, water cooling							
132	1PH8131	**48** **(1.89)**	M16	110 (4.33)	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133						
	1PH8135						
	1PH8137						

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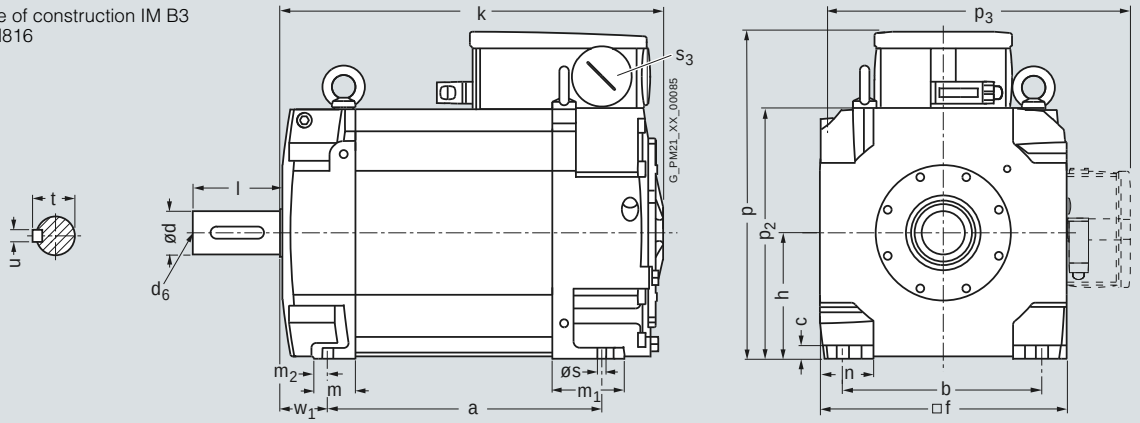
Dimensional drawings

For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	b A	c HA	c_1 LA	f AB	h H	k LB	m BA	m_1 –	m_2 –	n AA	p HD	p_2 –	p_3 –	s K	s_3 –	w_1 C
1PH8 motor, type of construction IM B3, water cooling																			
160	1PH8163		346.5 (13.64)	254 (10.00)	17 (0.67)	23 (0.91)	314 (12.36)	160 (6.30)	488.5 (19.23)	53 (2.09)	91 (3.58)	17 (0.67)	70 (2.76)	415.5 (16.36)	317 (12.48)	412.5 (16.24)	14 (0.55)	M63 × 1.5	61 (2.40)
	1PH8165		406.5 (16.00)						548.5 (21.59)										
	1PH8166																		

Type of construction IM B3
1PH816

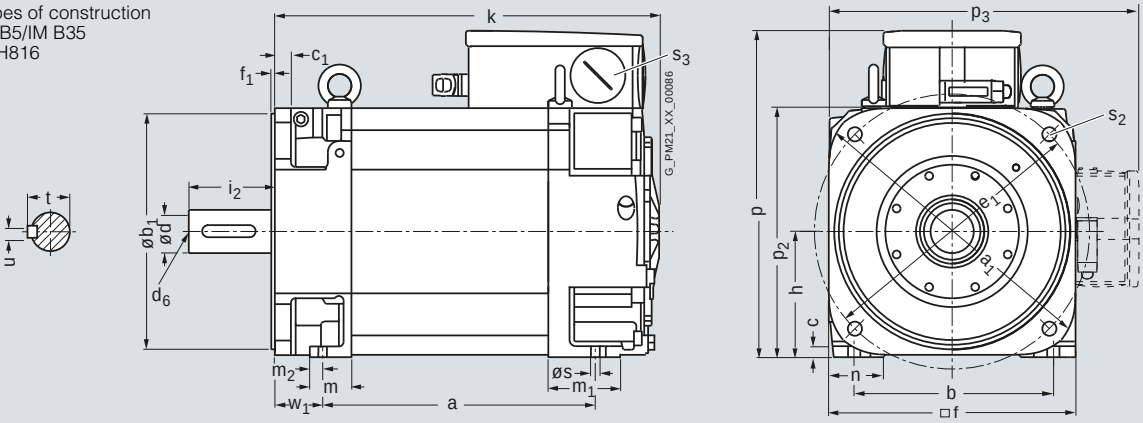


For motor — Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a_1 P	b A	b_1 N	c HA	e_1 M	f AB	f_1 T	h H	k LB	m BA	m_1 –	m_2 –	n AA
1PH8, types of construction IM B5/IM B35, water cooling																
160	1PH8163		346.5 (13.64)	393 (15.47)	254 (10.00)	300 (11.81)	17 (0.67)	350 (13.78)	314 (12.36)	5 (0.20)	160 (6.30)	488.5 (19.23)	53 (2.09)	91 (3.58)	17 (0.67)	70 (2.76)
	1PH8165		406.5 (16.00)									548.5 (21.59)				
	1PH8166															

Shaft height	Type	DIN IEC	p HD	p_2 –	p_3 –	s K	s_2 –	s_3 –	w_1 C	Shaft extension DE **d** **D**	d_6 –	i_2 E	l E	t GA	u F
1PH8, types of construction IM B5/IM B35, water cooling										**1PH8, types of construction IM B3/IM B5/IM B35, water cooling**					
	1PH8163		415.5 (16.36)	317 (12.48)	412.5 (16.24)	14 (0.55)	18 (0.71)	M63 × 1.5	61 (2.40)	55 (2.17)	M20	110 (4.33)	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8165														
	1PH8166														

Types of construction
IM B5/IM B35
1PH816



11

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Notes

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Measuring systems

12/2 **Overview**

12/3 **Built-on optoelectronic rotary encoders**

12/3 Introduction
12/4 Incremental encoders
12/4 sin/cos 1 V_{pp} incremental encoder
12/4 RS422 (TTL) incremental encoder
12/4 HTL incremental encoder
12/4 RS422 (TTL) double-track incremental encoder
12/7 Absolute encoders
12/7 Absolute encoder with DRIVE-CLiQ
12/7 SSI absolute encoder
12/7 EnDat absolute encoder
12/9 PROFIBUS DP absolute encoder
12/9 PROFINET IO absolute encoder
12/12 Accessories

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Encoder type	Interface	Safety Integrated[1]	Accuracy in angular seconds	Resolution	Degree of protection without/with shaft input	Page
Incremental encoders	sin/cos 1 V_{pp}	Yes	± 18 mech. × 3600/ number of signals/ revolution *z*	2500 S/R	IP67/IP64	**12/4**
	RS422 (TTL)	[2]	± 18 mech. × 3600/ number of signals/ revolution *z*	5000 S/R	IP67/IP64	**12/4**
	HTL	[2]	± 18 mech. × 3600/ number of signals/ revolution *z*	2500 S/R	IP67/IP64	**12/4**
	RS422 (TTL) double-track	[2]	Track 1: ± 63 Track 2: ± 12	Track 1: 1024 S/R Track 2: 9000 S/R	IP67/IP64	**12/4**
Absolute encoders	DRIVE-CLiQ	[2]	± 36	Single-turn 22 bit Multi-turn 34 bit (22 bit single-turn + 12 bit multi-turn)	IP67/IP64	**12/7**
	SSI	[2]	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 25 bit (8192 steps × 4096 revolutions)	IP67/IP64	**12/7**
	EnDat	Yes	± 60 (Incremental track)	Single-turn 13 bit (8192 steps) Multi-turn 25 bit (8192 steps × 4096 revolutions)	IP67/IP64	**12/7**
	PROFIBUS DP	[2]	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 27 bit (8192 steps × 16384 revolutions)	IP67/IP64	**12/9**
	PROFINET IO	[2]	± 79 (with 8192 steps)	Single-turn 13 bit (8192 steps) Multi-turn 27 bit (8192 steps × 16384 revolutions)	IP67/IP64	**12/9**

S/R = signals/revolution

12

[1] Built-on rotary encoders can be used for Safety Integrated.

[2] If you require information about the usability of built-on rotary encoders for Safety Integrated, please contact your local Siemens office.

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Overview

Absolute encoders, incremental encoders and mounting accessories

The built-on optoelectronic rotary encoders measure paths, angles of rotation or speeds in machines. They can be used in conjunction with computerized numerical controls, programmable logic controllers, drives and position displays, e.g. for:

- SINUMERIK CNCs
- SIMOTION Motion Control Systems
- SIMATIC programmable logic controllers
- SINAMICS drive systems
- SIMODRIVE drive systems
- SIMOVERT MASTERDRIVES 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 clamps 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.

For rotary encoders with cables, the cable length including the connector is 1 m (3.28 ft).

The following bending radii for the cables at the encoder must be complied with:

- One-time bending: ≥ 20 mm (0.79 in)
- Continuous bending: ≥ 75 mm (2.95 in)

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Incremental encoders

Function

Incremental encoders (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° 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:

- sin/cos 1 V_{pp} analog signals
  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

		sin/cos 1 V_{pp} incremental encoder 6FX2001-3....	**RS422 (TTL) incremental encoder** 6FX2001-2....	**HTL incremental encoder** 6FX2001-4...0	**RS422 (TTL) double-track incremental encoder** 6FX2001-2UK00
Operating voltage DC U_p on encoder	V	5 ± 10 %	5 ± 10 % or 10 ... 30	10 ... 30	5 ± 5 %
Limit frequency, typ.	kHz	≥ 180 (-3 dB) ≥ 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)	U_H ≥ 21 V at I_H = 20 mA at 24 V U_L ≤ 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 %) **Rise/fall time t_+/t_-** (with 1 m (3.28 ft) cable and recommended input circuit)	ns	–	≤ 50	≤ 200	≤ 100
Phase angle, signal A to B Edge spacing, min.	Degrees	90 ± 10	90	90	90
• At 1 MHz	µs	–	–	–	Track 2: ≥ 0.125
• At 300 kHz	µs	–	≥ 0.45	≥ 0.45	–
• At 160 kHz	µs	–	–	–	Track 1: ≥ 0.8
Cable length to downstream electronics, max. [1]	m (ft)	150 (492)	100 (328)	300 (984)	–
• Up to 500 kHz	m (ft)	–	–	–	100 (328)
• Up to 1 MHz	m (ft)	–	–	–	50 (164)

[1] With recommended cable and input circuitry of the downstream electronics, observe max. permissible cable length of module to be evaluated.

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Technical specifications (continued)

		sin/cos 1 V_{pp} incremental encoder 6FX2001-3....	RS422 (TTL) incremental encoder 6FX2001-2....	HTL incremental encoder 6FX2001-4...0	RS422 (TTL) double-track incremental encoder 6FX2001-2UK00
LED failure monitoring		–	High-resistance driver	High-resistance driver	–
Resolution, max.	S/R	2500	5000	2500	Track 1: 1024 Track 2: 9000
Accuracy	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
Speed, max.					
• Electrical	rpm	(27×10^6 rpm)/number of signals/revolution (at -6 dB)	(18×10^6 rpm)/number of signals/revolution	(18×10^6 rpm)/number of signals/revolution	Track 1: 9000 Track 2: 6500
• Mechanical	rpm	12000	12000	12000	12000
Friction torque (at 20 °C (68 °F))	Nm (lb_f-in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
Starting torque (at 20 °C (68 °F))	Nm (lb_f-in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
Shaft loading capacity					
• *n* > 6000 rpm					
- Axial	N (lb_f)	10 (2.25)	10 (2.25)	10 (2.25)	–
- Radial at shaft extension	N (lb_f)	20 (4.50)	20 (4.50)	20 (4.50)	–
• *n* ≤ 6000 rpm					
- Axial	N (lb_f)	40 (8.99)	40 (8.99)	40 (8.99)	10 (2.25)
- Radial at shaft extension	N (lb_f)	60 (13.5)	60 (13.5)	60 (13.5)	20 (4.50)
Angular acceleration, max.	rad/s^2	10^5	10^5	10^5	10^5
Moment of inertia of rotor	kgm^2 (lb_f-in-s^2)	1.45×10^{-6} (12.8×10^{-6})	1.45×10^{-6} (12.8×10^{-6})	1.45×10^{-6} (12.8×10^{-6})	20×10^{-6} (177×10^{-6})
Vibration (55 ... 2000 Hz) to EN 60068-2-6	m/s^2 (ft/s^2)	≤ 300 (984)	≤ 300 (984)	≤ 300 (984)	≤ 100 (328)
Shock to EN 60068-2-27					
• 2 ms	m/s^2 (ft/s^2)	≤ 2000 (6562)	≤ 2000 (6562)	≤ 2000 (6562)	–
• 6 ms	m/s^2 (ft/s^2)	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)
Degree of protection to EN 60529 (IEC 60529)					
• Without shaft input		IP67	IP67	IP67	IP67
• With shaft input		IP64	IP64	IP64	IP64
Ambient temperature					
Operation					
• Flange outlet or fixed cable					
- At U_p = 5 V ± 10 %	°C (°F)	-40 ... +100 (-40 ... +212)	-40 ... +100 (-40 ... +212)	-40 ... +100 (-40 ... +212)	-10 ... +70 (+14 ... +158)
- At U_p = 10 ... 30 V	°C (°F)	–	-40 ... +70 (-40 ... +158)	–	–
• Flexible cable					
- At U_p = 5 V ± 10 %	°C (°F)	-10 ... +100 (+14 ... +212)	-10 ... +100 (+14 ... +212)	-10 ... +100 (+14 ... +212)	-10 ... +70 (+14 ... +158)
- At U_p = 10 ... 30 V	°C (°F)	–	-10 ... +70 (+14 ... +158)	–	–
Weight, approx.	kg (lb)	0.3 (0.66)	0.3 (0.66)	0.3 (0.66)	0.7 (1.54)
EMC		Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EWG and the regulations of the EMC Directives (applicable basic standards)			
Approvals, according to		CE, cULus	CE, cULus	CE, cULus	CE, cULus

S/R= signals/revolution

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Selection and ordering data

Description	Order No.
sin/cos 1 V_{pp} incremental encoder	
5 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-3G■■■**
• Radial flange outlet	**6FX2001-3E■■■**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-3C■■■**
Resolution	
1000 S/R	**B00**
1024 S/R	**B02**
2500 S/R	**C50**
RS422 (TTL) incremental encoder	
5 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-2G■■■**
• Radial flange outlet	**6FX2001-2E■■■**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2C■■■**
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-2R■■■**
• Radial flange outlet	**6FX2001-2P■■■**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2M■■■**
10 ... 30 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-2H■■■**
• Radial flange outlet	**6FX2001-2F■■■**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2D■■■**
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-2S■■■**
• Radial flange outlet	**6FX2001-2Q■■■**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-2N■■■**
Resolution	
500 S/R	**A50**
1000 S/R	**B00**
1024 S/R	**B02**
1250 S/R	**B25**
1500 S/R	**B50**
2000 S/R	**C00**
2048 S/R	**C04**
2500 S/R	**C50**
3600 S/R	**D60**
5000 S/R	**F00**

S/R = signals/revolution

Description	Order No.
HTL incremental encoder	
10 ... 30 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-4H■■0**
• Radial flange outlet	**6FX2001-4F■■0**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-4D■■0**
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-4S■■0**
• Radial flange outlet	**6FX2001-4Q■■0**
• Cable 1 m (3.28 ft) with connector[1]	**6FX2001-4N■■0**
Resolution	
100 S/R	**A1**
500 S/R	**A5**
1000 S/R	**B0**
2500 S/R	**C5**
RS422 (TTL) double-track incremental encoder	
5 V DC supply voltage	
Synchro flange and connection via	
• Cable 1 m (3.28 ft) with axial connector 2 types of resolution: 9000/1024 S/R	**6FX2001-2UK00**

[1] Universal integrated cable outlet for axial and radial outlet direction.

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Function

SSI/EnDat and PROFIBUS DP absolute encoders, top, and DRIVE-CLiQ and PROFINET IO absolute encoders, 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.

DRIVE-CLiQ, SSI and EnDat absolute encoders are of advantage in time-critical applications.

In plants with a large number of encoders, PROFIBUS DP or PROFINET IO are more of an advantage due to the reduced wiring overhead. PROFIBUS DP encoders are programmable and support isochronous mode with slave-to-slave communication. PROFINET IO encoders are programmable as well, they have two additional ports and support RT and IRT operation.

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

		Absolute encoder with DRIVE-CLiQ 6FX2001-5.D..-0AA1	**SSI absolute encoder** 6FX2001-5.S..	**EnDat absolute encoder** 6FX2001-5.E..
Operating voltage DC U_p on encoder	V	24 - 15 % + 20 %	10 ... 30	5 ± 5 %
Power consumption, approx.				
• Single-turn	mA	245	160	160
• Multi-turn	mA	325	200	200
Interface		DRIVE-CLiQ	SSI	EnDat
Clock input		–	Differential cable receiver according to EIA standard RS485	Differential cable receiver according to EIA standard RS485
Data output		DRIVE-CLiQ	Differential cable driver according to EIA standard RS485	Differential cable driver according to EIA standard RS485
Short-circuit strength		Yes	Yes	Yes
Data transfer rate	Mbit	100	–	–
	kHz	–	100 ... 1000	100 ... 2000
Speed, max.				
• Electrical	rpm	14000	–	–
- At ± 1 bit accuracy	rpm	–	5000	5000
- At ± 100 bit accuracy	rpm	–	10000	10000
• Mechanical				
- Single-turn	rpm	12000	12000	12000
- Multi-turn	rpm	10000	10000	10000
Cable length to downstream electronics, max. [1]	m (ft)	100 (328)	–	–
• Up to 1-MHz-cycle	m (ft)	–	50 (164)	50 (164)
• Up to 300-kHz-cycle	m (ft)	–	100 (328)	150 (492)
• Up to 100-kHz-cycle	m (ft)	–	400 (1312)	–
Connection		DRIVE-CLiQ connector, radial	Flange outlet, axial/radial	Flange outlet, axial/radial

[1] Observe the maximum permissible cable length of the connected module.

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Technical specifications (continued)

		Absolute encoder with DRIVE-CLiQ 6FX2001-5.D..-0AA1	SSI absolute encoder 6FX2001-5.S..	EnDat absolute encoder 6FX2001-5.E..
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)
Frame				
• Single-turn	bit	–	13, without parity	According to EnDat specification
• Multi-turn	bit	–	25, without parity	According to EnDat specification
Incremental track	S/R	2048, 1 V_{pp} (encoder-internal only)	–	512, 1 V_{pp}
Code type				
• Sampling		Gray	Gray	Gray
• Transfer		DRIVE-CLiQ	Gray, fir tree format	Binary
Parameterization capability				
• Preset		–	Set to zero	–
• Counting direction		Yes	Yes	–
Accuracy	arcsec	± 36	± 79 (with 8192 steps)	± 60 (incremental track)
Friction torque (at 20 °C (68 °F))	Nm (lb_f-in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
Starting torque (at 20 °C (68 °F))	Nm (lb_f-in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
Shaft loading capacity				
• n > 6000 rpm				
- Axial	N (lb_f)	10 (2.25)	10 (2.25)	10 (2.25)
- Radial at shaft extension	N (lb_f)	20 (4.50)	20 (4.50)	20 (4.50)
• n ≤ 6000 rpm				
- Axial	N (lb_f)	40 (8.99)	40 (8.99)	40 (8.99)
- Radial at shaft extension	N (lb_f)	60 (13.5)	60 (13.5)	60 (13.5)
Angular acceleration, max.	rad/s²	10^5	10^5	10^5
Moment of inertia of rotor				
• Solid shaft	kgm² (lb_f-in-s²)	1.90×10^{-6} (16.8×10^{-6})	1.45×10^{-6} (12.8×10^{-6})	1.45×10^{-6} (12.8×10^{-6})
• Hollow shaft	kgm² (lb_f-in-s²)	2.80×10^{-6} (24.8×10^{-6})	–	–
Vibration (55 ... 2000 Hz) to EN 60068-2-6	m/s² (ft/s²)	≤ 100 (328)	≤ 300 (984)	≤ 300 (984)
Shock to EN 60068-2-27				
• 2 ms	m/s² (ft/s²)	≤ 2000 (6562)	≤ 2000 (6562)	≤ 2000 (6562)
• 6 ms	m/s² (ft/s²)	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)
Degree of protection to EN 60529 (IEC 60529)				
• Without shaft input		IP67	IP67	IP67
• With shaft input		IP64	IP64	IP64
Ambient temperature				
• Operation	°C (°F)	-20 ... +100 (-4 ... +212)	-40 ... +85 (-40 ... +185)	-40 ... +100 (-40 ... +212)
Weight, approx.				
• 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)
EMC		Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
Approvals, according to		CE, cULus	CE, cULus	CE, cULus

S/R= signals/revolution

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Technical specifications (continued)

		PROFIBUS DP absolute encoder 6FX2001-5.P..	PROFINET IO absolute encoder 6FX2001-5.N..
Operating voltage DC U_p on encoder	V	10 ... 30	10 ... 30
Power consumption, approx.			
• Single-turn	mA	300 ... 100 (2.5 W)	400 ... 130 (< 4 W)
• Multi-turn	mA	300 ... 100 (2.5 W)	400 ... 130 (< 4 W)
Interface		PROFIBUS DP-V2	PROFINET IO with RT/IRT
Clock input		Differential cable receiver according to EIA standard RS485	2 IRT ports
Data output		Differential cable driver according to EIA standard RS485	2 IRT ports
Short-circuit strength		Yes	Yes
Data transfer rate	Mbit/s	12	100
LED for diagnostics		Green/red	Green/red/yellow
Speed, max.			
• Electrical			
- At ± 1 bit accuracy	rpm	5800	5800
• Mechanical			
- Single-turn	rpm	12000	12000
- Multi-turn	rpm	6000	6000
Cable length to down-stream electronics, max.[1]	m (ft)	–	85 (279)
• Up to 12 Mbit/s	m (ft)	100 (328)	–
• Up to 1.5 Mbit/s	m (ft)	200 (565)	–
• Up to 93.75 kbit/s	m (ft)	1200 (3937)	–
Number of nodes		99	–
Connection		Terminal block with address selector switch and bus terminating resistor in removable cover with radial cable glands (3 units)	2 × 4-pin M12 connector for PROFINET ports 1 × 4-pin M12 connector for operating voltage
• Cable diameter	mm (in)	6.5 ... 9 (0.26 ... 0.35) Removal of cover possible without interrupting bus	–
Resolution			
• Single-turn	bit	13 (8192 steps)	13 (8192 steps)
• Multi-turn	bit	27 (8192 steps × 16384 revolutions)	27 (8192 steps × 16384 revolutions)
Frame		According to PNO encoder profile V4.1 Class 1, Class 2, Class 3 Standard telegram 81	According to PNO encoder profile V4.1 Class 1, Class 2, Class 3, Class 4 Standard telegrams 81/82/83/84 Siemens telegram 860
Code type			
• Sampling		Gray	Gray
• Transfer		Binary, PROFIBUS	Binary, PROFINET
Network load, approx.			
• At 12 Mbit/s per encoder	µs	20	–
Cycle time	ms	0.667	1 ... 100

[1] Observe the maximum permissible cable length of the connected module.

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Technical specifications (continued)

		PROFIBUS DP absolute encoder 6FX2001-5.P..	PROFINET IO absolute encoder 6FX2001-5.N..
Parameterization capability			
• 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
• Slave-to-slave communication		Yes	No
Online parameterization		Yes	Yes
PNO certificate		Yes	Yes
Supported profiles		PNO encoder profile V4.1	PNO encoder profile V4.1
Accuracy with 8192 steps	arcsec	± 79 (± ½ LSB)	± 79 (± ½ LSB)
Friction torque (at 20 °C (68 °F))	Nm (lb_f-in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
Starting torque (at 20 °C (68 °F))	Nm (lb_f-in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
Shaft loading capacity			
• n > 6000 rpm			
- Axial	N (lb_f)	10 (2.25)	10 (2.25)
- Radial at shaft extension	N (lb_f)	20 (4.50)	20 (4.50)
• n ≤ 6000 rpm			
- Axial	N (lb_f)	40 (8.99)	40 (8.99)
- Radial at shaft extension	N (lb_f)	110 (24.7)	110 (24.7)
Angular acceleration, max.	rad/s^2	10^5	10^5
Moment of inertia of rotor			
• Solid shaft	kgm^2 (lb_f-in-s^2)	1.90×10^{-6} (16.8×10^{-6})	1.90×10^{-6} (16.8×10^{-6})
• Hollow shaft	kgm^2 (lb_f-in-s^2)	2.80×10^{-6} (24.8×10^{-6})	2.80×10^{-6} (24.8×10^{-6})
Vibration (55 ... 2000 Hz) to EN 60068-2-6	m/s^2 (ft/s^2)	≤ 100 (328)	≤ 100 (328)
Shock to EN 60068-2-27			
• 2 ms	m/s^2 (ft/s^2)	≤ 2000 (6562)	≤ 2000 (6562)
• 6 ms	m/s^2 (ft/s^2)	≤ 1000 (3281)	≤ 1000 (3281)
Degree of protection to EN 60529 (IEC 60529)			
• Without shaft input		IP67	IP67
• With shaft input		IP64	IP64
Ambient temperature			
• Operation	°C (°F)	-40 ... +85 (-40 ... +185)	-40 ... +85 (-40 ... +185)
Weight, approx.			
• Single-turn	kg (lb)	0.4 (0.88)	0.4 (0.88)
• Multi-turn	kg (lb)	0.5 (1.10)	0.5 (1.10)
EMC		Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
Approvals, according to		CE, cULus	CE, cULus

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Selection and ordering data

Description	Order No.
Absolute encoder with DRIVE-CLiQ	
24 V DC supply voltage	
Radial connection	
• Synchro flange Solid shaft 6 mm (0.24 in)	**6FX2001-5FD■■-0AA1**
• Clamp flange Solid shaft 10 mm (0.39 in)	**6FX2001-5QD■■-0AA1**
• Torque bracket Hollow shaft 10 mm (0.39 in)	**6FX2001-5VD■■-0AA1**
• Torque bracket Hollow shaft 12 mm (0.47 in)	**6FX2001-5WD■■-0AA1**
Resolution	
• Single-turn 22 bit	**1 3**
• Multi-turn 34 bit	**2 5**
SSI absolute encoder	
10 ... 30 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-5HS■■**
• Radial flange outlet	**6FX2001-5FS■■**
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-5SS■■**
• Radial flange outlet	**6FX2001-5QS■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**1 2**
• Multi-turn 8192 steps/revolution, 4096 revolutions (25 bit)	**2 4**
EnDat absolute encoder	
5 V DC supply voltage	
Synchro flange and connection via	
• Axial flange outlet	**6FX2001-5HE■■**
• Radial flange outlet	**6FX2001-5FE■■**
Clamp flange and connection via	
• Axial flange outlet	**6FX2001-5SE■■**
• Radial flange outlet	**6FX2001-5QE■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**1 3**
• Multi-turn 8192 steps/revolution, 4096 revolutions (25 bit)	**2 5**

Description	Order No.
PROFIBUS DP absolute encoder	
10 ... 30 V DC supply voltage	
Radial connection	
• Synchro flange Solid shaft	**6FX2001-5FP■■**
• Clamp flange Solid shaft	**6FX2001-5QP■■**
• Torque bracket Hollow shaft 8 mm/10 mm/12 mm/15 mm (0.31 in/0.39 in/0.47 in/0.59 in)	**6FX2001-5WP■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**1 2**
• Multi-turn 8192 steps/revolution, 16384 revolutions (27 bit)	**2 4**
PROFINET IO absolute encoder	
10 ... 30 V DC supply voltage	
Radial connection	
• Synchro flange Solid shaft	**6FX2001-5FN■■**
• Clamp flange Solid shaft	**6FX2001-5QN■■**
• Torque bracket Hollow shaft 8 mm/10 mm/12 mm/15 mm (0.31 in/0.39 in/0.47 in/0.59 in)	**6FX2001-5WN■■**
Resolution	
• Single-turn 8192 steps/revolution (13 bit)	**1 3**
• Multi-turn 8192 steps/revolution, 16384 revolutions (27 bit)	**2 5**

More information

Description	Order No.
Decentralization with PROFIBUS DP/DPV1	**ISBN-13: 978-3-89578-218-3**

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Accessories

Overview

Couplings and clamps

Couplings and clamps

Couplings and clamps are available as mounting accessories for the built-on rotary encoders. The clamps are used to fix the encoders with Synchro flange.

Signal connector as mating connector

A signal connector is available as mating connector 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 EnDat absolute encoders.

Signal connector

A signal connector is available as replacement for encoders with cable and connector.

Technical specifications

		Spring disk coupling 6FX2001-7KF10 6FX2001-7KF06	Plug-in coupling 6FX2001-7KS06 6FX2001-7KS10
Transmission torque, max.	Nm (lb_f-in)	0.8 (7.08)	0.7 (6.20)
Shaft diameter			
• Both ends	mm (in)	6 (0.24)	6 (0.24) or 10 (0.39)
• d_1/d_2	mm (in)	6/5 (0.24/0.20)	–
Center offset of shafts, max.	mm (in)	0.4 (0.02)	0.5 (0.02)
Axial offset	mm (in)	± 0.4 (0.02)	± 0.5 (0.02)
Angular displacement of shafts, max.	Degrees	3	1
Torsional rigidity	Nm/rad (lb_f-ft/rad)	150 (111)	31 (22.9)
Lateral spring stiffness	N/mm (lb_f)	6 (1.35)	10 (2.25)
Moment of inertia	gcm^2 (lb_f-in-s^2)	19 (168 × 10^{-7})	20 (177 × 10^{-7})
Speed, max.	rpm	12000	12000
Ambient temperature			
• Operation	°C (°F)	-40 ... +150 (-40 ... +302)	-40 ... +80 (-40 ... +176)
Weight, approx.	g (oz)	16 (0.56)	20 (0.71)

Selection and ordering data

Description	Order No.
Spring disk coupling Shaft diameter:	
• 6 mm/6 mm (0.24 in/0.24 in)	**6FX2001-7KF10**
• 6 mm/5 mm (0.24 in/0.20 in)	**6FX2001-7KF06**
Plug-in coupling Shaft diameter:	
• 6 mm/6 mm (0.24 in/0.24 in)	**6FX2001-7KS06**
• 10 mm/10 mm (0.39 in/0.39 in)	**6FX2001-7KS10**
Clamp (1 unit) For double-track encoders and encoders with Synchro flange (3 units are required.)	**6FX2001-7KP01**
Signal connector with cap nut (1 unit) Mating connector for TTL, sin/cos 1 V_{pp}, HTL incremental encoders and SSI absolute encoders 12-pin, insulator with 12 socket contacts 0.08 ... 0.22 mm^2 and 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SU12**
Signal connector with cap nut (1 unit) Mating connector for EnDat absolute encoders 17-pin, insulator with 17 socket contacts 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SU17**
Signal connector with external thread for encoders with cable (1 unit) Replacement connector for RS422, sin/cos 1 V_{pp} and HTL incremental encoders 12-pin, insulator with 12 contact pins 0.20 ... 0.56 mm^2, 2 × cable clamping 6.5 ... 10 mm and 10.1 ... 13 mm	**6FX2003-0SA12**
Power connecting cable Pre-assembled cable for power supply of PROFINET IO absolute encoders with M12 connector and M12 socket, A-coded, 4-pin	
• Length: 2 m (6.56 ft)	**6XV1801-5DH20**
• Length: 3 m (9.84 ft)	**6XV1801-5DH30**
• Length: 5 m (16.4 ft)	**6XV1801-5DH50**
• Length: 10 m (32.8 ft)	**6XV1801-5DN10**
• Length: 15 m (49.2 ft)	**6XV1801-5DN15**
IE connecting cable Pre-assembled signal cable for PROFINET IO absolute encoders with M12 and RJ45 connectors, D-coded, 4-pin	
• Length: 2 m (6.56 ft)	**6XV1871-5TH20**
• Length: 3 m (9.84 ft)	**6XV1871-5TH30**
• Length: 5 m (16.4 ft)	**6XV1871-5TH50**
• Length: 10 m (32.8 ft)	**6XV1871-5TN10**
• Length: 15 m (49.2 ft)	**6XV1871-5TN15**
IE FC RJ45 Plug 145 (1 unit) 2 × 2 RJ45 plug connector with rugged metal enclosure and FC connecting method, cable outlet 145°	**6GK1901-1BB30-0AA0**
IE FC M12 Plug PRO (1 unit) M12 plug connector with metal enclosure and FC connecting method, axial cable outlet, D-coded	**6GK1901-0DB20-6AA0**
IE FC TP Trailing Cable 2 × 2 (Type C) 4-wire, shielded, PROFINET compliant, TP installation cable for use in cable carriers, sold by the meter Max. consignment: 2000 m (6562 ft) Min. ordering quantity: 20 m (65.62 ft)	**6XV1840-3AH10**

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Connection system MOTION-CONNECT

13

13/2 **Overview**

13/3 **Introduction**

13/3 General information

13/5 **Power cables for SINAMICS S110 and S120**

13/7 Power cables for 1FK7 motors with SPEED-CONNECT connector

13/8 Extensions for power cables with SPEED-CONNECT connector

13/9 Power cables for 1PH8 motors with terminal box

13/10 **Signal cables for SINAMICS S110 and S120**

13/13 DRIVE-CLiQ signal cables without 24 V DC cores

13/14 MOTION-CONNECT DRIVE-CLiQ signal cables with 24 V DC cores

13/15 Signal cables for motors with SPEED-CONNECT/full-thread connector Basic cables/extensions

13/16 **Connection overviews**

13/18 **Length code**

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Connection system MOTION-CONNECT

Overview

Cable	For motor	MOTION-CONNECT 500	MOTION-CONNECT 800PLUS	Page
Dynamic requirements		Medium	High	
Environmental requirements		Medium	High	
UL/CSA		✔	✔	
Halogen-free		–	✔	
RoHS		✔	✔	
Power cables with SPEED-CONNECT connector				
	1FK7	✔	✔	**13/7**
Extensions for power cables with SPEED-CONNECT connector				
	1FK7	✔	✔	**13/8**
Power cables for motors with terminal box				
	1PH8	✔	✔	**13/9**
MOTION-CONNECT DRIVE-CLiQ signal cables				
	1FK7	✔	✔	**13/14**
	1PH8	✔	✔	**13/14**
Signal cables with SPEED-CONNECT/full-thread connector				
	1FK7	✔	✔	**13/15**
	1PH8	✔	✔	**13/15**
Extensions for signal cables with SPEED-CONNECT/full-thread connector				
	1FK7	✔	✔	**13/15**

✔ = Possible
– = Not possible

13

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Overview

MOTION-CONNECT cables are suitable for use with many different types of machine tools and production machines.

MOTION-CONNECT cables are available as ready-to-connect power and signal cables as well as cables sold by the meter in the following versions:

- **MOTION-CONNECT 500**
  - Cost-effective solution for mainly fixed installation
  - Use for low mechanical loads
  - Tested for traversing paths up to 5 m (16.41 ft)
- **MOTION-CONNECT 800PLUS**
  - Fulfills the requirements for use in cable carriers
  - Use for high mechanical loads
  - Oil resistance
  - Tested for traversing paths up to 50 m (164 ft)

Benefits

The pre-assembled MOTION-CONNECT cables ensure high quality and system-tested, problem-free operation. MOTION-CONNECT cables have been tested in a cable carrier.

SPEED-CONNECT

The new pre-assembled cables with SPEED-CONNECT connectors support a fast, stable and reliable connection. With a short rotation as far as the stop, the lock nut of the connector secures the connection.

The cables with SPEED-CONNECT connectors supplement the previously offered MOTION-CONNECT cables with full-thread connectors.

Application

MOTION-CONNECT cables are designed for use in a machine. They are not intended for use in building management systems or outdoors. The MOTION-CONNECT cables have been tested in a cable carrier with horizontal traversing path and have also been designed for this type of application.

The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

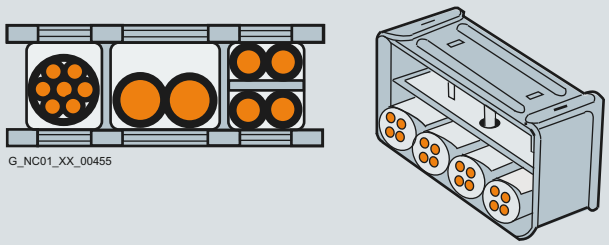
When cable lengths (basic cables and extensions) are determined for the systems and applications described in this catalog, the technically permissible maximum cable lengths (e.g. 25 m (82 ft)) specified in the catalog must be observed. Malfunctions can occur if longer cables are used.

Siemens AG assumes no liability for correct transmission of signals or power in this case.

Compatibility between connectors with SPEED-CONNECT and full-thread:

Connector on motor with external thread	Connector with lock nut on the cable	Compatibility
SPEED-CONNECT	SPEED-CONNECT	✔
SPEED-CONNECT	Full-thread	✔
Full-thread	Full-thread	✔
Full-thread	SPEED-CONNECT	–

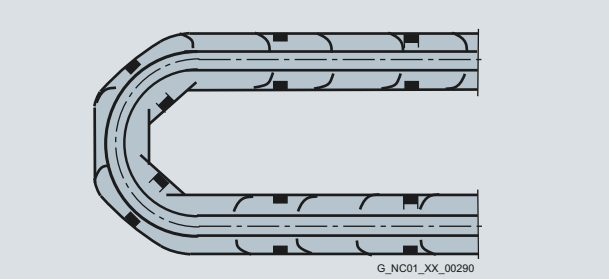
Function



To maximize the service life of the cable carrier and cables, cables in the carrier made from different materials must be separated in the cable carrier using spacers. 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 be separated by spacers.

The strain relief for the cables must be realized through a large surface area at the surface of the cable jacket without crushing the cable structure.

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.



The cables must not be fixed in the cable carrier. They must be freely movable. 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.

Cables must be installed in accordance with the instructions supplied by the cable carrier manufacturer.

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.

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.

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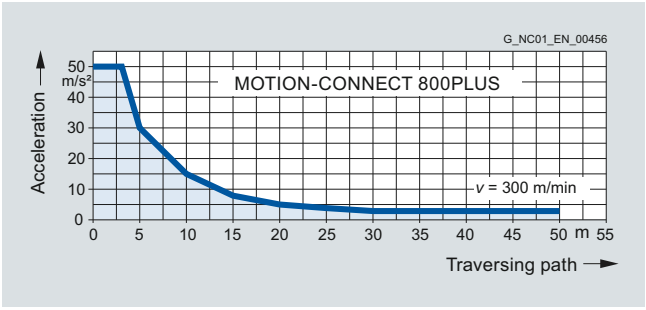
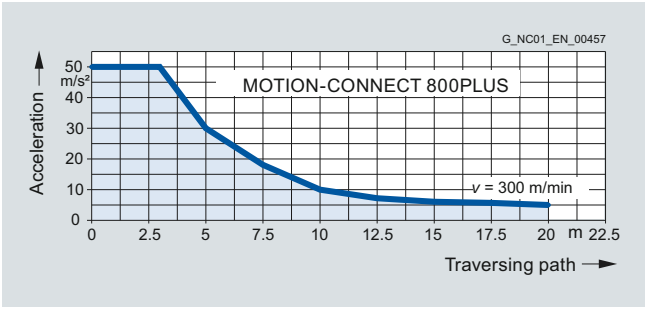
General information

Characteristic curves

Possible use for the cables lies in the area below the characteristic curve. The characteristic curves represent the tested usage points.



Acceleration for signal and power cables
MOTION-CONNECT 800PLUS up to 16 mm²



Acceleration for power cables
MOTION-CONNECT 800PLUS with 25 mm², 35 mm² and 50 mm²

More information

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.

Representation in connection overviews

Symbol	Explanation
	Connector with pin contacts
	Connector with socket contacts
	Exposed core ends
	Cable is not included in the scope of delivery. It must be provided by the customer.

More information (continued)

Current carrying capacity for power and signal cables

The current carrying capacity of PVC/PUR-insulated copper cables is specified in the table for installation types B1, B2, C and E under continuous operating conditions 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	**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
mm²				
Electronics (one control circuit pair)				
0.20	–	4.3	4.4	4.4
0.30	–	7.5	7.5	7.8
0.75	–	9	9.5	10
Power (one symmetrically loaded AC cable)				
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

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

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Overview

Power cable for connecting a 1PH8 motor with terminal box to a SINAMICS S120 Power Module

Power cable with connector supplied for connecting a 1FK7 motor to a SINAMICS S120 Power Module

MOTION-CONNECT power cables are used to connect synchronous and asynchronous (induction) motors with the Power Modules.

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 cables are installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connectors 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.

On request, all 6FX.002-5....-.... power cables are available with crimped contacts and with the connector enclosure **for the module end** supplied separately.

In this case, the 6th position of the Order No. must be changed from **0** to **1**: 6FX.0**1**2-5....-....

Note:

Once the contacts have latched into the insulator, they can no longer be removed.

Type of delivery of pre-assembled power cables

Pre-assembled power cables can be ordered in length units of 10 cm (3.94 in) up to 299.8 m (984 ft).

Cables up to 30 kg (66.2 lb) or 100 m (328 ft) are supplied as coils; above this, they are supplied on drums. This applies to both pre-assembled power cables and to those sold by the meter.

Type of delivery of power cables sold by the meter

Fixed lengths

Cross-section	**MOTION-CONNECT 500 MOTION-CONNECT 800PLUS**
1.5 mm^2	50 m, 100 m, 200 m, 500 m (164 ft, 328 ft, 656 ft, 1641 ft)
2.5 mm^2	50 m, 100 m, 200 m, 500 m (164 ft, 328 ft, 656 ft, 1641 ft)

Variable length, sold by the meter

Cross-section	Brake cores	**MOTION-CONNECT 500**	**MOTION-CONNECT 800PLUS**
4 mm^2	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
6 mm^2	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
10 mm^2	without	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
	with	≤ 500 m (1641 ft)	≤ 100 m (328 ft)
16 mm^2	without/with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
25 mm^2	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
35 mm^2	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
50 mm^2	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
70 mm^2	without	≤ 100 m (328 ft)	–

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Technical specifications

Power cables	MOTION-CONNECT 500 6FX500.-.....-....	MOTION-CONNECT 800PLUS 6FX800.-.....-....
Approvals, according to		
• VDE[1]	Yes	Yes
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No. [2]	Yes	Yes
• RoHS conformity	Yes	Yes
Rated voltage U_0/U in accordance with EN 50395		
• 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)
Test voltage, rms		
• Power conductors	4 kV	4 kV
• Signal conductors	2 kV	2 kV
Operating temperature on the surface		
• 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)
Tensile stress, max.		
• Fixed installation	50 N/mm^2 (7252 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)
• Flexible installation	20 N/mm^2 (2901 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)
Smallest bending radius		
• Fixed installation	5 × D_{max}	4 × D_{max}
• Flexible installation	See power cables	See power cables
Torsional stress	Absolute 30°/m	Absolute 30°/m
Bending	100000	10 million
Traversing velocity	30 m/min (98.43 ft/min)	Up to 300 m/min (984 ft/min)
Acceleration	2 m/s^2 (6.56 ft/s^2)	Up to 50 m/s^2 (164 ft/s^2), see characteristic curves
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color orange RAL 2003
Flame-retardant	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 plugged: IP67.

[1] The respective registration number is printed on the cable jacket (only applies to power cables).
[2] The file number is printed on the cable jacket.

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Selection and ordering data

For 1FK7 motors without brake, with SPEED-CONNECT connector on SINAMICS S110 and S120 Power Modules

Connection method, Power Module end	No. of cores × cross-section	Connector size, motor end	**Pre-assembled cable without brake cores**	**Cable sold by the meter[1] without brake cores**	D_{max}		Weight (without connector)		Smallest perm. bending radius[2]	
					6FX5	**6FX8**	**6FX5**	**6FX8**	**6FX5**	**6FX8**
	mm²		Order No.	Order No.	mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5	1	**6FX■002-5CG10-....**	**6FX■008-1BB11-....**	8.4 (0.33)	9.5 (0.37)	0.12 (0.08)	0.15 (0.10)	155 (6.10)	75 (2.95)
		1.5	**6FX■002-5CG22-....**							
	4 × 2.5	1	**6FX■002-5CG12-....**	**6FX■008-1BB21-....**	10 (0.39)	11 (0.43)	0.21 (0.14)	0.20 (0.13)	180 (7.09)	90 (3.54)
		1.5	**6FX■002-5CG32-....**							
	4 × 4	1.5	**6FX■002-5CG42-....**	**6FX■008-1BB31-....**	11.4 (0.45)	12.1 (0.48)	0.27 (0.18)	0.27 (0.18)	210 (8.27)	100 (3.94)
	4 × 6	1.5	**6FX■002-5CG52-....**	**6FX■008-1BB41-....**	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	**6FX■002-5CG62-....**	**6FX■008-1BB51-....**	20 (0.79)	18.2 (0.72)	0.73 (0.49)	0.62 (0.42)	360 (14.17)	140 (5.51)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800PLUS			**8**			**8**				
Length code			**....**			**....**				

For 1FK7 motors with brake, with SPEED-CONNECT connector on SINAMICS S110 and S120 Power Modules

Connection method, Power Module end	No. of cores × cross-section	Connector size, motor end	**Pre-assembled cable with brake cores**	**Cable sold by the meter[1] with brake cores**	D_{max}		Weight (without connector)		Smallest perm. bending radius[2]	
					6FX5	**6FX8**	**6FX5**	**6FX8**	**6FX5**	**6FX8**
	mm²		Order No.	Order No.	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	**6FX■002-5DN30-....**	**6FX■008-1BA11-....**	10.8 (0.43)	12 (0.47)	0.22 (0.15)	0.16 (0.11)	195 (7.68)	90 (3.54)
	4 × 1.5+2 × 1.5	1	**6FX■002-5DG10-....**	**6FX■008-1BA11-....**	10.8 (0.43)	12 (0.47)	0.22 (0.15)	0.16 (0.11)	195 (7.68)	90 (3.54)
		1.5	**6FX■002-5DG22-....**							
	4 × 2.5+2 × 1.5	1	**6FX■002-5DG12-....**	**6FX■008-1BA21-....**	12.4 (0.49)	13.8 (0.54)	0.25 (0.17)	0.30 (0.20)	225 (8.86)	105 (4.13)
		1.5	**6FX■002-5DG32-....**							
	4 × 4+2 × 1.5	1.5	**6FX■002-5DG42-....**	**6FX■008-1BA31-....**	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	**6FX■002-5DG52-....**	**6FX■008-1BA41-....**	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	**6FX■002-5DG62-....**	**6FX■008-1BA51-....**	21.7 (0.85)	20.1 (0.79)	0.81 (0.54)	0.71 (0.48)	395 (15.55)	150 (5.91)
MOTION-CONNECT 500			**5**			**5**				
MOTION-CONNECT 800PLUS			**8**			**8**				
Length code			**....**			**....**				

[1] Note type of delivery.

[2] Valid for installation in a cable carrier.

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Extensions for power cables with SPEED-CONNECT connector

Accessories

Extensions for power cables with SPEED-CONNECT connector

No. of cores × cross-section		Connector size, motor end	Basic cable for motors connected to SINAMICS S110 and S120	**Extension**
Without brake cores	With brake cores		Power Modules	
mm^2	mm^2		Type	Order No.
–	4 × 1.5 + 2 × 1.5	0.5	6FX5 002-5DN30-....	**6FX5 002-5MN05-....**
4 × 1.5	4 × 1.5 + 2 × 1.5	1	6FX . 002-5 . G10-....	**6FX■002-5■N05-....**
		1.5	6FX . 002-5 . G22-....	**6FX■002-5■Q28-....**
4 × 2.5	4 × 2.5 + 2 × 1.5	1	6FX . 002-5 . G12-....	**6FX■002-5■Q15-....**
		1.5	6FX . 002-5 . G32-....	**6FX■002-5■Q38-....**
4 × 4	4 × 4 + 2 × 1.5	1.5	6FX . 002-5 . G42-....	**6FX■002-5■Q48-....**
4 × 6	4 × 6 + 2 × 1.5	1.5	6FX . 002-5 . G52-....	**6FX■002-5■Q58-....**
4 × 10	4 × 10 + 2 × 1.5	1.5	6FX . 002-5 . G61-....	**6FX■002-5■A68-....**
			6FX . 002-5 . G62-....	**6FX■002-5■Q68-....**
		3[1]	6FX . 002-5 . G13-....	**6FX■002-5■X18-....**
4 × 16	4 × 16 + 2 × 1.5	3[1]	6FX . 002-5 . G23-....	**6FX■002-5■X28-....**
–	4 × 25 + 2 × 1.5	3[1]	6FX . 002-5DG33-....	**6FX■002-5DX38-....**
–	4 × 35 + 2 × 1.5	3[1]	6FX . 002-5DG43-....	**6FX■002-5DX48-....**
–	4 × 50 + 2 × 1.5	3[1]	6FX . 002-5DG53-....	**6FX■002-5DX58-....**

MOTION-CONNECT 500	5	**5**	
MOTION-CONNECT 800PLUS	8	**8**	
Without brake cores			**C**
With brake cores			**D**
Length code			**....**

The maximum specified cable length (basic cable and extensions) must not be exceeded.
For power cables with brake cores, the total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

[1] Connector at motor end with full-thread only.

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Selection and ordering data

For 1PH8 motors with terminal boxes on SINAMICS S110 and S120 Power Modules

Motor Type	Thread	No. of cores × cross-section mm²	Connection method Power Module end	**Pre-assembled cable** Order No.	**Cable sold by the meter**[1] Order No.	D_{max} mm (in)	Weight (without thread) kg/m (lb/ft)	Smallest perm. bending radius[2] mm (in)
1PH808	M25	4 × 2.5	Exposed core ends[3]	**6FX8002-5CR10-....** –	**6FX8008-1BB21-....** **6FX5008-1BB21-....**	11 (0.43) 10 (0.39)	0.20 (0.13) 0.21 (0.14)	90 (3.54) 180 (7.09)
		4 × 4		**6FX8002-5CR20-....** –	**6FX8008-1BB31-....** **6FX5008-1BB31-....**	12.3 (0.48) 11.4 (0.45)	0.27 (0.18) 0.27 (0.18)	100 (3.94) 210 (8.27)
1PH810	M32	4 × 2.5	Exposed core ends[3]	**6FX8002-5CR11-....** –	**6FX8008-1BB21-....** **6FX5008-1BB21-....**	11 (0.43) 10 (0.39)	0.20 (0.13) 0.21 (0.14)	90 (3.54) 180 (7.09)
		4 × 4		**6FX8002-5CR21-....** –	**6FX8008-1BB31-....** **6FX5008-1BB31-....**	12.3 (0.48) 11.4 (0.45)	0.27 (0.18) 0.27 (0.18)	100 (3.94) 210 (8.27)
		4 × 10		**6FX8002-5CR41-....** –	**6FX8008-1BB51-....** **6FX5008-1BB51-....**	18.2 (0.72) 20 (0.79)	0.62 (0.42) 0.73 (0.49)	140 (5.51) 360 (14.17)
1PH813	M40	4 × 10	Exposed core ends[3]	**6FX8002-5CR42-....** –	**6FX8008-1BB51-....** **6FX5008-1BB51-....**	18.2 (0.72) 20 (0.79)	0.62 (0.42) 0.73 (0.49)	140 (5.51) 360 (14.17)
	M50			**6FX8002-5CR43-....** –				
	M40	4 × 16		**6FX8002-5CR52-....** –	**6FX8008-1BB61-....** **6FX5008-1BB61-....**	22.3 (0.88) 24.2 (0.95)	1.01 (0.68) 1.10 (0.74)	170 (6.69) 440 (17.32)
	M50			**6FX8002-5CR53-....** –				
	M40	4 × 35		**6FX5002-5CR72-....**	**6FX5008-1BB35-....** **6FX8008-1BA35-....**	31.5 (1.24)	1.93 (1.3)	570 (22.44)
	M50			**6FX5002-5CR73-....**				
	M50	4 × 50		**6FX5002-5CR83-....**	**6FX5008-1BB50-....** **6FX8008-1BA50-....**	38 (1.50)	3.04 (2.04)	685 (26.97)
1PH816	M50	4 × 16	Exposed core ends[3]	**6FX8002-5CR53-....** –	**6FX8008-1BB61-....** **6FX5008-1BB61-....**	22.3 (0.88) 24.2 (0.95)	1.01 (0.68) 1.10 (0.74)	170 (6.69) 440 (17.32)
		4 × 35		**6FX5002-5CR73-....**	**6FX5008-1BB35-....** **6FX8008-1BA35-....**	31.5 (1.24)	1.93 (1.3)	570 (22.44)
		4 × 50		**6FX5002-5CR83-....**	**6FX5008-1BB50-....** **6FX8008-1BA50-....**	38 (1.50)	3.04 (2.04)	685 (26.97)
	M63	4 × 25		-	**6FX5008-1BB25-....** **6FX8008-1BA25-....**	28 (1.10)	1.62 (1.09)	505 (19.88)
		4 × 35		-	**6FX5008-1BB35-....** **6FX8008-1BA35-....**	31.5 (1.24)	1.93 (1.3)	570 (22.44)
		4 × 50		-	**6FX5008-1BB50-....** **6FX8008-1BA50-....**	38 (1.50)	3.04 (2.04)	685 (26.97)
		4 × 70		-	**6FX5008-1BB70- ....**	42.6 (1.68)	3.96 (2.66)	770 (30.31)

MOTION-CONNECT 500	5			5		
MOTION-CONNECT 800PLUS	8			8		
Length code		....			....	

[1] Note type of delivery.

[2] Valid for installation in a cable carrier.

[3] 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 delivery of the cables.

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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
- Pre-assembled MOTION-CONNECT signal cables

Type of delivery of pre-assembled signal cables

Pre-assembled signal cables can be ordered in length units of 10 cm (3.94 in).

Cables up to 30 kg (66.2 lb) or 100 m (328 ft) are supplied as coils; above this, they are supplied on drums.

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. in the event of a connection outside the cabinet between

- Motor Modules and Sensor Modules
- Motor Modules and motors with DRIVE-CLiQ interface

MOTION-CONNECT DRIVE-CLiQ signal cables have 24 V DC cores.

Pre-assembled MOTION-CONNECT signal cables

are used whenever motor encoders on motors without DRIVE-CLiQ interface are connected to Sensor Modules.

If pre-assembled signal cables are installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connectors 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.

All 6FX.002-2C...-.... 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 separately supplied connector enclosure **for the motor end**. In this case, the 6th position of the Order No. must be changed from **0** to **4**:
6FX.0**4**2-2C...-....

Signal cables with separately supplied connector enclosure **for the module end**. In this case, the 6th position of the Order No. must be changed from **0** to **1**:
6FX.0**1**2-2C...-....

Note:

Once the contacts have latched into the insulator, they can no longer be removed.

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Technical specifications

DRIVE-CLiQ signal cables	DRIVE-CLiQ 6FX2...-1DC..-....	DRIVE-CLiQ MOTION-CONNECT 500 6FX5...-.DC..-....	DRIVE-CLiQ MOTION-CONNECT 800PLUS 6FX8...-.DC..-....
Approvals, according to			
• 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. [1]	Yes	Yes	Yes
• RoHS conformity	Yes	Yes	Yes
Rated voltage according to EN 50395	30 V	30 V	30 V
Test voltage, rms	500 V	500 V	500 V
Operating temperature on the surface			
• Fixed installation	-20 … +80 °C (-4 … +176 °F)	-20 … +80 °C (-4 … +176 °F)	-20 … +80 °C (-4 … +176 °F)
• Flexible installation	–	0 … 60 °C (32 … 140 °F)	-20 … +60 °C (-4 … +140 °F)
Tensile stress, max.			
• Fixed installation	45 N/mm^2 (6526 lb$_f$/in^2)	80 N/mm^2 (11603 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)
• Flexible installation	–	30 N/mm^2 (4351 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)
Smallest bending radius			
• 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)
Torsional stress	–	Absolute 30°/m	Absolute 30°/m
Bending	–	100000	10 million
Traversing velocity	–	30 m/min (98.4 ft/min)	300 m/min (984 ft/min)
Acceleration	–	2 m/s^2 (6.56 ft/s^2)	Up to 50 m/s^2 (164 ft/s^2), see characteristic curves
Insulation material, incl. jacket	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC Gray RAL 7032	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	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 plugged: IP67.

[1] The file number is printed on the cable jacket.

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Technical specifications (continued)

Signal cables	MOTION-CONNECT 500 6FX500.-.....-....	MOTION-CONNECT 800PLUS 6FX800.-.....-....
Approvals, according to		
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No.[1]	Yes	Yes
• RoHS conformity	Yes	Yes
Rated voltage according to EN 50395	30 V	30 V
Test voltage, rms	500 V	500 V
Operating temperature on the surface		
• 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)
Tensile stress, max.		
• Fixed installation	50 N/mm^2 (7252 lb$_f$/in^2)	50 N/mm^2 (7252 lb$_f$/in^2)
• Flexible installation	20 N/mm^2 (2901 lb$_f$/in^2)	20 N/mm^2 (2901 lb$_f$/in^2)
Smallest bending radius		
• Fixed installation	60 mm (2.36 in)	4 × D_{max}
• Flexible installation	100 mm (3.94 in)	See signal cables
Torsional stress	Absolute 30°/m	Absolute 30°/m
Bending	2 million	10 million
Traversing velocity	180 m/min (591 ft/min)	Up to 300 m/min (984 ft/min)
Acceleration	5 m/s^2 (16.41 ft/s^2)	Up to 50 m/s^2 (164 ft/s^2), see characteristic curves
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	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 plugged: IP67.

[1] The file number is printed on the cable jacket.

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Selection and ordering data

Pre-assembled DRIVE-CLiQ signal cables without 24 V DC cores

Type	Length	D_{max}	Degree of protection Connector	**DRIVE-CLiQ signal cable** without 24 V DC cores
	m (ft)	mm (in)		Order No.
Fixed lengths	0.11 (0.36)		IP20/IP20	**6SL3060-4AB00-0AA0**
	0.16 (0.52)			**6SL3060-4AD00-0AA0**
	0.21 (0.69)			**6SL3060-4AF00-0AA0**
	0.26 (0.85)			**6SL3060-4AH00-0AA0**
	0.31 (1.02)			**6SL3060-4AK00-0AA0**
	0.36 (1.18)			**6SL3060-4AM00-0AA0**
	0.41 (1.35)			**6SL3060-4AP00-0AA0**
	0.60 (1.97)			**6SL3060-4AU00-0AA0**
	0.95 (3.12)			**6SL3060-4AA10-0AA0**
	1.20 (3.94)			**6SL3060-4AW00-0AA0**
	1.45 (4.76)			**6SL3060-4AF10-0AA0**
	2.80 (9.19)			**6SL3060-4AJ20-0AA0**
	5.00 (16.41)			**6SL3060-4AA50-0AA0**
To the meter	max. 70 (230)	7.0 (0.28)	IP20/IP20	**6FX2002-1DC00-....**
To the meter	max. 70 (230)	7.0 (0.28)	IP67/IP67	**6FX2002-1DC20-....**
Length code				**....**

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MOTION-CONNECT DRIVE-CLiQ signal cables with 24 V DC cores

Selection and ordering data (continued)

Pre-assembled MOTION-CONNECT DRIVE-CLiQ signal cables with 24 V DC cores

Type	Application	Length, max.	D_{max}	Degree of protection Connector	**MOTION-CONNECT DRIVE-CLiQ signal cable** with 24 V DC cores
		m (ft)	mm (in)		Order No.
To the meter	For components with DRIVE-CLiQ interface in the control cabinet, e.g. SINAMICS S120 Power Modules	100 (328)	7.1 (0.28)	IP20/IP20	**6FX5002-2DC00-....**
		75 (246)	7.1 (0.28)	IP20/IP20	**6FX8002-2DC00-....**
To the meter	For encoder systems with DRIVE-CLiQ, built into or onto 1FK7/1PH8 motors For connecting the motors to SINAMICS S120 Power Modules	100 (328)	7.1 (0.28)	IP20/IP67	**6FX5002-2DC10-....**
		75 (246)	7.1 (0.28)	IP20/IP67	**6FX8002-2DC10-....**
To the meter	For encoder systems with DRIVE-CLiQ, built into or onto 1FK7/1PH8 motors For the connection between motors	100 (328)	7.1 (0.28)	IP67/IP67	**6FX5002-2DC20-....**
		75 (246)	7.1 (0.28)	IP67/IP67	**6FX8002-2DC20-....**

MOTION-CONNECT 500	5	
MOTION-CONNECT 800PLUS	8	
Length code		**....**

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Selection and ordering data (continued)

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**
			m (ft)	mm (in)		Order No.	Order No.
Incremental encoder sin/cos 1 V_{pp} 2048 S/R	1FK701	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	**6FX■002-2CN20-....**	**6FX8002-2CN24-....**
Incremental encoder sin/cos 1 V_{pp} 2048 S/R, with C and D tracks	1FK7[1]	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	**6FX■002-2CQ31-....**	**6FX■002-2CQ34-....**
Absolute encoder with EnDat	1FK701	SMC20	50 (164)	9.8 (0.39)	IP20/IP67	**6FX■002-2EN20-....**	**6FX8002-2EN24-....**
Absolute encoder with EnDat	1FK7[1]	SMC20	100 (328)	9.8 (0.39)	IP20/IP67	**6FX■002-2EQ31-....**	**6FX■002-2EQ34-....**
Resolver							
• Multi-pole	1FK701	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	**6FX■002-2CN20-....**	**6FX8002-2CN24-....**
• 2-pole	1FK701	SMC10	130 (427)	9.2 (0.36)	IP20/IP67	**6FX■002-2CN20-....**	**6FX8002-2CN24-....**
MOTION-CONNECT 500						**5**	**5**
MOTION-CONNECT 800PLUS						**8**	**8**
Length code						**....**	**....**

Pre-assembled MOTION-CONNECT 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**
			m (ft)	mm (in)		Order No.	Order No.
Absolute encoder with SSI 6FX2001-5.S 24 V DC, clock-pulse rate 100 ... 250 kHz		SMC30 CU310-2	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2CC11-....**	**6FX■002-2CB54-....**
Absolute encoder with EnDat 6FX2001-5.E		SMC20	100 (328)	9.2 (0.36)	IP20/IP67	**6FX■002-2CH00-....**	**6FX■002-2AD04-....**
Resolver							
• Multi-pole	1FK7[1]	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	**6FX■002-2CF02-....**	**6FX■002-2CF04-....**
• 2-pole	1FK7[1]	SMC10	130 (427)	9.2 (0.36)	IP20/IP67	**6FX■002-2CF02-....**	**6FX■002-2CF04-....**
HTL incremental encoder	1PH8	SMC30	300 (984)[2]	9.3 (0.37)	IP20/IP67	**6FX■002-2AH00-....**	**6FX■002-2AH04-....**
HTL incremental encoder 5 V DC	1PH8	CU310-2	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2AH11-....**	–
HTL incremental encoder 24 V DC 6FX2001-4		SMC30	100 (328)	9.3 (0.37)	–/IP67	**6FX5002-2CA12-....**	–
TTL incremental encoder RS422 6FX2001-2							
• 5 V DC		SMC30 CU310-2	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2CR00-....**	**6FX■002-2CB54-....**
• 24 V DC		SMC30 CU310-2	100 (328)	9.3 (0.37)	IP20/IP67	**6FX■002-2CD24-....**	**6FX■002-2CB54-....**
HTL incremental encoder 5 V DC	1LA	CU310-2	100 (328)	8.0 (0.31)	IP20/IP67	**6SX7002-0AN30-....**	–
HTL incremental enc.1XP8001-1	1LA						
• Signals A, B		SMC30	100 (328)	6.3 (0.25)	IP20/IP67	**6SX7002-0AL00-....**	–
• Signals A*, A, B*, B, R*, R		SMC30	300 (984)[2]	8.0 (0.31)	IP20/IP67	**6SX7002-0AN00-....**	–
• Signals A*, A, B*, B, R*, R with right-angled connector		SMC30	300 (984)[2]	8.0 (0.31)	IP20/IP67	**6SX7002-0AN10-....**	–
Incremental encoder sin/cos 1 V_{pp} 6FX2001-3		SMC20	50 (164)	9.3 (0.37)	IP20/IP67	**6FX■002-2CG00-....**	**6FX■002-2CB54-....**
MOTION-CONNECT 500						**5**	**5**
MOTION-CONNECT 800PLUS						**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.

[1] Not for 1FK701 motors.

[2] With evaluation of difference signals A*, A, B*, B, otherwise ≤ 100 m (328 ft).

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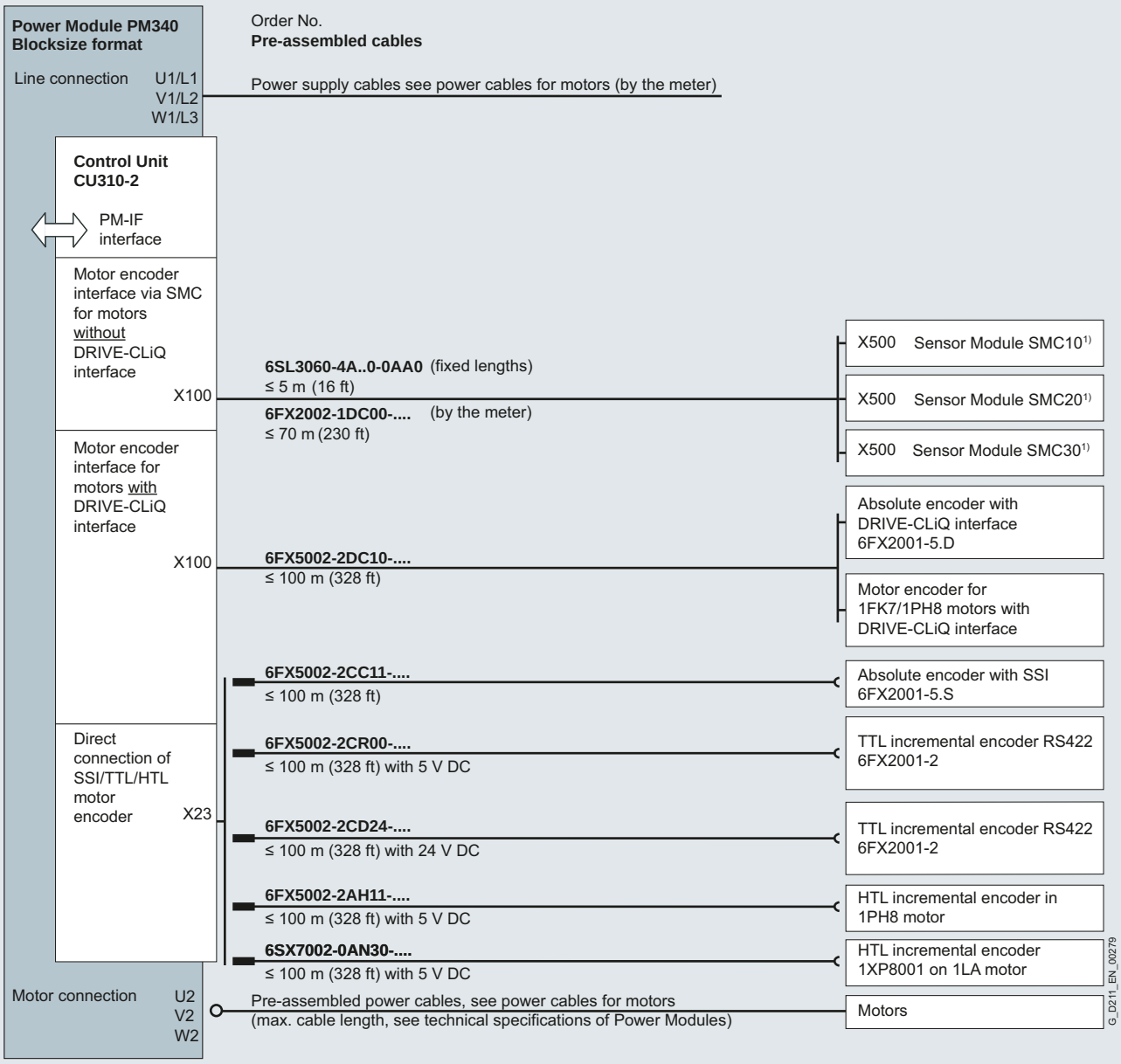
Integration

Connection overview of SINAMICS S110 and S120 Power Modules in blocksize format with CU310-2 Control Unit for motors with/without DRIVE-CLiQ interface



1) See connection overviews for SMC10/SMC20/SMC30.

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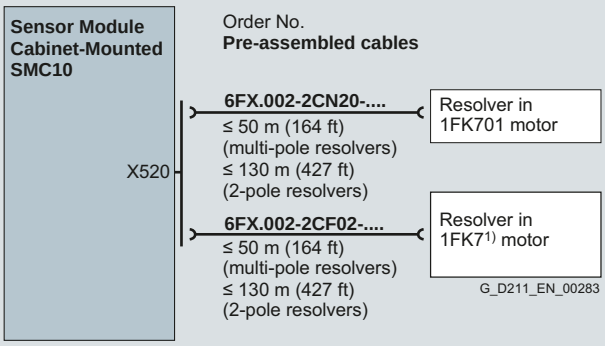
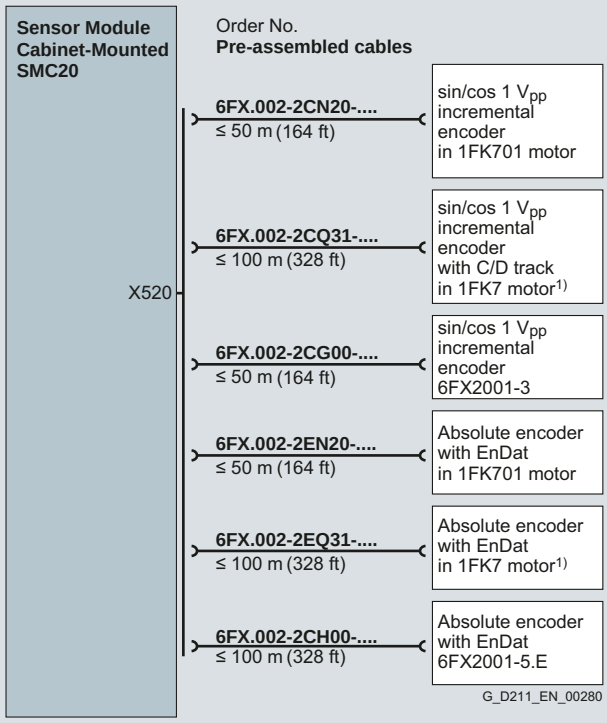
Integration (continued)

Connection overview for SINAMICS S110 and S120 SMC10 Sensor Module Cabinet-Mounted



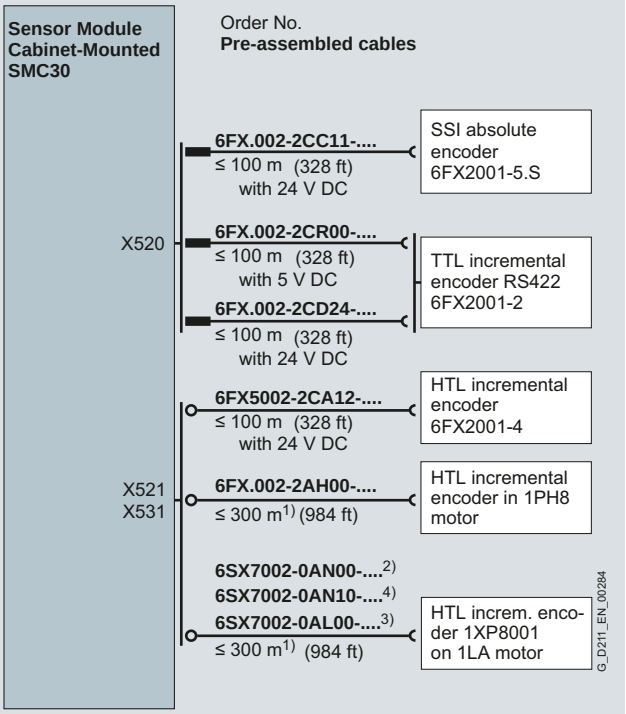
1) Not for 1FK701 motors.

Connection overview for SINAMICS S110 and S120 SMC20 Sensor Module Cabinet-Mounted



1) Not for 1FK701 motors.

Connection overview for SINAMICS S110 and S120 SMC30 Sensor Module Cabinet-Mounted



1) With evaluation of difference signals A*, A and B*, B, otherwise ≤ 100 m (328 ft).
2) Signals A*, A, B*, B, R*, R.
3) Signals A, B.
4) With right-angled connector.

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Length code

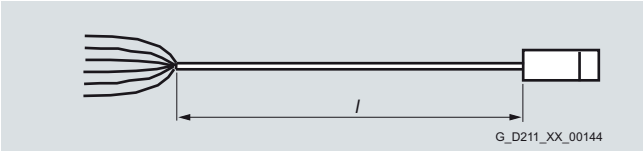
Overview

Description	Order No. supplement			
Length code for pre-assembled cables				
	6FX....-.....-	■	■	■	■
	6SX....-.....-	■	■	■	**0**
0 m (0 ft)		**1**			
100 m (328 ft)		**2**			
200 m (656 ft)		**3**			
0 m (0 ft)			**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 (0 ft)				**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 ft)					**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 (19.96 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

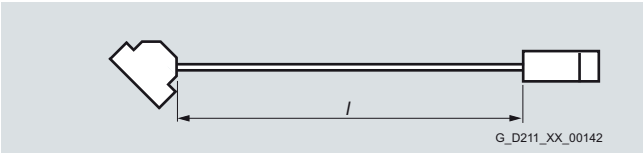
Description	Order No. supplement				
Length code for power and signal cables, sold by the meter [1]					
	6FX.008-.....-	■	■	**A**	**0**
50 m (164 ft)		**1**	**F**		
100 m (328 ft)		**2**	**A**		
200 m (656 ft)		**3**	**A**		
500 m (1641 ft)		**6**	**A**		

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 %

[1] Note type of delivery.

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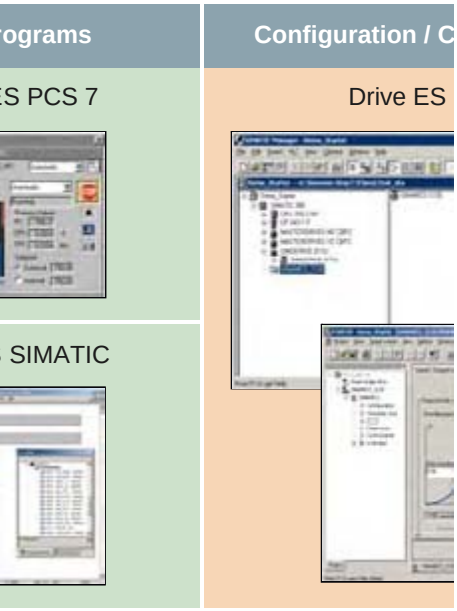
Engineering tools



14/2 **DT Configurator selection guide**
14/2 Overview
14/3 Selection and ordering data
14/3 More information

14/4 **SIZER for Siemens Drives engineering tool**
14/4 Overview
14/4 Selection and ordering data
14/4 More information

14/5 **STARTER commissioning tool**
14/5 Overview
14/5 Selection and ordering data
14/6 Accessories
14/6 More information

14/7 **SINAMICS StartDrive commissioning tool**
14/7 Overview
14/7 Benefits
14/7 Integration
14/7 Selection and ordering data

14/8 **Drive ES engineering software**
14/8 Overview
14/8 Application
14/9 Selection and ordering data
14/9 More information

14/10 **SinaSave energy-saving program**
14/10 Overview
14/10 Function
14/10 More information

14/11 **CAD CREATOR**
14/11 Overview
14/11 Selection and ordering data
14/11 Benefits
14/11 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

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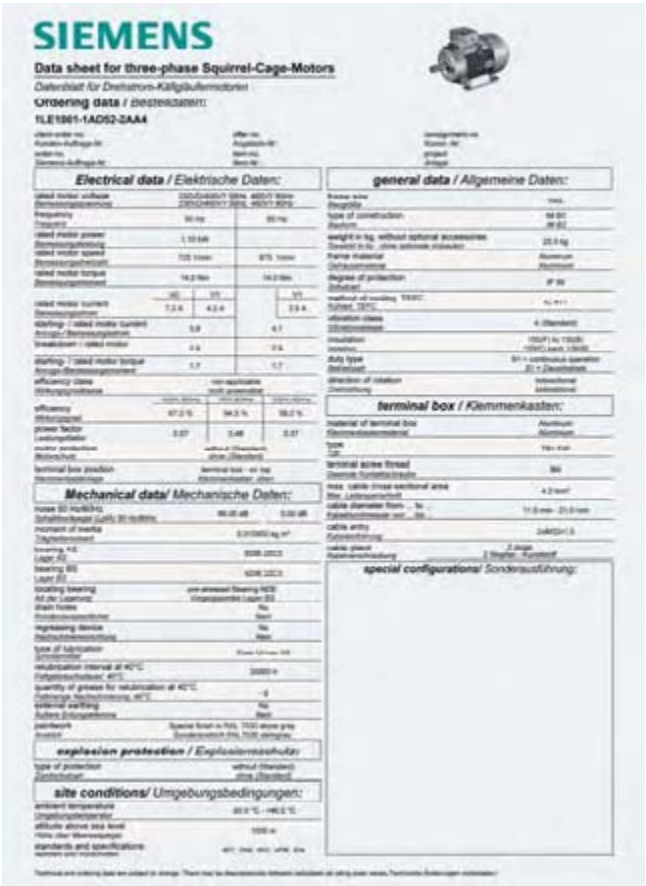
DT Configurator selection guide

Overview

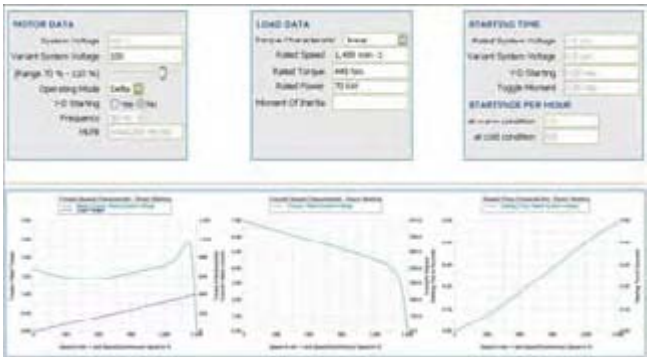
Product description

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.



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.

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Overview

Product range

The DT Configurator encompasses the following:

- Product range for low-voltage motors
- MICROMASTER 4 inverters
- SINAMICS G110 standard inverters
- SINAMICS G120 standard inverters
- SINAMICS G110D distributed inverters
- SINAMICS G120D distributed inverters
- SINAMICS S110 servo drives
- Frequency converters for SIMATIC ET 200S FC distributed I/O
- Frequency converters for SIMATIC ET 200pro FC distributed I/O

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 4.0 (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

Selection and ordering data

Description	Order No.
Interactive catalog CA 01 DVD-ROM including selection guide DT Configurator, English	**E86060-D4001-A510-D1-7600**

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

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

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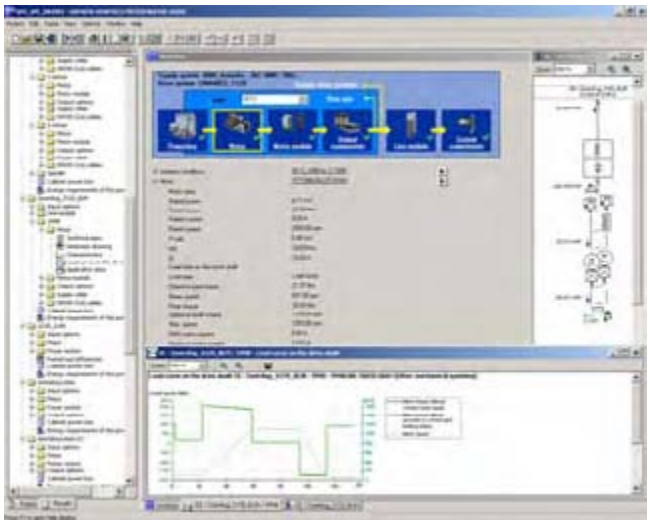
SIZER for Siemens Drives engineering tool

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, MICROMASTER 4, DYNAVERT T, SIMATIC ET 200S FC and SIMATIC ET 200pro FC drive systems
- Motor starters
- SINUMERIK CNC control
- SIMOTION Motion Control System
- SIMATIC Technology

It provides support when selecting the technologies involved in the hardware and firmware components required for a drive task. SIZER for Siemens Drives supports the complete configuration of the 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
- Comments on system reactions
- 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 English, French, German, Italian, Chinese and Japanese

System requirements

- PG or PC with Pentium III min. 800 MHz (recommended > 1 GHz)
- 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 Windows system drive
- Screen resolution 1024 × 768 pixels (1280 × 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.
SIZER for Siemens Drives engineering tool DVD-ROM English, French, German, Italian	**6SL3070-0AA00-0AG0**

More information

The SIZER for Siemens Drives engineering tool is available free on the Internet at:
www.siemens.com/sizer

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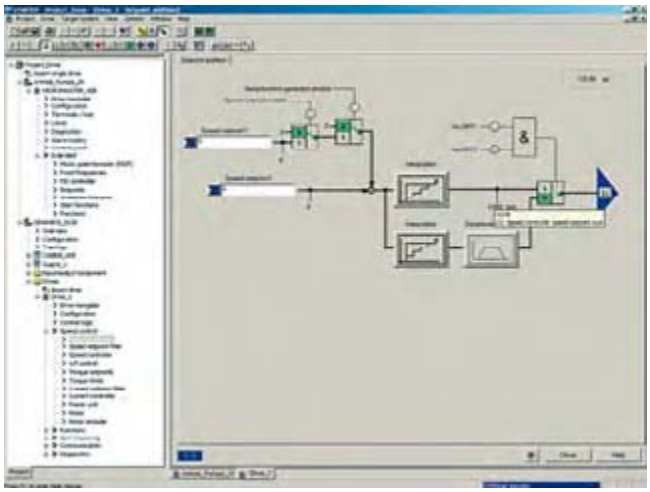
STARTER commissioning tool

Overview



The user-friendly STARTER commissioning tool can be used for:

- Commissioning
- Optimization
- 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 STARTER, MICROMASTER 4 devices and the SIMATIC ET 200S FC and SIMATIC ET 200pro FC frequency converters are also supported in addition to the SINAMICS drives.

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 < FW V4.4
  - SINAMICS G110D
  - SINAMICS G120D
  - SIMATIC ET 200S FC
  - SIMATIC ET 200pro FC)

Diagnostics functions provide information about:

- Control/status words
- Parameter status
- Operating conditions
- 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.

System requirements V4.2 and higher

- PG or PC Pentium III min. 1 GHz (recommended > 1 GHz)
- 1 GB RAM (recommended 2 GB RAM)
- Screen resolution 1024 × 768 pixels, 16 bit color depth
- Free hard disk memory min. 3 GB
- Operating system:
  - Windows 2000 SP4
  - Windows 2003 Server SP2
  - Windows 2008 Server
  - Windows XP Professional SP3
  - Windows 7 Professional 32 bit
  - Windows 7 Ultimate 32 bit
- Microsoft Internet Explorer V6.0 and higher

Selection and ordering data

Description	Order No.
STARTER commissioning tool for SINAMICS and MICROMASTER DVD-ROM English, French, German, Italian, Spanish	**6SL3072-0AA00-0AG0**

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STARTER commissioning tool

Accessories

Connection

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

Selection and ordering data (Accessories)

Description		Recommended accessories for communication between the drive unit and the programming device or PC Order No.
SINAMICS G110		
• RS232	**PC inverter connection kit** Scope of delivery: 9-pin SUB-D connector RS232 standard cable, 3 m (9.84 ft) STARTER commissioning tool on DVD-ROM	**6SL3255-0AA00-2AA1**
SINAMICS G120		
• PROFIBUS	**SIMATIC DP plug-in cable** 12 MBaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–
• USB	**PC inverter connection kit 2** For Control Units CU230.-2, CU240.-2 and SINAMICS G120C Scope of delivery: USB cable, 3 m (9.84 ft) STARTER commissioning tool on DVD-ROM	**6SL3255-0AA00-2CA0**
	Standard Mini B5 USB cable for Control Units CU230.-2, CU240.-2 and SINAMICS G120C	–
SINAMICS G110D		
• Optical	**USB interface cable** For communication with a PC, 2.5 m (8.2 ft)	**6SL3555-0PA00-2AA0**
SINAMICS G120D		
• Optical	**USB interface cable** For communication with a PC, 2.5 m (8.2 ft)	**6SL3555-0PA00-2AA0**
• PROFIBUS	Connection to the PROFIBUS system in the plant	–
• PROFINET/ Ethernet	Connection to the PROFINET system in the plant	–
SINAMICS S110		
• RS232	**SIMATIC S7 connecting cable** Null modem cable, 6 m (19.7 ft)	**6ES7901-1BF00-0XA0**
• PROFIBUS	**CP 5512 PROFIBUS communications module** PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/ Windows XP Professional and PCMCIA 32	**6GK1551-2AA00**
	CP 5711 PROFIBUS communications module USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m/6.56 ft) included in scope of delivery	**6GK1571-1AA00**
	SIMATIC DP plug-in cable 12 MBaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–
SINAMICS S120		
• RS232	**SIMATIC S7 connecting cable** Null modem cable, 6 m (19.7 ft)	**6ES7901-1BF00-0XA0**
• PROFIBUS	**CP 5512 PROFIBUS communications module** PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/ Windows XP Professional and PCMCIA 32	**6GK1551-2AA00**
	CP 5711 PROFIBUS communications module USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m/6.56 ft) included in scope of delivery	**6GK1571-1AA00**
	SIMATIC DP plug-in cable 12 MBaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	**6ES7901-4BD00-0XA0**
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–

More information

The STARTER commissioning tool is also available for update purposes on the Internet at www.siemens.com/starter

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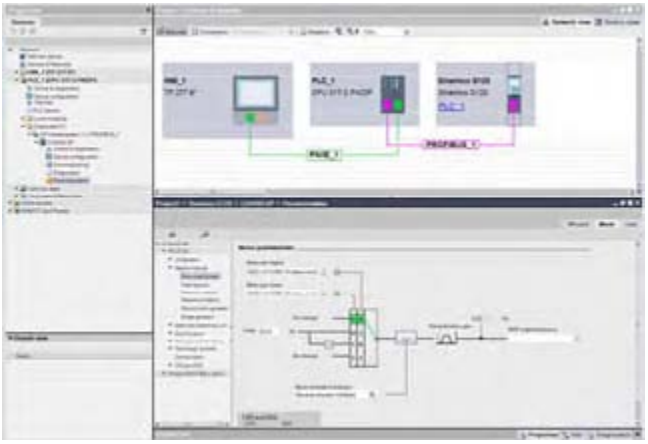
Overview



SINAMICS StartDrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal.

With SINAMICS StartDrive, drive tasks can be commissioned with the SINAMICS G120 inverter. The engineering tool has been optimized with regard to user friendliness and consistent use of the TIA Portal technologies.

Benefits

- With the TIA Portal framework, the SINAMICS converters and inverters can be integrated easily into your automation solution without the need for any additional tool
- Time-saving configuring thanks to simple and efficient parameter assignment with shortcut menus, fast startup wizard, and graphical user interface
- Reduction in plant downtimes thanks to integrated diagnostics functions for the drives
- Shorter commissioning times for the converters and inverters thanks to an integral control panel for direct operation of the drive from the TIA Portal
  - Device configuration and network connection in the TIA Portal wide configuration/network editor
  - Access to devices across network boundaries (routing)
  - Solution-oriented dialog-based user guidance simplifies commissioning
  - User-friendly drive parameterization using the wizard, parameterization screen forms, and structured parameter list
  - Integral diagnostics function provides information about:
    - Control/status words
    - Parameter status
    - Operating conditions
    - Communication statuses

Integration

Engineering in the TIA Portal

All the software packages based on the TIA Portal are harmonized with each other and offer further benefits:

- Reduction in the familiarization overhead thanks to cross-tool uniformity of the operator inputs
- Constant data consistency across all engineering tools
- Avoidance of duplicated inputs
- Shared project storage for all devices in the project

Supported inverters

The drives are being integrated in stages. The following SINAMICS G120 devices can be configured in SINAMICS StartDrive:

- CU240E-2 DP incl. all combinable Power Modules
- CU240B-2 DP incl. all combinable Power Modules

The software can be installed and operated as an optional package to SIMATIC STEP 7.

System requirements

- PG or PC with 2.0 GHz Core 2 Duo processor
- DVD drive
- SVGA 1024 × 768
- 1 GB RAM
- Free hard disk memory: 2 GB
- Operating system:
  - Windows 2003 Server R2 StdE SP2
  - Windows 2008 Server R2 StdE SP2
  - Windows XP Professional SP3
  - Windows 7 Professional / Enterprise / Ultimate 32 bit
  - Windows 7 Professional / Enterprise / Ultimate 64 bit

Selection and ordering data

Description	Order No.
SINAMICS StartDrive commissioning tool English, French, German, Italian, Spanish, Chinese (simplified)	**6SL3072-4AA02-0XG0**

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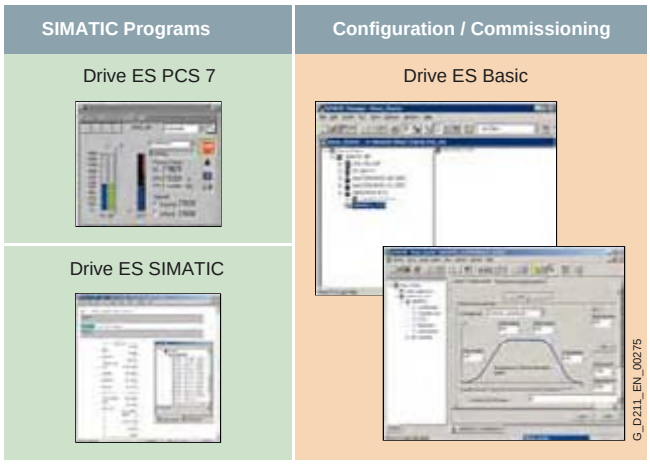
Drive ES engineering software

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 software. Drive ES Basic is the starting point for common data archiving for complete projects and for extending the use of the SIMATIC teleservice to drives. Drive ES Basic provides the configuration tools for the new Motion Control functions – slave-to-slave communication, equidistance and isochronous operation 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 and eliminates time-consuming programming. It requires STEP 7 to be installed. It features a SIMATIC function block library, thereby making the programming of the PROFIBUS and/or PROFINET IO interface in the SIMATIC CPU for the drives easy and secure.
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 user-specific projects.
Frequently used functions are set to run in program format:

- 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 (DRVUSSS7 function block library)
- **STEP 7 slave object manager** for easy configuration of drives and 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 integral PN interface, SIMATIC S7-400 with CPUs with integral PN interface or with CP (DRVDPS7 function 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 or 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

- **Function 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 convenient configuration of drives and non-cyclic PROFIBUS DP communication with the drives
- **SETUP program** for installing the software in the PCS 7 environment

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Selection and ordering data

Description	Order No.
Drive ES Basic V5.5 SPx *)	
Configuration software for the integration of drives into TIA (Totally Integrated Automation) Precondition: STEP 7 from V5.3, SP3 and higher Supplied as: DVD Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Floating license, 1 user	**6SW1700-5JA00-5AA0**
• Floating license (copy license), 60 users	**6SW1700-5JA00-5AA1**
• Update service for single-user license	**6SW1700-0JA00-0AB2**
• Update service for copy license, 60 users	**6SW1700-0JA00-1AB2**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JA00-5AA4**
Drive ES SIMATIC V5.5 SPx *)	
Function block library for SIMATIC for the parameterization of communication with the drives Precondition: STEP 7 from V5.3, SP3 and higher Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-5JC00-5AA0**
• Runtime license (without data carrier)	**6SW1700-5JC00-1AC0**
• Upgrade from V5.x to V5.5 SPx *)	**6SW1700-5JC00-5AA4**
Drive ES PCS 7 V6.1 SPx *)	
Function block library for PCS 7 for the integration of drives Precondition: PCS 7 V6.1 and higher Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-6JD00-1AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
Drive ES PCS 7 V7.0 SPx *)	
Function block library for PCS 7 for the integration of drives Precondition: PCS 7 V7.0 and higher Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-0AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V5.x to V7.0 SPx *)	**6SW1700-7JD00-0AA4**
Drive ES PCS 7 V7.1 SPx *)	
Function block library for PCS 7 for the integration of drives Precondition: PCS 7 V7.1 and higher Supplied as: CD-ROM Languages: Eng, Fr, Ger, It, Sp with electronic documentation	
• Single-user license incl. 1 runtime license	**6SW1700-7JD00-1AA0**
• Runtime license (without data carrier)	**6SW1700-5JD00-1AC0**
• Update service for single-user license	**6SW1700-0JD00-0AB2**
• Upgrade from V6.x to V7.1 SPx *)	**6SW1700-7JD00-1AA4**

*) Orders are always automatically supplied with the latest SP.

More information

More information is available on the Internet at:
www.siemens.com/drivesolutions

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SinaSave energy-saving program

Overview

SinaSave calculates the possible potential for savings for a specific application from the characteristic values of the plant. From the total monthly savings for the application and the purchase price and installation costs for the motor or frequency converter, the amortization time is calculated – in many cases just a few months.

Product range

SinaSave covers the product range of low-voltage motors/ energy-saving motors and low-voltage drives from the MICROMASTER 430 and MICROMASTER 440 product series as well as SINAMICS G110, SINAMICS G120 and SINAMICS G150 variable frequency drives.

Function

SinaSave is designed for selecting an energy-efficient motor for mains-fed operation or a frequency converter for variable-speed and thus energy-saving operation.

In mains-fed operation, you can calculate the cost savings as well as the amortization time of the Siemens energy-saving motors with High Efficiency IE2 or NEMA Premium with three cases for comparison: In comparison to motors with Standard Efficiency IE1 or EPAct, individually selected and known motors, or in comparison to known motors within an overall plant analysis.

In converter-fed operation, SinaSave takes into account all the necessary plant-specific parameters as well as the values required for the process; such as pump flowrate, the density of the transported medium and the efficiencies of the pumps, fans and compressors of the entire plant. Other basic data for the program include the number of working days and work shifts as well as the medium transport profile that decides the extent of the energy-saving effect throughout the day and the year.

From the entered plant-specific data, the program first obtains the drive system with the appropriate output and the price of the corresponding frequency converter. In a further step, the program determines the energy requirements of the variable-speed drive system and compares it to the calculated values for all alternative concepts that could be considered.

Apart from motors with High Efficiency IE2, SinaSave also contains information on low-voltage and medium-voltage frequency converters that are predestined for pump and fan applications.

The motors section was supplemented with high-torque motors and information on motors from the mechanical perspective. User-friendly functionalities such as an automatic update function and an up-to-date currency table round off the content of the energy saving tool.

More information

SinaSave is available free on the Internet at:
www.siemens.com/sinasave

More information about services for energy saving is available on the Internet:
www.siemens.com/energy-saving

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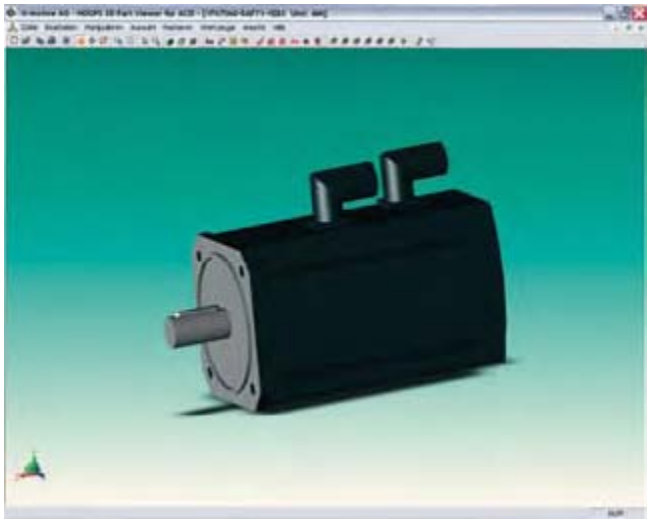
Overview

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, in addition to drafting engineers and project engineers.

Selection and ordering data

Description	Order No.
CAD CREATOR Dimension drawing and 2D/3D CAD generator on DVD-ROM English, French, German, Italian, Spanish	**6SL3075-0AA00-0AG0**

Benefits

- Provision of dimension drawings as 2D/3D CAD models in mm and inches
- Display of 2D/3D CAD models and dimension drawings on integrated viewers
- With the online version, 3D models and dimension drawings can also be displayed in the form of a 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, 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
    - Supplementary system components
    - Load-side power components
    - Encoder system connection
    - Connection system MOTION-CONNECT
  - SINUMERIK solution line
    - CNC controls
    - Operator components for CNC controls
  - 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 viewers and made available for export.

More information

The CAD CREATOR is available on DVD-ROM and as an Internet application.

You can find additional information on the Internet at:
www.siemens.com/cadcreator

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Notes

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Services and documentation

15

15/2	**Applications**
15/3	**Training**
15/3	SITRAIN
15/4	Training courses SINAMICS
15/5	SINAMICS G110 training case
15/6	**Control cabinets**
15/8	**Repair service contract RSC**
15/10	**Service & Support**
15/13	**Mechatronic Support**
15/14	**SparesOnWeb**
15/15	**My Documentation Manager**
15/16	**Documentation**
15/17	General documentation
15/18	SINAMICS S110
15/18	SINAMICS S120
15/19	Motors
15/19	Measuring systems

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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 180 application engineers in 15 countries.

Application centers

We currently have application centers in:

- Germany:
  Head Office in Erlangen and in 6 German regions, e.g. in Munich, Nuremberg, Stuttgart, Mannheim, Frankfurt, Chemnitz, Cologne, Bielefeld, Bremen, Hanover, Hamburg
- Brazil: Sao Paulo
- China: Beijing, Shanghai
- Denmark: Ballerup
- France: Paris
- Great Britain: Manchester
- India: Mumbai
- Italy: Bologna, Milan
- Japan: Tokyo, Osaka
- The Netherlands: The Hague
- Sweden: Göteborg
- Switzerland: Zurich
- South Korea: Seoul
- Turkey: Istanbul
- USA: Atlanta

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. We can 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 teleservice. For further information about servicing, please see "Service & Support".

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 can provide complete support for SIMOTION/SINAMICS! Contact your Siemens representative.

For more information, go to:
www.siemens.com/motioncontrol/apc

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Overview

Faster and more applicable know-how: Hands-on training from the manufacturer

SITRAIN® – the Siemens Training for Industry – provides you with comprehensive support in solving your tasks.

Training by the market leader in automation and plant engineering 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 SITRAIN

- 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

More information

Contact

Visit our site on the Internet at:
www.siemens.com/sitrain

or let us advise you personally. You can request our latest training catalog from:

SITRAIN Customer Support Germany:
Phone: +49 (911) 895-7575
Fax: +49 (911) 895-7576
E-mail: info@sitrain.com

Training office, US:
Phone: 1-800-241-4453
E-mail: sitrain.register.sea@siemens.com

SITRAIN highlights

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 the course time. You can therefore immediately implement your new knowledge in practice. We train you methodically on state-of-the-art 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 products from Siemens Industry 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 location.

The right mixture: Blended learning

"Blended learning" means a combination of various training media and sequences. For example, a participant based course in a Training Center can be optimally supplemented by a self-teach program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.

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Training
Training courses SINAMICS

Overview

Training courses for SINAMICS drive system

This provides an overview of the training courses available for the SINAMICS 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 SINAMICS drive system and its place in the existing Siemens drives environment very quickly.

The configuration course provides all the information you need to size 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	**Target group**						**Duration**	**Course code**
(all courses are available in English and German)	Decision-makers, sales personnel	Project managers, project assistants	Programmers	Commissioning engineers, configuring engineers	Service engineers	Maintenance personnel		
Basic courses								
Fundamentals of drive technology	✓	✓	–	✓	✓	✓	5 days	DR-GAT
SINAMICS System Overview	✓	✓	–	–	–	–	2 days	DR-SN-UEB
SINAMICS S120 Configuration	✓	✓	–	✓	–	–	5 days	DR-SNS-PRJ
SINAMICS S120 Service and Commissioning	–	–	✓	✓	✓	✓	5 days	DR-SNS-SI
SINAMICS S120 Maintenance	–	–	–	–	✓	✓	5 days	DR-SNS-IH
SINAMICS G120 Service and Commissioning	✓	–	–	✓	✓	✓	2 days	DR-G120
MICROMASTER 4/ SINAMICS G110 Compact Course	–	✓	–	–	✓	✓	1 day	SD-WSMM4
Follow-up courses								
SINAMICS S120 Drive Control Chart and Basic Positioner	–	–	✓	✓	✓	–	3 days	DR-SNS-DCC
SINAMICS S120 Chassis Unit Servicing	–	–	–	✓	✓	✓	2 days	DR-SNS-CHA
SINAMICS S120 Safety Integrated	–	✓	✓	✓	–	–	2 days	DR-SNS-SAF
SINAMICS Communication	–	–	✓	✓	✓	–	5 days	DR-SN-COM
MICROMASTER 4/ SINAMICS G120 Advanced Course Commissioning	–	–	–	✓	✓	–	3 days	SD-MM4-AUF

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Overview

The SINAMICS G110 training case is designed for mobile use in sales and service.

The training case is equipped with an analog version of a SINAMICS G110 inverter.

The training case can be operated on its own or together with training systems such as LOGO!, SIMATIC S7-200, and SITOP DC-UPS.

A conversion guide is enclosed with the training case that enables the user to replace the SINAMICS G110 inverter with a SINAMICS G110 USS version (not included in the scope of delivery).

Design

- Tanos Systainer – size III
- SINAMICS G110 inverter with BOP operator panel
- 1 × 1LA70 asynchronous (induction) motor

The training cases can be stacked.

Technical specifications

	SINAMICS G110 training case 6AG1064-1AA03-0AA0
Degree of protection In accordance with DIN VDE 0470 Part 1/EN 60529/ IEC 60529	IP00
Ambient temperature	
• Storage	-5 ... +60 °C (23 ... 140 °F)
• Transport	-5 ... +60 °C (23 ... 140 °F)
• Operation	5 ... 40 °C (41 ... 104 °F)
Dimensions	
• Width	400 mm (15.75 in)
• Height	300 mm (11.81 in)
• Depth	210 mm (8.27 in)
Weight, approx.	12 kg (26.5 lb)

Selection and ordering data

Description	Order No.
Training case SINAMICS G110 (incl. BOP operator panel)	**6AG1064-1AA03-0AA0**
Power supply adapter 110 V/230 V	**6AG1064-1AA02-0AA0**

More information

Information on additional SINAMICS training cases including G120 and S120 is available on the Internet at www.siemens.com/sidemo

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Control cabinets

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:

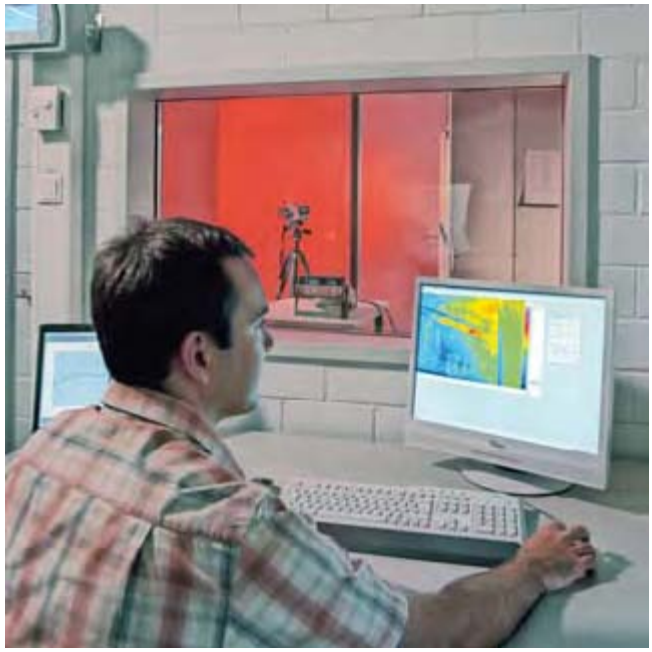
Engineering support

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.

Control cabinet engineering

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.



Testing in the heat laboratory

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

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Overview

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.

Worldwide repair service

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

In the framework of complete equipment, Siemens also offers the development and construction of customized supplementary products, e.g. special operator panels and power supply systems.

Liability of product nonconformance

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.

Control cabinet with SINAMICS S120 in booksize format

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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
- Fault correction on site
- Proof of fault correction

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.

Fault correction is carried out by repairing and/or replacing faulty components. In the event of a machine standstill, fault correction 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 fault correction 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 spare parts warehouse or from regional spare parts warehouses using our worldwide spare parts logistics infrastructure. All of the 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[1)].

The following components are not defined as spare parts:

- Motors [2)]
- Cables [3)]
- Special or customer-specific modules and components not available from Siemens as spare parts.

Faulty components [4)] are replaced free-of-charge within the agreed contract period. See under Service exclusions.

Contract prerequisites

- Final destination certificate
- Data backup at the user´s site
- Parts lists for the individual components with order numbers and serial numbers.

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´s site. 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 numbers and serial numbers.

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[5)].

Contract periods

The RSC is offered for the limitation period (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"[4)]. 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 RSV.

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.

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 in the USA. These motors can be manufactured and delivered within a few working days. You can obtain the current list from your Siemens partner.

3) The delivery times known to you usually apply.

4) Examples of 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).

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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

Response time

As a rule, the following response times apply when the RSC is implemented in the case of a machine standstill:

Country groups	
CG 1	Next working day
CG 2	Within two working days
CG 3	Depending on country-specific conditions

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.

Country list

Repair service is offered for the following countries:

Continent	**Country/region**
Country group 1	
America	Brazil, USA
Asia	China, Japan
Europe	Andorra, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland
Country group 2	
Africa	South Africa
America	Argentina, Canada, Mexico
Asia	India, Indonesia, Malaysia, South Korea, Taiwan, Thailand
Australia	Australia
Europe	Bulgaria, Greece, Russia, Turkey
Country group 3	
Africa	Egypt
America	Chile, Columbia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Peru, Venezuela
Asia	Bahrain, Israel, Kuwait, Pakistan, Oman, Qatar, Saudi Arabia, Singapore, United Arab Emirates (Dubai)
Australia	New Zealand
Europe	Belarus, Croatia, Ireland, Malta, Serbia and Montenegro, Ukraine

Selection and ordering data

Description	Order No.
Repair service contract RSC	
For Siemens I IA&DT components on production machines for countries in country groups 1 to 3	
• 12 month contract period [1]	**6FC8507-0RX12-■■■0**
• 24 month contract period [2]	**6FC8507-0RX24-■■■0**
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:
Validity period of the contract 12 months and equipment value € 96000.–
6FC8507-0RX12-0KG0

[1] Max. 24 months from the transfer of risk (delivery of components).
[2] Max. 36 months from the transfer of risk (delivery of components).

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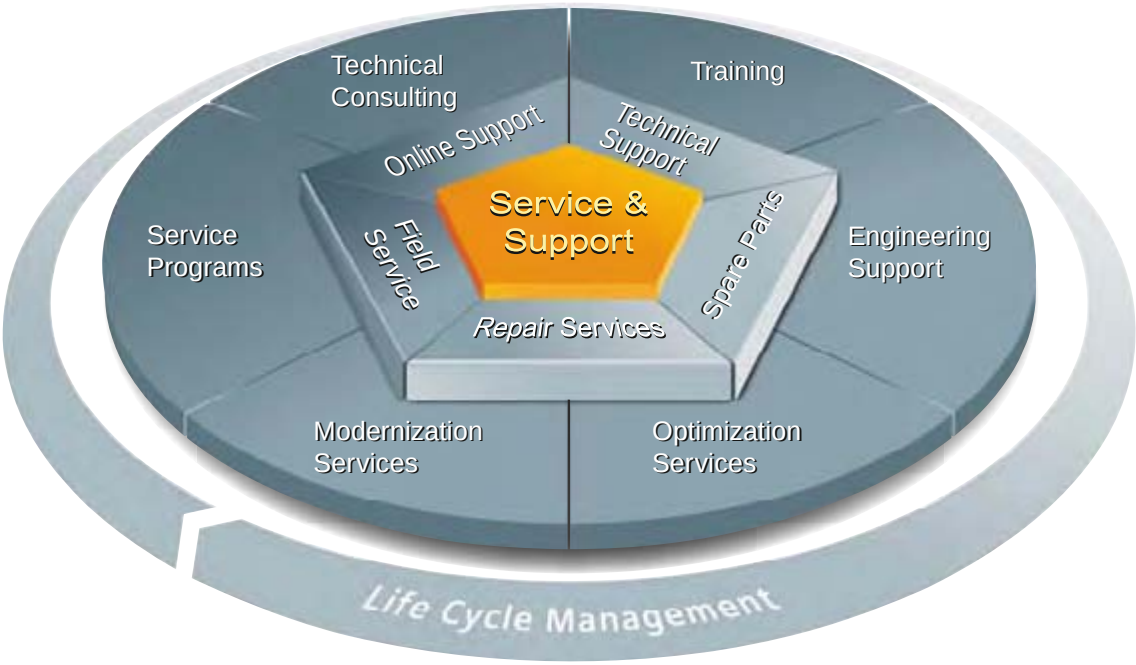
Service & Support

The unmatched complete service for the entire life cycle



For machine constructors, solution providers and plant operators: The service offering from Siemens Industry, Automation and Drive Technologies includes comprehensive services for a wide range of different users in all sectors of the manufacturing and process industry.

To accompany our products and systems, we offer integrated and structured services that provide valuable support in every phase of the lifecycle of your machine or plant – from planning and implementation through commissioning as far as maintenance and modernization.

Our Service & Support accompanies you worldwide in all matters concerning automation and drives from Siemens. We provide direct on-site support in more than 100 countries through all phases of the life cycle of your machines and plants.

You have an experienced team of specialists at your side to provide active support and bundled know-how. Regular training courses and intensive contact among our employees – even across continents – ensure reliable service in the most diverse areas.

Online Support

The comprehensive online information platform supports you in all aspects of our Service & Support at any time and from any location in the world.

www.siemens.com/automation/service&support

Technical Consulting

Support in planning and designing your project: From detailed actual-state analysis, definition of the goal and consulting on product and system questions right through to the creation of the automation solution.

Technical Support

Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

www.siemens.com/automation/support-request

In the United States, call:
Phone: 1-800 333 7421

In Canada, call:
Phone: 1-888 303 3353

Training

Extend your competitive edge – through practical know-how directly from the manufacturer.

www.siemens.com/sitrain

Training office, US
Phone: 1-800 241 4453

Contact information is available on the Internet at: www.siemens.com/automation/partner

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Engineering Support

Support during project engineering and development with services fine-tuned to your requirements, from configuration through to implementation of an automation project.

Field Service

Our Field Service offers you services for commissioning and maintenance – to ensure that your machines and plants are always available.

In the United States, call:
Phone: 1-800 333 7421

In Canada, call:
Phone: 1-888 303 3353

Spare parts

In every sector worldwide, plants and systems are required to operate with constantly increasing reliability. 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.

In the United States, call:
Phone: 1-800 241 4453

In Canada, call:
Phone: 1-888 303 3353

Repairs

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.

In the United States, call:
Phone: 1-800 241 4453

In Canada, call:
Phone: 1-888 303 3353

Optimization

During the service life of machines and plants, there is often a great potential for increasing productivity or reducing costs. To help you achieve this potential, we are offering a complete range of optimization services.

Modernization

You can also rely on our support when it comes to modernization – with comprehensive services from the planning phase all the way to commissioning.

Service programs

Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each other to ensure smooth coverage of the entire life cycle and support optimum use of your products and systems.

The services of a Service Program can be flexibly adapted at any time and used separately.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Services

Advantages at a glance:

- Reduced downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability due to guaranteed response times and spare part delivery times
- Customer service personnel will be supported and relieved of additional tasks
- Comprehensive service from a single source, fewer interfaces and greater expertise

Contact information is available on the Internet at: www.siemens.com/automation/partner

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Service & Support

Knowledge Base on DVD

For locations without online connections to the Internet there are excerpts of the free part of the information sources available on DVD (Service & Support Knowledge Base). This DVD contains all the latest product information at the time of production (FAQs, Downloads, Tips and Tricks, Updates) as well as general information on Service & Support.

The DVD also includes a full-text search and our Knowledge Manager for targeted searches for solutions. The DVD will be updated every 4 months.

Just the same as our online offer in the Internet, the Service & Support Knowledge Base on DVD comes complete in 5 languages (German, English, French, Italian, Spanish).

You can order the **Service & Support Knowledge Base** DVD from your Siemens contact.

Order No. **6ZB5310-0EP30-0BA2**

Automation Value Card

Small card – great support

The Automation Value Card is an integral component of the comprehensive service concept with which Siemens Automation and Drives will accompany you in each phase of your automation project.

It doesn't matter whether you want just specific services from our Technical Support or want to purchase something on our Online portal, you can always pay with your Automation Value Card. No invoicing, transparent and safe. With your personal card number and associated PIN you can view the state of your account and all transactions at any time.

Services on card. This is how it's done.

Card number and PIN are on the back of the Automation Value Card. When delivered, the PIN is covered by a scratch field, guaranteeing that the full credit is on the card.

By entering the card number and PIN you have full access to the Service & Support services being offered. The charge for the services procured is debited from the credits on your Automation Value Card.

All the services offered are marked in currency-neutral credits, so you can use the Automation Value Card worldwide.

Order your Automation and Value Card easily and comfortably like a product with your sales contact.

Credits	Order No.
200	**6ES7997-0BA00-0XA0**
500	**6ES7997-0BB00-0XA0**
1000	**6ES7997-0BC00-0XA0**
10000	**6ES7997-0BG00-0XA0**

Detailed information on the services offered is available on our Internet site at:

www.siemens.com/automation/service&support

Service & Support à la Card: Examples

Technical Support	
"Priority"	Priority processing for urgent cases
"24 h"	Availability round the clock
"Extended"	Technical consulting for complex questions
"Mature Products"	Consulting service for products that are not available any more
Support Tools in the Support Shop	
	Tools that can be used directly for configuration, analysis and testing

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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.

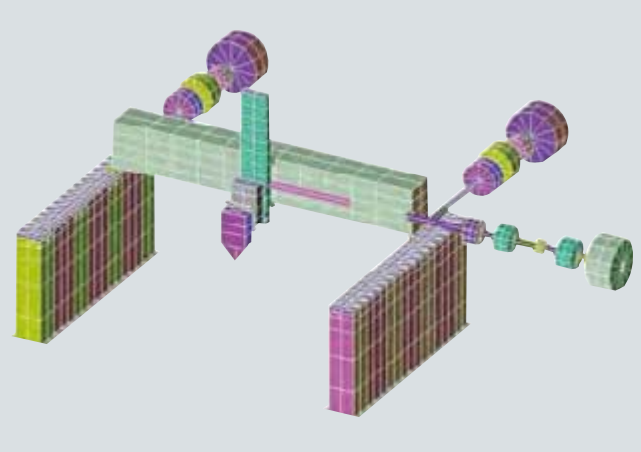
Virtual simulation, real construction

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	Type
Consultation Technical consultation with customer	**6FC5088-1....**
Machine optimization Optimum setting of control and drives on the customer's machine	**6FC5088-2....**
Machine analysis and optimization Analysis of the machine and its limits. Recommendations for manufacturer	**6FC5088-3....**
Machine simulation Simulation of individual axes and the dynamic response on the machine	**6FC5088-4....**
Machine simulation with interpolating axes Simulation of interpolating axes	**6FC5088-5....**
Machine simulation with FE model Modeling of machine using the Finite Element method	**6FC5088-6....**

More information

Please contact your local Siemens sales office or representative for more information.

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SparesOnWeb

Overview

SparesOnWeb – Online spare parts catalog

SparesOnWeb is a web-based tool for selecting the spare parts available for the SINAMICS system. After you have registered and entered the serial number and order number, the spare parts available for the relevant unit are displayed.

The delivery state for specific orders can be displayed for all shipped SINAMICS products.

http://workplace.automation.siemens.com/sparesonweb

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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 configuring and generating/managing (the existing login can be used, e.g. Industry Mall)
www.siemens.com/industrymall

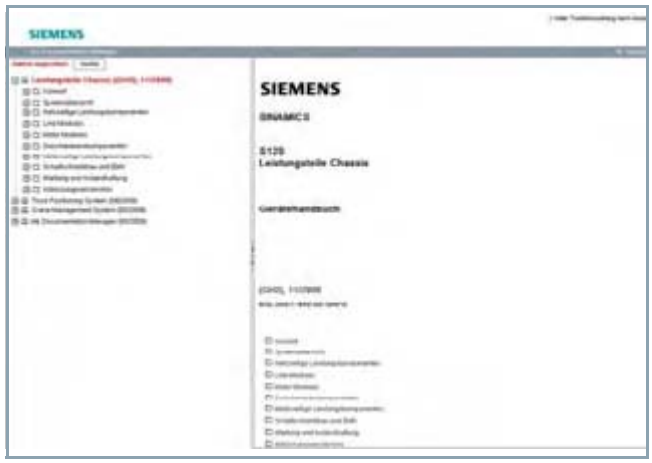
Benefits

- 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 Service & Support Portal.

Search in the Service & Support portal



Document in My Documentation Manager

Function

Opening My Documentation Manager

My Documentation Manager opens in two ways

- Search in the Service & Support portal
  www.siemens.com/automation/service&support
  The appropriate manuals are designated by "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 Service & Support portal
  www.automation.siemens.com/docconf/
  After logon/registration, the online help is displayed as current document.

More information

More information is available on the Internet at
www.siemens.com/mdm

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Documentation

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, 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 on the Internet at www.siemens.com/motioncontrol/docu
- Documentation (PDF) on the SINAMICS Manual Collection (DVD-ROM)

Information and documentation on SINAMICS G110, SINAMICS G110D, SINAMICS G120, SINAMICS G120C, SINAMICS G120D and SINAMICS G120P are available as:

- Documentation (PDF) on the SINAMICS Manual Collection (DVD-ROM)
- Documents/documentation at: http://support.automation.siemens.com/WW/view/en/36426537/133300

Application

Explanations of manuals:

- **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, or 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/warnings for the product/system as well as their meanings and setting options. It contains parameter data and fault/warning 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.

More information

Please send any queries or suggestions to docu.motioncontrol@siemens.com

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Selection and ordering data

Description	Order No.
Catalog D 31	
• German	**E86060-K4931-A101-A1**
• English	**E86060-K4931-A101-A1-7600**
• Italian[1)]	**E86060-K4931-A101-A1-7200**
• French[1)]	**E86060-K4931-A101-A1-7700**
• Spanish[1)]	**E86060-K4931-A101-A1-7800**
Catalog NC 61	
• German	**E86060-K4461-A101-A3**
• English	**E86060-K4461-A101-A3-7600**
• Italian	**E86060-K4461-A101-A3-7200**
• French	**E86060-K4461-A101-A3-7700**
• Spanish	**E86060-K4461-A101-A3-7800**
Catalog PM 21	
• German	**E86060-K4921-A101-A2**
• English	**E86060-K4921-A101-A2-7600**
• Italian	**E86060-K4921-A101-A2-7200**
• French	**E86060-K4921-A101-A2-7700**
Catalog ST 70	
• German	**E86060-K4670-A101-B3**
• English	**E86060-K4670-A101-B3-7600**
• Italian	**E86060-K4670-A101-B3-7200**
• French	**E86060-K4670-A101-B3-7700**
• Spanish	**E86060-K4670-A101-B3-7800**
Catalog ST 80/ST PC	
• German	**E86060-K4680-A101-B8**
• English	**E86060-K4680-A101-B8-7600**
• Italian	**E86060-K4680-A101-B8-7200**
• French	**E86060-K4680-A101-B8-7700**
• Spanish	**E86060-K4680-A101-B8-7800**
Catalog IK PI	
• German	**E86060-K6710-A101-B7**
• English	**E86060-K6710-A101-B7-7600**
• Italian[1)]	**E86060-K6710-A101-B7-7200**
• French[1)]	**E86060-K6710-A101-B7-7700**
• Spanish[1)]	**E86060-K6710-A101-B7-7800**
Catalog Safety Integrated	
• German	**E86060-K7010-A101-A2**
• English	**E86060-K7010-A101-A2-7600**
PROFINET compact catalog	
• German	**E86060-K6710-B211-A6**
• English	**E86060-K6710-B201-A6-7600**
Decentralization with PROFIBUS DP/DPV1	**ISBN-13: 978-3-89578-218-3**

Description	Order No.
User/Manufacturer Documentation	
SINAMICS Manual Collection On DVD-ROM with full text search over the complete DVD Network-enabled (storage of the PDFs on a central server), revision level: 04/2011 Languages: English, French, German, Italian, Spanish	**6SL3097-4CA00-0YG0**
Manufacturer and service documentation	
EMC Installation Guidelines SINUMERIK, SIROTEC, SIMODRIVE, SIMOTION, SINAMICS S120	
• German	**6FC5297-0AD30-0AP2**
• English	**6FC5297-0AD30-0BP2**

1) Available soon.

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Documentation SINAMICS S110

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
Manual SINAMICS S110	
• German	**6SL3097-4AC10-0AP2**
• English	**6SL3097-4AC10-0BP2**
• Italian	**6SL3097-4AC10-0CP2**
• French	**6SL3097-4AC10-0DP2**
• Spanish	**6SL3097-4AC10-0EP2**
List Manual SINAMICS S110	
• German	**6SL3097-4AP10-0AP2**
• English	**6SL3097-4AP10-0BP2**
• Italian	**6SL3097-4AP10-0CP2**
• French	**6SL3097-4AP10-0DP2**
• Spanish	**6SL3097-4AP10-0EP2**
Getting Started SINAMICS S110	
• German	**6SL3097-4AG10-0AP0**
• English	**6SL3097-4AG10-0BP0**
• Italian	**6SL3097-4AG10-0CP0**
• French	**6SL3097-4AG10-0DP0**
• Spanish	**6SL3097-4AG10-0EP0**
Function Manual SINAMICS S110	
• German	**6SL3097-4AB10-0AP3**
• English	**6SL3097-4AB10-0BP3**
• Italian	**6SL3097-4AB10-0CP3**
• French	**6SL3097-4AB10-0DP3**
• Spanish	**6SL3097-4AB10-0EP3**

Documentation SINAMICS S120

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
Manual SINAMICS S120 AC Drive	
• German	**6SL3097-4AL00-0AP1**
• English	**6SL3097-4AL00-0BP1**
• Italian	**6SL3097-4AL00-0CP1**
• French	**6SL3097-4AL00-0DP1**
• Spanish	**6SL3097-4AL00-0EP1**
Commissioning Manual SINAMICS S120	
• German	**6SL3097-4AF00-0AP1**
• English	**6SL3097-4AF00-0BP1**
• Italian	**6SL3097-4AF00-0CP1**
• French	**6SL3097-4AF00-0DP1**
• Spanish	**6SL3097-4AF00-0EP1**
List Manual SINAMICS S120/SINAMICS S150	
• German	**6SL3097-4AP00-0AP2**
• English	**6SL3097-4AP00-0BP2**
• Italian	**6SL3097-4AP00-0CP2**
• French	**6SL3097-4AP00-0DP2**
• Spanish	**6SL3097-4AP00-0EP2**
Getting Started SINAMICS S120	
• German	**6SL3097-4AG00-0AP0**
• English	**6SL3097-4AG00-0BP0**
• Italian	**6SL3097-4AG00-0CP0**
• French	**6SL3097-4AG00-0DP0**
• Spanish	**6SL3097-4AG00-0EP0**
Function Manual SINAMICS S120 Drive Functions	
• German	**6SL3097-4AB00-0AP1**
• English	**6SL3097-4AB00-0BP1**
• Italian	**6SL3097-4AB00-0CP1**
• French	**6SL3097-4AB00-0DP1**
• Spanish	**6SL3097-4AB00-0EP1**
Function Manual SINAMICS S120 Safety Integrated	
• German	**6SL3097-4AR00-0AP2**
• English	**6SL3097-4AR00-0BP2**
• Italian	**6SL3097-4AR00-0CP2**
• French	**6SL3097-4AR00-0DP2**
• Spanish	**6SL3097-4AR00-0EP2**

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Documentation Motors

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
Configuration Manual 1FK7 Synchronous Motors	
• German	**6SN1197-0AD16-0AP2**
• English	**6SN1197-0AD16-0BP2**
• Italian	**6SN1197-0AD16-0CP2**
• French	**6SN1197-0AD16-0DP2**
• Spanish	**6SN1197-0AD16-0EP2**
Configuration Manual 1PH8 Synchronous/Asynchronous Motors	
• German	**6SN1197-0AD74-0AP1**
• English	**6SN1197-0AD74-0BP1**
• Italian	**6SN1197-0AD74-0CP1**
• French	**6SN1197-0AD74-0DP1**
• Spanish	**6SN1197-0AD74-0EP1**

Documentation Measuring systems

Selection and ordering data

Description	Order No.
Manufacturer and service documentation	
User Manual SIMODRIVE sensor Absolute encoder with PROFIBUS-DP	
• English/German	**6SN1197-0AB10-0YP4**

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Notes

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Appendix

16

16/2 **Approvals**

16/3 **Partner at Industry Automation and Drive Technologies**

16/4 **Online services**
16/4 Information and ordering in the Internet and on DVD

16/5 **Notes on software**
16/5 Software licenses
16/6 Setup texts and software update services

16/7 **Indexes**
16/7 Subject index
16/12 Order number index

16/15 **Catalog improvement suggestions**
16/15 Fax form

16/16 **Conversion tables**

16/18 **Metal surcharges**

16/20 **Conditions of sale and delivery/ Export regulations**

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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

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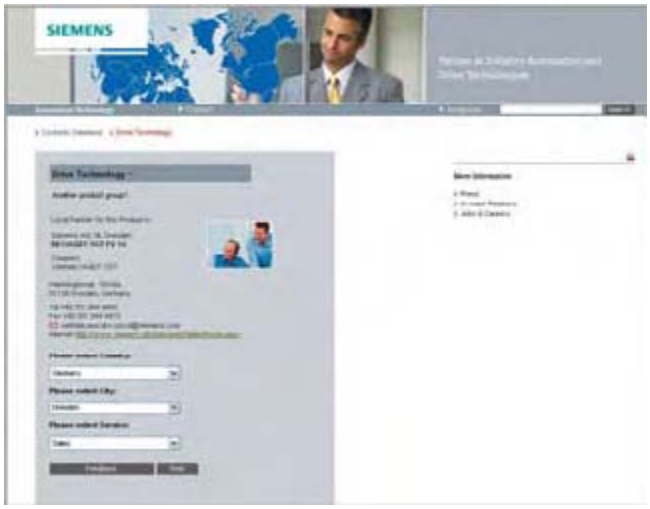
Partner at Industry Automation and Drive Technologies



At Siemens Industry Automation and Drive Technologies, more than 85000 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

You start by selecting a

- Product group,
- Country,
- City,
- Service.

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Information and ordering in the Internet and on DVD

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.

At the address

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 80000 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.
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Overview

Software types

Software requiring a license is categorized into types.
The following software types have been defined:

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- Runtime software

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This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

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- Rental License
- Trial License
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- Upgrade

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Overview

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More information

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Numeric

1FK7 synchronous motors ... 11/4
1PH8 asynchronous (induction) motors ... 11/10

A

Absolute encoders ... 12/7
Accessories
- for SINAMICS G110 ... 3/10
- for SINAMICS G110D ... 7/16
- for SINAMICS G120D ... 8/24
- for SINAMICS G120P ... 5/7
- for SINAMICS S110 ... 9/4, 9/21

Accessories for built-on rotary encoders ... 12/12
Adapter for mounting on DIN rails ... 6/99
Adapter for mounting SINAMICS G110D instead of SIRIUS M200D motor starter for SINAMICS G110D ... 7/18
Additional EMC filter, class B, for SINAMICS G110 ... 3/14
Application
- 1FK7 synchronous motors ... 11/4
- 1PH8 asynchronous (induction) motors ... 11/10
- Connection system MOTION-CONNECT ... 13/3
- Measuring systems ... 12/3
- SINAMICS G110 ... 3/2
- SINAMICS G110D ... 7/2
- SINAMICS G120 ... 6/2
- SINAMICS G120C ... 4/2
- SINAMICS G120D ... 8/2
- SINAMICS G120P ... 5/2, 5/6
- SINAMICS S110 ... 9/2
- SINAMICS S120 ... 10/2

Application examples
- Centrifugal pumps ... 1/8
- Centrifuges ... 1/9
- Drills ... 1/9
- Storage and retrieval machines ... 1/8

Application-orientated design of SINAMICS G120 ... 6/6
Applications ... 15/2
AS-Interface ... 2/13
Asynchronous (induction) motors 1PH8 ... 11/10
Automation Value Card ... 15/12
Available drives with Efficient Infeed Technology ... 2/11

B

BacNet MS/TP ... 2/13
Basic Operator Panel (BOP) for SINAMICS G110 ... 3/10
Basic Operator Panel BOP-2
- for SINAMICS G120 ... 6/95
- for SINAMICS G120C ... 4/26
- for SINAMICS G120P ... 5/34

Basic Operator Panel BOP20 for SINAMICS S110 ... 9/36
Basic positioner (EPos) ... 9/5
Basic positioning drive for single-axis applications – SINAMICS S110 ... 9/3
Benefits
- 1FK7 synchronous motors ... 11/4
- 1PH8 asynchronous (induction) motors ... 11/10
- Connection system MOTION-CONNECT ... 13/3
- SINAMICS G110 ... 3/3
- SINAMICS G110D ... 7/4
- SINAMICS G120 ... 6/5
- SINAMICS G120C ... 4/3
- SINAMICS G120D ... 8/4
- SINAMICS G120P ... 5/5

BICO technology ... 9/3
Blanking cover for SINAMICS G120P/G120 ... 5/35, 6/97
Block diagram SINAMICS G110 ... 3/12
BOP for SINAMICS G110 ... 3/10
BOP-2
- for SINAMICS G120 ... 6/95
- for SINAMICS G120C ... 4/26
- for SINAMICS G120P ... 5/34

BOP20 for SINAMICS S110 ... 9/36
Brake Relay for SINAMICS G120 ... 6/98
Braking Modules for SINAMICS G120 ... 6/75
Braking resistors
- for SINAMICS G110D ... 7/15
- for SINAMICS G120 ... 6/72
- for SINAMICS G120C ... 4/22
- for SINAMICS S110 ... 9/31

Built-on optoelectronic rotary encoders ... 12/3
- Accessories ... 12/12

C

CAD CREATOR Dimension drawing and 2D/3D CAD generator ... 14/11
CANopen ... 2/13
Capacitive reactive currents ... 2/12
Card holder for memory card for SINAMICS G110D ... 7/18
Catalog improvement suggestions ... 16/15
Characteristic curves
- 1PH8 asynchronous (induction) motors ... 11/10, 11/18
- Connection system MOTION-CONNECT ... 13/4
- SINAMICS G110D ... 7/11
- SINAMICS G120 ... 6/54
- SINAMICS G120C ... 4/17
- SINAMICS G120D ... 8/21
- SINAMICS G120P ... 5/25
- SINAMICS S110 ... 9/22

Commissioning tool
- SINAMICS StartDrive ... 14/7
- STARTER ... 14/5

Commissioning Manual ... 15/16
Communication ... 2/13
Compact inverters SINAMICS G120C ... 4/1
CompactFlash card for SINAMICS S120 ... 10/9
Complete equipment for machine tools and production systems ... 15/6
Compliance with standards
- SINAMICS G110 ... 3/8
- SINAMICS G120 ... 6/13
- SINAMICS G120P ... 5/9

Compressor, pump and fan inverters SINAMICS G120P ... 5/1
Configuration
- SINAMICS G110D ... 7/7
- SINAMICS G120 ... 6/10
- SINAMICS G120C ... 4/8
- SINAMICS G120D ... 8/6
- SINAMICS G120P ... 5/7
- SINAMICS S110 ... 9/6

Connecting cable and socket for AS-Interface for SINAMICS G110D ... 7/19
Connecting cables
- for the SINAMICS G120D Control Unit ... 8/26
- for SINAMICS G110D ... 7/16
- for SINAMICS G120D ... 8/24
  - Power Module ... 8/27
  - PROFIBUS ... 8/26
  - PROFINET ... 8/26

Connecting cables and connectors for digital inputs
- for SINAMICS G110D ... 7/19
- for SINAMICS G120D ... 8/26

Connecting cables pre-assembled at one end and connector sets
- for the line supply for SINAMICS G120D ... 8/27
- for the line supply for SINAMICS G110D ... 7/19
- to connect the Power Module to the motor for SINAMICS G120D ... 8/27
- to connect the inverter to the motor for SINAMICS G110D ... 7/20

Connecting cables/connectors for supplying the SINAMICS G120D Control Unit with power ... 8/26
Connection diagram
- SINAMICS G110 ... 3/12
- SINAMICS G110D ... 7/6
- SINAMICS G120 Control Units ... 6/20
- SINAMICS G120 Power Modules ... 6/34
- SINAMICS G120D Control Units ... 8/11
- SINAMICS G120D PM250D Power Module ... 8/17
- SINAMICS G120P PM230 Power Module ... 5/19

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Subject index

Connection example SINAMICS G120C ... 4/5, 4/6, 4/7
Connection overviews for Connection system ... 13/16
Connection system MOTION-CONNECT ... 1/15, 13/1
- Length code ... 13/18

Connector kit for braking resistor for SINAMICS G110D ... 7/19
Connectors for SINAMICS G120C ... 4/28
Control cabinets ... 15/6
Control Units
- CU305 for SINAMICS S110 ... 9/9
- CU310-2 for SINAMICS S120 ... 10/6
- CU230P-2 for SINAMICS G120P and SINAMICS G120 ... 5/10, 6/14
- CU240B-2 for SINAMICS G120 ... 6/15
- CU240E-2 for SINAMICS G120 ... 6/15
- CU240D for SINAMICS G120D ... 8/8

Controlled Power Modules SINAMICS G110 ... 3/3
Conversion tables ... 16/16
Converter/inverter selection ... 1/6
Current carrying capacity for power and signal cables ... 13/4

D

DCC ... 10/5
DC drives ... 1/13
DC link components
- for SINAMICS G110D ... 7/15
- for SINAMICS G120 ... 6/72
- for SINAMICS G120C ... 4/22
- for SINAMICS S110 ... 9/31

Derating data
- SINAMICS G110D ... 7/11
- SINAMICS G120
  - PM230 Power Modules ... 6/54
  - PM240 Power Modules ... 6/56
  - PM250 Power Modules ... 6/58
  - PM260 Power Modules ... 6/59
- SINAMICS G120C ... 4/17
- SINAMICS G120D PM250D Power Modules ... 8/21
- SINAMICS G120P PM230 Power Modules ... 5/25
- SINAMICS S110 PM340 Power Modules ... 9/23

Derating data and power loss SINAMICS G110 ... 3/7
Derating factors for power and signal cables ... 13/4
Design
- CompactFlash card for CU310-2 ... 10/9
- Measuring systems ... 12/3
- SINAMICS G110 ... 3/4
- SINAMICS G110D ... 7/5
- SINAMICS G120 ... 6/6
- SINAMICS G120 CU230P-2 Control Units ... 6/17
- SINAMICS G120 CU240B-2 Control Units ... 6/18
- SINAMICS G120 CU240E-2 Control Units ... 6/19
- SINAMICS G120C ... 4/3
- SINAMICS G120D ... 8/5
- SINAMICS G120D CU240D Control Units ... 8/9
- SINAMICS G120P ... 5/6
- SINAMICS G120P CU230P-2 Control Units ... 5/11
- SINAMICS G120P PM230 Power Modules ... 5/18
- SINAMICS S110 CU305 Control Unit ... 9/9
- SINAMICS S120 CU310-2 Control Units ... 10/6

Dimension drawing and 2D/3D CAD generator CAD CREATOR ... 14/11
Dimensional drawings
- 1FK7 synchronous motors ... 11/19
- 1PH8 asynchronous (induction) motors ... 11/22
- SINAMICS G110 ... 3/11
- SINAMICS G110D ... 7/12
- SINAMICS G120 ... 6/60
- SINAMICS G120C ... 4/18
- SINAMICS G120D ... 8/22
- SINAMICS G120P ... 5/27

Distributed inverters
- SINAMICS G110D ... 7/1
- SINAMICS G120D ... 8/1

Documentation ... 15/16
- Measuring systems ... 15/19
- Motors ... 15/19
- SINAMICS G110 ... 3/10
- SINAMICS S110 ... 15/18
- SINAMICS S120 ... 15/18

Door mounting kit
- for SINAMICS G120 ... 6/93, 6/95
- for SINAMICS G120C ... 4/24, 4/26
- for SINAMICS S110 ... 9/37

Drive Control Chart (DCC) ... 10/5
Drive ES ... 14/8
Drive system SINAMICS S120 ... 10/1
DRIVE-CLiQ signal cables ... 13/13
DT Configurator selection guide ... 14/2

E

Efficient Infeed Technology ... 2/11
- for SINAMICS G120 ... 6/5
- for SINAMICS G120D ... 8/4

Electromagnetic compatibility SINAMICS G110 ... 3/9
EMC filter, class B with low leakage currents SINAMICS G110 ... 3/14
EMC Installation Guidelines ... 15/17
Encoder system connection for SINAMICS S110 ... 9/39
Energy efficiency ... 1/4
- SINAMICS G120 ... 6/5
- SINAMICS G120P ... 5/5

Energy management process ... 1/4
Energy recovery for SINAMICS G120 and SINAMICS G120D ... 2/11
Energy transparency ... 1/4
Energy-saving program SinaSave ... 14/10
Engineering software Drive ES ... 14/8
Engineering Support ... 15/11
Engineering tool SIZER for Siemens Drives ... 14/4
Engineering tools ... 14/1
Extensions for power cables ... 13/8
External fan unit
- for SINAMICS G120 ... 6/103
- for SINAMICS G120P ... 5/38

F

Fan units
- for SINAMICS G120 ... 6/103
- for SINAMICS G120C ... 4/28
- for SINAMICS G120P ... 5/38

Fan, pump and compressor inverters SINAMICS G120P ... 5/1
Feedback of braking energy, regenerative ... 1/4
Field Service ... 15/11
Free function blocks ... 9/3
Function
- Absolute encoders ... 12/7
- Connection system MOTION-CONNECT ... 13/3
- Incremental encoders ... 12/4
- SINAMICS G110 ... 3/4
- SINAMICS G120P ... 5/7, 5/10
- SINAMICS S110 ... 9/4

Function Manual Drive Functions ... 15/16

G

Getting Started ... 15/16
Guided operation using wizards ... 5/4

H

Highlights ... 2/1

I

Incremental encoders ... 12/4
Innovative cooling concept SINAMICS G120 ... 6/5
Integrated EMC filter SINAMICS G110 ... 3/14

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Integration
• Connection system MOTION-CONNECT ... 13/16
• SINAMICS G110D ... 7/6
• SINAMICS G120
- Control Units ... 6/20
- Power Modules ... 6/34
• SINAMICS G120C ... 4/5
• SINAMICS G120D
- CU240D Control Units ... 8/11
- PM250D Power Modules ... 8/17
• SINAMICS G120P
- CU230P-2 Control Units ... 5/12
- PM230 Power Modules ... 5/19
• SINAMICS S110
- CU305 Control Unit ... 9/9
- PM340 Power Module ... 9/12
• SINAMICS S120
- CU310-2 Control Units ... 10/6
Integration in automation ... 1/2
Intelligent Operator Panel IOP
• for SINAMICS G120 ... 6/92
• for SINAMICS G120C ... 4/24
• for SINAMICS G120P ... 5/33
• for SINAMICS S110 ... 9/37
Intelligent Operator Panel IOP Handheld
• for SINAMICS G110D ... 7/16
• for SINAMICS G120 ... 6/92
• for SINAMICS G120C ... 4/24
• for SINAMICS G120D ... 8/24
Internal fan unit
• for SINAMICS G120 ... 6/103
• for SINAMICS G120P ... 5/38
Introduction
• Connection system MOTION-CONNECT ... 13/3
• SINAMICS G110 ... 3/2
• SINAMICS G110D ... 7/2
• SINAMICS G120 ... 6/2
• SINAMICS G120C ... 4/2
• SINAMICS G120D ... 8/2
• SINAMICS G120P ... 5/2
• SINAMICS S110 ... 9/2
• SINAMICS S120 ... 10/2
IOP
• for SINAMICS G120 ... 6/92
• for SINAMICS G120C ... 4/24
• for SINAMICS G120P ... 5/33
• for SINAMICS S110 ... 9/37
IOP Handheld
• for SINAMICS G110D ... 7/16
• for SINAMICS G120 ... 6/92
• for SINAMICS G120C ... 4/24
• for SINAMICS G120D ... 8/24

K

Keyswitch for SINAMICS G110D ... 7/17
Knowledge Base on DVD ... 15/12

L

Length code ... 13/18
Liability of product nonconformance ... 15/7
Line filters
• for SINAMICS G120 ... 6/62
• for SINAMICS S110 ... 9/28
Line reactors
• for SINAMICS G110 ... 3/14
• for SINAMICS G120 ... 6/65
• for SINAMICS G120C ... 4/20
• for SINAMICS S110 ... 9/24
Line supply conditions ... 2/11
Line-side components
• for SINAMICS G120 ... 6/62
• for SINAMICS G120C ... 4/20
• for SINAMICS S110 ... 9/24
Line-side power components
• for SINAMICS G110D ... 7/14
• for SINAMICS G120 ... 6/69
• for SINAMICS G120C ... 4/21
• for SINAMICS G120D ... 8/23
• for SINAMICS G120P ... 5/31
• for SINAMICS S110 ... 9/29
List Manual ... 15/16
Load-side power components for SINAMICS G120 ... 6/77
Load-side power components for SINAMICS S110 ... 9/33

M

Main motors ... 1/14
Manual local control for SINAMICS G110D ... 7/17
Manual/Configuration Manual ... 15/16
Measuring systems ... 12/1
• Overview ... 12/2
Mechatronic Support ... 15/13
Medium-voltage converters and DC drives ... 1/13
Members of the SINAMICS family ... 1/10
Memory card for SINAMICS S110 ... 9/11
Memory card, SIMATIC memory card (SD card)
• for SINAMICS G110D ... 7/17
• for SINAMICS G120 ... 6/97
• for SINAMICS G120C ... 4/27
• for SINAMICS G120P ... 5/35
Memory card, SINAMICS micro memory card (MMC)
• for SINAMICS G110D ... 7/17
• for SINAMICS G120 ... 6/97
• for SINAMICS G120C ... 4/27
• for SINAMICS G120D ... 8/25
• for SINAMICS G120P ... 5/35
Micro memory card (MMC)
• for SINAMICS G110D ... 7/17
• for SINAMICS G120 ... 6/97
• for SINAMICS G120C ... 4/27
• for SINAMICS G120D ... 8/25
• for SINAMICS G120P ... 5/35
MMC memory card, SINAMICS micro memory card
• for SINAMICS G110D ... 7/17
• for SINAMICS G120 ... 6/97
• for SINAMICS G120C ... 4/27
• for SINAMICS G120D ... 8/25
• for SINAMICS G120P ... 5/35
Modernization ... 15/11
Modular automation system ... 1/3
Modular design SINAMICS G120P ... 5/6
MOTION-CONNECT 500 ... 13/3
MOTION-CONNECT 800PLUS ... 13/3
MOTION-CONNECT ... 13/1
Motor reactors for SINAMICS S110 ... 9/33
Motors ... 11/1
• Overview ... 11/2
Mounting set
• for SINAMICS G120 ... 6/101
• for SINAMICS G120P ... 5/37
My Documentation Manager ... 15/15

O

Online spare parts catalog – SparesOnWeb ... 15/14
Online Support ... 15/10
Operating Instructions SINAMICS G110 ... 3/10
Operator panels
• for SINAMICS G110 ... 3/10
• for SINAMICS G120 ... 6/91
• for SINAMICS G120C ... 4/23
• for SINAMICS G120P ... 5/32
• for SINAMICS S110 ... 9/36

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Subject index

Operator-friendly design SINAMICS G120 ..... 6/4
Optimization 15/11
Order No. supplements for 1PH8 motors 11/16
Output reactors for SINAMICS G120 ..... 6/77
Overload capability SINAMICS S110 ..... 9/22
Overview
- 1FK7 synchronous motors 11/4
- 1PH8 asynchronous (induction) motors 11/10
- CompactFlash card for CU310-2 ..... 10/9
- Connection system MOTION-CONNECT 13/2
- Measuring systems 12/2
- Motors 11/2
- SINAMICS G110 ..... 3/3
- SINAMICS G110D 7/3
- SINAMICS G120 ..... 6/3
  - Control Units 6/28
  - PM230 Power Modules 6/28
  - PM240 Power Modules 6/29
  - PM250 Power Modules 6/30
  - PM260 Power Modules 6/31
- SINAMICS G120C 4/3
- SINAMICS G120D 8/3
  - CU240D Control Units 8/8
  - PM250D Power Modules 8/16
- SINAMICS G120P 5/3
  - CU230P-2 Control Units 5/10
  - PM230 Power Modules 5/17
- SINAMICS S110 ..... 9/3
  - CU305 Control Unit 9/9
  - PM340 Power Module 9/12
- SINAMICS S120 ..... 10/3
  - CU310-2 Control Unit 10/6
- Types of communication 2/14

P

PC inverter connection kit
- for SINAMICS G110 ..... 3/10

PC inverter connection kit 2
- for SINAMICS G120 ..... 6/99
- for SINAMICS G120C 4/27
- for SINAMICS G120P 5/36

Platform concept 1/5
Potential savings thanks to Efficient Infeed Technology 2/11
Power bus distribution 400 V in IP65 degree of protection
- for SINAMICS G110D 7/20
- for SINAMICS G120D 8/28

Power cables 13/5
Power Modules
- PM230 for SINAMICS G120P 5/17
- PM230 for SINAMICS G120 ..... 6/28
- PM240 for SINAMICS G120 ..... 6/29
- PM250 for SINAMICS G120 ..... 6/30
- PM250D for SINAMICS G120D 8/16
- PM260 for SINAMICS G120 ..... 6/31

PROFIBUS 2/13
PROFINET 2/14
Protection bar for SINAMICS G110D 7/19
Pump, fan and compressor inverters SINAMICS G120P 5/1

Q

Quality management according to DIN EN ISO 9001 ..... 1/5

R

Recommended line-side power components
- for SINAMICS G110D 7/14
- for SINAMICS G120 ..... 6/69
- for SINAMICS G120C 4/21
- for SINAMICS G120D 8/23
- for SINAMICS G120P 5/31
- for SINAMICS S110 ..... 9/29

Regenerative feedback of braking energy 1/4
Repair service contract RSC 15/8
Repairs 15/11
Replacement connector SINAMICS G120 ..... 6/102
Replacement door for PM240, frame size FSGX 6/102
Replacement fans
- for SINAMICS G110D 7/21
- for SINAMICS G120 ..... 6/104
- for SINAMICS G120D 8/29

Roof-mounted fan for SINAMICS G120C 4/28
Rotary encoders, built on 12/1
RS232 connecting cable
- for SINAMICS G110D 7/16
- for SINAMICS G120D 8/24

RS232 interface cable for communication with a PC
- for SINAMICS G120D 8/25
- for SINAMICS G110D 7/18

RSC 15/8

S

Safe Brake Control (SBC) 2/6
Safe Brake Relay for SINAMICS S110 ..... 9/38
Safe Direction (SDI) 2/7
Safe Operating Stop (SOS) 2/5
Safe Speed Monitor (SSM) 2/7
Safe Stop 1 (SS1) 2/4
Safe Stop 2 (SS2) 2/5
Safe Torque Off (STO) 2/4
Safely Limited Speed (SLS) 2/6
Safety Integrated 2/2
- SINAMICS G120 ..... 6/4
- SINAMICS G120D 8/8
- SINAMICS S110 ..... 9/4

Schematics SINAMICS G110 ..... 3/12
SD card (SIMATIC memory card)
- for SINAMICS G110D 7/17
- for SINAMICS G120 ..... 6/97
- for SINAMICS G120C 4/27
- for SINAMICS G120P 5/35

Selecting optional SINAMICS G120 system components 6/8
Selecting the SINAMICS G120 Control Unit 6/6
Selecting the SINAMICS G120 Power Module 6/7
Selection and ordering data
- 1FK7 synchronous motors 11/6
- 1PH8 asynchronous (induction) motors 11/12
- Absolute encoders 12/11
- Documentation 15/17
- Incremental encoders 12/6
- Power cables 13/7
- Repair service contract RSC 15/9
- Signal cables 13/13
- SINAMICS G110 ..... 3/5
- SINAMICS G110D 7/4
- SINAMICS G120
  - CU230P-2 Control Units 6/16
  - CU240B-2 Control Units 6/16
  - CU240E-2 Control Units 6/16
  - PM230 Power Modules 6/32
  - PM240 Power Modules 6/33
  - PM250 Power Modules 6/32
  - PM260 Power Modules 6/33
- SINAMICS G120C 4/9
- SINAMICS G120D
  - CU240D Control Units 8/9
  - PM250D Power Modules 8/16
- SINAMICS G120P
  - CU230P-2 Control Units 5/10
  - PM230 Power Modules 5/18
- SINAMICS S110
  - CU305 Control Unit 9/11
  - PM340 Power Module 9/21
- SINAMICS S120
  - CompactFlash card for CU310-2 ..... 10/9
  - CU310-2 Control Units 10/8

Selection guide – typical applications 1/6
Selection guide DT Configurator 14/2
Selection guides 1PH8 asynchronous (induction) motors 11/16

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Sensor Module Cabinet-Mounted
- SMC10 ... 9/40
- SMC20 ... 9/41
- SMC30 ... 9/42

Service & Support ... 15/10
Service programs ... 15/11
Services and documentation ... 15/1
Servo drives SINAMICS S110 ... 9/1
Servomotors ... 1/14, 11/4
Shield connection kit 1 for SINAMICS G120P ... 5/36
Shield connection kits
- for SINAMICS G120 Control Units ... 6/100
- for SINAMICS G120 Power Modules ... 6/100

Shield plate for SINAMICS G120C ... 4/28
Signal cables ... 13/10
SIMATIC memory card (SD card)
- for SINAMICS G110D ... 7/17
- for SINAMICS G120 ... 6/97
- for SINAMICS G120C ... 4/27
- for SINAMICS G120P ... 5/35

SINAMICS drive family ... 1/2
SINAMICS G – The efficient drives ... 1/10
SINAMICS G110 parameter list ... 3/10
SINAMICS G110 training case ... 15/5
SINAMICS G110 ... 3/1
SINAMICS G110D ... 7/1
SINAMICS G120 ... 6/1
SINAMICS G120C ... 4/1
SINAMICS G120D ... 8/1
SINAMICS G120P ... 5/1
SINAMICS in automation ... 1/2
SINAMICS infeed concepts ... 2/12
SINAMICS Manual Collection ... 15/17
SINAMICS medium-voltage converters and DC drives ... 1/13
SINAMICS micro memory card (MMC)
- for SINAMICS G110D ... 7/17
- for SINAMICS G120 ... 6/97
- for SINAMICS G120C ... 4/27
- for SINAMICS G120D ... 8/25
- for SINAMICS G120P ... 5/35

SINAMICS S – The flexible drives ... 1/12
SINAMICS S110 ... 9/1
SINAMICS S120 ... 10/1
SINAMICS selection guide – typical applications ... 1/6
SINAMICS StartDrive ... 14/7
SINAMICS variants ... 1/5
SinaSave ... 14/10
Sine-wave filter for SINAMICS G120 ... 6/84
SITRAIN ... 15/3
SIZER for Siemens Drives engineering tool ... 14/4
SMC10 ... 9/40
SMC20 ... 9/41
SMC30 ... 9/42
Spare Parts Kit
- for SINAMICS G110D ... 7/21
- for SINAMICS G120C ... 4/28
- for SINAMICS G120D ... 8/29

Spare parts ... 15/11
- for SINAMICS G110D ... 7/21
- for SINAMICS G120 ... 6/101
- for SINAMICS G120C ... 4/28
- for SINAMICS G120D ... 8/29
- for SINAMICS G120P ... 5/37

SparesOnWeb – Online spare parts catalog ... 15/14
SPEED-CONNECT ... 13/3
Standard inverters
- SINAMICS G110 ... 3/1
- SINAMICS G120 ... 6/1

Starter kit SINAMICS G110 ... 3/13
STARTER ... 14/5
Supplementary system components
- for SINAMICS G110D ... 7/16
- for SINAMICS G120 ... 6/91
- for SINAMICS G120C ... 4/23
- for SINAMICS G120D ... 8/24
- for SINAMICS G120P ... 5/32
- for SINAMICS S110 ... 9/36

System components
- for SINAMICS G110D ... 7/16
- for SINAMICS G120 ... 6/91
- for SINAMICS G120C ... 4/23
- for SINAMICS G120D ... 8/24
- for SINAMICS G120P ... 5/32

System overview ... 1/1

T

Technical Consulting ... 15/10
Technical specifications
- 1FK7 synchronous motors ... 11/5
- 1PH8 asynchronous (induction) motors ... 11/11
- Absolute encoders ... 12/7
- Incremental encoders ... 12/4
- Power cables ... 13/6
- Signal cables ... 13/11
- SINAMICS G110 ... 3/6
- SINAMICS G110D ... 7/7
- SINAMICS G120 ... 6/11
  - Control Units ... 6/24
  - Power Modules ... 6/38
  - PM230 Power Modules ... 6/40
  - PM240 Power Modules ... 6/44
  - PM250 Power Modules ... 6/49
  - PM260 Power Modules ... 6/52
- SINAMICS G120C ... 4/10
- SINAMICS G120D ... 8/7
  - CU240D Control Units ... 8/14
  - PM250D Power Modules ... 8/18
- SINAMICS G120P ... 5/8
  - CU230P-2 Control Units ... 5/15
  - PM230 Power Module ... 5/20
- SINAMICS S110 ... 9/7
  - CU305 Control Unit ... 9/11
  - PM340 Power Module ... 9/15
- SINAMICS S120 CU310-2 Control Unit ... 10/8

Technical Support ... 15/10
Terminal box ... 11/17
Terminal cover kit
- for SINAMICS G120
  - frame size FSF ... 6/102
  - frame sizes FSD and FSE ... 6/102

The basic positioning drive for single-axis applications – SINAMICS S110 ... 9/3
The efficient drives – SINAMICS G ... 1/10
The flexible drives – SINAMICS S ... 1/12
The members of the SINAMICS family ... 1/10
The SINAMICS drive family ... 1/2
Totally Integrated Automation and communication ... 1/2
Training courses for SINAMICS drive system ... 15/4
Training ... 15/3, 15/10
Typical applications – selection guide ... 1/6

U

UL connector kit for SINAMICS G110D ... 7/19
USB interface cable for communication with a PC
- for SINAMICS G120D ... 8/25
- for SINAMICS G110D ... 7/18

User-friendliness SINAMICS G120P ... 5/4
Using the SINAMICS selection guide ... 1/7
USS and Modbus RTU ... 2/13

V

Varnished modules for SINAMICS S110 ... 9/4
Varnishing of SINAMICS G120 electronic modules ... 6/5

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Order number index

1FK7

1FK7011-5A ... 11/6
1FK7015-5A ... 11/6
1FK7022-5A ... 11/6
1FK7032-2A ... 11/8
1FK7034-2A ... 11/8
1FK7040-2A ... 11/8
1FK7042-2A ... 11/8
1FK7060-2A ... 11/8
1FK7062-2A ... 11/8
1FK7063-2A ... 11/8
1FK7080-2A ... 11/8
1FK7081-2A ... 11/8
1FK7083-2A ... 11/8
1FK7084-2A ... 11/8
1FK7100-2A ... 11/8
1FK7101-2A ... 11/8
1FK7103-2A ... 11/8
1FK7105-2A ... 11/8

1PH8

1PH8083 ... 11/12, 11/14
1PH8087 ... 11/12, 11/14
1PH8101 ... 11/12, 11/14
1PH8103 ... 11/12, 11/14
1PH8105 ... 11/12, 11/14
1PH8107 ... 11/12, 11/14
1PH8131 ... 11/12, 11/14
1PH8133 ... 11/12, 11/14
1PH8135 ... 11/12, 11/14
1PH8137 ... 11/12, 11/14
1PH8138 ... 11/14
1PH8163 ... 11/12, 11/14
1PH8165 ... 11/12, 11/14
1PH8166 ... 11/14

3KA5

3KA5 ... 9/29

3KL5

3KL5 ... 9/30

3LD2

3LD2 ... 9/29

3NA3

3NA31 ... 5/31, 6/69 ... 71, 9/30
3NA32 ... 6/70
3NA33 ... 6/70
3NA38 ... 3/15, 4/21, 5/31, 6/69 ... 71, 7/14, 8/23, 9/30

3NE1

3NE10 ... 5/31, 6/69 ... 71
3NE12 ... 5/31, 6/69 ... 71
3NE1333-2 ... 6/70
3NE1436-2 ... 6/70
3NE18 ... 5/31, 6/69 ... 71

3NP1

3NP1123-1 ... 9/30

3RK1

3RK1901-1NR21 ... 7/19
3RK1901-1NR22 ... 7/19
3RK1902-2DA00 ... 8/26
3RK1902-4BA00-5AA0 ... 7/19, 8/26
3RK1902-4CA00-4AA0 ... 7/19
3RK1902-4DA00-5AA0 ... 7/19, 8/26
3RK1902-4H ... 7/19, 8/26
3RK1911-0DB ... 7/19, 8/27
3RK1911-2BE ... 7/19
3RK1922-2BP00 ... 7/16, 7/18, 6/93, 8/24 ... 25

3RT10

3RT10 ... 9/29

3RV10

3RV10 ... 3/15, 4/21, 5/31, 6/69 ... 71, 7/14, 8/23, 9/29

3VL

3VL17 ... 5/31, 6/69 ... 71, 9/29
3VL372 ... 5/31, 6/69 ... 71, 9/29
3VL47 ... 5/31, 6/69 ... 71, 9/29
3VL57 ... 6/70

5SJ

5SJ42 ... 9/29

5TT

5TT57 ... 9/29

6AG

6AG1064-1AA02-0AA0 ... 15/5
6AG1064-1AA03-0AA0 ... 15/5

6AU

6AU1810-1HA21-0XA0 ... 10/5

6ES

6ES7194-1AB01-0XA0 ... 7/20
6ES7194-4JA50-0AA0 ... 8/29
6ES7194-4JD50-0AA0 ... 8/29
6ES7901-1BF00-0XA0 ... 14/6
6ES7901-1BF00-0XA0 ... 14/6
6ES7901-4BD00-0XA0 ... 14/6
6ES7954-8LB01-0AA0 ... 4/27, 5/35, 6/8, 6/97, 7/17
6ES7997-0B ... 15/12

6FC

6FC5088 ... 15/13
6FC5297-0AD30-0AP2 ... 15/17
6FC5297-0AD30-0BP2 ... 15/17
6FC8507-0RX ... 15/9

6FX

6FX2001-2 ... 12/6
6FX2001-3 ... 12/6
6FX2001-4 ... 12/6
6FX2001-5 ... 12/11
6FX2001-7 ... 12/12

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6FX2002-1DC00 ... 13/13
6FX2002-1DC20 ... 13/13
6FX2003-0S ... 12/12
6FX5002-2A ... 13/15
6FX5002-2C ... 13/15
6FX5002-2DC ... 13/14
6FX5002-2E ... 13/15
6FX5002-5CA ... 13/8
6FX5002-5CG ... 13/7
6FX5002-5CN ... 13/8
6FX5002-5CQ ... 13/8
6FX5002-5CR ... 13/9
6FX5002-5CX ... 13/8
6FX5002-5DA ... 13/8
6FX5002-5DG ... 13/7
6FX5002-5DN ... 13/7, 13/8
6FX5002-5DQ ... 13/8
6FX5002-5DX ... 13/8
6FX5002-5MN05 ... 13/8
6FX5008-1BA ... 13/7, 13/9
6FX5008-1BB ... 13/7, 13/9
6FX8002-2DC ... 13/14
6FX8002-5CA ... 13/8
6FX8002-5CG ... 13/7
6FX8002-5CN ... 13/8
6FX8002-5CQ ... 13/8
6FX8002-5CR ... 13/9
6FX8002-5CX ... 13/8
6FX8002-5DA ... 13/8
6FX8002-5DG ... 13/7
6FX8002-5DN ... 13/7, 13/8
6FX8002-5DQ ... 13/8
6FX8002-5DX ... 13/8
6FX8008-1BA ... 13/7, 13/9
6FX8008-1BB ... 13/7, 13/9

6GK

6GK1551-2AA00 ... 14/6
6GK1571-1AA00 ... 14/6
6GK1901-0DB20-6AA ... 8/26, 12/12
6GK1901-1BB10-6AA0 ... 8/26
6GK1901-1BB30-0AA0 ... 12/12
6GK1905-0E ... 8/26
6GK1905-0F ... 8/26
6GK1907-0AB10-6AA0 ... 8/26

6SE

6SE6400-2FA00-6AD0 ... 6/62, 9/28
6SE6400-2FB00-6AD0 ... 6/62
6SE6400-2FL0 ... 3/15
6SE6400-2FS0 ... 3/15
6SE6400-3CC00-2AD3 ... 3/15, 6/65, 9/27
6SE6400-3CC01-0AB3 ... 9/27
6SE6400-3CC11-2FD0 ... 6/65, 9/27
6SE6400-3CC11-7FD0 ... 6/65, 9/27
6SE6400-3TC00-4AD2 ... 6/77, 9/35
6SE6400-3TC03-8DD0 ... 6/77, 9/35
6SE6400-3TC05-4DD0 ... 6/77, 9/35
6SE6400-3TC07-5ED0 ... 6/77, 9/35
6SE6400-3TC08-0ED0 ... 6/77, 9/35
6SE6400-3TC14-5FD0 ... 6/77, 9/35
6SE6400-3TC15-4FD0 ... 6/77, 9/35
6SE6400-4BC05-0AA0 ... 9/31
6SE6400-4BD11-0AA0 ... 6/72, 9/31
6SE6400-4BD16-5CA0 ... 6/72, 9/31
6SE6400-4BD21-2DA0 ... 6/72, 9/31
6SE6400-4BD22-2EA1 ... 6/72, 9/31
6SE6400-4BD24-0FA0 ... 6/72, 9/31
6SE6400-4BD26-0FA0 ... 6/72

6SL

6SL3000-0BE34-4AA0 ... 6/62
6SL3000-0BE36-0AA0 ... 6/62
6SL3000-0CE32-3AA0 ... 6/65
6SL3000-0CE32-8AA0 ... 6/65
6SL3000-0CE33-3AA0 ... 6/65
6SL3000-0CE35-1AA0 ... 6/65
6SL3000-1BE31-3AA0 ... 6/72
6SL3000-1BE32-5AA0 ... 6/72
6SL3000-2BE32-1AA0 ... 6/77
6SL3000-2BE32-6AA0 ... 6/77
6SL3000-2BE33-2AA0 ... 6/77
6SL3000-2BE33-8AA0 ... 6/77
6SL3000-2BE35-0AA0 ... 6/77
6SL3000-2CE32-3AA0 ... 6/84
6SL3000-2CE32-8AA0 ... 6/84
6SL3000-2CE33-3AA0 ... 6/84
6SL3000-2CE34-1AA0 ... 6/84
6SL3040-0JA0 ... 9/11
6SL3040-1LA0 ... 10/8
6SL3054-0EE00-1BA0 ... 10/9
6SL3054-4 ... 9/11
6SL3055-0AA00-4BA0 ... 9/36
6SL3055-0AA00-5AA3 ... 9/40
6SL3055-0AA00-5BA3 ... 9/41
6SL3055-0AA00-5CA2 ... 9/42
6SL3060-4A ... 13/13
6SL3066-4CA00-0AA0 ... 10/8
6SL3070-0AA00-0AG0 ... 14/4
6SL3072-0AA00-0AG0 ... 6/8, 3/10. 7/18, 8/25, 9/11, 10/8, 14/5
6SL3072-4AA02-0XG0 ... 14/7
6SL3074-0AA10-0AA0 ... 9/11, 10/9
6SL3075-0AA00-0AG0 ... 14/11
6SL3097-4AB00-0 ... 15/18
6SL3097-4AB10-0 ... 15/18
6SL3097-4AC10-0 ... 15/18
6SL3097-4AF00-0 ... 15/18
6SL3097-4AG00-0 ... 15/18
6SL3097-4AG10-0 ... 15/18
6SL3097-4AL00-0 ... 15/18
6SL3097-4AP00-0 ... 15/18
6SL3097-4AP10-0 ... 15/18
6SL3097-4AR00-0 ... 15/18
6SL3097-4CA00-0YG0 ... 3/10, 15/17
6SL3200-0AB10-0AA0 ... 3/13
6SL3200-0S ... 4/28, 5/37 ... 38, 6/101 ... 104
6SL3201-0BE ... 4/22, 6/72, 9/31
6SL3202-0AE20-3SA0 ... 6/84
6SL3202-0AE20-6SA0 ... 6/84
6SL3202-0AE21-0CA0 ... 6/77, 9/35
6SL3202-0AE21-1SA0 ... 6/84
6SL3202-0AE21-4SA0 ... 6/84
6SL3202-0AE22-0SA0 ... 6/84
6SL3202-0AE23-3SA0 ... 6/84

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Order number index

6SL3202-0AE24-6SA0 ..... 6/84
6SL3202-0AE26-2SA0 ..... 6/84
6SL3202-0AE28-8SA0 ..... 6/84
6SL3202-0AE31-5SA0 ..... 6/84
6SL3202-0AE31-8SA0 ..... 6/84
6SL3202-0AJ23-2CA0 ..... 6/77, 9/35
6SL3202-0AJ23-2CA0 ..... 6/77
6SL3203-0BD23-8SA0 ..... 6/62
6SL3203-0BE21-6SA0 ..... 6/62
6SL3203-0BE32-5AA0 ..... 6/62
6SL3203-0CD21-0AA0 ..... 6/65, 9/27
6SL3203-0CD21-4AA0 ..... 6/65, 9/27
6SL3203-0CD22-2AA0 ..... 6/65, 9/27
6SL3203-0CD23-5AA0 ..... 6/65, 9/27
6SL3203-0CD25-3AA0 ..... 6/65, 9/27
6SL3203-0CE 4/20
6SL3203-0CJ24-5AA0 ..... 6/65, 9/27
6SL3203-0CJ28-6AA0 ..... 6/65, 9/27
6SL3210-1KE 4/9
6SL3210-1SB 9/20
6SL3210-1SE 9/20
6SL3211-0AB 3/5
6SL3223-0DE 5/18, 6/7, 6/32
6SL3224-0BE 6/7, 6/33
6SL3224-0XE4 ..... 6/7, 6/33
6SL3225-0BE 6/7, 6/32
6SL3225-0BH 6/7, 6/33
6SL3243-0BB30-1 ..... 5/10, 6/6, 6/16
6SL3244-0BB00-1 ..... 6/6, 6/16
6SL3244-0BB12-1 ..... 6/6, 6/16
6SL3244-0BB13-1 ..... 6/6, 6/16
6SL3252-0BB00-0AA0 ..... 6/8, 6/98
6SL3252-0BB01-0AA0 ..... 9/38
6SL3254-0AM00-0AA0 ..... 4/27, 5/35, 6/8, 6/97, 7/17, 8/25
6SL3255-0AA00-2AA1 ..... 3/10, 14/6
6SL3255-0AA00-2CA0 ..... 4/27, 5/36, 6/8, 6/99, 14/6
6SL3255-0AA00-4BA1 ..... 3/10
6SL3255-0AA00-4CA1 ..... 4/26, 5/34, 6/8, 6/95
6SL3255-0AA00-4HA0 ..... 4/24, 6/8, 6/93, 7/16, 8/24, 9/37
6SL3255-0AA00-4JA0 ..... 4/24, 5/33, 6/8, 6/93, 9/37
6SL3256-0AP00-0JA0 ..... 4/24, 4/26, 6/8, 6/93, 6/95
6SL3256-0AP00-4JA0 ..... 9/37
6SL3256-1BA00-0AA0 ..... 5/35, 6/8, 6/97
6SL3261-1BA00-0AA0 ..... 3/10
6SL3261-1BB00-0AA0 ..... 3/10
6SL3262-1A 6/8, 6/100, 9/20
6SL3262-1B 6/8, 6/99
6SL3262-1F 6/8, 6/100
6SL3263-1GA20-0GA0 ..... 7/18
6SL3263-1H 7/19
6SL3264-1E 5/36, 6/8, 6/100
6SL3266-1E 4/28
6SL3298-0AA11 ..... 3/10
6SL3298-0BA11 ..... 3/10
6SL3300-1AE32-5AA0 ..... 6/75
6SL3362-0AG00-0AA1 ..... 6/104
6SL3500-0SF01-0AA0 ..... 8/29
6SL3500-0SK01-0AA0 ..... 8/29
6SL3500-0TF01-0AA0 ..... 7/21
6SL3500-0TK01-0AA0 ..... 7/21
6SL3501-0BE 7/15
6SL3511-0PE 7/4
6SL3511-1PE 7/4
6SL3525-0PE 8/16
6SL3544-0FA2 ..... 8/9
6SL3555-0PA00-2AA0 ..... 7/18, 8/25, 14/6
6SL3555-0PL00-2AA0 ..... 7/17
6SL3555-0PM00-0AA0 ..... 7/18
6SL3563-4RA00-0GA0 ..... 7/19
6SL3563-4UA00-0GA0 ..... 7/19

6SN

6SN1197-0A 15/19

6SW

6SW1700 ..... 14/9

6SX

6SX7002-0A 13/15

6XV

6XV1801-5D 12/12
6XV1822-5B 8/26
6XV1830-3D 8/26
6XV1840-3AH10 ..... 12/12
6XV1870-8A 8/26
6XV1871-5T 12/12

6ZB

6ZB5310-0EP30-0BA2 ..... 15/12

E86060

E86060-D4001-A510-D1-7600 ..... 14/3
E86060-K4461-A101-A3 ..... 15/17
E86060-K4670-A101-B3 ..... 15/17
E86060-K4680-A101-B8 ..... 15/17
E86060-K4921-A101-A2 ..... 15/17
E86060-K4931-A101-A1 ..... 15/17
E86060-K6710-A101-B7 ..... 15/17
E86060-K6710-B211-A6 ..... 15/17
E86060-K7010-A101-A2 ..... 15/17

HTG

HTG: 61 83 401 ..... 7/20, 8/27
HTG: 61 88 201 ..... 7/20, 8/27

ISBN

ISBN-13: 978-3-89578-218-3 ..... 12/11, 15/17

ZKT

ZKT: 100320 ..... 7/20, 8/27
ZKT: 70009601000 ..... 7/20, 8/27
ZKT: 70017001000 ..... 7/20, 8/27
ZKT: 70020501000 ..... 7/20, 8/27

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We invite you to grade our catalog on a point system from 1 (= good) to 6 (= poor):

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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?

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Rotary inertia (to convert from A to B, multiply by entry in table)

A \ B	lb-in^2	lb-ft^2	lb-in-s^2	lb-ft-s^2 slug-ft^2	kg-cm^2	kg-cm-s^2	gm-cm^2	gm-cm-s^2	oz-in^2	oz-in-s^2
lb-in^2	1	6.94×10^{-3}	2.59×10^{-3}	2.15×10^{-4}	2.926	2.98×10^{-3}	2.92×10^{3}	2.984	16	4.14×10^{-2}
lb-ft^2	144	1	0.3729	3.10×10^{-2}	421.40	0.4297	4.21×10^{5}	429.71	2304	5.967
lb-in-s^2	386.08	2.681	1	8.33×10^{-2}	1.129×10^{3}	1.152	1.129×10^{6}	1.152×10^{3}	6.177×10^{3}	16
lb-ft-s^2 slug-ft^2	4.63×10^{3}	32.17	12	1	1.35×10^{4}	13.825	1.355×10^{7}	1.38×10^{4}	7.41×10^{4}	192
kg-cm^2	0.3417	2.37×10^{-3}	8.85×10^{-4}	7.37×10^{-5}	1	1.019×10^{-3}	1000	1.019	5.46	1.41×10^{-2}
kg-cm-s^2	335.1	2.327	0.8679	7.23×10^{-2}	980.66	1	9.8×10^{5}	1000	5.36×10^{3}	13.887
gm-cm^2	3.417×10^{-4}	2.37×10^{-6}	8.85×10^{-7}	7.37×10^{-8}	1×10^{-3}	1.01×10^{-6}	1	1.01×10^{-3}	5.46×10^{-3}	1.41×10^{-5}
gm-cm-s^2	0.335	2.32×10^{-3}	8.67×10^{-4}	7.23×10^{-5}	0.9806	1×10^{-3}	980.6	1	5.36	1.38×10^{-2}
oz-in^2	0.0625	4.34×10^{-4}	1.61×10^{-4}	1.34×10^{-5}	0.182	1.86×10^{-4}	182.9	0.186	1	2.59×10^{-3}
oz-in-s^2	24.13	0.1675	6.25×10^{-2}	5.20×10^{-3}	70.615	7.20×10^{-2}	7.09×10^{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	8.333×10^{-2}	16	0.113	1.152	1.152×10^{-2}	1.152×10^{3}	1.129×10^{6}
lb-ft	12	1	192	1.355	13.825	0.138	1.382×10^{4}	1.355×10^{7}
oz-in	6.25×10^{-2}	5.208×10^{-3}	1	7.061×10^{-3}	7.200×10^{-2}	7.200×10^{-4}	72.007	7.061×10^{4}
N-m	8.850	0.737	141.612	1	10.197	0.102	1.019×10^{4}	1×10^{7}
kg-cm	0.8679	7.233×10^{-2}	13.877	9.806×10^{-2}	1	10^{-2}	1000	9.806×10^{5}
kg-m	86.796	7.233	1.388×10^{3}	9.806	100	1	1×10^{5}	9.806×10^{7}
gm-cm	8.679×10^{-4}	7.233×10^{-5}	1.388×10^{-2}	9.806×10^{-5}	1×10^{-3}	1×10^{-5}	1	980.665
dyne-cm	8.850×10^{-7}	7.375×10^{-8}	1.416×10^{-5}	10^{-7}	1.0197×10^{-6}	1.019×10^{-8}	1.019×10^{-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	1.09×10^{-2}	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	1.09×10^{-3}	1	0.001
m	39.37	3.281	100	1.09	1000	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)	2.645×10^{-6}	1.972×10^{-3}
(lb-in) (rpm)	1.587×10^{-5}	1.183×10^{-2}
(lb-ft) (deg./s)	3.173×10^{-5}	2.366×10^{-2}
(lb-ft) (rpm)	1.904×10^{-4}	0.1420
Watts	1.341×10^{-3}	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	4.448×10^{5}	4.4482
oz	0.0625	1	28.35	2.780×10^{4}	0.27801
gm	2.205×10^{-3}	0.03527	1	1.02×10^{-3}	N.A.
dyne	2.248×10^{-6}	3.59×10^{-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	6.25×10^{-2}	1	28.35	0.02835	1.93×10^{-3}
gm	2.205×10^{-3}	3.527×10^{-2}	1	10^{-3}	6.852×10^{-5}
kg	2.205	35.27	10^{3}	1	6.852×10^{-2}
slug	32.17	514.8	1.459×10^{4}	14.59	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	1.745×10^{-2}	1

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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 $^5/_9$		multiply by $^9/_5$ 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	μ
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	μ
Ball bushings	<0.001
Linear bearings	<0.001
Dove-tail slides	~0.2++
Gibb ways	~0.5++

Material Densities

Material	lb-in^3	gm-cm^3
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[1)]

Cross-section mm^2	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

[1)] The table shows approximate SWG/AWG sizes nearest to standard metric sizes; the cross-sections do not match exactly.

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Explanation of the metal factor

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold if the respective basic official prices for these metals are exceeded.

The surcharges will be determined based on the following criteria:

- Official price of the metal
- Official price on the day prior to receipt of the order or prior to the release order (=daily price) for
  - silver (sale price of the processed material),
  - gold (sale price of the processed material)

  Source: Umicore, Hanau (www.metalsmanagement.umicore.com)

  and for
  - copper (low DEL notation + 1 %),
  - aluminum (aluminum in cables) and
  - lead (lead in cables)

  Source: German Trade Association for Cables and Conductors (www.kabelverband.org)
- Metal factor of the products
- Certain products are assigned a metal factor. The metal factor determines the official price as of which the metal surcharges are charged 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 method of calculation refers to the list price or a discounted price (customer net price)
(L = list price / N = customer net price).

The remaining digits indicate the method of calculation used for the respective metal. If no surcharge is added, 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)

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 result is then multiplied by the raw material weight.

The basic official price can be found in the table below using the number (2 to 9) of the respective digit of the metal factor. The raw material weight can be found in the respective product descriptions.

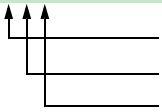
Percentage method

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.

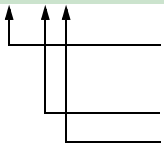
Metal factor examples

L E A – – –



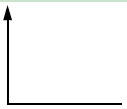
Basis for % surcharge: List price
Silver: basis 150 €, step range 50 €, 0.5 %
Copper: basis 150 €, step range 50 €, 0.1 %
No surcharge for aluminum
No surcharge for lead
No surcharge for gold

N – A 6 – –



Basis for % surcharge: Customer net price
No surcharge for silver
Copper: basis 150 €, step range 50 €, 0.1 %
Aluminum acc. to weight, basic offic. price 225 €
No surcharge for lead
No surcharge for gold

– – 3 – – –



No basis necessary
No surcharge for silver
Copper acc. to weight, basic official price150 €
No surcharge for aluminum
No surcharge for lead
No surcharge for gold

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Values of the metal factor

Percentage method	Basic official price	Step range	% surcharge 1st step	% surcharge 2nd step	% surcharge 3rd step	% surcharge 4th step	% surcharge per additional step
			Official price	Official price	Official price	Official price	
			151 € – 200 €	201 € – 250 €	251 € – 300 €	301 € – 350 €	
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
H	150	50	1.2	2.4	3.6	4.8	1.2
J	150	50	1.8	3.6	5.4	7.2	1.8
			176 € – 225 €	226 € – 275 €	276 € – 325 €	326 € – 375 €	
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
			226 € – 275 €	276 € – 325 €	326 € – 375 €	376 € – 425 €	
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
			151 € – 175 €	176 € – 200 €	201 € – 225 €	226 € – 250 €	
Y	150	25	0.3	0.6	0.9	1.2	0.3
			401 € – 425 €	426 € – 450 €	451 € – 475 €	476 € – 500 €	
Z	400	25	0.1	0.2	0.3	0.4	0.1
	Price basis (1st digit)						
L	Charged on the list price						
N	Charged on the customer net price or discounted list price						

Weight method	Basic official price	
2	100	Calculation based on raw material weight
3	150	
4	175	
5	200	
6	225	
7	300	
8	400	
9	555	
Misc.		
-	No metal surcharge	

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Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

Surcharges will be added to the prices of products that contain silver, copper, aluminium, lead and/or gold, if the respective basic official prices for these metals are exceeded. These surcharges will be determined based on the official price and the metal factor of the respective product.

The surcharge will be calculated on the basis of the official price on the day prior to receipt of the order or prior to the release order.

The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used. The metal factor, provided it is relevant, is included with the price information of the respective products. An exact explanation of the metal factor can be found on the page entitled "Metal surcharges".

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