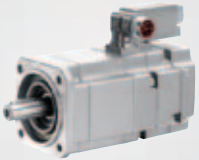


# SINAMICS and Motors for Single-Axis Drives

Catalog D 31 · 2012



## Motion Control Drives

Answers for industry.

**SIEMENS**

## Related catalogs

<p><b>Motion Control</b> SIMOTION, SINAMICS S120 and Motors for Production Machines</p> <p>E86060-K4921-A101-A2-7600</p>	<p>PM 21</p> 	<p><b>SITRAIN</b> Training for Automation and Industrial Solutions <sup>2)</sup></p> <p>E86060-K6850-A101-C2</p>	<p>ITC</p> 
<p><b>SINAMICS Drives</b> SINAMICS G130 Drive Converter Chassis Units SINAMICS G150 Drive Converter Cabinet Units</p> <p>E86060-K5511-A101-A5-7600</p>	<p>D 11</p> 	<p><b>Catalog CA 01</b> Products for Automation and Drives</p> <p>DVD: E86060-D4001-A510-D1-7600</p>	<p>CA 01</p> 
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<p><b>MOTOX</b> MOTOX Geared Motors</p> <p>E86060-K5287-A111-A4-7600</p>	<p>D 87.1</p> 		
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## CD-ROM for Catalog D 31 · 2012

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](http://www.siemens.com/automation/doconweb)
- Dimensional drawings of our motors in PDF/DXF format or via CAD CREATOR [www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)
- Catalog D 31 · 2012 in electronic form (PDF format)



### Hardware and software requirements:

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

### Start

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

The program starts automatically.

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

### Note

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

<sup>1)</sup> Supplement: E86060-K5581-E111-A1-7600  
News: E86060-K5581-A121-A3-7600

<sup>2)</sup> Language: German.

# Motion Control Drives SINAMICS and Motors for Single-Axis Drives

Catalog D 31 · 2012



The products and systems described in this catalog are distributed under application of a certified quality and environmental management system in accordance with DIN EN ISO 9001 (Certified Registration No. 001258 QM08) and DIN EN ISO 14001 (Certified Registration No. 001258 UM). The certificate is recognized by all IQNet countries.

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

Order No.:

E86060-D4001-A510-D1-7600

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# SINAMICS and Motors for Single-Axis Drives

## Overview

### 1

#### System overview

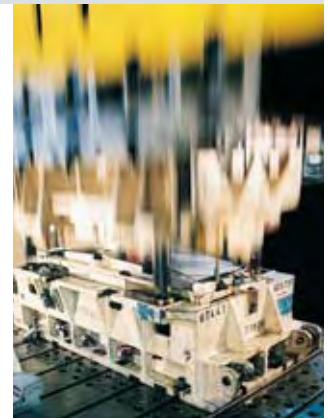
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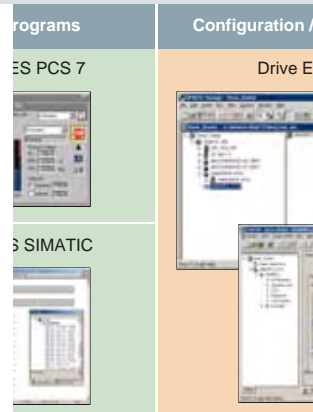
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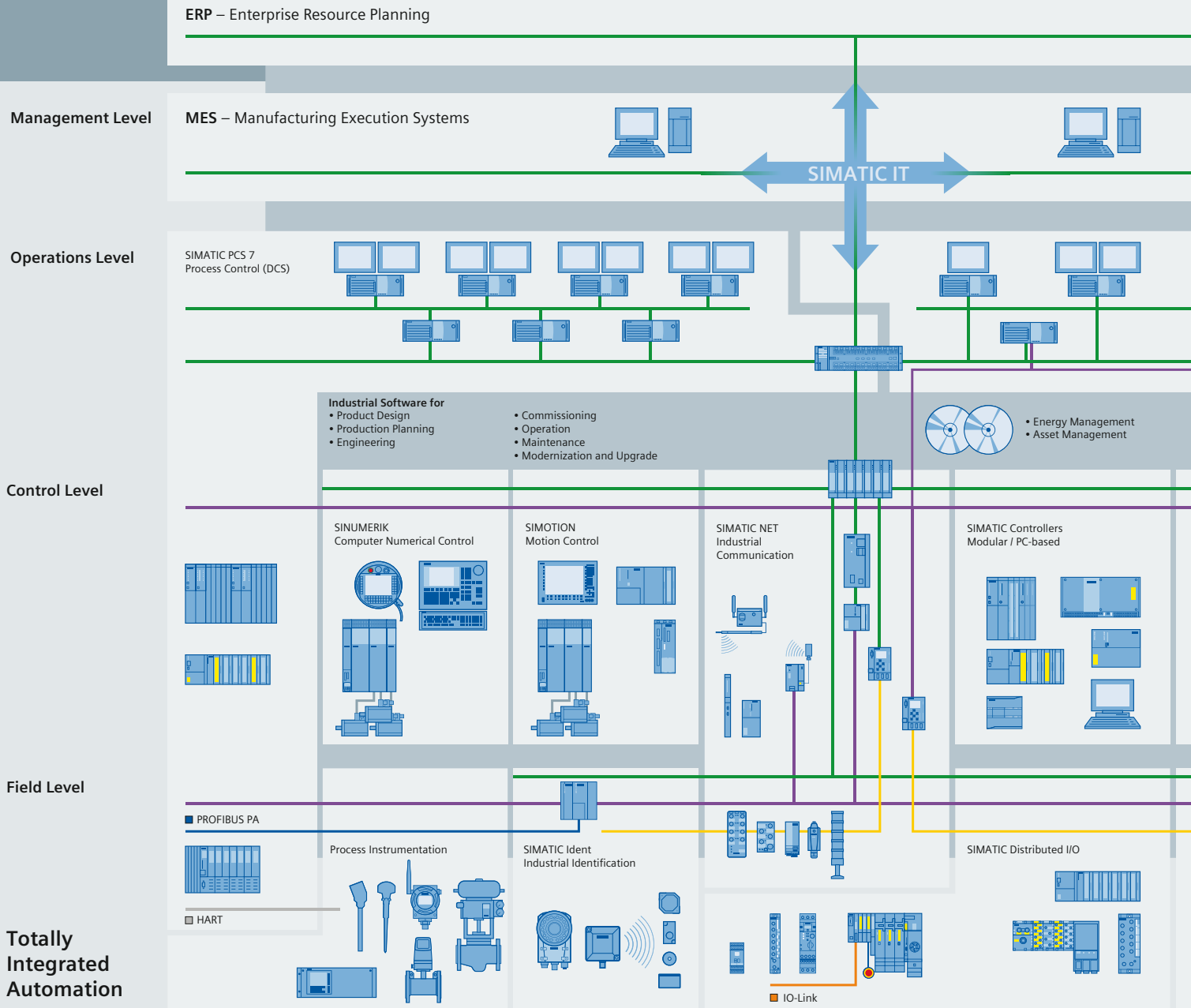
## Answers for industry.

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.

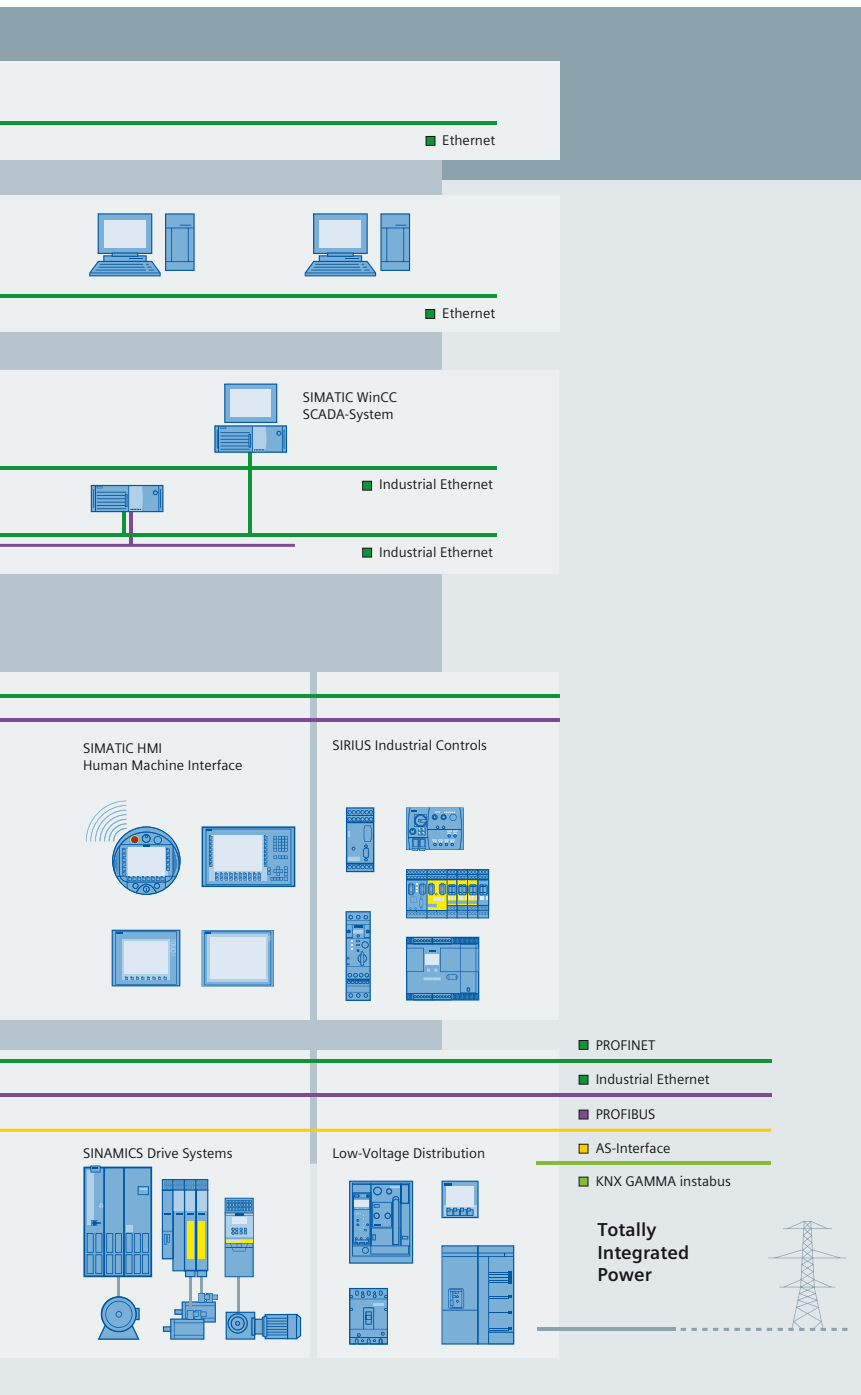
The high quality of our products sets industry-wide benchmarks. High environmental aims are part of our eco-management, and we implement these aims consistently. Right from product design, possible effects on the environment are examined. Hence many of our products and systems are RoHS compliant (Restriction 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.



# Setting standards in productivity and competitiveness.

**Totally Integrated Automation.**



**TIA is characterized by its unique continuity.**

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

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

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

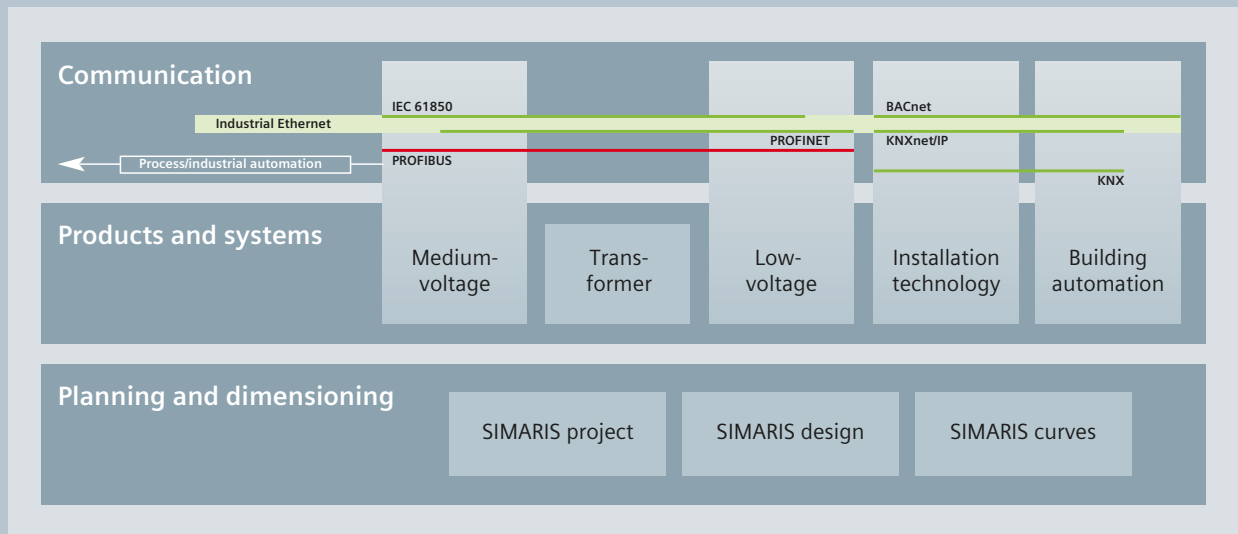
IA/DT TIA En 18.08.11

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



## Integrated power distribution from one source.

**Totally Integrated Power.**



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



## Much more than a catalog. The Industry Mall.

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](http://www.siemens.com/industrymall)



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So you have found your product and want more information about it? In just a few clicks of the mouse, you will arrive at the image data base, manuals and operating instructions. Create your own user documentation with My Documentation Manager. 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!

# System overview



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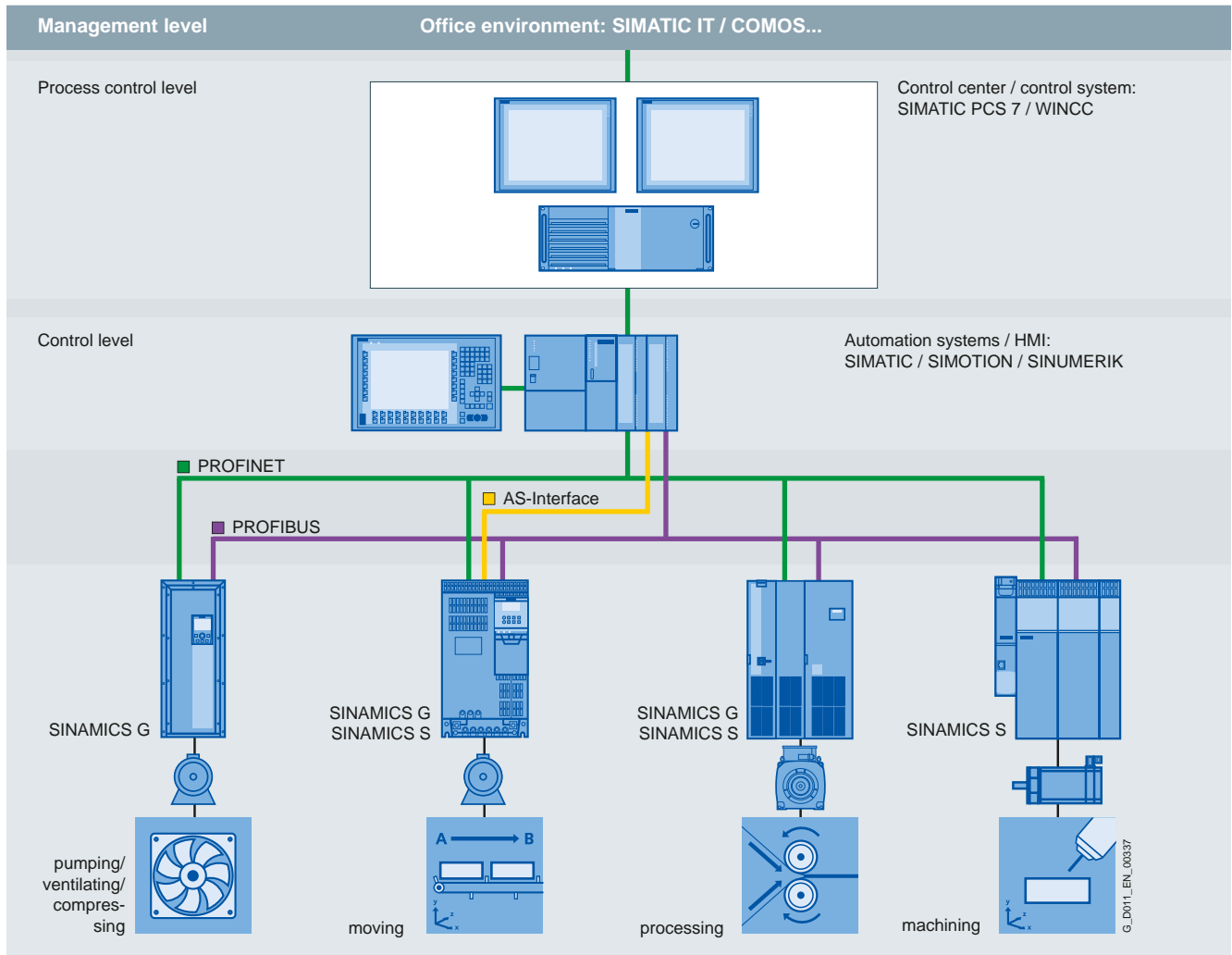
# System overview

## The SINAMICS drive family

1

### 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

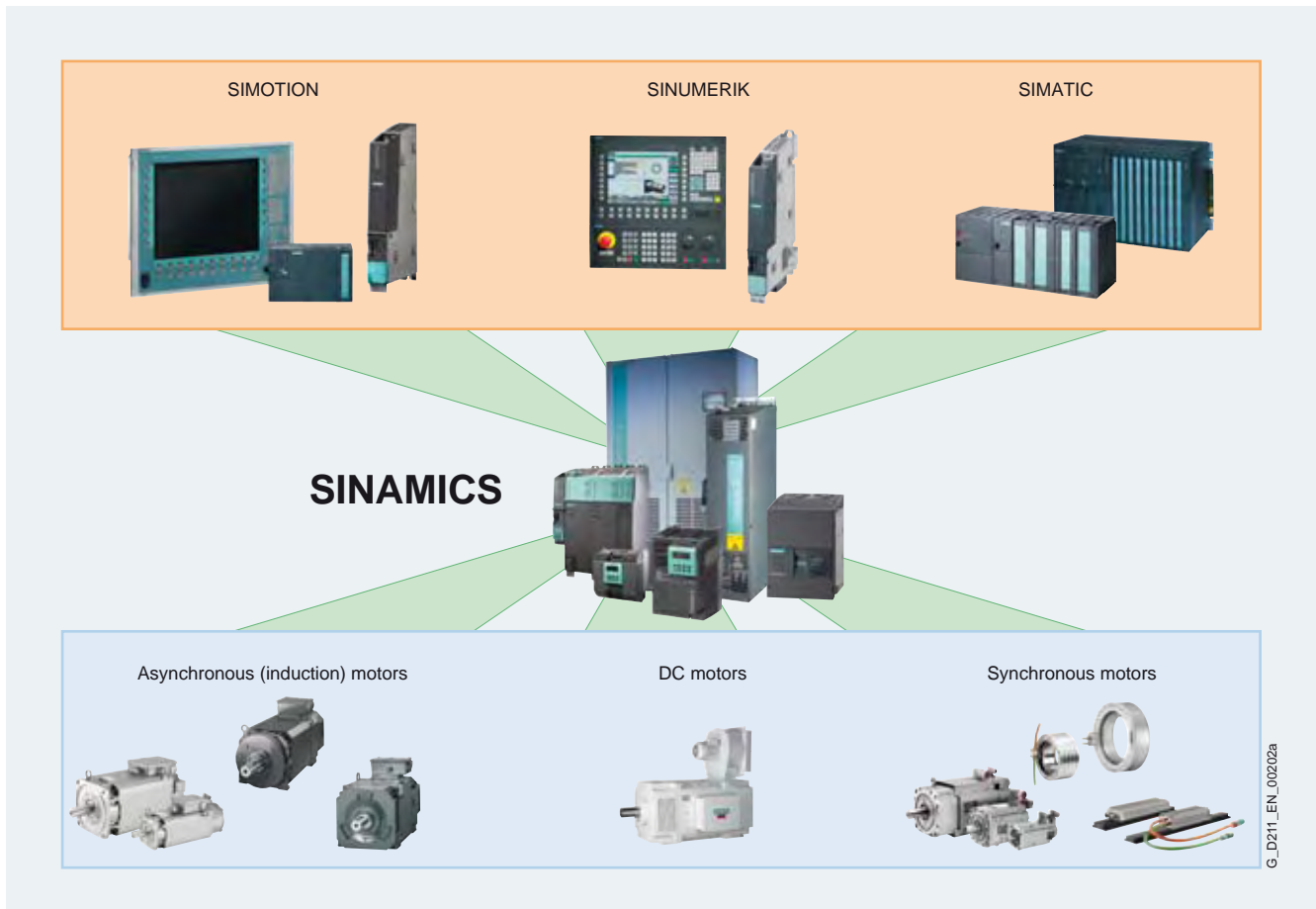
#### Applications

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



## 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.

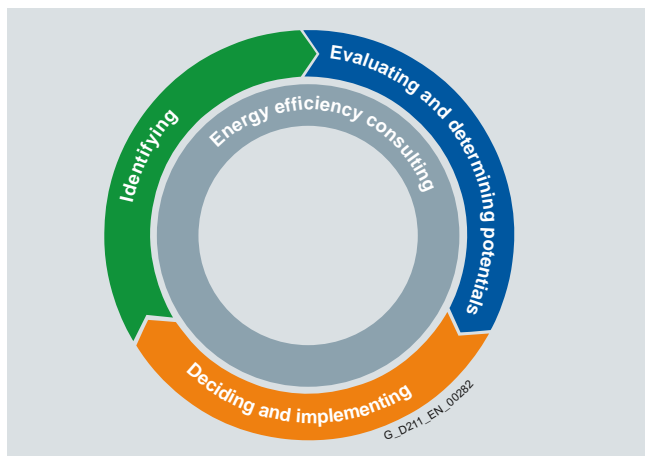
# System overview

## The SINAMICS drive family

1

### 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

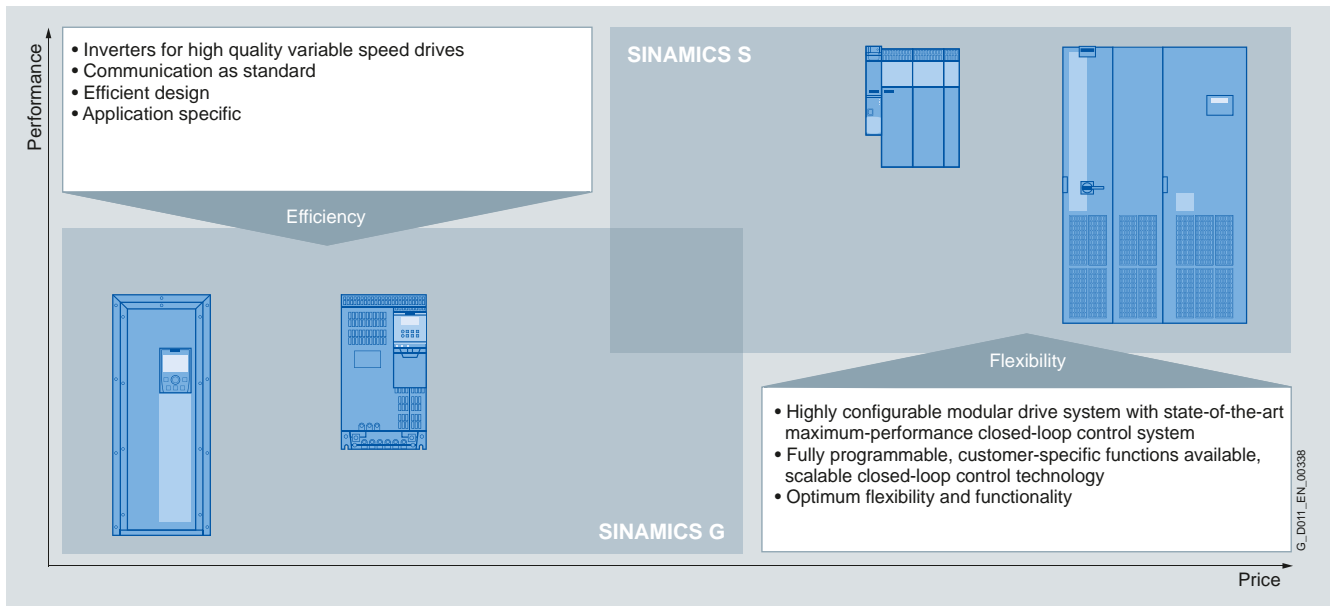
Early on, in the configuration phase, the SIZER for Siemens Drives engineering tool provides information on the specific energy requirement. The energy consumption across the entire drive train is visualized and compared with different plant concepts.

#### 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.

## 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.

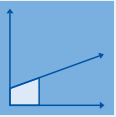
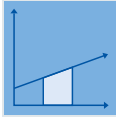
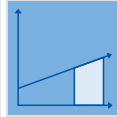
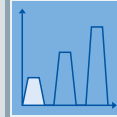
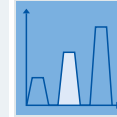


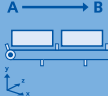
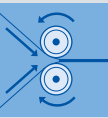

# System overview

## Converter/inverter selection

1

### Overview

#### SINAMICS selection guide – typical applications

Application	Continuous motion			Non-continuous motion		
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality					
	Basic	Medium	High	Basic	Medium	High
						
<b>Pumping, ventilating, compressing</b> 	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
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)
<b>Moving</b> 	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
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (DCM)
<b>Processing</b> 	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
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)
<b>Machining</b> 	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
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>

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

**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

# System overview

## Converter/inverter selection

1

### 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

#### *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.

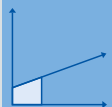
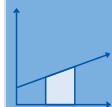

#### Storage and retrieval machines




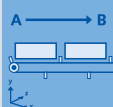


SINAMICS S110 and SINAMICS S120, with power ratings from 0.12 kW to 90 kW (0.16 hp to 125 hp), are ideally suited to motion control for synchronous and asynchronous (induction) motors in storage and retrieval machines. Depending on the application, there is a solution based on the drive-integrated positioning 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	Continuous motion	
	Requirements for torque accuracy/speed accuracy/functionality	
	Basic	Medium
		
<b>Pumping, ventilating, compressing</b>	Centrifugal pumps	
		
<b>Supply voltages</b>	200 ... 240 V 1 AC 380 ... 690 V 3 AC	
<b>Power</b>	0.12 ... 250 kW (0.16 ... 400 hp)	
<b>Degree of protection</b>	IP00 ... IP55	
<b>SINAMICS platform</b>	<b>SINAMICS G110</b> <b>SINAMICS G120C</b>	<b>SINAMICS G120P</b> <b>SINAMICS G120C</b> <b>SINAMICS G120</b>

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

## 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

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

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

# System overview

1

## The members of the SINAMICS family

### Overview

#### SINAMICS G – The efficient drives

##### SINAMICS G110



*The versatile single drive for low power ratings*

##### SINAMICS G120C



*The compact drive with high power density*

##### SINAMICS G120P



*The specialist for pumps, fans, and compressors*

##### SINAMICS G120



*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

- |   |   |   |  |
|---|---|---|--|
| <ul style="list-style-type: none"> <li>• Simple pumps and fans</li> <li>• Auxiliary drives</li> <li>• Conveyor systems</li> <li>• Billboards</li> <li>• Door/gate operating mechanisms</li> </ul> | <ul style="list-style-type: none"> <li>• Mixers</li> <li>• Extruders</li> <li>• Simple pumps, fans, compressors</li> <li>• Vibrator motors</li> <li>• Simple wire drawing machines</li> </ul> | <ul style="list-style-type: none"> <li>• Pumps and fans</li> <li>• Compressors</li> </ul> | <ul style="list-style-type: none"> <li>• Pumps and fans</li> <li>• Compressors</li> <li>• Centrifuges</li> <li>• Conveyor systems</li> </ul> |
|---|---|---|--|

#### Highlights

- |  |   |   |  |
|--|---|---|--|
| <ul style="list-style-type: none"> <li>• Compact</li> <li>• Can be flexibly adapted to different applications</li> <li>• Simple and fast commissioning</li> <li>• Clear terminal layout</li> <li>• Optimum interaction with SIMATIC and LOGO!</li> </ul> | <ul style="list-style-type: none"> <li>• Compact</li> <li>• High power density</li> <li>• Simple and fast commissioning</li> <li>• USB port</li> <li>• Plug-in terminal strips</li> <li>• Standard commissioning with SD card</li> <li>• Optimum interaction with SIMOTION and SIMATIC</li> </ul> | <ul style="list-style-type: none"> <li>• High degree of protection IP54</li> <li>• Integrated pumping, ventilation, compressing functions</li> <li>• Reduced line harmonic distortions</li> <li>• Optimum energy management through innovative technology</li> <li>• Easy-to-use application wizards</li> <li>• Flexible and modular</li> </ul> | <ul style="list-style-type: none"> <li>• Modular</li> <li>• Can be flexibly expanded</li> <li>• Simple and fast commissioning</li> <li>• Regenerative feedback</li> <li>• Innovative cooling concept</li> <li>• Optimum interaction with SIMOTION and SIMATIC</li> </ul> |
|--|---|---|--|

#### Regenerative feedback capability

No	No	No	Yes
----	----	----	-----

#### Minimal low-frequency line harmonic distortions

No	No	Yes	Yes
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#### Integrated safety functions

None	STO	None	STO, SS1, SLS, SBC, SDI, SSM
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#### 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



*The distributed single drive for basic solutions*

## SINAMICS G120D



*The distributed single drive for high-performance solutions*

## SINAMICS G130, SINAMICS G150



*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

# System overview

## The members of the SINAMICS family

1

### Overview

#### SINAMICS S – The flexible drives

##### SINAMICS S110



*The specialist for simple positioning tasks*

##### Main applications

Machines and plants in industrial applications, where machine axes should be quickly and precisely positioned in the simplest possible way.

##### 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

##### 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

##### SINAMICS S120



*The flexible, modular drive system for demanding drive tasks*

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)

- Motion control applications (positioning, synchronous operation)
- Numerical control, interpolating motion control
- Converting
- Technological applications

- 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

##### SINAMICS S150



*The drive solution for sophisticated single drives with high output ratings*

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

- Test stand drives
- Centrifuges
- Elevators and cranes
- Cross cutters and shears
- Conveyor belts
- Presses
- Cable winches

- 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

## Overview

## SINAMICS medium-voltage converters and DC drives

## SINAMICS GM150, SINAMICS SM150, SINAMICS GL150, SINAMICS SL150



*The drive solution for single-motor and multi-motor drives in the medium-voltage range*

## SINAMICS DCM



*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

# System overview

1

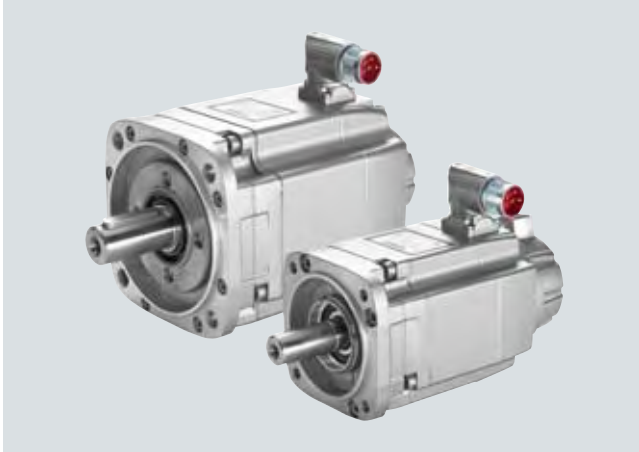
## Servomotors/main motors

### Overview

#### Servomotors

##### 1FK7 synchronous motors

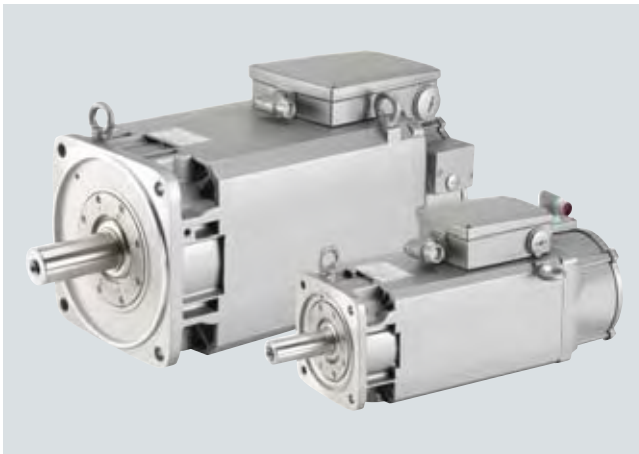
Application areas are e.g. robots and handling systems, wood, glass, ceramics and stone working, packaging, plastics and textile machines



#### 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](http://www.siemens.com/sizer)
- CAD CREATOR
  - Dimension drawing and 2D/3D CAD generator  
[www.siemens.com/cadcreator](http://www.siemens.com/cadcreator)

**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.

# System overview

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

## Safety Integrated

## Overview

2

**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.



## 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.

## 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

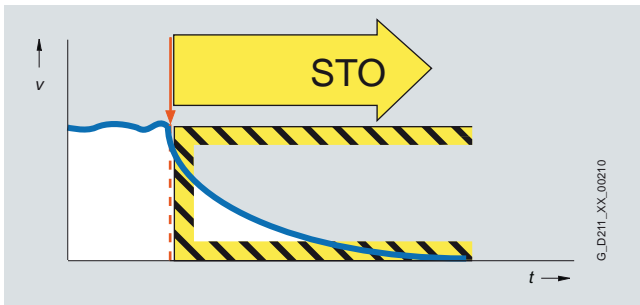
This function is a mechanism that prevents the drive from restarting unexpectedly, in accordance with EN 60204-1, Section 5.4. Safe Torque Off suppresses the drive pulses (corresponds to Stop Category 0 of EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

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 switch-gear 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

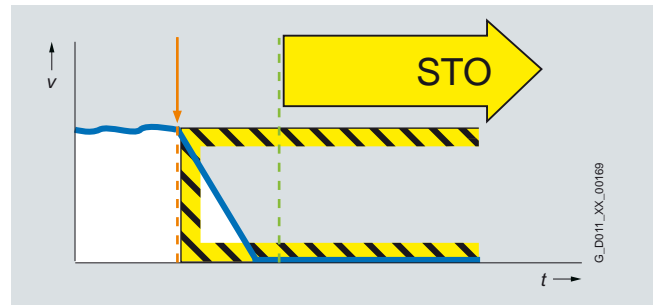
The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes autonomously along a quick stop ramp. The Safe Torque Off and Safe Brake Control functions (if activated) are then activated automatically depending on 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.



**Function****Safe Operating Stop (SOS)**

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

Activation

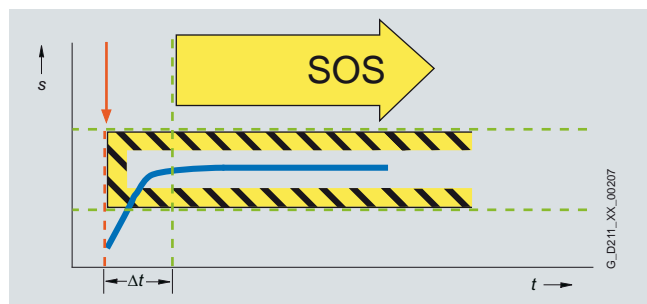
The Safe Operating Stop function constitutes safe standstill monitoring. The drive control remains in operation. The motor can therefore deliver the full torque to hold the current position. The actual position is reliably monitored. In contrast to safety functions SS1 and SS2, the speed setpoint is 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

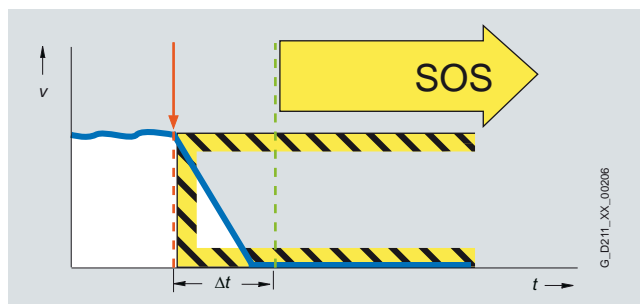
The Safe Stop 2 function can safely stop the drive in accordance with EN 60204-1, Stop Category 2. When the SS2 function is selected, the drive brakes autonomously along a quick stop ramp. In contrast to SS1, the drive control remains operational afterwards, i.e. the motor can supply the full torque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



## 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

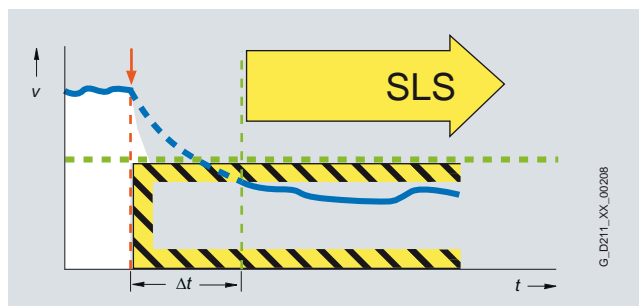
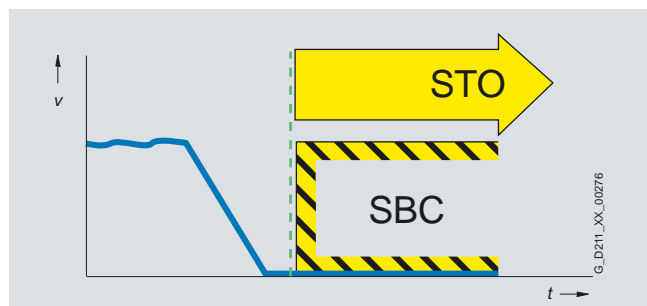
If the preset speed limit is exceeded, this is detected reliably. If the limit is exceeded, a customizable drive-integrated fault reaction occurs.

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.



**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

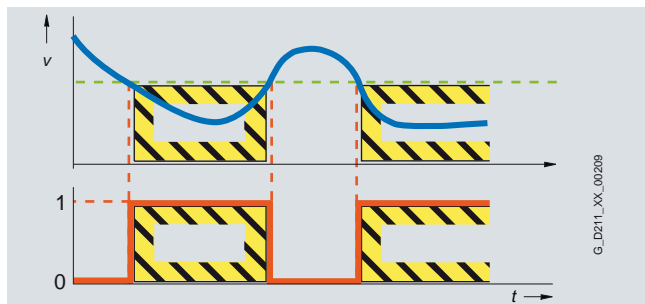
If a speed/velocity value drops below a parameterized level, a safety-related signal is generated. This can, for example, be processed in a safety controller to respond to the event by programming, depending on the situation.

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

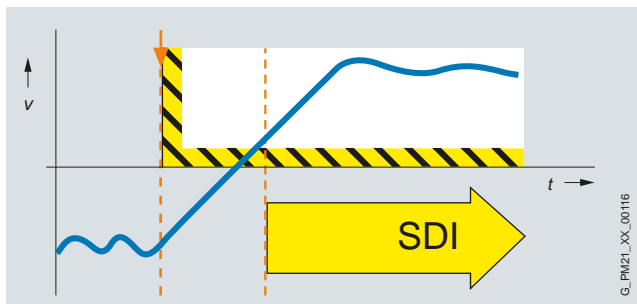
Deviation from the direction of rotation currently being monitored is detected reliably and the configured drive-integrated fault reaction is initiated. It is possible to select which direction of rotation is to be monitored.

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.



# Highlights

## Safety Integrated

### Function

*SINAMICS G120, SINAMICS G120C, SINAMICS G110D and SINAMICS G120D*

2



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
<b>STO</b>	<ul style="list-style-type: none"> <li>• F-DI <sup>1)</sup></li> <li>• PROFIsafe</li> </ul>	–	–	No	No	No	G120 - CU240E-2 - CU240E-2 DP - CU240E-2 F - CU240E-2 DP-F G120C G110D <sup>2)</sup> G120D - CU240D DP-F - CU240D PN-F
<b>SS1</b>	<ul style="list-style-type: none"> <li>• F-DI <sup>1)</sup></li> <li>• PROFIsafe</li> </ul>	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
<b>SLS</b>	<ul style="list-style-type: none"> <li>• F-DI <sup>1)</sup></li> <li>• PROFIsafe</li> </ul>	–	Activation of STO or SS1	Yes	No	No	G120 - CU240E-2 F - CU240E-2 DP-F G120D - CU240D DP-F - CU240D PN-F
<b>SDI</b>	<ul style="list-style-type: none"> <li>• F-DI <sup>1)</sup></li> <li>• PROFIsafe</li> </ul>	–	Activation of STO or SS1	Yes	No	No	G120 - CU240E-2 F - CU240E-2 DP-F
<b>SSM</b>	Always active	–	Signals that the speed has fallen below a specified value	–	No	No	G120 - CU240E-2 DP-F

<sup>1)</sup> Not for SINAMICS G110D and SINAMICS G120D.

<sup>2)</sup> Through safety-related switching off of the black AS-Interface cable.

## 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](#).

2

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
<b>Basic Functions</b>						
<b>STO</b>	<ul style="list-style-type: none"> <li>F-DI0 on CU305</li> <li>PROFIsafe</li> </ul>	SBC (if activated)	–	No	No	No
<b>SBC</b>	<ul style="list-style-type: none"> <li>With STO (immediately or following expiry of the delay time with SS1)</li> </ul>	–	–	–	No	No
<b>SS1</b>	<ul style="list-style-type: none"> <li>F-DI0 on CU305</li> </ul>	STO following expiry of the parameterized delay time, followed by SBC (if activated)	–	No	No	No
<b>Extended Functions</b>						
<b>SS1 with SBR</b>	<ul style="list-style-type: none"> <li>F-DI0-2 on CU305</li> <li>PROFIsafe</li> </ul>	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
<b>SS2 with SBR</b>	<ul style="list-style-type: none"> <li>F-DI0-2 on CU305</li> <li>PROFIsafe</li> </ul>	Safe acceleration monitoring during braking. Following expiry of the parameterized delay time SOS	STO	No	Yes	Yes
<b>SOS</b>	<ul style="list-style-type: none"> <li>F-DI0-2 on CU305</li> <li>PROFIsafe</li> </ul>	–	SS1	Yes	Yes	Yes
<b>SLS</b>	<ul style="list-style-type: none"> <li>F-DI0-2 on CU305</li> <li>PROFIsafe</li> </ul>	–	SS1, STO, or SOS (parameterizable)	Yes	No	Yes
<b>SSM</b>	Always active	–	Message only	Yes	No	Yes
<b>SDI</b>	<ul style="list-style-type: none"> <li>F-DI0-2 on CU305</li> <li>PROFIsafe</li> </ul>	–	SS1, STO, or SOS (parameterizable)	Yes	No	Yes

## 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
<b>Basic Functions</b>						
<b>STO</b>	<ul style="list-style-type: none"> <li>• EP terminals on the device and on the CU3xx</li> <li>• Terminals on the TM54F</li> <li>• PROFIsafe</li> </ul>	SBC (if activated)	–	No	No <sup>1)</sup>	No <sup>2)</sup>
<b>SBC</b>	<ul style="list-style-type: none"> <li>• With STO (immediately or following expiry of the delay time with SS1)</li> </ul>	–	–	–	No	No <sup>2)</sup>
<b>SS1</b>	<ul style="list-style-type: none"> <li>• EP terminals on the device and on the CU3xx</li> <li>• PROFIsafe</li> </ul>	STO following expiry of the parameterized delay time, SBC (if activated)	–	No	No	No <sup>2)</sup>
<b>Extended Functions</b>						
<b>SS1 with SBR</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F</li> <li>• PROFIsafe</li> </ul>	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 <sup>3)</sup>	Yes
<b>SS2</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F</li> <li>• PROFIsafe</li> </ul>	Safe acceleration monitoring (SBR) during braking. Following expiry of the parameterized delay time SOS	STO	No	Yes	Yes
<b>SLS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F</li> <li>• PROFIsafe</li> </ul>	–	SS1, STO or SOS (parameterizable)	Yes	No <sup>3)</sup>	Yes
<b>SOS</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F</li> <li>• PROFIsafe</li> </ul>	–	SS1/STO	Yes	Yes	Yes
<b>SSM</b>	Always active	–	Display only	Yes	Yes	Yes
<b>SDI</b>	<ul style="list-style-type: none"> <li>• Terminals on the TM54F</li> <li>• PROFIsafe</li> </ul>	–	SS1, STO or SOS (parameterizable)	Yes	No <sup>3)</sup>	Yes

<sup>1)</sup> Activation using terminals on the TM54F currently requires an encoder.

<sup>2)</sup> Activation using terminals on the TM54F currently requires a license.

<sup>3)</sup> Not available for CU310 (SINAMICS Firmware V2.x)



## Efficient Infeed Technology

### 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

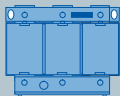

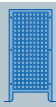

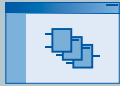

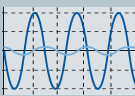

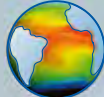

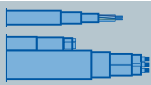

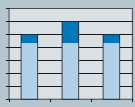





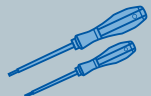

The following drives are equipped with Efficient Infeed Technology:

- 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  $\cos \varphi$ 
  - Slightly capacitive at input  $\approx 0.94$ .
  - 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  $S_{inverter}$ :

$$S_{K\_line} \geq 100 \times S_{inverter} \text{ according to } u_K \leq 1\%$$

#### 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

# Highlights

## 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
<b>Basic Infeed</b>	<ul style="list-style-type: none"> <li>• Automatic energy exchange via the common DC link during infeed with Basic Line Module infeed unit</li> <li>• No regenerative feedback capability</li> <li>• Braking resistor required for braking operation</li> <li>• High harmonic content (reactor available as option)</li> <li>• Efficiency approx. 99 %</li> </ul>
<b>Smart Infeed</b>	<ul style="list-style-type: none"> <li>• Automatic energy exchange via the common DC link</li> <li>• Regenerative feedback capability</li> <li>• Line reactor is required</li> <li>• Efficiency approx. 98 % to 99 %</li> </ul>
<b>Efficient Infeed</b>	<ul style="list-style-type: none"> <li>• <b>Regenerative feedback capability</b></li> <li>• <b>Line reactor not required/not permitted</b></li> <li>• <b>Low harmonic component</b></li> <li>• <b>Efficiency approx. 98 %</b></li> <li>• <b>High energy efficiency and high active current component</b></li> </ul>
<b>Active Infeed</b>	<ul style="list-style-type: none"> <li>• <b>Automatic energy exchange via the common DC link</b></li> <li>• <b>Regenerative feedback capability</b></li> <li>• <b>Low harmonics in motor and generator operation</b></li> <li>• <b>Efficiency approx. 97 % to 98 %</b></li> <li>• <b>Operation on island networks possible</b></li> <li>• <b>Operation on weak networks possible (<math>u_K \leq 5\%</math>)</b></li> <li>• <b>Boosting DC link voltage permits smaller power units</b></li> <li>• <b>Decoupling from line voltage fluctuations due to constantly controlled DC link voltage</b></li> </ul>

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 <u>LO</u>		Filter capacitance	50 Hz impedance	Current at 400 V	60 Hz impedance	Current at 480 V
kW	hp	$\mu\text{F}$	$\Omega$	A	$\Omega$	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

Values apply to PM250 Power Modules with integrated line filter class A

Rated power of the PM250D Power Module for high overload <u>HO</u>		Filter capacitance	50 Hz impedance	Current at 400 V	60 Hz impedance	Current at 480 V
kW	hp	$\mu\text{F}$	$\Omega$	A	$\Omega$	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](http://www.siemens.com/automation/service&support)

## 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 **N**etworks **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



G\_PM10\_XX\_00144

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.

# Highlights

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

# SINAMICS G110

## standard inverters

### 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

3



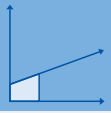
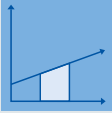
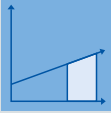
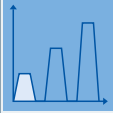
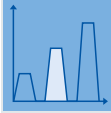
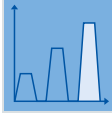
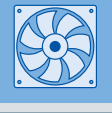
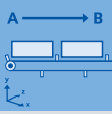
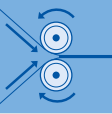
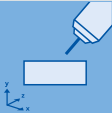
<b>3/2</b>	<b>Introduction</b>
3/2	Application
3/2	More information
<b>3/3</b>	<b>Controlled Power Modules</b>
3/3	Overview
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3/4	Function
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3/10	Accessories
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<b>3/13</b>	<b>Starter kit</b>
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<b>3/14</b>	<b>Line-side power components</b>
3/14	Overview
3/14	Technical specifications
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# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Introduction

### Application

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

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

The SINAMICS G110 inverter is especially suited for applications with pumps and fans, as a drive in various sectors, e.g. food and beverages, textiles, packaging, as well as conveyor

technology, with factory gate and garage door drives and as a universal drive for moving advertising media.

### More information

You may also be interested in these inverters:

- More performance, higher functionality ⇒ SINAMICS G120 ([chapter 6](#)), SINAMICS G120C ([chapter 4](#))
- Higher degree of protection ⇒ SINAMICS G110D ([chapter 7](#)), SINAMICS G120D ([chapter 8](#))
- Special functions for pumps, fans, and compressors ⇒ SINAMICS G120P ([chapter 5](#))

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

**Controlled Power Modules**
**Overview**


SINAMICS G110, frame size FSA (right with flat heat sink)



SINAMICS G110, frame sizes FSB and FSC

SINAMICS G110 is an inverter with basic functions for a wide range of industrial drive applications with variable speeds.

The extremely compact SINAMICS G110 inverter operates with voltage-frequency control from 200 V to 240 V on single-phase line supply systems.

It is the ideal "price-conscious" inverter solution in the lower power range of the SINAMICS product family.

The following **line-side power components** are available for SINAMICS G110 inverters:

- EMC filters
- Line reactors
- Fuses
- Circuit breakers

The **accessories** listed below are also available:

- Operator panel
- Mounting accessories
- Commissioning tool

The latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions), are available on the Internet at the following address:

[www.siemens.com/sinamics-g110/documentation](http://www.siemens.com/sinamics-g110/documentation)

and offline on the DVD-ROM CA 01 in the DT Configurator. In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

**Benefits**

- Simple installation, configuration and commissioning
- Robust EMC design
- Extensive parameter range enables configurations for a wide range of applications
- Simple cable connection
- Scalable functionality with analog and USS versions
- Quiet motor operation as a result of the high pulse frequency
- Status information and alarms via the optional BOP (Basic Operator Panel)
- Rapid copying of parameters via the optional BOP
- External options for PC communication and BOP
- Fast response time of the digital inputs with a high degree of reproducibility for applications demanding fast responses
- Precise setpoint input using a high-resolution 10-bit analog input (analog versions only)
- LED for status information
- Variants with integrated EMC filter class A or B
- DIP switches for easy adaptation to 50 Hz or 60 Hz applications
- DIP switches for simple bus termination for the USS version (RS 485)
- Bus-capable serial RS485 interface (USS versions only) enables integration into a networked drive system
- 2/3-wire method (pulsed/maintained signals) for universal control via digital inputs
- Adjustable lower voltage limit for the DC link to ensure controlled motor braking if the power fails

**Accessories (overview)**

- BOP operator panel
- Adapter for mounting on DIN rails (frame sizes FSA and FSB)
- PC inverter connection kit
- STARTER commissioning tool

**Line-side power components (overview)**

- EMC filter, class B with low leakage currents (additionally available for inverters with integrated filter)
- EMC filter, class B (additionally available for inverters with integrated filter)
- Line reactors

**International standards**

- Fulfills the requirements of the EU low-voltage guideline
- CE marking
- Certified to UL and cUL
- c-tick

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Design

The SINAMICS G110 standard inverters are equipped with a control module and a power module, providing the CPM 110 version (Controlled Power Module) with a compact and efficient design. They operate with the latest IGBT technology and digital microprocessor control.

The SINAMICS G110 converter product range consists of the following variants and versions:

- The **analog variant** is available in the following versions:
  - Without EMC filter, with heat sink
  - With integrated EMC filter, class A/B, with heat sink
  - Without EMC filter, with flat heat sink (FSA frame size only)
  - With integrated EMC filter, class B, with flat heat sink (FSA frame size only)
- The **USS variant** (RS485) is available in the following versions:
  - Without EMC filter, with heat sink
  - With integrated EMC filter, class A/B, with heat sink
  - Without EMC filter, with flat heat sink (FSA frame size only)
  - With integrated EMC filter, class B, with flat heat sink (FSA frame size only)

For frame size FSA, cooling is achieved through a heat sink and natural convection. Frame size FSA with flat heat sink offers space-saving and favorable heat dissipation since an additional heat sink can be installed outside the control cabinet. For frame sizes FSB and FSC, an integrated fan is used to cool the heat sink, making the compact design possible.

The connections for all converter variants are easily accessible and in the same location. To ensure optimum electromagnetic compatibility and easy connection, the line and motor connections are located on opposite sides (as with contactors). The control terminal block does not require screws to install it.

The optional BOP (Basic Operator Panel) can be installed without the use of tools.

#### Function

- The stress on the machine mechanical system is reduced by using a skippable frequency range to avoid resonance effects, selecting ramp-up/ramp-down times up to 650 s, using ramp smoothing as well as being able to switch the inverter to a spinning motor (flying restart circuit)
- Increased plant availability as a result of automatic restarting following a power failure or stoppage
- Fast current limiting (FCL) for fault-free operation in the event of sudden load surges
- Adjustable V/Hz ratio (e.g. for synchronous motors)
- DC braking as well as compound braking for fast braking without an external braking resistor
- DC link voltage limiting using  $V_{DCmax}$  controller
- Slip compensation, electronic motorized potentiometer function and three fixed speed setpoints
- Parameterizable voltage boost for a higher dynamic performance when starting and accelerating
- Motor holding brake function to control an external mechanical brake



# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Selection and ordering data

The G110 drive supports most 2-pole, 4-pole and 6-pole motors rated up to 3.0 kW (4.0 hp). The drive should be selected by matching the output current to the motor FLA. For a description

of the overload performance, please refer to the general technical specifications of the Controlled Power Modules.

Power		Rated input current (at 230 V) A	Rated output current A	Frame size	Version	SINAMICS G110 without filter	SINAMICS G110 with integrated filter	Filter class <sup>1)</sup> With use of shielded cables with a max. cable length of		
kW	hp					Order No.	Order No.	5 m (16 ft)	10 m (33 ft)	25 m (82 ft)
0.12	0.16	2.3	0.9	FSA	Analog	<b>6SL3211-0AB11-2UA1</b>	<b>6SL3211-0AB11-2BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS	<b>6SL3211-0AB11-2UB1</b>	<b>6SL3211-0AB11-2BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					Analog (with flat heat sink)	<b>6SL3211-0KB11-2UA1</b>	<b>6SL3211-0KB11-2BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS (with flat heat sink)	<b>6SL3211-0KB11-2UB1</b>	<b>6SL3211-0KB11-2BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
0.25	0.33	4.5	1.7	FSA	Analog	<b>6SL3211-0AB12-5UA1</b>	<b>6SL3211-0AB12-5BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS	<b>6SL3211-0AB12-5UB1</b>	<b>6SL3211-0AB12-5BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					Analog (with flat heat sink)	<b>6SL3211-0KB12-5UA1</b>	<b>6SL3211-0KB12-5BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS (with flat heat sink)	<b>6SL3211-0KB12-5UB1</b>	<b>6SL3211-0KB12-5BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
0.37	0.5	6.2	2.3	FSA	Analog	<b>6SL3211-0AB13-7UA1</b>	<b>6SL3211-0AB13-7BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS	<b>6SL3211-0AB13-7UB1</b>	<b>6SL3211-0AB13-7BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					Analog (with flat heat sink)	<b>6SL3211-0KB13-7UA1</b>	<b>6SL3211-0KB13-7BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS (with flat heat sink)	<b>6SL3211-0KB13-7UB1</b>	<b>6SL3211-0KB13-7BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
0.55	0.75	7.7	3.2	FSA	Analog	<b>6SL3211-0AB15-5UA1</b>	<b>6SL3211-0AB15-5BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS	<b>6SL3211-0AB15-5UB1</b>	<b>6SL3211-0AB15-5BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					Analog (with flat heat sink)	<b>6SL3211-0KB15-5UA1</b>	<b>6SL3211-0KB15-5BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS (with flat heat sink)	<b>6SL3211-0KB15-5UB1</b>	<b>6SL3211-0KB15-5BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
0.75	1.0	10.0	3.9 (at 40 °C (104 °F))	FSA	Analog	<b>6SL3211-0AB17-5UA1</b>	<b>6SL3211-0AB17-5BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS	<b>6SL3211-0AB17-5UB1</b>	<b>6SL3211-0AB17-5BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					Analog (with flat heat sink)	<b>6SL3211-0KB17-5UA1</b>	<b>6SL3211-0KB17-5BA1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
					USS (with flat heat sink)	<b>6SL3211-0KB17-5UB1</b>	<b>6SL3211-0KB17-5BB1</b>	<b>B</b>	A <sup>2)</sup>	A <sup>2)</sup>
1.1	1.5	14.7	6.0	FSB	Analog	<b>6SL3211-0AB21-1UA1</b>	<b>6SL3211-0AB21-1AA1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
					USS	<b>6SL3211-0AB21-1UB1</b>	<b>6SL3211-0AB21-1AB1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
1.5	2.0	19.7	7.8 (at 40 °C (104 °F))	FSB	Analog	<b>6SL3211-0AB21-5UA1</b>	<b>6SL3211-0AB21-5AA1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
					USS	<b>6SL3211-0AB21-5UB1</b>	<b>6SL3211-0AB21-5AB1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
2.2	3.0	27.2	11.0	FSC	Analog	<b>6SL3211-0AB22-2UA1</b>	<b>6SL3211-0AB22-2AA1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
					USS	<b>6SL3211-0AB22-2UB1</b>	<b>6SL3211-0AB22-2AB1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
3.0	4.0	35.6	13.6 (at 40 °C (104 °F))	FSC	Analog	<b>6SL3211-0AB23-0UA1</b>	<b>6SL3211-0AB23-0AA1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>
					USS	<b>6SL3211-0AB23-0UB1</b>	<b>6SL3211-0AB23-0AB1</b>	B	<b>A <sup>2)</sup></b>	<b>A <sup>2)</sup></b>

The current data apply to an ambient temperature of 50 °C (122 °F) unless specified otherwise.

The last digit of the order number for the SINAMICS G110 inverters represents the version. When ordering, a different digit from the one specified may be provided due to technical updates.

All SINAMICS G110 inverters are supplied without an operator panel (OP). A BOP or other accessories must be ordered separately.

<sup>1)</sup> The filter class **in bold** is stamped on the inverter rating plate.

<sup>2)</sup> With additional filter also class B.

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Technical specifications

	Controlled Power Modules
<b>Power range</b>	0.12 ... 3.0 kW (0.16 ... 4.0 hp)
<b>Line voltage</b>	200 ... 240 V 1 AC ± 10 %
<b>Line frequency</b>	47 ... 63 Hz
<b>Output frequency</b>	0 ... 650 Hz
<b>cos φ</b>	≥ 0.95
<b>Inverter efficiency</b>	90 ... 94 %
• For devices < 0.75 kW	90 ... 94 %
• For devices ≥ 0.75 kW	≥ 95 %
<b>Overload capability</b>	Overload current 1.5 × rated output current (i.e. 150 % overload) for 60 s, then 0.85 × rated output current for 240 s, cycle time 300 s
<b>Inrush current</b>	Not higher than the rated input current
<b>Control methods</b>	Linear V/f characteristic (with parameterizable voltage boost); square V/f characteristic; multipoint characteristic (parameterizable V/f characteristic)
<b>Pulse frequency</b>	8 kHz (standard) 2 ... 16 kHz (in 2 kHz increments)
<b>Fixed frequencies</b>	3, programmable
<b>Skippable frequency range</b>	1, programmable
<b>Setpoint resolution</b>	0.01 Hz digital 0.01 Hz serial 10 bit analog (motorized potentiometer 0.1 Hz)
<b>Digital inputs</b>	3 programmable digital inputs, non-floating, PNP type, SIMATIC-compatible
<b>Analog input (analog variant)</b>	1, for setpoint (0 V ... 10 V, scalable or for use as 4th digital input)
<b>Digital output</b>	1 isolated optocoupler output (24 V DC, 50 mA, ohmic, NPN type)
<b>Universal serial interface (USS variant)</b>	RS485, for operation with USS protocol
<b>Motor cable length, max.</b>	25 m (82 ft) 50 m (164 ft)
• Shielded	25 m (82 ft)
• Unshielded	50 m (164 ft)
<b>Electromagnetic compatibility</b>	All devices with integrated EMC filter for drive systems in category C2 installations (limit value in accordance with EN 55011, class A, group 1) and category C3 installations (limit value in accordance with EN 55011, class A, group 2). All devices with an integrated EMC filter and shielded cables with a maximum length of 5 m (16 ft) also fulfill the limit values of EN 55011, class B for conducted interference.
<b>Braking</b>	DC injection braking, compound braking
<b>Degree of protection</b>	IP20
<b>Operating temperature</b>	-10 ... +40 °C (14 ... +104 °F) up to +50 °C (122 °F) with derating
<b>Storage temperature</b>	-40 ... +70 °C (-40 ... +158 °F)
<b>Relative humidity</b>	95 % (non-condensing)
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating <ul style="list-style-type: none"> <li>• Rated output current <ul style="list-style-type: none"> <li>at 4000 m (13124 ft) above sea level: 90 %</li> </ul> </li> <li>• Line voltage <ul style="list-style-type: none"> <li>up to 2000 m (6562 ft) above sea level: 100 %</li> <li>at 4000 m (13124 ft) above sea level: 75 %</li> </ul> </li> </ul>
<b>Standard SCCR (Short Circuit Current Rating) <sup>1)</sup></b>	10 kA
<b>Protection features for</b>	<ul style="list-style-type: none"> <li>• Undervoltage</li> <li>• Overvoltage</li> <li>• Ground fault</li> <li>• Short-circuit</li> <li>• Stall prevention</li> <li>• Thermal motor protection <math>I^2t</math></li> <li>• Inverter overtemperature</li> <li>• Motor overtemperature</li> </ul>
<b>Compliance with standards</b>	UL, cUL, CE, c-tick
<b>CE marking, according to</b>	Low-Voltage Directive 2006/95/EC

<sup>1)</sup> Applies to industrial control cabinet installations to NEC article 409/UL 508A.

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Technical specifications

		Controlled Power Modules						
Dimensions (without accessories)		FSA ≤ 0.37 kW (0.5 hp)	FSA 0.55 kW (0.75 hp) and 0.75 kW (1.0 hp)	FSA ≤ 0.37 kW (0.5 hp) with flat heat sink	FSA 0.55 kW (0.75 hp) and 0.75 kW (1.0 hp) with flat heat sink	FSB 1.1 kW (1.5 hp) and 1.5 kW (2.0 hp)	FSC 2.2 kW (3.0 hp)	FSC 3.0 kW (4.0 hp)
• Width	mm (in)	90 (3.54)	90 (3.54)	90 (3.54)	90 (3.54)	140 (5.51)	184 (7.24)	184 (7.24)
• Height	mm (in)	150 (5.91)	150 (5.91)	150 (5.91)	150 (5.91)	160 (6.30)	181 (7.13)	181 (7.13)
• Depth	mm (in)	116 (4.57)	131 (5.16)	101 (3.98)	101 (3.98)	142 (5.59)	152 (5.98)	152 (5.98)
<b>Weight, approx.</b>								
• Without filter	kg (lb)	0.7 (1.54)	0.8 (1.76)	0.6 (1.32)	0.7 (1.54)	1.4 (3.09)	1.9 (4.19)	2.0 (4.41)
• With filter	kg (lb)	0.8 (1.76)	0.9 (1.98)	0.7 (1.54)	0.8 (1.76)	1.5 (3.31)	2.1 (4.63)	2.2 (4.85)

#### Technical specifications for variant with flat heat sink

The design with flat heat sink offers space-saving and improved heat dissipation using an external heat sink.

		Controlled Power Modules frame size FSA with flat heat sink				
		0.12 kW (0.16 hp)	0.25 kW (0.33 hp)	0.37 kW (0.5 hp)	0.55 kW (0.75 hp)	0.75 kW (1.0 hp)
<b>Operating temperature</b>	°C (°F)	-10 ... +50 (14 ... 122)	-10 ... +50 (14 ... 122)	-10 ... +50 (14 ... 122)	-10 ... +50 (14 ... 122)	-10 ... +40 (14 ... 104)
<b>Total power losses at full load and maximum operating temperature as specified</b>	W	22	28	36	43	54
<b>Line-side and control electronics losses</b>	W	9	10	12	13	15
<b>Recommended thermal resistance of heat sink</b>	K/W	3.0	2.2	1.6	1.2	1.2
<b>Recommended output current</b>	A	0.9	1.7	2.3	3.2	3.9

#### Derating data and power loss

##### Pulse frequency

Power kW (hp)	Power loss W	Rated output current in A for a pulse frequency of							
		2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.12	22	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
0.25	28	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
0.37	36	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
0.55	43	3.2	3.2	3.2	3.2	3.0	2.7	2.5	2.2
0.75 (at 40 °C)	54	3.9	3.9	3.9	3.9	3.6	3.3	3.0	2.7
0.75	54	3.2	3.2	3.2	3.2	3.0	2.7	2.5	2.2
1.1	86	6.0	6.0	6.0	6.0	5.9	5.7	5.6	5.4
1.5 (at 40 °C)	118	7.8	7.8	7.8	7.8	7.6	7.4	7.2	7.0
1.5	118	6.0	6.0	6.0	6.0	5.9	5.7	5.6	5.4
2.2	174	11.0	11.0	11.0	11.0	10.8	10.5	10.2	9.9
3.0 (at 40 °C)	210	13.6	13.6	13.6	13.6	13.3	12.9	12.6	12.3
3.0	210	11.0	11.0	11.0	11.0	10.8	10.5	10.2	9.9

The current data apply to an ambient temperature of 50 °C (122 °F) unless specified otherwise.

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Technical specifications

##### Compliance with standards

##### CE marking



The SINAMICS G110 inverters meet the requirements of the Low-Voltage Directive 2006/95/EC.

##### Low-Voltage Directive

The inverters comply with the following standards listed in the official journal of the EU:

- EN 60204-1  
Safety of machinery, electrical equipment of machines
- EN 61800-5-1  
Electrical power drive systems with variable speed – Part 5-1: Requirements regarding safety – electrical, thermal, and energy requirements

##### UL listing



Inverter devices in UL category NMMS certified to UL and cUL, in compliance with UL 508C. UL list number E121068.

For use in environments with pollution degree 2.

On the Internet at [www.ul.com](http://www.ul.com)

##### Machinery Directive

The inverters are suitable for installation in machines. Compliance with the Machinery Directive 2006/42/EC requires a separate certificate of conformity. This must be provided by the plant construction company or the organization marketing the machine.

##### EMC Directive

- EN 61800-3  
Variable-speed electric drives  
Part 3: EMC product standard including specific test methods

The EMC product standard EN 61800-3 for electric drive systems has been valid since July 1, 2005. The transition period for the predecessor standard EN 61800-3/A11 dated February 2001 ended on October 1, 2007. The following information applies to Siemens SINAMICS G110 inverters:

- The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter.
- Frequency inverters are normally only supplied to experts for installation in machines or systems. A frequency inverter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The inverter's operating instructions, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to a PDS. For a PDS, the EMC Directive in the EU is complied with by observing the product standard EN 61800-3 for variable-speed electric drive systems. The frequency inverters on their own do not generally require identification according to the EMC Directive.

- In the Standard EN 61800-3 of July 2005, a distinction is no longer made between "general availability" and "restricted availability". Instead, different categories C1 to C4 have been defined in accordance with the environment of the PDS at the operating location:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in the first environment
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in the first environment, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning note is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment. A warning note is required.
  - **Category C4:** Drive systems for rated voltages  $\geq$  1000 V or for rated currents  $\geq$  400 A or for use in complex systems in the second environment. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for the "second environment" (= industrial power supply systems that do not supply households). These limit values are below the limit values of filter class A to EN 55011. Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side.
- With SINAMICS G110, Power Drive Systems (PDS) that fulfill the EMC product standard EN 61800-3 can be configured when observing the installation instructions in the product documentation. The table "Overview of SINAMICS G110 components and PDS categories" and the SINAMICS G110 ordering documentation show which of the components can be installed directly in a PDS.
- A differentiation must be made between the product standards for electrical drive systems (PDS) of the range of standards EN 61800 (of which Part 3 covers EMC topics) and the product standards for the devices/systems/machines, etc. This will probably not result in any changes in the practical use of frequency inverters. Since frequency inverters are always part of a PDS and these are part of a machine, the machine manufacturer must observe various standards depending on their type and environment (e.g. EN 61000-3-2 for line harmonics and EN 55011 for radio interference). The product standard for PDS on its own is, therefore, either insufficient or irrelevant.
- With respect to the compliance with limits for line supply harmonics, the EMC product standard EN 61800-3 for PDS refers to compliance with the EN 61000-3-2 and EN 61000-3-12 standards.
- Regardless of the configuration with SINAMICS G110 and its components, the machine construction company (OEM) can also apply other measures to ensure that the machine complies with the EU EMC Directive. The EU EMC Directive is generally fulfilled when the relevant EMC product standards are observed. If they are not available, the generic standards (e.g. DIN EN 61000-x-x) can be used instead. It is important that the conducted and emitted interference at the line connection point and outside the machine remain below the relevant limit values. Any suitable measures can be applied to ensure this.

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

Controlled Power Modules

### Technical specifications

#### Overview of SINAMICS G110 components and PDS categories

Environment 1 (Residential, commercial)	Category C1 Unfiltered devices and external filter class B with low leakage currents (shielded motor cable up to 5 m (16.41 ft))	Environment 2 (Industry)
	<b>Category C2</b> All devices with integrated filter (shielded motor cable up to 5 m (16.41 ft)) <u>or</u> All devices with integrated filter (frame size FSA: up to 10 m (32.81 ft); Frame sizes FSB and FSC: shielded motor cable up to 25 m (82.03 ft)) + warning <u>or</u> All devices with integrated filter plus external filter, class B (shielded motor cable up to 25 m (82.03 ft))	<b>Category C2</b> All devices with integrated filter (shielded motor cable up to 5 m (16.41 ft)) <u>or</u> All devices with integrated filter (frame size FSA: up to 10 m (32.81 ft); Frame sizes FSB and FSC: shielded motor cable up to 25 m (82.03 ft)) <u>or</u> All devices with integrated filter plus external filter, class B (shielded motor cable up to 25 m (82.03 ft))  Note: When devices with an integrated filter and a max. motor cable length of 5 m (16.41 ft) or external class B filters are used, this exceeds the requirements of EN 61800-3 by a considerable margin!
	<b>Category C3</b> All devices with integrated filter (frame size FSA: up to 10 m (32.81 ft); frame sizes FSB and FSC: shielded motor cable up to 25 m (82.03 ft)) <u>or</u> All devices with integrated filter plus external filter, class B (shielded motor cable up to 25 m (82.03 ft)) A warning note is required. Note: When devices with an integrated filter and external class B filters are used, this exceeds the requirements of EN 61800-3 by a considerable margin!	
	<b>Category C4</b> Does not apply to SINAMICS G110	

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#### Electromagnetic compatibility

Observing the installation guidelines specific to the product will ensure electromagnetic compliance.

The table below lists the measured results for emissions of and immunity to interference for the SINAMICS G110 inverters.

The inverters were installed according to the guidelines with shielded motor cables and shielded control cables.

EMC phenomenon Standard/test	Relevant criteria	Limit value
Noise emissions EN 61800-3 (environment 1)	Conducted via mains cable	150 kHz ... 30 MHz  Unfiltered devices: not tested All devices with integrated/external filter: Depending on the filter type and intended PDS installation: Category C1: The limit value corresponds to EN 55011, class B. Category C2: The limit value corresponds to EN 55011, class A, group 1 Further, all drive units with an integrated/external filter fulfill the limit value for category C3 installations. The limit value corresponds to EN 55011, class A, group 2.
	Emitted by the drive	30 MHz ... 1 GHz  All devices The limit value corresponds to EN 55011, class A, group 1
ESD immunity EN 61000-4-2	ESD by air discharge	Test level 3 8 kV
	ESD by contact discharge	Test level 3 6 kV
Electrical fields immunity EN 61000-4-3	Electrical field applied to unit	Test level 3 80 MHz ... 1 GHz 10 V/m
Burst interference immunity EN 61000-4-4	Applied to all cable terminations	Test level 4 4 kV
Surge immunity EN 61000-4-5	Applied to mains cables	Test level 3 2 kV
Immunity to RFI emissions, conducted EN 61000-4-6	Applied to mains, motor and control cables	Test level 3 0.15 MHz ... 80 MHz 80 % AM (1 kHz) 10 V

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Accessories

##### Basic Operator Panel (BOP)



The BOP can be used to make individual parameter settings. Values and units are displayed via a 5-digit display.

One BOP can be used for several inverters. It is plugged directly into the inverter.

The BOP provides a function for time-saving copying of parameters. A parameter set of one inverter can be saved and then loaded to another inverter.

##### PC inverter connection kit



For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool) has been installed.

Isolated RS232 adapter module for a reliable point-to-point connection to a PC.

The scope of supply includes a 9-pin Sub-D connector, an RS232 standard cable (3 m (9.84 ft)) and the STARTER commissioning tool <sup>1)</sup> on DVD-ROM.

#### Accessories (continued)

##### STARTER commissioning tool

STARTER is a commissioning tool with a graphical interface for commissioning SINAMICS G110 inverters in Windows NT/2000/XP Professional. It can be used to read, change, store, enter, and print parameter lists.

#### Selection and ordering data

##### Accessories

The options listed here are suitable for all SINAMICS G110 inverters.

Description	Order No.
<b>BOP operator panel</b> (Basic Operator Panel)	<b>6SL3255-0AA00-4BA1</b>
<b>PC inverter connection kit</b> including a 9-pin Sub-D connector, an RS232 standard cable (3 m (9.84 ft)), and the STARTER commissioning tool <sup>1)</sup> on DVD-ROM	<b>6SL3255-0AA00-2AA1</b>
<b>Adapter for mounting on DIN rails</b>	
• Size 1 (frame size FSA)	<b>6SL3261-1BA00-0AA0</b>
• Size 2 (frame size FSB)	<b>6SL3261-1BB00-0AA0</b>
<b>SINAMICS Manual Collection</b> on DVD-ROM, multilingual All manuals for low-voltage motors, geared motors and low-voltage inverters	<b>6SL3097-4CA00-0YGO</b>
<b>STARTER commissioning tool <sup>1)</sup></b> on DVD-ROM	<b>6SL3072-0AA00-0AGO</b>

##### Paper documentation

A Getting Started Guide is supplied in hard copy for the Controlled Power Modules. Additionally, the operating instructions and the parameter list can be ordered as hard copy.

Type of documentation	Language	Order No.
<b>SINAMICS G110 Operating Instructions</b> (hard copy)	German	<b>6SL3298-0AA11-0AP0</b>
	English	<b>6SL3298-0AA11-0BP0</b>
	French	<b>6SL3298-0AA11-0DP0</b>
	Italian	<b>6SL3298-0AA11-0CP0</b>
	Spanish	<b>6SL3298-0AA11-0EP0</b>
<b>SINAMICS G110 parameter list</b> (hard copy)	German	<b>6SL3298-0BA11-0AP0</b>
	English	<b>6SL3298-0BA11-0BP0</b>
	French	<b>6SL3298-0BA11-0DP0</b>
	Italian	<b>6SL3298-0BA11-0CP0</b>
	Spanish	<b>6SL3298-0BA11-0EP0</b>

<sup>1)</sup> STARTER commissioning tool also available on the Internet at <http://support.automation.siemens.com/WWW/view/en/10804985/133100>

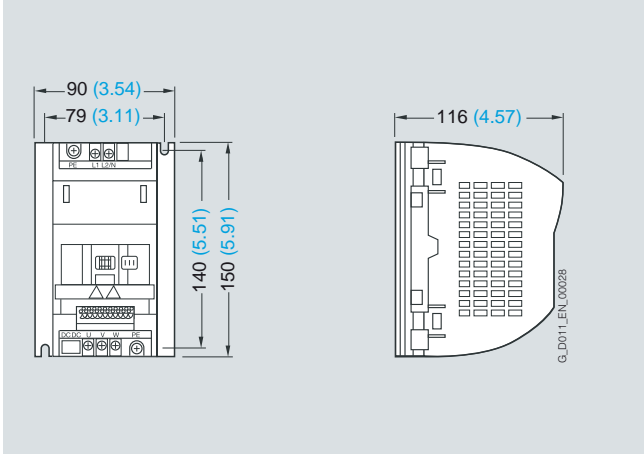
# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

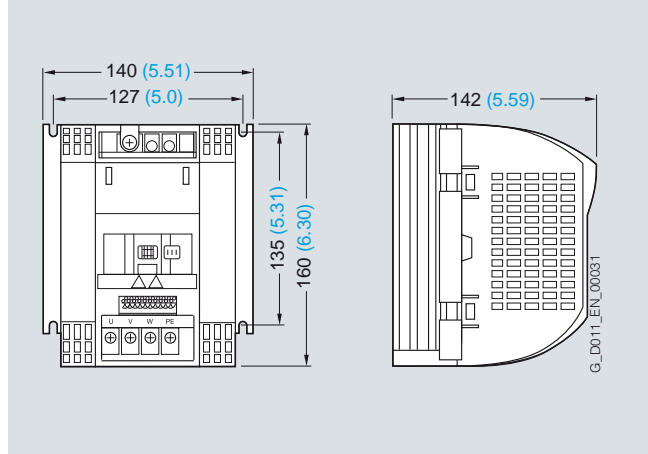
### Controlled Power Modules

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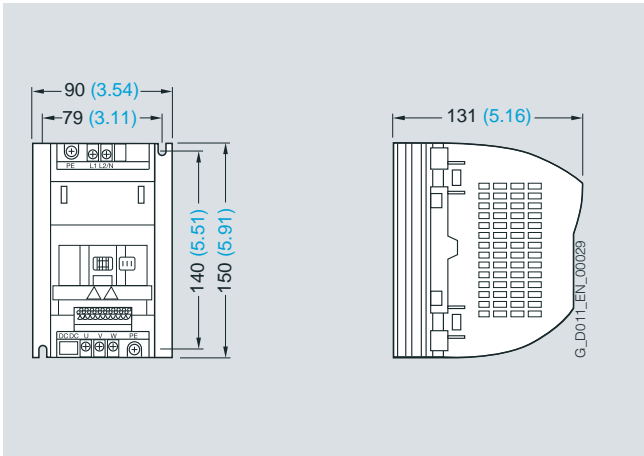
#### Dimensional drawings



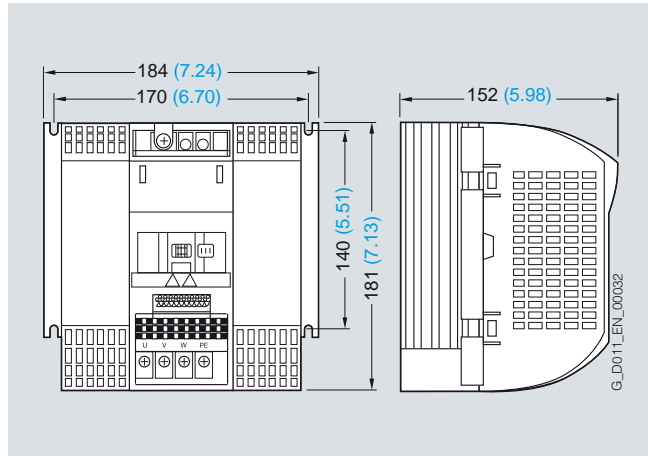
Inverter frame size FSA; 0.12 kW to 0.37 kW (0.16 hp to 0.5 hp)



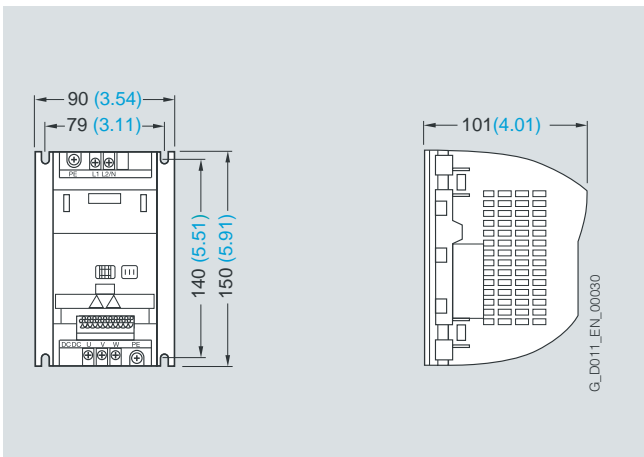
Inverter frame size FSB; 1.1 kW to 1.5 kW (1.5 hp to 2.0 hp)



Inverter frame size FSA; 0.55 kW to 0.75 kW (0.75 hp to 1.0 hp)



Inverter frame size FSC; 2.2 kW to 3.0 kW (3.0 hp to 4.0 hp)



Inverter frame size FSA with flat heat sink; 0.12 kW to 0.75 kW (0.16 hp to 1.0 hp)

Mounted using screws and washers  
(not included in the scope of supply)

- Frame size FSA: 2 × M4
- Frame size FSB: 4 × M4
- Frame size FSC: 4 × M5

With attached operator panel (BOP), the mounting depth is increased by 8 mm (0.31 inches).

All dimensions in mm (values in brackets are in inches).

# SINAMICS G110 standard inverters

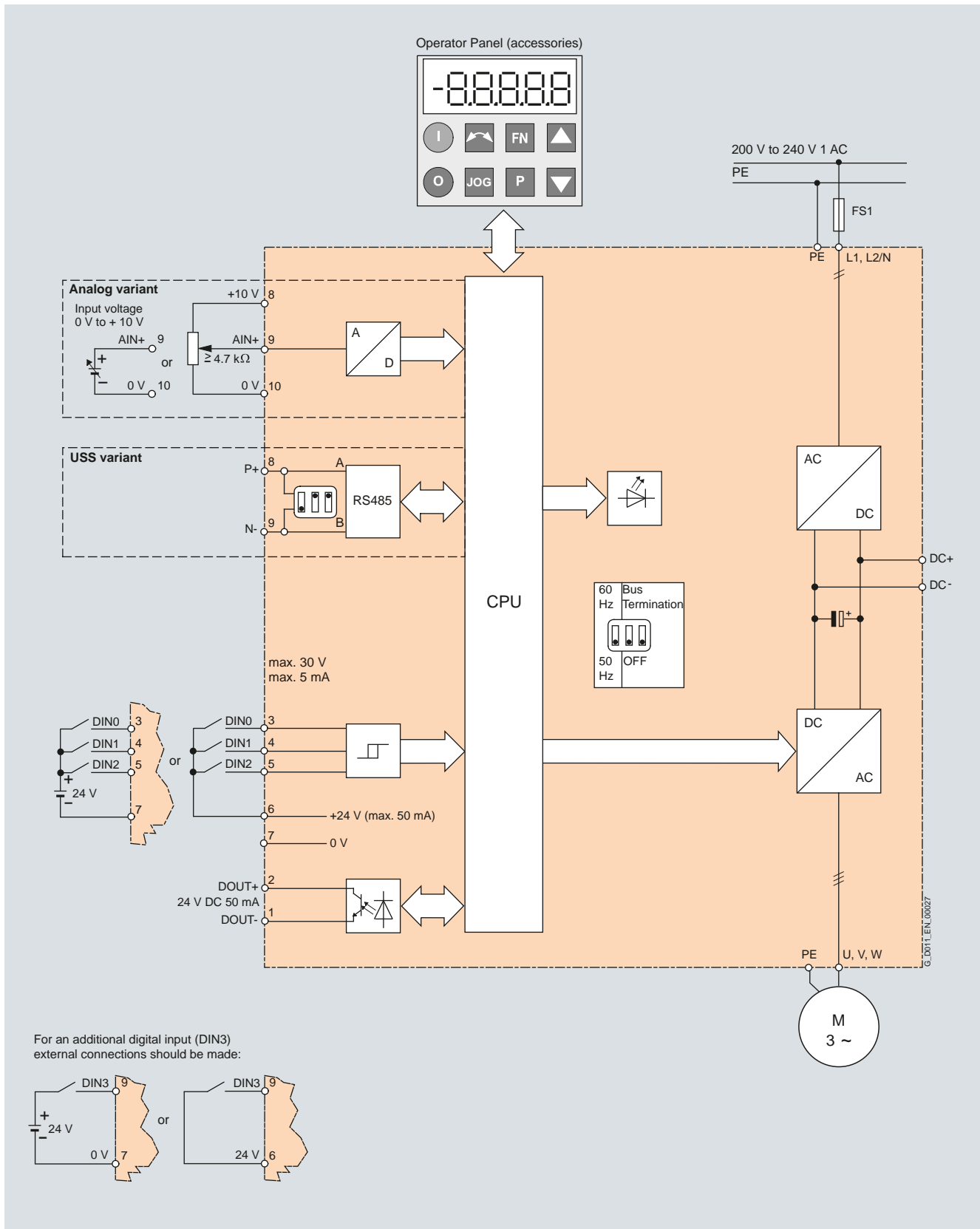
## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Controlled Power Modules

#### Schematics

#### Block diagram

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# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

**Starter kit**
**Overview**


The SINAMICS G110 starter kit offers an easy introduction to variable-speed drives.

Available in a stackable transport case, it contains:

- Inverter (0.75 kW/1.0 hp) with analog input and integrated EMC filter
- BOP operator panel
- PC inverter connection kit with STARTER commissioning tool <sup>1)</sup> on DVD-ROM
- Operating instructions and parameter list (hard copy, in German)
- Screwdriver

**Selection and ordering data**

Description	Order No.
<b>Starter kit</b> 0.75 kW (1.0 hp), German	<b>6SL3200-0AB10-0AA0</b>

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<sup>1)</sup> STARTER commissioning tool also available on the Internet at <http://support.automation.siemens.com/WW/view/en/10804985/133100>

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Line-side power components

#### Overview

##### Integrated EMC filter

Versions with integrated EMC filters class A and class B are available for the corresponding environments.

##### • Class A

The requirements are fulfilled when shielded cables with a max. length of 10 m (32.8 ft) (for frame size FSA) or 25 m (82 ft) (for frame sizes FSB and FSC) are used. The limits comply with EN 55011 class A for conducted interference.

##### • Class B

The requirements are fulfilled when shielded cables with a max. length of 5 m (16.4 ft) are used. The limits comply with EN 55011 class B for conducted interference.

An inverter with an integrated EMC filter can be used with a 30 mA residual-current circuit breaker and is only suitable for installations with fixed wiring.

Inverters without filters, which are used with "EMC filter class B with low leakage currents", have a leakage current < 3.5 mA (up to 5 m (16.4 ft) shielded motor cable).

##### Additional EMC filter, class B

Available for inverters with an integrated EMC filter.

With this filter, the inverter complies with the emission standard EN 55011, class B for conducted interference.

The requirements are fulfilled using shielded cables with a max. length of 25 m (82 ft).

##### EMC filter, class B with low leakage currents

With this filter, the unfiltered inverter complies with the emission standard EN 55011, class B for conducted interference. The leakage currents are reduced to < 3.5 mA.

Unfiltered inverters can, therefore, be used for drive systems in Category C1 installations.

The requirements are fulfilled with

- Shielded cables with a max. length of 5 m (16.4 ft)
- Installation of the inverter in a metal housing (e.g. control cabinet)
- Pulse frequency of 16 kHz (only for frame sizes FSB and FSC)

With Category C1 installations, generally a pulse frequency of 16 kHz is recommended for inverter operation in the inaudible spectrum and for quiet motor operation.

##### Line reactor

Line reactors are used to smooth voltage peaks or to bridge commutating dips.

Line reactors also reduce the effects of harmonics on the inverter and the power supply.

If the ratio of the rated inverter power to supply short-circuit power is less than 1 %, a line reactor must be used in order to reduce the current peaks.

In line with EN 61000-3-2 regulations "Limits for harmonic currents with device input current ≤ 16 A per phase", there are special aspects for drives with 120 W to 550 W and 230 V single-phase supplies which can be used in non-industrial applications (environment 1).

For devices with 120 W to 370 W, either the recommended line reactors must be installed or permission obtained from the power utility company for the connection to the public supply system.

In accordance with the specifications of EN 61000-3-12 ("Limits for harmonic currents > 16 A and ≤ 75 A per phase"), permission must be obtained from the power utility company to operate drives connected to the public low-voltage line supply. For the harmonic currents, see the Operating Instructions.

#### Technical specifications

EMC filters and line reactors cannot be installed as base components.

		EMC filter, class B with low leakage currents		Additional EMC filter, class B		
		6SE6400-2FL01-0AB0	6SE6400-2FL02-6BB0	6SE6400-2FS01-0AB0	6SE6400-2FS02-6BB0	6SE6400-2FL03-5CB0
<b>Dimensions</b>						
• Width	mm (in)	73 (2.87)	149 (5.87)	73 (2.87)	149 (5.87)	185 (7.28)
• Height	mm (in)	200 (7.87)	213 (8.39)	200 (7.87)	213 (8.39)	245 (9.65)
• Depth	mm (in)	43.5 (1.71)	50.5 (1.99)	43.5 (1.71)	50.5 (1.99)	55 (2.17)
<b>Weight, approx.</b>	kg (lb)	0.5 (1.10)	1 (2.21)	0.5 (1.10)	1 (2.21)	1.5 (3.31)

		Line reactor			
		6SE6400-3CC00-4AB3	6SE6400-3CC01-0AB3	6SE6400-3CC02-6BB3	6SE6400-3CC03-5CB3
<b>Dimensions</b>					
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	150 (5.91)	185 (7.28)
• Height	mm (in)	200 (7.87)	200 (7.87)	213/233 (8.39/9.17) <sup>1)</sup>	245/280 (9.65/11.02) <sup>1)</sup>
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)
<b>Weight, approx.</b>	kg (lb)	1.31 (2.89)	1.32 (2.91)	2.2 (4.85)	3.05 (6.73)

<sup>1)</sup> The 233 mm (9.17 in) or 280 mm (11.02 in) dimensions are valid for lateral mounting using a mounting bracket.

# SINAMICS G110 standard inverters

## 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

### Line-side power components

#### Selection and ordering data

The line-side power components listed here must be selected in accordance with the particular inverter. EMC filters and line reactors cannot be installed as base components.

The inverter and associated line-side power components have the same rated voltage.

All line-side power components are certified to UL (with the exception of fuses). 3NA3 fuses and the 3RV10 circuit breakers are recommended for European countries.

Fuses for use in North America must be UL-certified (e.g. the Class NON fuse series from Busmann) or approved circuit breakers from the SIRIUS 3RV and SENTRON 3VL series according to UL 489 (category control number CCN: DiV Q).

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 und IC 10.](#)

Power		EMC filter class B with low leakage currents	Line reactor	Additional EMC filter class B	Fuse	Circuit breaker
kW	hp	Order No.	Order No.	Order No.	Order No.	Order No.
<b>Line-side power components for inverters without EMC filter</b>						
0.12	0.16	6SE6400-2FL01-0AB0	6SE6400-3CC00-4AB3	–	3NA3803	3RV1021-1DA10
0.25	0.33	6SE6400-2FL01-0AB0	6SE6400-3CC00-4AB3	–	3NA3803	3RV1021-1FA10
0.37	0.50	6SE6400-2FL01-0AB0	6SE6400-3CC01-0AB3	–	3NA3803	3RV1021-1HA10
0.55	0.75	6SE6400-2FL01-0AB0	6SE6400-3CC01-0AB3	–	3NA3803	3RV1021-1JA10
0.75	1.0	6SE6400-2FL01-0AB0	6SE6400-3CC01-0AB3	–	3NA3805	3RV1021-1KA10
1.1	1.5	6SE6400-2FL02-6BB0	6SE6400-3CC02-6BB3	–	3NA3807	3RV1021-4BA10
1.5	2.0	6SE6400-2FL02-6BB0	6SE6400-3CC02-6BB3	–	3NA3810	3RV1021-4CA10
2.2	3.0	6SE6400-2FL02-6BB0	6SE6400-3CC02-6BB3	–	3NA3814	3RV1031-4EA10
3.0	4.0	–	6SE6400-3CC03-5CB3	–	3NA3820	3RV1031-4FA10
<b>Line-side power components for inverters with integrated EMC filter class A/B</b>						
0.12	0.16	–	6SE6400-3CC00-4AB3	6SE6400-2FS01-0AB0	3NA3803	3RV1021-1DA10
0.25	0.33	–	6SE6400-3CC00-4AB3	6SE6400-2FS01-0AB0	3NA3803	3RV1021-1FA10
0.37	0.50	–	6SE6400-3CC01-0AB3	6SE6400-2FS01-0AB0	3NA3803	3RV1021-1HA10
0.55	0.75	–	6SE6400-3CC01-0AB3	6SE6400-2FS01-0AB0	3NA3803	3RV1021-1JA10
0.75	1.0	–	6SE6400-3CC01-0AB3	6SE6400-2FS01-0AB0	3NA3805	3RV1021-1KA10
1.1	1.5	–	6SE6400-3CC02-6BB3	6SE6400-2FS02-6BB0	3NA3807	3RV1021-4BA10
1.5	2.0	–	6SE6400-3CC02-6BB3	6SE6400-2FS02-6BB0	3NA3810	3RV1021-4CA10
2.2	3.0	–	6SE6400-3CC02-6BB3	6SE6400-2FS02-6BB0	3NA3814	3RV1031-4EA10
3.0	4.0	–	6SE6400-3CC03-5CB3	6SE6400-2FS03-5CB0	3NA3820	3RV1031-4FA10

# SINAMICS G110 standard inverters

0.12 kW to 3 kW (0.16 hp to 4.0 hp)

Notes

3

# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

# 4



<b>4/2</b>	<b>Introduction</b>
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4/2	More information
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# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### Introduction

### Application

Application	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality			Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality		
<b>Pumping, ventilating, compressing</b>	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
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)
<b>Moving</b>	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
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (GM150)
<b>Processing</b>	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
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)
<b>Machining</b>	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
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>

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

SINAMICS G120C compact inverters continuously control the speed of three-phase asynchronous (induction) motors and can be used in a wide range of industrial areas. They are generally

suitable for applications involving conveyor belts, mixers, extruders, pumps, fans, compressors and basic handling machines.

### More information

You may also be interested in these inverters:

- More performance in the control cabinet in IP20 degree of protection ⇒ SINAMICS G120 ([chapter 6](#))
- Higher degree of protection for power ratings up to 7.5 kW ⇒ SINAMICS G110D ([chapter 7](#)), SINAMICS G120D ([chapter 8](#))
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110 ([chapter 9](#))

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Overview



SINAMICS G120C frame sizes FSA, FSB and FSC with mounted blanking cover

SINAMICS G120C compact inverters offer a well-balanced combination of features to address a wide range of applications. SINAMICS G120C inverters are compact, rugged devices that are easy to operate and can be optionally equipped with a basic or advanced operator panel.

SINAMICS G120C inverters are especially suitable when it comes to meeting the requirements of system integrators, OEMs and distributors regarding high productivity and tailored performance.

#### Benefits

- Compact design
- Side-by-side design
- High power density, low envelope dimensions
- Simple installation in the tightest space
- Low space requirement
- Use in small control cabinets, close to the machine
- Optimized parameter set
- Optimized commissioning
- Getting Started document
- BOP-2 or IOP operator panels can be used
- Integrated USB connection
- Simple and fast software parameter assignment
- Simple to use during commissioning and in operation
- Minimized training costs, existing SINAMICS know-how can be used
- High degree of service friendliness, simple maintenance
- Plug-in terminals
- Cloning function using BOP-2 or SD card
- Operating hours counter for "drive on" and "motor on"
- Fast mechanical installation
- Intuitive standard commissioning
- Integrated component of Totally Integrated Automation
- Energy-efficient, sensorless vector control
- Automatic flux reduction with V/f ECO
- Integrated energy saving computer
- Safety Integrated (STO)
- Integrated communication interfaces PROFIBUS DP, CAN, USS, Modbus RTU
- Coated modules
- Operation up to an ambient temperature of 60° C (140 °F)

#### Design

SINAMICS G120C is a compact inverter in IP20 degree of protection where the Control Unit (CU) and Power Module (PM) function units are combined in one device.

The compact mechanical design and the high power density allow these devices to be installed in machine control enclosures and control cabinets for maximum space utilization. SINAMICS G120C compact inverters can be lined up next to one another without requiring any derating.



SINAMICS G120C, frame size FSB, with BOP-2

SINAMICS G120C can be integrated into the widest range of applications, either using the integrated digital and analog inputs or via the integrated fieldbus interface (available in the USS/Modbus RTU, PROFIBUS DP, CANopen versions). Especially the product versions with integrated PROFIBUS-DP interface make full integration into the Siemens TIA family possible, therefore allowing the advantages of the seamless TIA product family to be fully utilized. SINAMICS G120C devices are preset in the factory so that they can be immediately connected to PROFIBUS DP and CANopen fieldbuses and used without parameterization.

SINAMICS G120C is also equipped with the safety function STO (Safe Torque Off) as standard, which is used to safely stop drives. As a consequence, machine manufacturers can simply comply with current machinery directives with minimum associated costs.

SINAMICS G120C can control asynchronous (induction) motors in the power range from 0.37 kW up to 18.5 kW (0.5 hp up to 25 hp). Reliable and efficient motor operation is achieved by using state-of-the-art IGBT technology combined with vector control. The extensive range of functions integrated in the SINAMICS G120C also offers a high degree of protection for the inverter and motor.

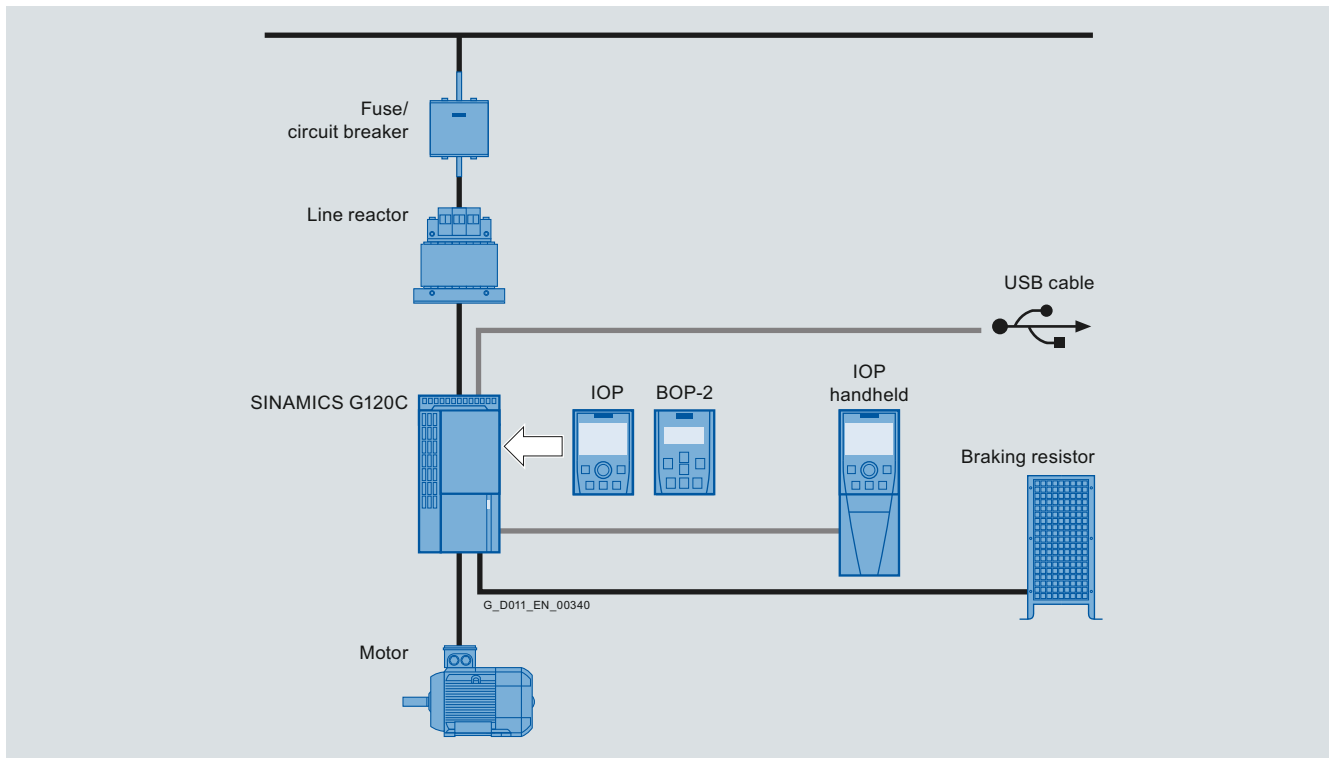
# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Design

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#### Line-side components

##### Line reactors

A line reactor is used to smooth voltage peaks (inverter protection) and to reduce commutating dips (line harmonic distortion).

##### Recommended line-side power components

Standard fuses can be used for the SINAMICS G120C. These must be dimensioned to comply with local regulations. In this chapter, you will find recommended components such as fuses and circuit breakers in compliance with IEC and UL regulations.

#### DC link components

##### Braking resistors

The excess energy of the DC link is dissipated using the braking resistor. The braking resistors are designed for use with the SINAMICS G120C. This has an integrated brake chopper (electronic switch).

#### Supplementary system components

##### Intelligent Operator Panel IOP

Graphics-based, user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G120C.

##### Basic Operator Panel BOP-2

A 2-line display to provide support when commissioning and troubleshooting the drive. The drive can be locally controlled.

##### Memory cards

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) or SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The associated memory card holder is integrated in the inverter.

##### PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC, if the STARTER commissioning tool V4.2 and higher has been installed on the PC.

#### Spare parts

##### Shield plates

A set of shield plates can be ordered for the motor and signal lines corresponding to the frame size of the SINAMICS G120C inverter.

##### Spare Parts Kit

This kit comprises 5 sets of I/O terminals, 1 RS485 terminal, 2 Control Unit doors and 1 blanking cover.

##### Set of connectors

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the SINAMICS G120C inverter.

##### Roof-mounted fan

A roof-mounted fan (at the top of the device) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C.

##### Fan unit

A replacement fan (at the rear of the device; heat sink) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C.



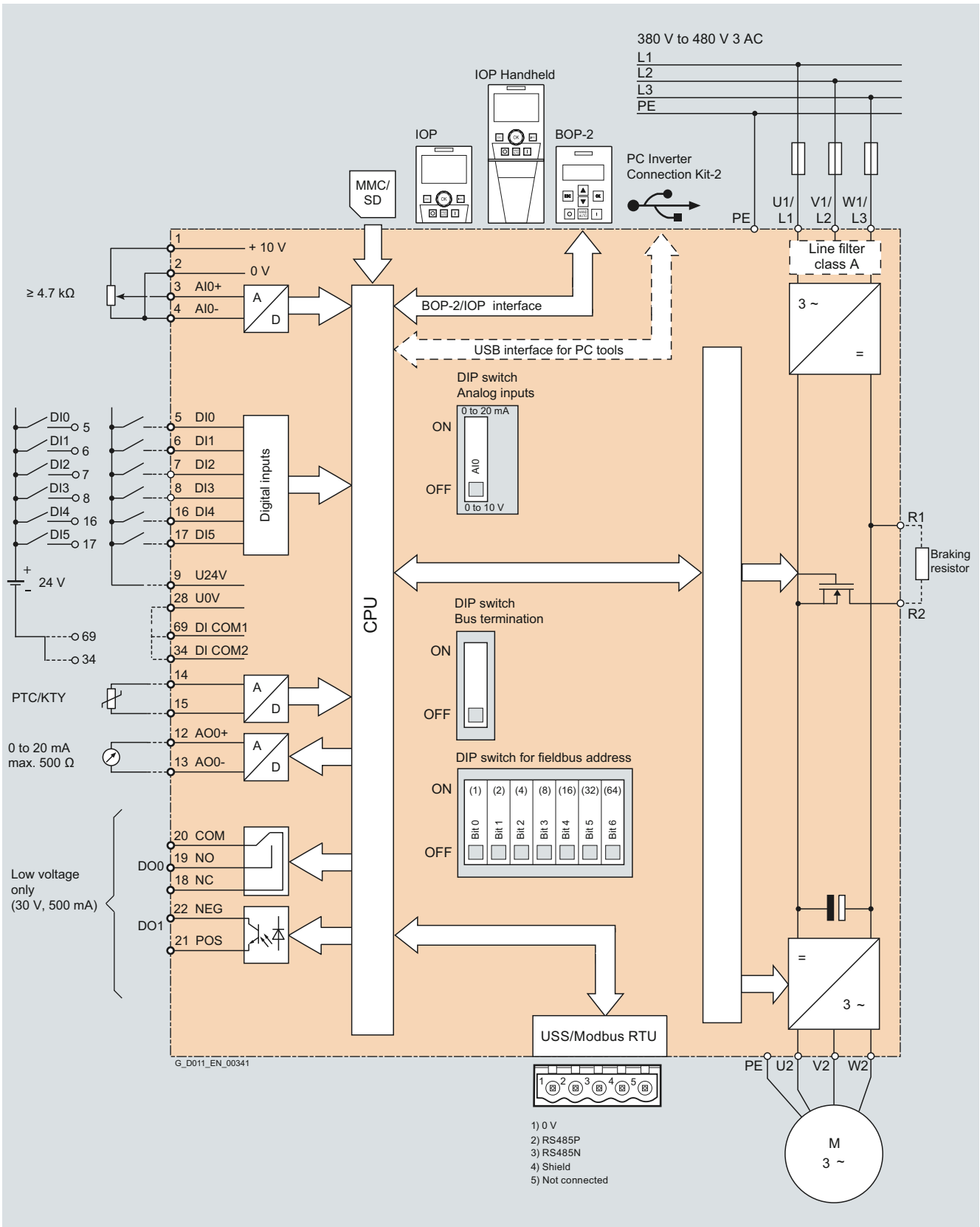
# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

## SINAMICS G120C compact inverters

### Integration

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Connection example SINAMICS G120C, USS/Modbus RTU version

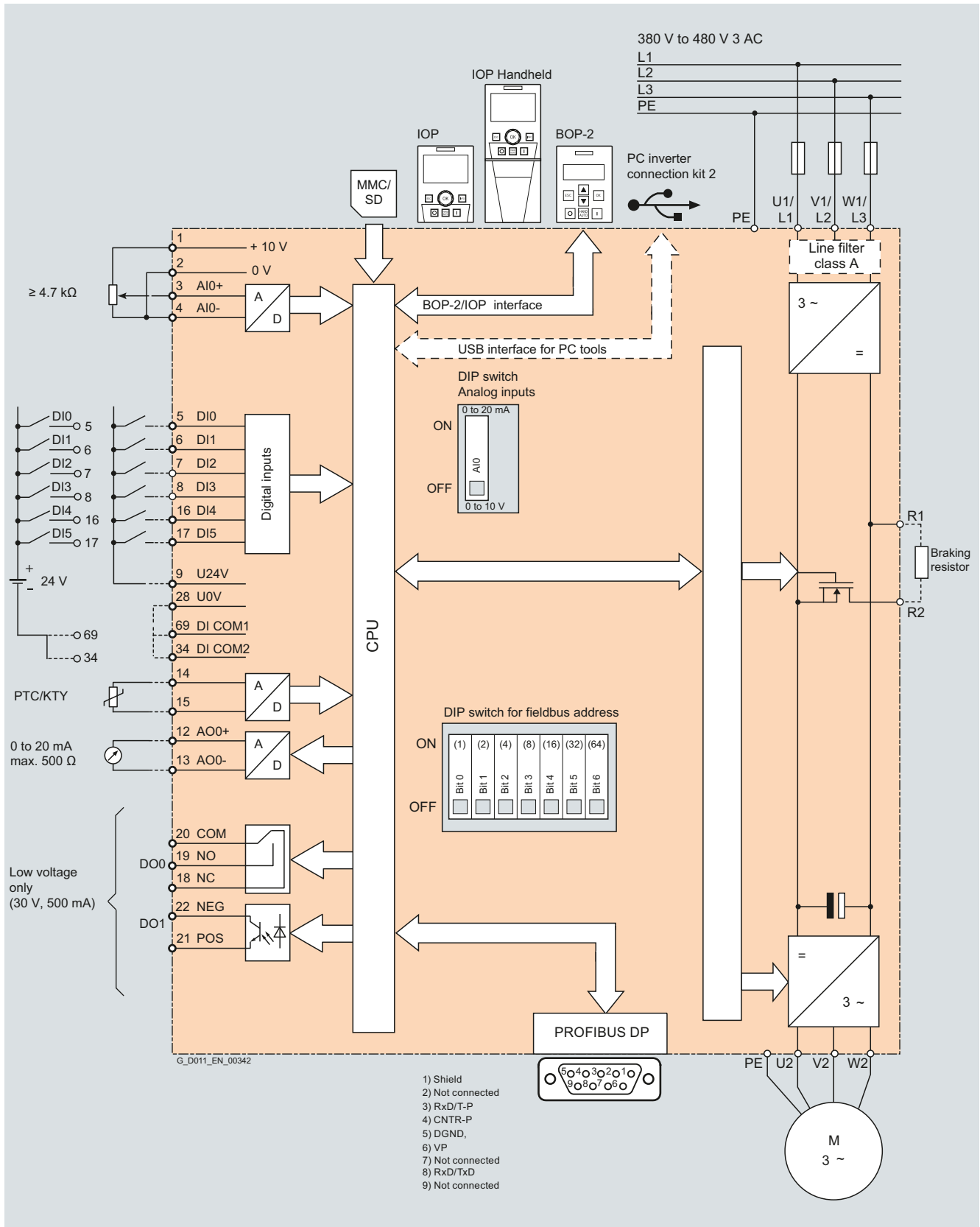
# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

## SINAMICS G120C compact inverters

### Integration

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Connection example SINAMICS G120C, PROFIBUS DP version

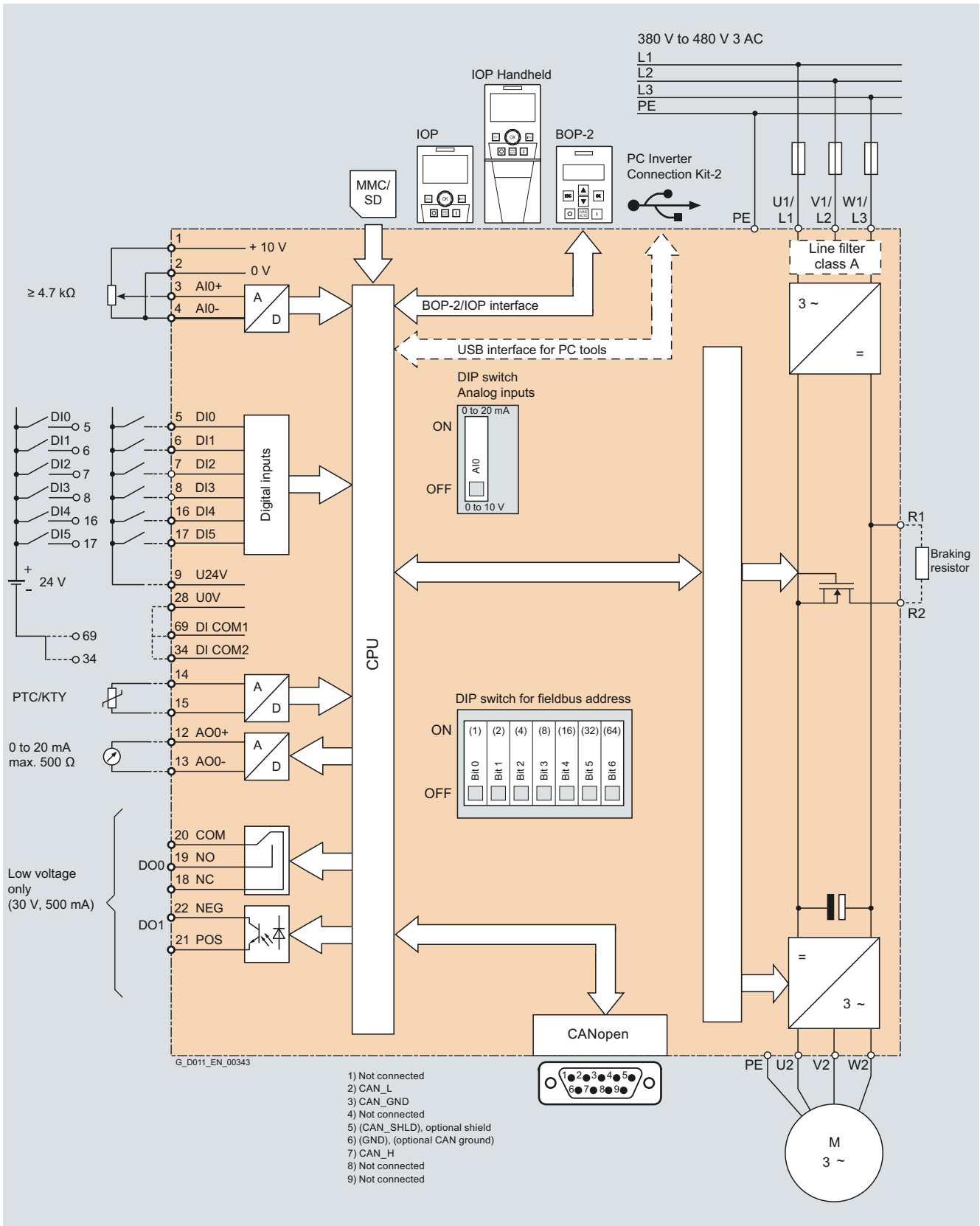
# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

## SINAMICS G120C compact inverters

### Integration

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Connection example SINAMICS G120C, CANopen version

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Configuration

The following electronic configuring guides and engineering tools are available for SINAMICS G120C compact inverters:

##### **Selection guide DT Configurator within the 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 DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. The configurator is integrated as a "selection guide" in this catalog on the DVD-ROM with the selection and configuration tools.

##### **Online DT Configurator**

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address: [www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

##### **SIZER for Siemens Drives engineering tool**

The SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

[Additional information on the SIZER for Siemens Drives engineering tool is provided in the chapter Engineering tools.](#)

##### **STARTER commissioning tool**

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. In addition to SINAMICS drives, STARTER is also suitable for MICROMASTER 4 units and the frequency converters for the distributed I/O SIMATIC ET 200S FC and SIMATIC ET 200pro FC. For SINAMICS G120D from STARTER version 4.1, SP1 and higher.

[Additional information on the STARTER commissioning tool is provided in the chapter Engineering tools.](#)

##### **Drive ES engineering system**

Drive ES is the engineering system used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7.1.

[Additional information on the Drive ES engineering system is provided in the chapter Engineering tools.](#)

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Selection and ordering data

The order number is selected corresponding to

- the required motor power or the motor current required and the overload requirements of the application,
- the necessary EMC classification and
- the required integrated fieldbus interface

Rated power <sup>1)</sup>		Base load current $I_L$ <sup>2)</sup>	Base load current $I_H$ <sup>3)</sup>	Frame size	Version	SINAMICS G120C without filter	SINAMICS G120C with integrated filter class A
kW	hp	A	A			Order No.	Order No.
0.55	0.75	1.7	1.3	FSA	USS/Modbus RTU	<b>6SL3210-1KE11-8UB0</b>	<b>6SL3210-1KE11-8AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE11-8UP0</b>	<b>6SL3210-1KE11-8AP0</b>
					CANopen	<b>6SL3210-1KE11-8UC0</b>	<b>6SL3210-1KE11-8AC0</b>
0.75	1.0	2.2	1.7	FSA	USS/Modbus RTU	<b>6SL3210-1KE12-3UB0</b>	<b>6SL3210-1KE12-3AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE12-3UP0</b>	<b>6SL3210-1KE12-3AP0</b>
					CANopen	<b>6SL3210-1KE12-3UC0</b>	<b>6SL3210-1KE12-3AC0</b>
1.1	1.5	3.1	2.2	FSA	USS/Modbus RTU	<b>6SL3210-1KE13-2UB0</b>	<b>6SL3210-1KE13-2AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE13-2UP0</b>	<b>6SL3210-1KE13-2AP0</b>
					CANopen	<b>6SL3210-1KE13-2UC0</b>	<b>6SL3210-1KE13-2AC0</b>
1.5	2.0	4.1	3.1	FSA	USS/Modbus RTU	<b>6SL3210-1KE14-3UB0</b>	<b>6SL3210-1KE14-3AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE14-3UP0</b>	<b>6SL3210-1KE14-3AP0</b>
					CANopen	<b>6SL3210-1KE14-3UC0</b>	<b>6SL3210-1KE14-3AC0</b>
2.2	3.0	5.6	4.1	FSA	USS/Modbus RTU	<b>6SL3210-1KE15-8UB0</b>	<b>6SL3210-1KE15-8AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE15-8UP0</b>	<b>6SL3210-1KE15-8AP0</b>
					CANopen	<b>6SL3210-1KE15-8UC0</b>	<b>6SL3210-1KE15-8AC0</b>
3.0	4.0	7.3	5.6	FSA	USS/Modbus RTU	<b>6SL3210-1KE17-5UB0</b>	<b>6SL3210-1KE17-5AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE17-5UP0</b>	<b>6SL3210-1KE17-5AP0</b>
					CANopen	<b>6SL3210-1KE17-5UC0</b>	<b>6SL3210-1KE17-5AC0</b>
4.0	5.0	8.8	7.3	FSA	USS/Modbus RTU	<b>6SL3210-1KE18-8UB0</b>	<b>6SL3210-1KE18-8AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE18-8UP0</b>	<b>6SL3210-1KE18-8AP0</b>
					CANopen	<b>6SL3210-1KE18-8UC0</b>	<b>6SL3210-1KE18-8AC0</b>
5.5	7.5	12.5	8.8	FSB	USS/Modbus RTU	<b>6SL3210-1KE21-3UB0</b>	<b>6SL3210-1KE21-3AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE21-3UP0</b>	<b>6SL3210-1KE21-3AP0</b>
					CANopen	<b>6SL3210-1KE21-3UC0</b>	<b>6SL3210-1KE21-3AC0</b>
7.5	10	16.5	12.5	FSB	USS/Modbus RTU	<b>6SL3210-1KE21-7UB0</b>	<b>6SL3210-1KE21-7AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE21-7UP0</b>	<b>6SL3210-1KE21-7AP0</b>
					CANopen	<b>6SL3210-1KE21-7UC0</b>	<b>6SL3210-1KE21-7AC0</b>
11	15	25	16.5	FSC	USS/Modbus RTU	<b>6SL3210-1KE22-6UB0</b>	<b>6SL3210-1KE22-6AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE22-6UP0</b>	<b>6SL3210-1KE22-6AP0</b>
					CANopen	<b>6SL3210-1KE22-6UC0</b>	<b>6SL3210-1KE22-6AC0</b>
15	20	31	25	FSC	USS/Modbus RTU	<b>6SL3210-1KE23-2UB0</b>	<b>6SL3210-1KE23-2AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE23-2UP0</b>	<b>6SL3210-1KE23-2AP0</b>
					CANopen	<b>6SL3210-1KE23-2UC0</b>	<b>6SL3210-1KE23-2AC0</b>
18.5	25	37	31	FSC	USS/Modbus RTU	<b>6SL3210-1KE23-8UB0</b>	<b>6SL3210-1KE23-8AB0</b>
					PROFIBUS DP	<b>6SL3210-1KE23-8UP0</b>	<b>6SL3210-1KE23-8AP0</b>
					CANopen	<b>6SL3210-1KE23-8UC0</b>	<b>6SL3210-1KE23-8AC0</b>

<sup>1)</sup> The rated power of the device based on the rated output current  $I_{LO}$  and a rated input voltage of 400 V 3 AC. The rated power is specified on the device rating plate.

<sup>2)</sup> The base load current  $I_L$  is based on the duty cycle for low overload (LO). The current value is specified on the device rating plate.

<sup>3)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO). The current value is not specified on the device rating plate.

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all SINAMICS G120C compact inverters.

Mechanical specifications	
<b>Vibratory load</b> According to EN 60068-2-6	
<ul style="list-style-type: none"> <li>Transport in the transport packaging</li> <li>Operation</li> </ul>	5 ... 9 Hz: Constant deflection 3.1 mm 9 ... 200 Hz: Constant acceleration = 9.81 m/s <sup>2</sup> (1 × g)  2 ... 9 Hz: Constant deflection 7 mm 9 ... 200 Hz: Constant acceleration = 19.62 m/s <sup>2</sup> (2 × g)
<b>Shock load</b> According to EN 60068-2-27	
<ul style="list-style-type: none"> <li>Transport in the transport packaging</li> <li>Operation</li> </ul>	147.15 m/s <sup>2</sup> (15 × g)/11 ms 3 shocks in each axis and direction  147.15 m/s <sup>2</sup> (15 × g)/11 ms 3 shocks in each axis and direction
<b>Degree of protection</b>	IP20/ UL open type
<b>Permissible mounting position</b>	Horizontal panel mounting
Ambient conditions	
<b>Protection class</b> According to EN 61800-5-1	Class III (PELV1)
<b>Touch protection</b> According to EN 61800-5-1	Class I (with protective conductor system)
<b>Humidity, max.</b>	95 % at 40 °C (104 °F), condensation and icing not permissible
<b>Ambient temperature</b>	
<ul style="list-style-type: none"> <li>Storage <sup>1)</sup> acc. to EN 60068-2-1</li> <li>Transport <sup>1)</sup> acc. to EN 60068-2-1</li> <li>Operation acc. to EN 60068-2-2</li> </ul>	-40 ... +70 °C (-40 ... +158 °F) -40 ... +70 °C (-40 ... +158 °F) 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (104 ... 140 °F) <a href="#">see derating characteristics</a>
<b>Environmental class in operation</b>	
<ul style="list-style-type: none"> <li>Harmful chemical substances</li> <li>Organic/biological pollutants</li> <li>Degree of pollution</li> </ul>	Class 3C2 to EN 60721-3-3 Class 3B1 to EN 60721-3-3 2 acc. to EN 61800
Standards	
<b>Compliance with standards</b>	CE, cULus, c-tick
<b>Fail-safe certification</b>	Function: Safe Torque Off (STO) SIL 2 according to IEC 61508, Parts 1 to 7 (1998 ... 2001) PL d according to EN ISO 13849 Part 1 (2008) Category 3 according to EN 60204 (2007) PFH <sub>D</sub> : 5 × 10E-8 / T1: 10 years
<b>CE marking, according to</b>	EMC Directive 2004/108/EC Low-Voltage Directive 2006/95/EC
<b>EMC behavior</b> According to EN 61800-3	The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter.
<ul style="list-style-type: none"> <li>Frame sizes FSA to FSB with integrated line filter class A</li> <li>Frame size FSC with integrated line filter class A</li> </ul>	Category C2 with max. 25 m (82 ft) shielded motor cable  Category C3 with max. 25 m (82 ft) shielded motor cable

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

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

Control Unit	USS/Modbus RTU version	PROFIBUS DP version	CANopen version
	6SL3210-0KE...-B0	6SL3210-0KE...-P0	6SL3210-0KE...-C0
<b>I/O interfaces</b>			
<b>Signal cable cross-section</b>	0.15 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> (AWG28 ... AWG16)		
<b>Digital inputs – Standard</b>	6 isolated inputs Optically isolated; Free reference potential (own potential group) NPN/PNP logic can be selected using the wiring		
• Switching level: 0 → 1	11 V		
• Switching level: 1 → 0	5 V		
• Input current, max.	15 mA		
<b>Fail-safe input</b>	1 safety input When using the standard digital inputs (DI4+DI5) Safety function: Safe Torque OFF (STO)		
<b>Digital outputs</b>	1 relay changeover contact 30 V DC, 0.5 A (ohmic load) 1 transistor 30 V DC, 0.5 A (ohmic load)		
<b>Analog inputs</b>	1 analog input Differential input Switchable between voltage (-10 ... +10 V) and current (0/4 ... 20 mA) using a DIP switch 10-bit resolution Can be used as additional digital input Analog inputs are protected in a voltage range of ± 30 V and have a common-mode voltage in the ± 15 V range.		
• Switching threshold: 0 → 1	4 V		
• Switching threshold: 1 → 0	1.6 V		
<b>Analog outputs</b>	1 analog output Non-isolated output Switchable between voltage (0 ... 10 V) and current (0/4 ... 20 mA) using a parameter Voltage mode: 10 V, min. burden 10 kΩ Current mode: 20 mA, max. burden 500 Ω The analog outputs have short circuit protection		
<b>PTC/KTY interface</b>	1 motor temperature sensor input sensors that can be connected: PTC, KTY and Thermo-Click, Accuracy ±5 °C		
<b>Integrated bus interface</b>			
Type	<b>RS485</b>	<b>PROFIBUS DP</b>	<b>CANopen</b>
<b>Protocols</b>	USS Modbus RTU (switchable using a parameter)	PROFIdrive Profile V4.1	CANopen
<b>Hardware</b>	Plug-in terminal, insulated, USS: max. 187.5 kbaud Modbus RTU: 19.2 kbaud, Bus terminating resistors that can be switched in	9-pin SUB-D connector, insulated, Max. 12 Mbit/s Slave address can be set using DIP switches	9-pin SUB-D socket, insulated, Max. 1 Mbit/s
<b>Tool interfaces</b>			
<b>Memory cards</b>	Optional 1 SINAMICS micro memory card (MMC) or 1 SIMATIC memory card (SD card)		
<b>Operator panels</b>	Optional Basic Operator Panel BOP-2 or Intelligent Operator Panel IOP		
<b>PC interface</b>	USB		

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

Control Unit	USS/Modbus RTU version	PROFIBUS DP version	CANopen version
	6SL3210-0KE...-B0	6SL3210-0KE...-P0	6SL3210-0KE...-C0
<b>Open-loop/closed-loop control techniques</b>			
V/f linear/square/ parameterizable	✓		
V/f with flux current control (FCC)	✓		
V/f ECO linear/square	✓		
Vector control, sensorless	✓		
Vector control, with sensor	–		
Torque control, sensorless	–		
Torque control, with sensor	–		
<b>Software functions</b>			
Setpoint input	✓		
Fixed frequencies	16, parameterizable		
JOG	✓		
Digital motorized potentiometer (MOP)	✓		
Ramp smoothing	✓		
Extended ramp-function generator (with ramp smooth- ing Off3)	✓		
Positioning down ramp	–		
Slip compensation	✓		
Signal interconnection with BICO technology	✓		
Free function blocks (FFB) for logical and arithmetic operations	–		
Switchable drive data sets (DDS)	–		
Switchable command data sets (CDS)	✓ (2)		
Flying restart	✓		
Automatic restart after line supply failure or operating fault (AR)	✓		
Technology controller (internal PID)	✓		
Energy consumption counter	✓		
Energy saving computer	✓		
Thermal motor protection	✓ ( $I^2t$ , sensor: PTC/KTY/Thermo-Click)		
Thermal inverter protection	✓		
Motor identification	✓		
Motor holding brake	✓		
Auto-ramping ( $V_{dcmax}$ controller)	✓		
Kinetic buffering ( $V_{dcmin}$ controller)	✓		
<b>Braking functions</b>			
• DC braking	✓		
• Compound braking	✓		
• Dynamic braking with integrated brake chopper	✓		



# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

##### General technical specifications of the power electronics

<b>System operating voltage</b>	380 ... 480 V 3 AC +10 % -20 %
<b>Line supply requirements</b>	No restriction
<b>Line short circuit voltage <math>u_K</math></b>	
<b>Input frequency</b>	47 ... 63 Hz
<b>Output frequency</b>	
• Control type $V/f$	0 ... 650 Hz
• Control type Vector	0 ... 240 Hz
<b>Pulse frequency</b>	4 kHz for higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>
<b>Power factor <math>\lambda</math></b>	0.7 ... 0.85
<b>Offset factor <math>\cos \varphi</math></b>	$\geq 0.95$
<b>Output voltage, max.</b>	0 ... 95 % of input voltage
<b>Overload capability</b>	
• Low overload (LO)	150 % base load current $I_L$ for 3 s, followed by 110 % base load current $I_L$ for 57 s followed by 100 % base load current $I_L$ for 240 s in a 300 s cycle time
• High overload (HO)	200 % base load current $I_H$ for 3 s, followed by 150 % base load current $I_H$ for 57 s followed by 100 % base load current $I_L$ for 240 s in a 300 s cycle time
<b>Electromagnetic compatibility</b>	With integrated line filter Category C2/C3 according to EN 61800-3
<b>Cooling</b>	Air cooling using an integrated fan
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m (3281 ft) <a href="#">see derating characteristics</a>
<b>Standard SCCR (Short Circuit Current Rating) <sup>1)</sup></b>	65 kA
<b>Protection functions</b>	<ul style="list-style-type: none"> <li>• Undervoltage</li> <li>• Overvoltage</li> <li>• Overcontrol/overload</li> <li>• Ground fault</li> <li>• Short-circuit</li> <li>• Stall protection</li> <li>• Motor blocking protection</li> <li>• Motor overtemperature</li> <li>• Inverter overtemperature</li> </ul>

<sup>1)</sup> Applies to industrial control cabinet installations to NEC article 409/UL 508A.

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		SINAMICS G120C power electronics			
		6SL3210-1KE11-8..0	6SL3210-1KE12-3..0	6SL3210-1KE13-2..0	6SL3210-1KE14-3..0
<b>Output current</b> at 400 V 3 AC					
• Rated current $I_{\text{rated}}^{1)}$	A	1.8	2.3	3.2	4.3
• Base load current $I_{\text{L}}^{2)}$	A	1.7	2.2	3.1	4.1
• Base load current $I_{\text{H}}^{3)}$	A	1.3	1.7	2.2	3.1
• $I_{\text{max}}$	A	2.6	3.4	4.4	6.2
<b>Rated power</b>					
• Based on $I_{\text{L}}$	kW (hp)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Based on $I_{\text{H}}$	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)
<b>Rated pulse frequency</b>	kHz	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.97	0.97	0.97	0.97
<b>Power loss</b> at rated current	kW	0.04	0.05	0.05	0.07
<b>Cooling air requirement</b>	$\text{m}^3/\text{s}$ ( $\text{ft}^3/\text{s}$ )	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)
<b>Sound pressure level <math>L_{\text{pA}}</math></b> (1 m)	dB	<52	<52	<52	<52
<b>Rated input current <math>I_{\text{I}}^{4)}</math></b>					
• Based on $I_{\text{L}}$	A	2.3	2.9	4.1	5.5
• Based on $I_{\text{H}}$	A	1.9	2.5	3.2	4.5
<b>Length of cable to braking resistor, max.</b>	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	$\text{mm}^2$	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)
<b>Motor connection</b> U2, V2, W2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	$\text{mm}^2$	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)
<b>Connection for braking resistor</b> R1, R2		Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	$\text{mm}^2$	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)
<b>PE connection</b>		On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
<b>Motor cable length, max.<sup>5)</sup></b>					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Dimensions</b>					
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth					
- Without operator panel	mm (in)	203 (7.99)	203 (7.99)	203 (7.99)	203 (7.99)
- With operator panel	mm (in)	224 (8.82)	224 (8.82)	224 (8.82)	224 (8.82)
<b>Frame size</b>		FSA	FSA	FSA	FSA
<b>Weight, approx.</b>	kg (lb)	1.7 (3.75)	1.7 (3.75)	1.7 (3.75)	1.7 (3.75)

<sup>1)</sup> The rated output current  $I_{\text{rated}}$  can be used up to 100 %; however, without overload.

<sup>2)</sup> The base load current  $I_{\text{L}}$  is based on the duty cycle for low overload (LO).

<sup>3)</sup> The base load current  $I_{\text{H}}$  is based on the duty cycle for high overload (HO).

<sup>4)</sup> The rated input currents are valid for an input voltage of 400 V 3 AC and a line impedance corresponding to  $u_{\text{K}} = 1 \%$  (without line reactor). The rated input current based on  $I_{\text{L}}$  is stamped on the inverter rating plate. In the particular application, the input current depends on the motor load and line impedance. The input current is reduced when using a line reactor.

<sup>5)</sup> The maximum motor cable lengths are valid for an input voltage of 400 V 3 AC and operation with a 4 kHz pulse frequency. To maintain limit values according to EN 61800-3 Category C2, a maximum motor cable length of 25 m (82 ft) (shielded) is permissible.

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		SINAMICS G120C power electronics			
		6SL3210-1KE15-8..0	6SL3210-1KE17-5..0	6SL3210-1KE18-8..0	6SL3210-1KE21-3..0
<b>Output current</b> at 400 V 3 AC					
• Rated current $I_{\text{rated}}^{1)}$	A	5.8	7.5	9.0	13.0
• Base load current $I_{\text{L}}^{2)}$	A	5.6	7.3	8.8	12.5
• Base load current $I_{\text{H}}^{3)}$	A	4.1	5.6	7.3	8.8
• $I_{\text{max}}$	A	8.2	11.2	14.6	17.6
<b>Rated power</b>					
• Based on $I_{\text{L}}$	kW (hp)	2.2 (3.0)	3.0 (4.0)	4.0 (5.0)	5.5 (7.5)
• Based on $I_{\text{H}}$	kW (hp)	1.5 (2.0)	2.2 (3.0)	3.0 (4.0)	4.0 (5.0)
<b>Rated pulse frequency</b>	kHz	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.97	0.97	0.97	0.97
<b>Power loss</b> at rated current	kW	0.09	0.14	0.15	0.18
<b>Cooling air requirement</b>	$\text{m}^3/\text{s}$ ( $\text{ft}^3/\text{s}$ )	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.009 (0.32)
<b>Sound pressure level <math>L_{\text{pA}}</math></b> (1 m)	dB	<52	<52	<52	<63
<b>Rated input current <sup>4)</sup></b>					
• Based on $I_{\text{L}}$	A	7.4	9.5	11.4	16.5
• Based on $I_{\text{H}}$	A	6.0	8.2	10.6	12.8
<b>Length of cable to braking resistor, max.</b>	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3					
• Conductor cross-section	$\text{mm}^2$	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	4 ... 6 (12 ... 10 AWG)
<b>Motor connection</b> U2, V2, W2					
• Conductor cross-section	$\text{mm}^2$	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	4 ... 6 (12 ... 10 AWG)
<b>Connection for braking resistor</b> R1, R2					
• Conductor cross-section	$\text{mm}^2$	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	1 ... 2.5 (16 ... 14 AWG)	4 ... 6 (12 ... 10 AWG)
<b>PE connection</b>					
		On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
<b>Motor cable length, max.<sup>5)</sup></b>					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Dimensions</b>					
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	100 (3.94)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth					
- Without operator panel	mm (in)	203 (7.99)	203 (7.99)	203 (7.99)	203 (7.99)
- With operator panel	mm (in)	224 (8.82)	224 (8.82)	224 (8.82)	224 (8.82)
<b>Frame size</b>					
		FSA	FSA	FSA	FSB
<b>Weight, approx.</b>					
	kg (lb)	1.7 (3.75)	1.7 (3.75)	1.7 (3.75)	2.3 (5)

<sup>1)</sup> The rated output current  $I_{\text{rated}}$  can be used up to 100 %; however, without overload.

<sup>2)</sup> The base load current  $I_{\text{L}}$  is based on the duty cycle for low overload (LO).

<sup>3)</sup> The base load current  $I_{\text{H}}$  is based on the duty cycle for high overload (HO).

<sup>4)</sup> The rated input currents are valid for an input voltage of 400 V 3 AC and a line impedance corresponding to  $u_{\text{K}} = 1\%$  (without line reactor). The rated input current based on  $I_{\text{L}}$  is stamped on the inverter rating plate. In the particular application, the input current depends on the motor load and line impedance. The input current is reduced when using a line reactor.

<sup>5)</sup> The maximum motor cable lengths are valid for an input voltage of 400 V 3 AC and operation with a 4 kHz pulse frequency. To maintain limit values according to EN 61800-3 Category C2, a maximum motor cable length of 25 m (82 ft) (shielded) is permissible.

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		SINAMICS G120C power electronics			
		6SL3210-1KE21-7..0	6SL3210-1KE22-6..0	6SL3210-1KE23-2..0	6SL3210-1KE23-8..0
<b>Output current</b> at 400 V 3 AC					
• Rated current $I_{rated}^{1)}$	A	17.0	26.0	32.0	38.0
• Base load current $I_L^{2)}$	A	16.5	25.0	31.0	37.0
• Base load current $I_H^{3)}$	A	12.5	16.5	25.0	31.0
• $I_{max}$	A	25.0	33.0	50.0	62.0
<b>Rated power</b>					
• Based on $I_L$	kW (hp)	7.5 (10)	11.0 (15)	15.0 (20)	18.5 (25)
• Based on $I_H$	kW (hp)	5.5 (7.5)	7.5 (10)	11.0 (15)	15.0 (20)
<b>Rated pulse frequency</b>		kHz	4	4	4
<b>Efficiency <math>\eta</math></b>			0.97	0.97	0.97
<b>Power loss</b> at rated current		kW	0.24	0.35	0.43
<b>Cooling air requirement</b>		$m^3/s$ ( $ft^3/s$ )	0.009 (0.32)	0.018 (0.64)	0.018 (0.64)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)		dB	<63	<66	<66
<b>Rated input current <sup>4)</sup></b>					
• Based on $I_L$	A	21.5	33.0	40.6	48.2
• Based on $I_H$	A	18.2	24.1	36.4	45.2
<b>Length of cable to braking resistor, max.</b>		m (ft)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3			Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm <sup>2</sup>	4 ... 6 (12 ... 10 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)
<b>Motor connection</b> U2, V2, W2			Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm <sup>2</sup>	4 ... 6 (12 ... 10 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)
<b>Connection for braking resistor</b> R1, R2			Plug-in screw terminals	Plug-in screw terminals	Plug-in screw terminals
• Conductor cross-section	mm <sup>2</sup>	4 ... 6 (12 ... 10 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)	6 ... 16 (10 ... 5 AWG)
<b>PE connection</b>			On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
<b>Motor cable length, max.<sup>5)</sup></b>					
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Dimensions</b>					
• Width	mm (in)	100 (3.94)	140 (5.51)	140 (5.51)	140 (5.51)
• Height	mm (in)	196 (7.72)	295 (11.61)	295 (11.61)	295 (11.61)
• Depth					
- Without operator panel	mm (in)	203 (7.99)	203 (7.99)	203 (7.99)	203 (7.99)
- With operator panel	mm (in)	224 (8.82)	224 (8.82)	224 (8.82)	224 (8.82)
<b>Frame size</b>			FSB	FSC	FSC
<b>Weight, approx.</b>		kg (lb)	2.3 (5)	4.5 (10)	4.5 (10)

<sup>1)</sup> The rated output current  $I_{rated}$  can be used up to 100 %; however, without overload.

<sup>2)</sup> The base load current  $I_L$  is based on the duty cycle for low overload (LO).

<sup>3)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>4)</sup> The rated input currents are valid for an input voltage of 400 V 3 AC and a line impedance corresponding to  $u_K = 1\%$  (without line reactor). The rated input current based on  $I_L$  is stamped on the inverter rating plate. In the particular application, the input current depends on the motor load and line impedance. The input current is reduced when using a line reactor.

<sup>5)</sup> The maximum motor cable lengths are valid for an input voltage of 400 V 3 AC and operation with a 4 kHz pulse frequency. To maintain limit values according to EN 61800-3 Category C2, a maximum motor cable length of 25 m (82 ft) (shielded) is permissible.

# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

## SINAMICS G120C compact inverters

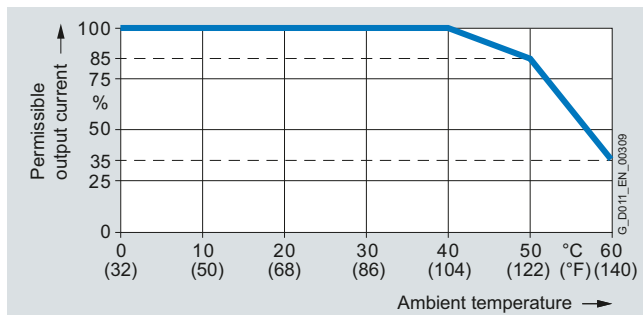
### Characteristic curves

#### Derating data

##### Pulse frequency

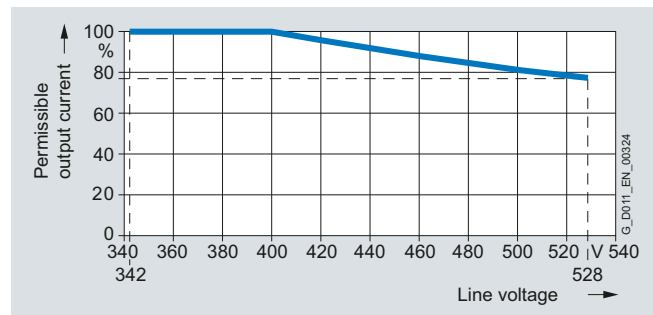
Rated power based on low overload (LO)		Rated output current A for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.55 <sup>1)</sup>	0.75	1.7	1.4	1.2	1.0	0.9	0.8	0.7
0.75 <sup>1)</sup>	1.0	2.2	1.9	1.5	1.3	1.1	1.0	0.9
1.1 <sup>1)</sup>	1.5	3.1	2.6	2.2	1.9	1.6	1.4	1.2
1.5 <sup>1)</sup>	2.0	4.1	3.5	2.9	2.5	2.1	1.8	1.6
2.2 <sup>1)</sup>	3.0	5.6	4.8	3.9	3.4	2.8	2.5	2.2
3.0 <sup>1)</sup>	4.0	7.3	6.2	5.1	4.4	3.7	3.3	2.9
4.0 <sup>1)</sup>	5.0	8.8	7.5	6.2	5.3	4.4	4.0	3.5
5.5	7.5	12.5	10.6	8.8	7.5	6.3	5.6	5.0
7.5	10	16.5	14.0	11.6	9.9	8.3	7.4	6.6
11.0	15	25.0	21.3	17.5	15.0	12.5	11.3	10.0
15.0	20	31.0	26.4	21.7	18.6	15.5	14.0	12.4
18.5	25	37.0	31.5	25.9	22.2	18.5	16.7	14.8

##### Ambient temperature



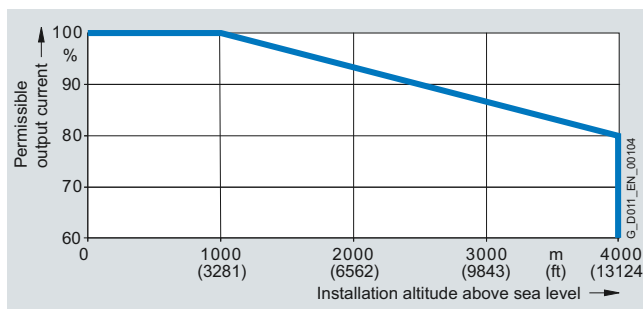
High overload (HO) and low overload (LO)

##### Line voltage

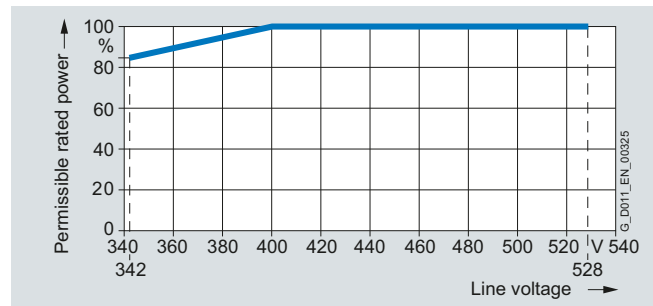


Permissible output current as a function of line voltage

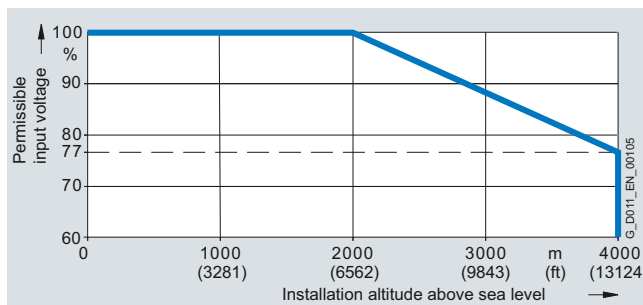
##### Installation altitude



Permissible output current as a function of installation altitude



Permissible rated power as a function of line voltage



Permissible input voltage as a function of installation altitude

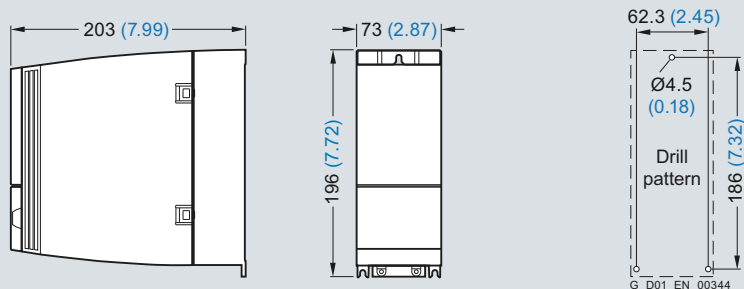
<sup>1)</sup> The permissible motor cable length depends on the cable type and the pulse frequency.

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### SINAMICS G120C compact inverters

#### Dimensional drawings



SINAMICS G120C, frame size FSA

Mounted with 3 M4 studs, 3 M4 nuts, 3 M4 washers.

Ventilation clearance required at the top: 80 mm (3.15 inches).

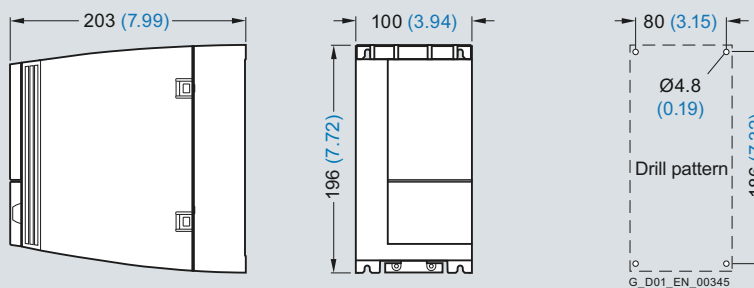
Ventilation clearance required at the bottom: 100 mm (3.94 inches).

Ventilation clearance required at the side: 0 mm (0 inches).

When the IOP is inserted, the mounting depth increases by 21 mm (0.83 inches).

When the BOP-2 is inserted, the mounting depth increases by 11 mm (0.43 inches).

All dimensions in mm (values in brackets are in inches).



SINAMICS G120C, frame size FSB

Mounted with 4 M4 studs, 4 M4 nuts, 4 M4 washers.

Ventilation clearance required at the top: 80 mm (3.15 inches).

Ventilation clearance required at the bottom: 100 mm (3.94 inches).

Ventilation clearance required at the side: 0 mm (0 inches).

When the IOP is inserted, the mounting depth increases by 21 mm (0.83 inches).

When the BOP-2 is inserted, the mounting depth increases by 11 mm (0.43 inches).

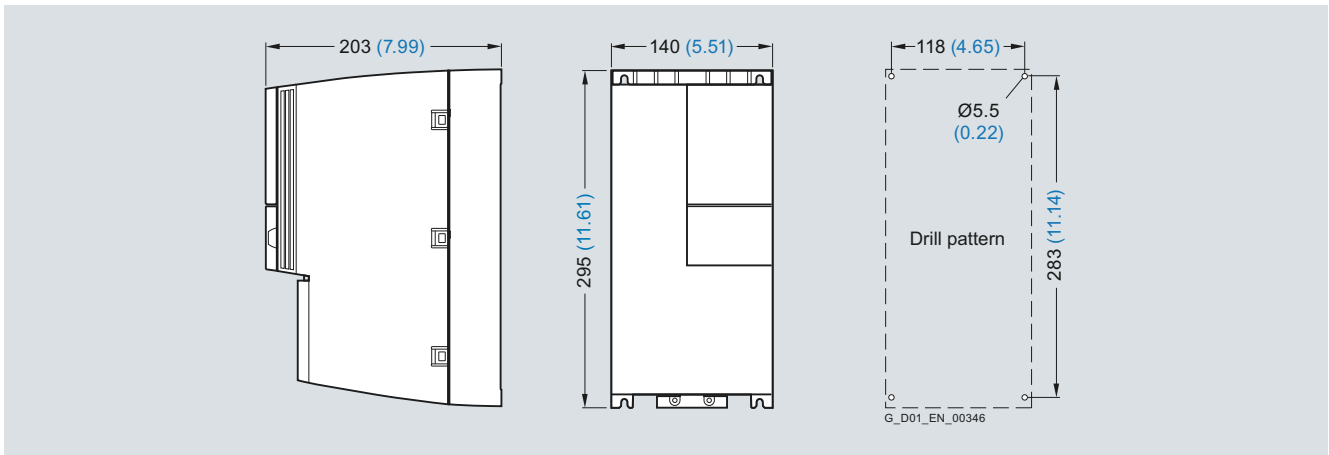
All dimensions in mm (values in brackets are in inches).

# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

## SINAMICS G120C compact inverters

### Dimensional drawings



SINAMICS G120C, frame size FSC

Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.

Ventilation clearance required at the top: 80 mm (3.15 inches).

Ventilation clearance required at the bottom: 100 mm (3.94 inches).

Ventilation clearance required at the side: 0 mm (0 inches).

When the IOP is inserted, the mounting depth increases by 21 mm (0.83 inches).

When the BOP-2 is inserted, the mounting depth increases by 11 mm (0.43 inches).

All dimensions in mm (values in brackets are in inches).

### More information

Detailed information on SINAMICS G120C, the latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions), are available on the Internet at:

[www.siemens.com/sinamics-g120c](http://www.siemens.com/sinamics-g120c)

You can find information offline about SINAMICS G120C on the DVD-ROM CA 01 in the DT Configurator.

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### Line-side components

#### Line reactors

#### Overview



Line reactor for SINAMICS G120C, frame size FSB

Line reactors are used to smooth voltage peaks or to bridge commutating dips. Line reactors also reduce the effects of harmonics on the inverter and the line supply.

If the ratio of the rated inverter power to the line supply short-circuit power is less than 1 %, then it is recommended to use a line reactor to reduce the current peaks.

#### Selection and ordering data

Rated power		Suitable for SINAMICS G120C		Line reactor
kW	hp	Type 6SL3210-...	Frame size	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
0.55	0.75	1KE11-8..0	FSA	<b>6SL3203-0CE13-2AA0</b>
0.75	1	1KE12-3..0		
1.1	1.5	1KE13-2..0		
1.5	2	1KE14-3..0	FSA	<b>6SL3203-0CE21-0AA0</b>
2.2	3	1KE15-8..0		
3	4	1KE17-5..0		
4	5	1KE18-8..0		
5.5	7.5	1KE21-3..0	FSB	<b>6SL3203-0CE21-8AA0</b>
7.5	10	1KE21-7..0		
11	15	1KE22-6..0	FSC	<b>6SL3203-0CE23-8AA0</b>
15	20	1KE23-2..0		
18.5	25	1KE23-8..0		

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor			
		6SL3203-0CE13-2AA0	6SL3203-0CE21-0AA0	6SL3203-0CE21-8AA0	6SL3203-0CE23-8AA0
<b>Rated current</b>	A	4	11.3	22.3	47
<b>Power loss at 50/60 Hz</b>	W	23/26	36/40	53/59	88/97
<b>Line supply/load connection</b> 1L1, 1L2, 1L3 2L1, 2L2, 2L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	4	4	10	16
<b>PE connection</b>		M4 × 8; U washer; spring lock washer	M4 × 8; U washer; spring lock washer	M5 × 10; U washer; spring lock washer	M5 × 10; U washer; spring lock washer
<b>Degree of protection</b>		Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20	Control cabinet built-in unit IP20
<b>Dimensions</b>					
• Width	mm (in)	125 (4.92)	125 (4.92)	125 (4.92)	190 (7.48)
• Height	mm (in)	120 (4.72)	140 (5.51)	145 (5.71)	220 (8.66)
• Depth	mm (in)	71 (2.80)	71 (2.80)	91 (3.58)	91 (3.58)
<b>Weight, approx.</b>	kg (lb)	1.1 (2.4)	2.1 (4.6)	2.95 (6.5)	7.8 (17.2)
<b>Suitable for SINAMICS G120C</b>	Type	6SL3210-1KE11-8..0 6SL3210-1KE12-3..0 6SL3210-1KE13-2..0	6SL3210-1KE14-3..0 6SL3210-1KE15-8..0 6SL3210-1KE17-5..0 6SL3210-1KE18-8..0	6SL3210-1KE21-3..0 6SL3210-1KE21-7..0	6SL3210-1KE22-6..0 6SL3210-1KE23-2..0 6SL3210-1KE23-8..0
• Frame size		FSA	FSA	FSB	FSC



# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

Line-side components  
Recommended line-side power components

### Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers.

Note for use in compliance with IEC standards:

3NA3 fuses are recommended for European countries. The values in the table take into account the overload capability of the inverter.

Note for use in compliance with UL regulations:

Fuses for use in North America must be UL-certified, such as the Class NON fuse series from Bussmann or approved circuit breakers from the SIRIUS 3RV and SENTRON 3VL series according to UL 489 (category control number CCN: DiV Q). The specified circuit breakers are UL-certified.

An overvoltage protection device is required for installation in conformance with UL corresponding to the UL certification of SINAMICS G120C. The overvoltage protection device must be marked with the Listed test symbol and category code VZCA. The detailed UL installation guidelines are included in the equipment manual.

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 and IC 10.](#)

Rated power		Suitable for SINAMICS G120C Type 6SL3210-...	Corresponding to the IEC standard			Corresponding to the UL/cUL standard		
kW	hp		Standard fuse Current in A	Order No.	Circuit breaker Order No.	Standard fuse Current in A	Class	Circuit breaker Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>								
0.55	0.75	1KE11-8A.0	6	<b>3NA3801</b>	<b>3RV1021-1DA10</b>	10	J	<b>3RV1021-1DA10</b>
0.75	1	1KE12-3A.0	6	<b>3NA3801</b>	<b>3RV1021-1EA10</b>	10	J	<b>3RV1021-1EA10</b>
1.1	1.5	1KE13-2A.0	6	<b>3NA3801</b>	<b>3RV1021-1FA10</b>	10	J	<b>3RV1021-1FA10</b>
1.5	2	1KE14-3A.0	10	<b>3NA3803</b>	<b>3RV1021-1HA10</b>	10	J	<b>3RV1021-1HA10</b>
2.2	3	1KE15-8A.0	10	<b>3NA3803</b>	<b>3RV1021-1JA10</b>	10	J	<b>3RV1021-1JA10</b>
3.0	4	1KE17-5A.0	16	<b>3NA3805</b>	<b>3RV1021-1KA10</b>	15	J	<b>3RV1021-1KA10</b>
4.0	5	1KE18-8A.0	16	<b>3NA3805</b>	<b>3RV1021-4AA10</b>	15	J	<b>3RV1021-4AA10</b>
5.5	7.5	1KE21-3A.0	20	<b>3NA3807</b>	<b>3RV1021-4BA10</b>	20	J	<b>3RV1021-4BA10</b>
7.5	10	1KE21-7A.0	25	<b>3NA3810</b>	<b>3RV1021-4DA10</b>	25	J	<b>3RV1021-4DA10</b>
11	15	1KE22-6A.0	40	<b>3NA3817</b>	<b>3RV1031-4FA10</b>	40	J	<b>3RV1031-4FA10</b>
15	20	1KE23-2A.0	50	<b>3NA3820</b>	<b>3RV1031-4GA10</b>	50	J	<b>3RV1031-4GA10</b>
18.5	25	1KE23-8A.0	63	<b>3NA3822</b>	<b>3RV1031-4HA10</b>	60	J	<b>3RV1031-4HA10</b>

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ .  
The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### DC link components Braking resistors

#### Overview



Braking resistor for SINAMICS G120C, frame size FSB

The excess energy of the DC link is dissipated using the braking resistor. The braking resistors are designed for use with the SINAMICS G120C. SINAMICS G120C has an integrated brake chopper and cannot feed back regenerative energy to the line supply. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors are designed for mounting horizontally or vertically onto a heat-resistant sheet steel panel. The resistors should be mounted such as to ensure that the air can flow in and out and heat cannot build up. The heat dissipated by the braking resistor must not diminish the inverter cooling.

Every braking resistor is equipped with a temperature switch. The temperature switch can be evaluated to prevent consequential damage if the braking resistor overheats.

#### Selection and ordering data

Rated power		Suitable for SINAMICS G120C		Braking resistor
kW	hp	Type 6SL3210-...	Frame size	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
0.55	0.75	1KE11-8..0	FSA	<b>6SL3201-0BE14-3AA0</b>
0.75	1	1KE12-3..0		
1.1	1.5	1KE13-2..0		
1.5	2	1KE14-3..0		
2.2	3	1KE15-8..0	FSA	<b>6SL3201-0BE21-0AA0</b>
3	4	1KE17-5..0		
4	5	1KE18-8..0		
5.5	7.5	1KE21-3..0	FSB	<b>6SL3201-0BE21-8AA0</b>
7.5	10	1KE21-7..0		
11	15	1KE22-6..0	FSC	<b>6SL3201-0BE23-8AA0</b>
15	20	1KE23-2..0		
18.5	25	1KE23-8..0		

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Braking resistor			
		6SL3201-0BE14-3AA0	6SL3201-0BE21-0AA0	6SL3201-0BE21-8AA0	6SL3201-0BE23-8AA0
<b>Resistance</b>	Ω	370	140	75	30
<b>Rated power <math>P_{DB}</math></b>	kW	0.075	0.2	0.375	0.925
<b>Peak power <math>P_{max}</math></b> (on-load factor 5 %)	kW	1.5	4	7.5	18.5
<b>Power connection</b>		Terminal block	Terminal block	Terminal block	Terminal block
• Conductor cross-section	mm <sup>2</sup>	2.5	2.5	2.5	6
<b>Thermostatic switch</b>		NC contact	NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
• Conductor cross-section	mm <sup>2</sup>	2.5	2.5	2.5	2.5
<b>PE connection</b>					
• Via terminal block		Yes	Yes	Yes	Yes
• PE connection on housing		M4 screw	M4 screw	M4 screw	M4 screw
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm (in)	105 (4.13)	105 (4.13)	175 (6.89)	250 (9.84)
• Height	mm (in)	295 (11.61)	345 (13.58)	345 (13.58)	490 (19.29)
• Depth	mm (in)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)
<b>Weight, approx.</b>	kg (lb)	1.48 (3.26)	1.8 (3.97)	2.73 (6.02)	6.2 (13.7)
<b>Suitable for SINAMICS G120C</b>	Type	6SL3210-1KE11-8..0 6SL3210-1KE12-3..0 6SL3210-1KE13-2..0 6SL3210-1KE14-3..0	6SL3210-1KE15-8..0 6SL3210-1KE17-5..0 6SL3210-1KE18-8..0	6SL3210-1KE21-3..0 6SL3210-1KE21-7..0	6SL3210-1KE22-6..0 6SL3210-1KE23-2..0 6SL3210-1KE23-8..0
• Frame size		FSA	FSA	FSB	FSC

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### Supplementary system components Operator panels

#### Overview

Operator panel	Intelligent Operator Panel IOP and IOP Handheld	Basic Operator Panel BOP-2
		
Description	<p>Thanks to the large plain text display, menu-based operation and the application wizards, commissioning of the standard drives is easy. Integrated application wizards guide the user interactively through the commissioning process for important applications such as pumps, fans, compressors and conveyor systems.</p>	<p>Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.</p>
Possible applications	<ul style="list-style-type: none"> <li>• Directly mounted on SINAMICS G120C</li> <li>• Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP54/UL Type 12)</li> <li>• Available as handheld version</li> <li>• 5 languages available</li> </ul>	<ul style="list-style-type: none"> <li>• Directly mounted on SINAMICS G120C</li> <li>• Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP55/UL Type 12)</li> </ul>
Quick commissioning without expert knowledge	<ul style="list-style-type: none"> <li>• Standard commissioning using the clone function</li> <li>• User-defined parameter list with a reduced number of self-selected parameters</li> <li>• Simple commissioning of standard applications using application-specific wizards; it is not necessary to know the parameter structure</li> <li>• Simple local commissioning using the handheld version</li> <li>• Commissioning largely without documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Standard commissioning using the clone function</li> </ul>
High degree of operator friendliness and intuitive operation	<ul style="list-style-type: none"> <li>• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes</li> <li>• Intuitive navigation using a rotary knob – just like in everyday applications</li> <li>• Graphic display to show status values such as pressure or flow in bar-type diagrams</li> <li>• Status display with freely selectable units to specify physical values</li> </ul>	<ul style="list-style-type: none"> <li>• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes</li> <li>–</li> <li>• 2-line display for showing up to 2 process values with text</li> <li>• Status display of predefined units</li> </ul>
Minimization of maintenance times	<ul style="list-style-type: none"> <li>• Diagnostics using plain text display, can be used locally on-site without documentation</li> <li>• Simple update of languages, wizards and firmware via USB</li> </ul>	<ul style="list-style-type: none"> <li>• Diagnostics with menu prompting with 7-segment display</li> </ul>

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### Supplementary system components Intelligent Operator Panel IOP

#### Overview

#### Intelligent Operator Panel IOP



Intelligent Operator Panel IOP

The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for the SINAMICS G120, SINAMICS G120C, SINAMICS G120D, SINAMICS G120P standard drives and SIMATIC ET 200 frequency converters.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors. There are quick commissioning wizards for general commissioning.

Up to 2 process values can be displayed graphically or numerically on the status screen/status display. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP and downloaded into other drive units of the same type as required.

The IOP includes the following language packages: English, French, German, Italian and Spanish.

The IOP can be installed in control cabinet doors using the optionally available door mounting kit.

#### Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP.

The IOP is supplied with power via the USB interface during an update.

#### IOP Handheld



IOP Handheld

A handheld version of the IOP can be ordered for mobile use. In addition to the IOP, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP Handheld to SINAMICS G110D and SINAMICS G120D, the RS232 connecting cable with optical interface is required in addition.

#### Selection and ordering data

Description	Order No.
<b>Intelligent Operator Panel IOP</b>	<b>6SL3255-0AA00-4JA0</b>
<b>IOP Handheld</b> For use with SINAMICS G120, SINAMICS G120C, SINAMICS G110D, SINAMICS G120D, SIMATIC ET 200S FC or SIMATIC ET 200pro FC Included in the scope of delivery:	<b>6SL3255-0AA00-4HA0</b>
<ul style="list-style-type: none"> <li>• IOP</li> <li>• Handheld housing</li> <li>• Rechargeable batteries (4 × AA)</li> <li>• Charging unit (international)</li> <li>• RS232 connecting cable (3 m/9.84 ft long, can only be used for SINAMICS G120 and SIMATIC ET 200S FC)</li> <li>• USB cable (1 m/3.28 ft long)</li> </ul>	
<b>Accessories</b>	
<b>Door mounting kit</b> For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery:	<b>6SL3256-0AP00-0JA0</b>
<ul style="list-style-type: none"> <li>• Seal</li> <li>• Mounting material</li> <li>• Connecting cable (5 m/16.4 ft long)</li> </ul>	

# SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

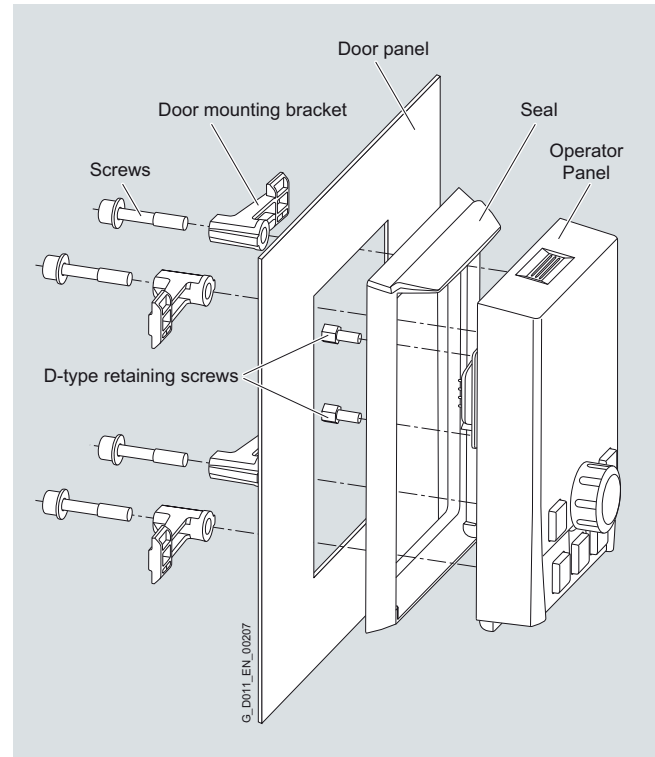
Supplementary system components  
Intelligent Operator Panel IOP

## Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive; you can toggle between the automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive navigation using a wheel – just like in everyday applications
- Graphic display with bar charts e.g. for status values such as pressure or flowrate
- Quickly and simply mounted in the door – mechanically and electrically
- Simple local commissioning on-site using the handheld version
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- 5 integrated languages
- Simple update of languages, wizards and firmware updates via USB

## Integration

Using the optionally available door mounting kit, an operator panel can be simply mounted in a control cabinet door with just a few manual operations. For door mounting with an IOP, degree of protection IP54/UL Type 12 is achieved, and with BOP-2, degree of protection IP55.



Door mounting kit with IOP

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### Supplementary system components Basic Operator Panel BOP-2

#### Overview



Basic Operator Panel BOP-2

The Basic Operator Panel BOP-2 can be used to commission drives, monitor drives in operation and input individual parameter settings.

Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.

The drives are easily controlled manually using directly assigned navigation buttons. The BOP-2 has a dedicated switchover button to switch from automatic to manual mode.

Diagnostics can easily be performed on the connected inverter by following the menus.

Up to 2 process values can be numerically visualized simultaneously.

BOP-2 supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the BOP-2 and when required, downloaded into other drive units of the same type.

#### Benefits

- Shorten commissioning times – Easy commissioning of standard drives using basic commissioning wizards (setup)
- Minimize standstill times – Fast detection and rectification of errors (Diagnostics)
- Greater transparency in the process – The status display of the BOP makes process variable monitoring easy (Monitoring)
- Direct mounting on the inverter ([also see IOP](#))
- User-friendly user interface:
  - Easy navigation using clear menu structure and clearly assigned control keys
  - Two-line display

#### Selection and ordering data

Description	Order No.
<b>Basic Operator Panel BOP-2</b>	<b>6SL3255-0AA00-4CA1</b>
<b>Accessories</b>	
<b>Door mounting kit</b>	<b>6SL3256-0AP00-0JA0</b>
For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery:	
<ul style="list-style-type: none"> <li>• Seal</li> <li>• Mounting material</li> <li>• Connecting cable (5 m/16.4 ft long)</li> </ul>	

# SINAMICS G120C compact inverters

## 0.5 kW to 18.5 kW (0.75 hp to 25 hp)

### Supplementary system components Memory cards

### Supplementary system components PC inverter connection kit 2

#### Overview



SINAMICS micro memory card (MMC)/SIMATIC memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) or SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of an operator panel such as the BOP-2 or the STARTER commissioning tool.

#### Note:

The memory card is not required for operation and does not have to remain inserted.

#### Selection and ordering data

Description	Order No.
<b>SINAMICS micro memory card (MMC)</b>	<b>6SL3254-0AM00-0AA0</b>
<b>SIMATIC memory card (SD card)</b> (for SINAMICS G120C and the SINAMICS G120 CU2 . 0 . -2 Control Units)	<b>6ES7954-8LB01-0AA0</b>

#### Overview

For controlling and commissioning an inverter directly from a PC, if the STARTER commissioning tool has been installed on the PC. With this, the inverter can be

- parameterized (commissioned, optimized),
- monitored (diagnostics)
- controlled (master control via the STARTER commissioning tool for test purposes).

A USB cable (3 m/9.84 ft) and the STARTER commissioning tool on DVD-ROM are included in the scope of delivery.

#### Selection and ordering data

Description	Order No.
<b>PC inverter connection kit 2</b> for SINAMICS G120C and SINAMICS G120 Control Units CU2 . 0 . -2	<b>6SL3255-0AA00-2CA0</b>
Including USB cable (3 m/9.84 ft) and STARTER commissioning tool on DVD-ROM <sup>1)</sup>	

<sup>1)</sup> The STARTER commissioning tool is also available on the Internet at <http://support.automation.siemens.com/WW/view/en/10804985/133100>

# SINAMICS G120C compact inverters

## 0.55 kW to 18.5 kW (0.75 hp to 25 hp)

### Spare parts

#### Overview

The following spare parts are available for SINAMICS G120C for service and maintenance work.

#### **SINAMICS G120C shield plates**

A set of shield plates can be ordered for the motor and signal cables corresponding to the frame size of the SINAMICS G120C compact inverter.

#### **SINAMICS G120C Spare Parts Kit**

This kit comprises 5 sets of I/O terminals, 1 RS485 terminal, 2 Control Unit doors and 1 blanking cover.

#### **SINAMICS G120, SINAMICS G120C connectors**

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the SINAMICS G120C compact inverter.

#### **SINAMICS G120C roof-mounted fan**

A roof-mounted fan (at the top of the device) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C compact inverter.



SINAMICS G120C, frame size FSB, with integrated roof-mounted fan

#### **SINAMICS G120, SINAMICS G120C fan unit**

A replacement fan (at the rear of the device; heat sink) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C compact inverter.



SINAMICS G120C, frame size FSB, with fan unit (rear view of rotated inverter)

#### Selection and ordering data

Description	Order No.
<b>SINAMICS G120C shield plate</b>	
• Frame size FSA	6SL3266-1EA00-0KA0
• Frame size FSB	6SL3266-1EB00-0KA0
• Frame size FSC	6SL3266-1EC00-0KA0
<b>SINAMICS G120C Spare Parts Kit</b>	6SL3200-0SK40-0AA0
<b>SINAMICS G120, SINAMICS G120C connectors</b>	
• Frame size FSA	6SL3200-0ST05-0AA0
• Frame size FSB	6SL3200-0ST06-0AA0
• Frame size FSC	6SL3200-0ST07-0AA0
<b>SINAMICS G120C roof-mounted fan</b>	
• Frame size FSA	6SL3200-0SF40-0AA0
• Frame size FSB	6SL3200-0SF41-0AA0
• Frame size FSC	6SL3200-0SF42-0AA0
<b>SINAMICS G120, SINAMICS G120C fan unit</b>	
• Frame size FSA	6SL3200-0SF12-0AA0
• Frame size FSB	6SL3200-0SF13-0AA0
• Frame size FSC	6SL3200-0SF14-0AA0



# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

5



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# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### Introduction

### Application

Application	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality			Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality		
<b>Pumping, ventilating, compressing</b> 	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
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)
<b>Moving</b> 	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
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (DCM)
<b>Processing</b> 	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
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)
<b>Machining</b> 	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
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>

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

The SINAMICS G120P inverter is a cost-effective, space-saving drive for pump and fan drives, which is easy to operate and has a wide range of functions. As a consequence, it is especially

well-suited for building automation, the process industry, the water industry as well as for heating, ventilation and air conditioning (HVAC).

### More information

You may also be interested in these inverters/converters:

- More performance in the control cabinet in IP20 degree of protection ⇒ SINAMICS G120 ([chapter 6](#))
- Higher degree of protection for power ratings up to 7.5 kW (10 hp) ⇒ SINAMICS G110D ([chapter 7](#)), SINAMICS G120D ([chapter 8](#))
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110 ([chapter 9](#))

# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

**SINAMICS G120P pump, fan and compressor inverters**

## Overview

Energy awareness, economy and energy efficiency – Siemens offers an answer to these trends with the new SINAMICS G120P inverter series. SINAMICS G120P is an innovative and user-friendly inverter series that has been specifically optimized for pump, fan and compressor applications in the industrial environment, but also for tasks in building automation.

SINAMICS G120P offers efficient drive solutions for a wide range of applications. With their easy handling, the drives support the

user not only in optimizing existing frequency-controlled drives, but also in converting fixed-speed drives and in retrofitting.

The SINAMICS G120P inverter series features advanced hardware and software functions that make a substantial contribution towards saving energy and thus make more careful use of our natural resources. SINAMICS G120P is also particularly "line-friendly", i.e. the inverter topology keeps harmonic currents to a minimum. There is no need to use a line reactor at the line infeed.



SINAMICS G120P in degree of protection IP54/UL Type12, frame sizes FSA, FSB and FSC; comprising a PM230 Power Module and mounted IOP Intelligent Operator Panel



SINAMICS G120P in degree of protection IP54/UL Type12, frame sizes FSD, FSE and FSF; comprising a PM230 Power Module and mounted IOP Intelligent Operator Panel

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### SINAMICS G120P pump, fan and compressor inverters

#### Overview

SINAMICS G120P has the following connections and interfaces in order to address specific requirements:

- Fieldbus interface of the CU230P-2 Control Unit optionally with
  - RS485/USS, Modbus/RTU, BACnet MS/TP
  - PROFIBUS DP
  - CANopen
- Ni1000/Pt1000 interface for direct connection of temperature sensors
- 230 V relay for direct connection of auxiliary equipment
- Isolated digital inputs with a separate potential group to prevent potential transfers
- Isolated analog inputs for EMC-compatible installation without the need for additional components

#### User-friendliness

A high degree of user-friendliness is one of the main characteristics of the SINAMICS G120P:

- Simple application-specific commissioning wizard "on board" the Intelligent Operator Panel (IOP)
- Plain text scripts for integration in the STARTER commissioning tool for more demanding applications
- Operator panel with plain text display and extensive diagnostics functions (IOP)
- SINAMICS micro memory card (MMC)/SIMATIC memory card (SD card) for storing parameter settings, cloning and local commissioning
- Plug-in terminal blocks for supply cables and motor cables (for power outputs of up to 18.5 kW/25 hp)
- Fast replacement of drive components thanks to modular structure

#### Guided operation using wizards

SINAMICS G120P offers two basic options for guided parameterization/setting in a target application:

##### Commissioning of simple applications

using application wizards integrated in the IOP operator panel.

The following wizards are available:

- Quick commissioning
- Pump with/without PID control
- Fan with/without PID control
- Compressor with/without PID control
- PID setting
- Boost setting

An appropriate connection diagram for the standard wiring can be found in the documentation of the IOP operator panel.

##### Commissioning of more demanding applications

using plain text scripts through solution-based dialog prompting in the STARTER commissioning tool

The wizards support setpoint input for process values and setpoint exchange using timers. Not only this, they also allow technological functions such as motor staging or hibernation to be easily integrated. The connection diagrams for standard wiring that are required for the wizards are also supplied.

The following wizards are available:

- Fan for exhaust air with closed-loop control of pressure/air quality
- Fan for cooling tower with closed-loop control of cooling water temperature
- Fan for stairwell with closed-loop control of pressure and enhanced fire emergency operation
- Fan for tunnel/multi-storey car park with closed-loop control of air quality and enhanced fire emergency operation
- Fan for supply air with closed-loop control of pressure/temperature/air quality/flowrate
- Pumps with closed-loop control of pressure
- Pumps with closed-loop control of level
- Pumps for cooling circuits with closed-loop control of temperature
- Compressor with closed-loop control of pressure

#### Line supply conditions

The inverter topology implemented ensures minimal line harmonic distortion. This means that the harmonic currents are low and the relevant low-frequency single harmonics as well as the THD value (Total Harmonic Distortion) are in compliance with EN 61000-3-12 and IEC 61000-3-12 standards.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

SINAMICS G120P pump,  
fan and compressor inverters

### Benefits

#### Energy efficiency

SINAMICS G120P increases the efficiency and minimizes energy consumption in the complete process chain. The inverter has integrated hardware as well as software functions as standard. The main features are:

- Extremely high active power component of apparent power thanks to efficient inverter topology: For the same drive power, SINAMICS G120P requires a lower line current than comparable inverters.
- ECO mode through automatic adaptation of the motor current to the prevailing load conditions with the closed-loop control mode  $V/f$  ECO and vector control without encoder (SLVC), therefore achieving savings of up to 40 % under partial load conditions
- Hibernation as a function of setpoints in the process
- Automatic switchover to line operation at rated speed (bypass mode)
- Elimination of mechanical closed-loop control systems and the associated efficiency losses, by using 4 internal PID controllers
- Auto-ramping function for current limitation purposes

#### Optimum energy management through innovative technology

##### Optimized inverter topology

- Harmonic limit values and THD according to IEC/EN 61000-3 12 are fulfilled without the need for additional measures ( $R_{sce} \geq 120$ )
- Reduced line harmonic distortions
- No reactors → Compact design
- Lower apparent power → Smaller cable cross-sections

##### ECO mode

- Energy-saving capability through automatic adaptation of the magnetic flux in the motor to prevailing load conditions (lower motor losses under partial load conditions)

##### Hibernation

- Energy-saving capability: The drive is started/stopped in line with the currently applicable setpoints, thereby avoiding excessive mechanical loads

#### Straightforward, application-specific commissioning and operation using operator panel

- Local commissioning without specialized knowledge of inverters using application-specific wizards
- Unique: SINAMICS micro memory card (MMC)/SIMATIC memory card (SD card) for pre-parameterization and cloning inverter data sets
- Data backup for easy replacement
- USB port integrated on the CU230P-2 Control Unit for commissioning and easy diagnostics using the STARTER commissioning tool
- Commissioning/diagnostics and controlling of inverters

#### Flexible deployment of integrated functions

- PLC functions for local control tasks  
Flexible use of integrated function blocks → No need for additional, external components
- 4 integrated PID controllers  
Distributed closed-loop control for motor-independent process control without higher-level controller (PLC)
- 3 freely programmable digital timer switches  
Control for freely selectable daily and weekly programs

#### Flexible deployment across a wide range of applications

- Isolated digital inputs with separate potential group
- Isolated analog inputs
  - Potential transfer avoided
  - EMC-compliant design without the need for additional components in line with process industry requirements
- Ni1000-/Pt1000 temperature sensor interface
  - Direct connection of temperature sensors without external interface unit
- 230 V relay
  - Direct control for auxiliary equipment, e.g. reactor or valve actuators

#### Flexible, modular system for challenging environmental conditions

- Operation at ambient temperatures of up to 60 °C (140 °F)
- Modular design of power and control electronics
  - Power range can be easily extended
  - Fast exchange of power units
- Removable operator panel
  - Protection against unauthorized access
  - Degree of protection IP54/UL Type 12 with IOP operator panel
  - Degree of protection IP55/UL Type 12 with BOP-2 operator panel or blanking cover
- Replacement of individual components without the need for reinstallation

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### SINAMICS G120P pump, fan and compressor inverters

#### Application

##### The specialist for pump, fan and compressor applications

SINAMICS G120P is ideally suited to pump, fan and compressor applications in the industrial environment, in the process industry, water industry, and in building automation.

SINAMICS G120P is ideally suited for the following applications:

- Circulating pumps for heating and cooling systems
- Pumps for pressure boosting stations
- Level control
- Fans in cooling towers
- Fans for air intake and discharge
- Fans for tunnels and multi-storey car parks
- Fans for stairwells
- Compressors for supplying compressed air

##### Reliable operation in harsh environments

SINAMICS G120P is suitable for use under harsh environmental conditions:

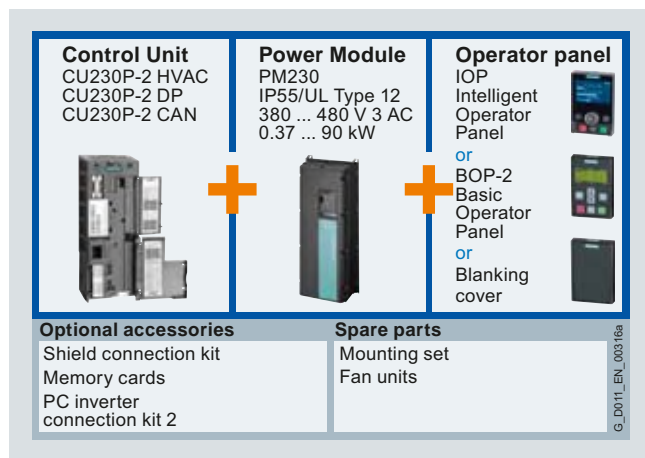
- High degree of protection IP55/UL Type 12 for installation outside the control cabinet
- Operation at ambient temperatures of up to 60 °C (140 °F)
- The power loss is dissipated using an external heat sink, separate internal air circulation
- Coated modules for increased resistance to humidity and dust

#### Design

##### Modular design

SINAMICS G120P is a modular inverter system comprising the following components.

- CU230P-2 Control Unit
- PM230 Power Module
- Operator panel or blanking cover



#### CU230P-2 Control Unit

The inverter communication interface is defined when selecting the Control Unit (firmware version V4.3.2 and higher).

- CU230P-2 HVAC → USS, Modbus RTU, BACnet MS/TP
- CU230P-2 DP → PROFIBUS
- CU230P-2 CAN → CANopen

The CU230P-2 Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control modes that can be selected. It supports communication to a local or central controller as well as to the monitoring equipment, and allows all process-related auxiliary equipment and external components to be connected (sensors, valves, contactors, etc.).

#### PM230 Power Module

The power unit is selected depending on the power requirement and the application.

- PM230 with integrated class A filter, degree of protection IP55/UL Type 12, 0.37 kW up to 90 kW (0.5 hp up to 125 hp)
- PM230 with integrated class B filter, degree of protection IP55/UL Type 12, 0.37 kW up to 90 kW (0.5 hp up to 125 hp)

State-of-the-art IGBT technology with pulse-width modulation is used for reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor.

#### Operator panel or blanking cover

- Intelligent Operator Panel IOP, degree of protection IP54/UL Type 12  
The IOP supports entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission, diagnose and locally control standard drives. Integrated application wizards interactively guide users through the commissioning process.
- Basic Operator Panel BOP-2, degree of protection IP55/UL Type 12  
The menu prompting and the 2-line display facilitate fast and user-friendly commissioning of the inverter. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can also be performed without a printed parameter list.
- Blanking cover, degree of protection IP55/UL Type 12  
The blanking cover is mounted on the inverter in place of an operator panel, provided that an operator panel is not required.

The operator panel supports user-friendly local commissioning, control and diagnostics and enables complete inverter data sets to be pre-parameterized and cloned.

As an alternative, instead of the operator panel, a blanking cover can be used to cover the interface.

**To achieve a high degree of protection, either an operator panel or the blanking cover must be mounted.**

#### Optional accessories

- Shield connection kit for CU230P-2 Control Unit
- SINAMICS micro memory card (MMC)/ SIMATIC memory card (SD card)
- PC inverter connection kit 2

#### Spare parts

- Mounting set
- Fan units

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

SINAMICS G120P pump,  
fan and compressor inverters

### Function

#### Technology function

Functions specific to pumps, fans and compressors are already integrated, e.g.:

- **Automatic restart**  
Application restart after a power failure or fault occurrence
- **Flying restart**  
Connection of the inverter when the motor is running
- **ECO mode**  
Automatic adaptation of the motor current to the prevailing load conditions, e.g. for applications with a low dynamic response and a constant speed setpoint
- **Motor staging**  
For applications that require simultaneous operation of between 1 and 4 motors depending on load, e.g. closed-loop control of highly variable flow volumes
- **Hibernation**  
Drive is started/stopped in line with the actual setpoints
- **4 integrated PID controllers**  
For controlling the speed of the drive as a function of pressure, temperature, flowrate, level, air quality and other process variables
- **Extended emergency mode**  
Special inverter operating mode that enhances the availability of the drive system in the event of a fire
- **Multi-zone controller**
  - Closed-loop control of a zone with up to 3 sensors for pressure or temperature, or
  - Closed-loop control of two independent zones, each with one sensor
- **Bypass mode**  
When the setpoint is reached or a fault occurs, the system changes over to line operation
- **Programmable timer switches**
- **Real-time clock**  
For time-dependent process controls, e.g. to reduce the temperature at night via heating control
- **Freely programmable logical function blocks**  
For simulating simple PLC functions

### Accessories

#### Optional accessories

##### Shield connection kit 1 for the CU230P-2 Control Unit

Shield connection kit 1 offers optimum shield connection and strain relief for all signal and communication cables. It includes a matching shield bonding plate and all of the necessary connecting and retaining elements for mounting.

##### SINAMICS micro memory card (MMC)/ SIMATIC memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC)/SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The associated slot is located on the top of the Control Unit.

##### PC inverter connection kit 2

For controlling and commissioning the inverter directly from a PC, if the STARTER commissioning tool has been installed on the PC. The STARTER commissioning tool on DVD-ROM is included in the scope of delivery of the PC inverter connection kit 2.

### Spare parts

#### Mounting set

Depending on the frame size, different mounting sets are available for the PM230 Power Modules.

#### Fan units

The PM230 Power Module is equipped with an internal and an external fan unit. Both of these can be replaced if necessary.

### Configuration

The following electronic configuring guides and engineering tools are available for SINAMICS G120P inverters:

#### **Selection guide DT Configurator**

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 DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. It is provided on a DVD-ROM. [Refer to the chapter Engineering tools for information on the DT Configurator.](#)

#### **Online DT Configurator**

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address: [www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

#### **SIZER for Siemens Drives engineering tool**

The PC-based SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

#### **STARTER commissioning tool**

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. In addition to SINAMICS drives, STARTER is also suitable for MICROMASTER 4 units and the frequency converters for the distributed I/O SIMATIC ET 200S FC and SIMATIC ET 200pro FC.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### SINAMICS G120P pump, fan and compressor inverters

#### Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS G120P inverter series.

Mechanical specifications	
<b>Vibratory load</b>	
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2M3
• Operation Test values acc. to EN 60068-2-6	Class 3M2
<b>Shock load</b>	
• Transport <sup>1)</sup> acc. to EN 60721-3-2 - All units and components	Class 2M3
• Operation Test values acc. to EN 60068-2-27 - Frame sizes FSA to FSF	Class 3M2
Ambient conditions	
<b>Protection class</b> According to EN 61800-5-1	Class I (with protective conductor system) and Class III (PELV)
<b>Touch protection</b> According to EN 61800-5-1	For the intended purpose
<b>Permissible ambient and coolant temperature (air)</b> during operation for line-side power components and Power Modules	
• Low overload (LO)	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (104 ... 140 °F) <a href="#">see derating characteristics</a>
• High overload (HO)	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (122 ... 140 °F) <a href="#">see derating characteristics</a>
<b>Permissible ambient and coolant temperature (air)</b> during operation for Control Units and supplementary system components	
	With CU230P-2: 0 ... 60 °C (32 ... 140 °F) With IOP: 0 ... 50 °C (32 ... 122 °F) With BOP-2: 0 ... 50 °C (32 ... 122 °F) With blanking cover: 0 ... 60 °C (32 ... 140 °F) Up to 2000 m (6562 ft) above sea level
Climatic ambient conditions	
• Storage <sup>1)</sup> acc. to EN 60721-3-1	Class 1K3 -25 ... +55 °C (-13 ... +131 °F)
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2K4 -40 ... +70 °C (-40 ... +158 °F) Max. humidity 95 % at 40 °C (104 °F)
• Operation acc. to EN 60721-3-3	Class 3K3 Condensation, splashwater, and ice formation not permitted (EN 60204, Part 1)

Ambient conditions	
<b>Environmental class/harmful chemical substances</b>	
• Storage <sup>1)</sup> acc. to EN 60721-3-1	Class 1C2
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2C2
• Operation acc. to EN 60721-3-3	Class 3C1
<b>Organic/biological influences</b>	
• Storage <sup>1)</sup> acc. to EN 60721-3-1	Class 1B1
• Transport <sup>1)</sup> acc. to EN 60721-3-2	Class 2B1
• Operation acc. to EN 60721-3-3	Class 3B1
<b>Degree of pollution</b> According to EN 61800-5-1	2
Standards	
<b>Compliance with standards</b>	UL <sup>2)</sup> , CE, c-tick
<b>CE marking</b>	According to Low-Voltage Directive 2006/95/EC
<b>EMC Directive</b> According to EN 61800-3	
• Frame sizes FSA to FSF with integrated line filter class A	Category C2 <sup>3)</sup> (corresponds to class A acc. to EN 55011)
• Frame sizes FSA to FSF with integrated line filter class B	Category C1 Table 14 <sup>3)</sup> (corresponds to class B acc. to EN 55011 for conducted interference emission)

#### Note:

The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the frequency inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

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

<sup>2)</sup> UL approval for frame sizes FSD to FSF will be available soon.

<sup>3)</sup> With shielded motor cable up to 25 m (82 ft).



# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

SINAMICS G120P pump,  
fan and compressor inverters

### Technical specifications

#### Compliance with standards

##### CE marking



The SINAMICS G120P inverters meet the requirements of the Low-Voltage Directive 2006/95/EC.

##### Low-Voltage Directive

The inverters comply with the following standards listed in the official journal of the EU:

- EN 60204-1  
Safety of machinery, electrical equipment of machines
- EN 61800-5-1  
Electrical power drive systems with variable speed – Part 5-1: Requirements regarding safety – electrical, thermal, and energy requirements

##### UL listing



Inverter devices in UL category NMMS certified to UL, in compliance with UL 508C. UL list numbers E121068 and E192450. UL approval for frame sizes FSD to FSF will be available soon.

For use in environments with pollution degree 2.

On the Internet at [www.ul.com](http://www.ul.com)

##### Machinery Directive

The inverters are suitable for installation in machines. Compliance with the Machinery Directive 2006/42/EC requires a separate certificate of conformity. This must be provided by the plant construction company or the organization marketing the machine.

##### EMC Directive

- EN 61800-3  
Variable-speed electric drives  
Part 3: EMC product standard including specific test methods

The following information applies to the SINAMICS G120P inverters from Siemens:

- The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the frequency inverter.
- Frequency inverters are normally only supplied to experts for installation in machines or systems. A frequency inverter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The inverter's operating instructions, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to become a PDS. For a PDS, the EMC Directive in the EU is complied with by observing the product standard EN 61800-3 for variable-speed electric drive systems. The frequency inverters on their own do not generally require identification according to the EMC Directive.

- In the Standard EN 61800-3 of July 2005, a distinction is no longer made between "general availability" and "restricted availability". Instead, different categories C1 to C4 have been defined in accordance with the environment of the PDS at the operating location:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in the first environment
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in the first environment, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning note is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment. A warning note is required.
  - **Category C4:** Drive systems for rated voltages  $\geq$  1000 V or for rated currents  $\geq$  400 A or for use in complex systems in the second environment. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for the "second environment" (= industrial power supply systems that do not supply households). These limit values are below the limit values of filter class A to EN 55011. Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side.
- With SINAMICS G120P, Power Drive Systems (PDS) that fulfill the EMC product standard EN 61800-3 can be configured when observing the installation instructions in the product documentation.
- A differentiation must be made between the product standards for electrical drive systems (PDS) of the range of standards EN 61800 (of which Part 3 covers EMC topics) and the product standards for the devices/systems/machines, etc. This will probably not result in any changes in the practical use of frequency inverters. Since frequency inverters are always part of a PDS and these are part of a machine, the machine manufacturer must observe various standards depending on their type and environment (e.g. EN 61000-3-2 for line harmonics and EN 55011 for radio interference). The product standard for PDS on its own is, therefore, either insufficient or irrelevant.
- With respect to the compliance with limits for line supply harmonics, the EMC product standard EN 61800-3 for PDS refers to compliance with the EN 61000-3-2 and EN 61000-3-12 standards.
- Regardless of the configuration with SINAMICS G120P and its components, the machine construction company (OEM) can also apply other measures to ensure that the machine complies with the EU EMC Directive. The EU EMC Directive is generally fulfilled when the relevant EMC product standards are observed. If they are not available, the generic standards (e.g. DIN EN 61000-x-x) can be used instead. It is important that the conducted and emitted interference at the line connection point and outside the machine remain below the relevant limit values. Any suitable technical measures can be applied to ensure this.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### CU230P-2 Control Units

#### Overview



Example: CU230P-2 HVAC Control Unit in the PM230 Power Module, frame size FSC

The CU230P-2 Control Units are designed for drives with integrated technological functions for pump, fan and compressor applications. The I/O interface, the fieldbus interfaces and the additional software functions optimally support these applications.

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#### Selection and ordering data

Communication	Digital inputs	Digital outputs	Analog inputs	Analog outputs	Designation	Control Unit Order No.
RS485/USS, Modbus RTU, BACnet MS/TP	6	3	4	2	CU230P-2 HVAC	<b>6SL3243-0BB30-1HA2</b>
PROFIBUS DP	6	3	4	2	CU230P-2 DP	<b>6SL3243-0BB30-1PA2</b>
CANopen	6	3	4	2	CU230P-2 CAN	<b>6SL3243-0BB30-1CA2</b>

#### Function

##### Control modes

- Linear and square torque characteristic for fluid flow and positive displacement machines
- ECO mode for additional energy saving
- Sensorless Vector Control for sophisticated control tasks

##### Connections

- 2 analog inputs (current/voltage can be selected) to directly connect pressure/level sensors
- 2 additional analog inputs to connect Ni1000/Pt1000 temperature sensors
- Direct control of valves and flaps using two 230 V relays

##### Interfaces

- PROFIBUS, USS, BACnet MS/TP, CANopen and Modbus-RTU communication

##### Software functions

- Automatic restart function after power failure
- Flying restart
- Skip frequencies
- 1 PID controller for the closed-loop control of the motor speed as process controller for temperature, pressure, air quality or levels
- 3 freely-programmable PID controllers
- Energy saving through hibernation
- Load check function to monitor belts and flow
- Motor staging
- Multi-zone controller
- Extended emergency mode
- Real time clock with three time generators

##### IOP wizards for special applications with and without PID controller, such as

- Pumps: Positive displacement (constant load torque) and centrifugal pumps (square load torque)
- Fans: Radial and axial fans (square load torque)
- Compressors: Positive displacement (constant load torque) and fluid flow machines (square load torque)

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### CU230P-2 Control Units

#### Design

#### CU230P-2 HVAC, CU230P-2 DP, CU230P-2 CAN Control Units



Example: CU230P-2 DP Control Unit with open terminal covers

Terminal No.	Signal	Features
<b>Digital inputs (DI) – Standard</b>		
69	DI Com	Reference potential for digital inputs
5 ... 8, 16, 17	DI0 ... DI5	Freely programmable isolated, inputs in compliance with IEC 61131-2
<b>Digital outputs (DO)</b>		
18	DO0, NC	Relay output 1 NC contact (2 A, 230 V AC)
19	DO0, NO	Relay output 1 NO contact (2 A, 230 V AC)
20	DO0, COM	Relay output 1 Common contact (2 A, 230 V AC)
21	DO1, NO	Relay output 2 NO contact (0.5 A, 30 V DC)
22	DO1, COM	Relay output 2 Common contact (0.5 A, 30 V DC)
23	DO2, NC	Relay output 3 NC contact (2 A, 230 V AC)
24	DO2, NO	Relay output 3 NO contact (2 A, 230 V AC)
25	DO2, COM	Relay output 3 Common contact (2 A, 230 V AC)

Terminal No.	Signal	Features
<b>Analog inputs (AI)</b>		
3	AI0+	Differential input, switchable between current and voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
10	AI1+	Differential input, switchable between current and voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
11	AI1-	
50	AI2+/Ni1000	Non-isolated input, switchable between current and temperature sensors, type Pt1000/Ni1000 Value range: 0/4 ... 20 mA, Pt1000: -50 ... +250 °C (-58 ... +482 °F) Ni1000: -50 ... +150 °C (-58 ... +302 °F)
51	GND	Reference potential of the AI2/internal electronics ground
52	AI3+/Ni1000	Non-isolated input for temperature sensors, type Pt1000/Ni1000 Value range: Pt1000: -50 ... +250 °C (-58 ... +482 °F) Ni1000: -50 ... +150 °C (-58 ... +302 °F)
53	GND	Reference potential of the AI3/internal electronics ground
<b>Analog outputs (AO)</b>		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	AO GND	Reference potential of the AO0/internal electronics ground
26	AO1+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
27	AO GND	Reference potential of the AO1/internal electronics ground
<b>Motor temperature sensor interface</b>		
14	T1 Motor	Positive input for motor temperature sensor Type: PTC, KTY sensor, Thermo-Click
15	T2 Motor	Negative input for motor temperature sensor
<b>Power supply</b>		
9	+24 V OUT	Power supply output 24 V DC, max. 200 mA
28	GND	Reference potential of the power supply/internal electronics ground
1	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/internal electronics ground
31	+24 V IN	Power supply input 18 ... 30 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input
35	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
36	GND	Reference potential of the power supply/internal electronics ground

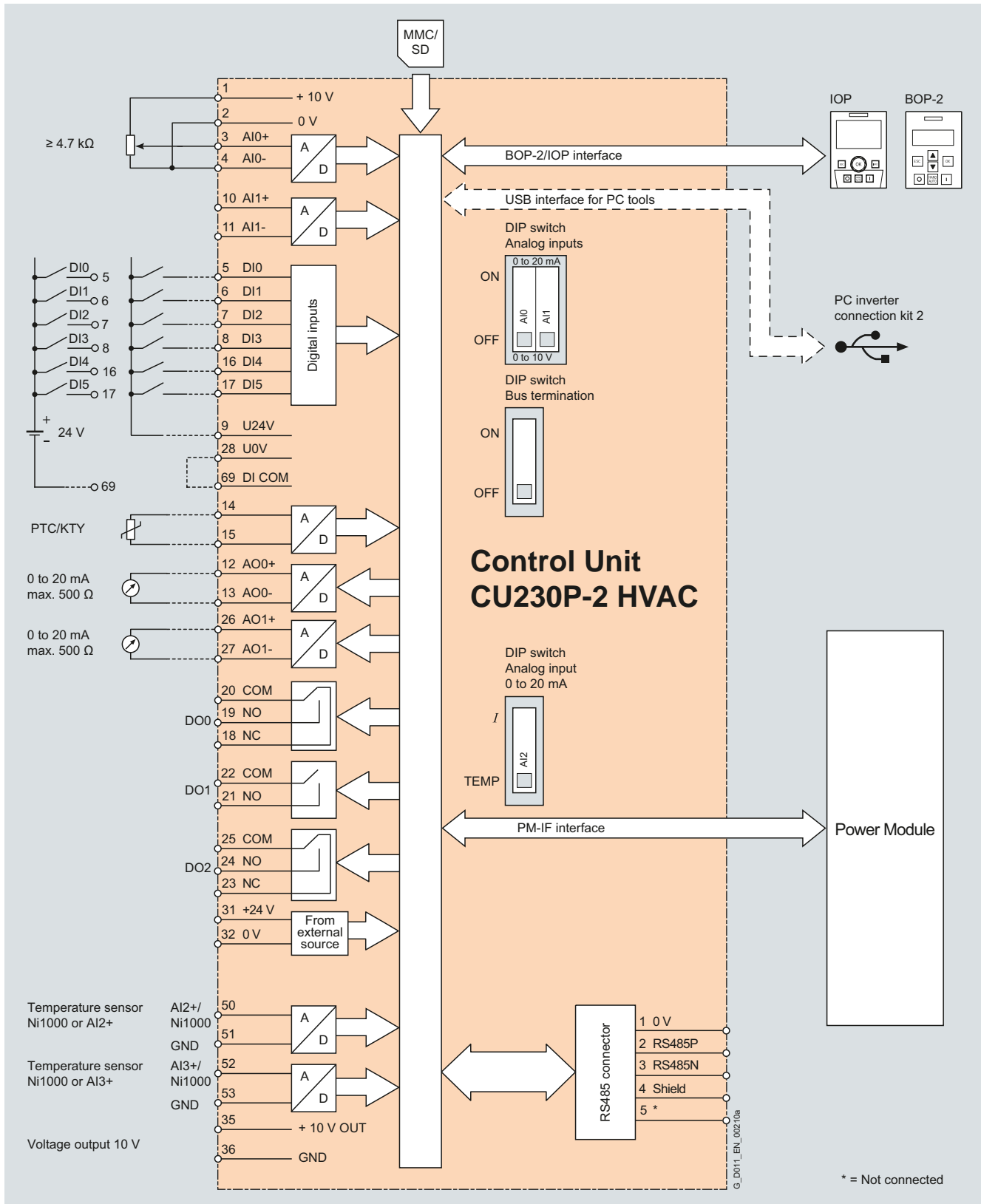
# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

## CU230P-2 Control Units

### Integration

5



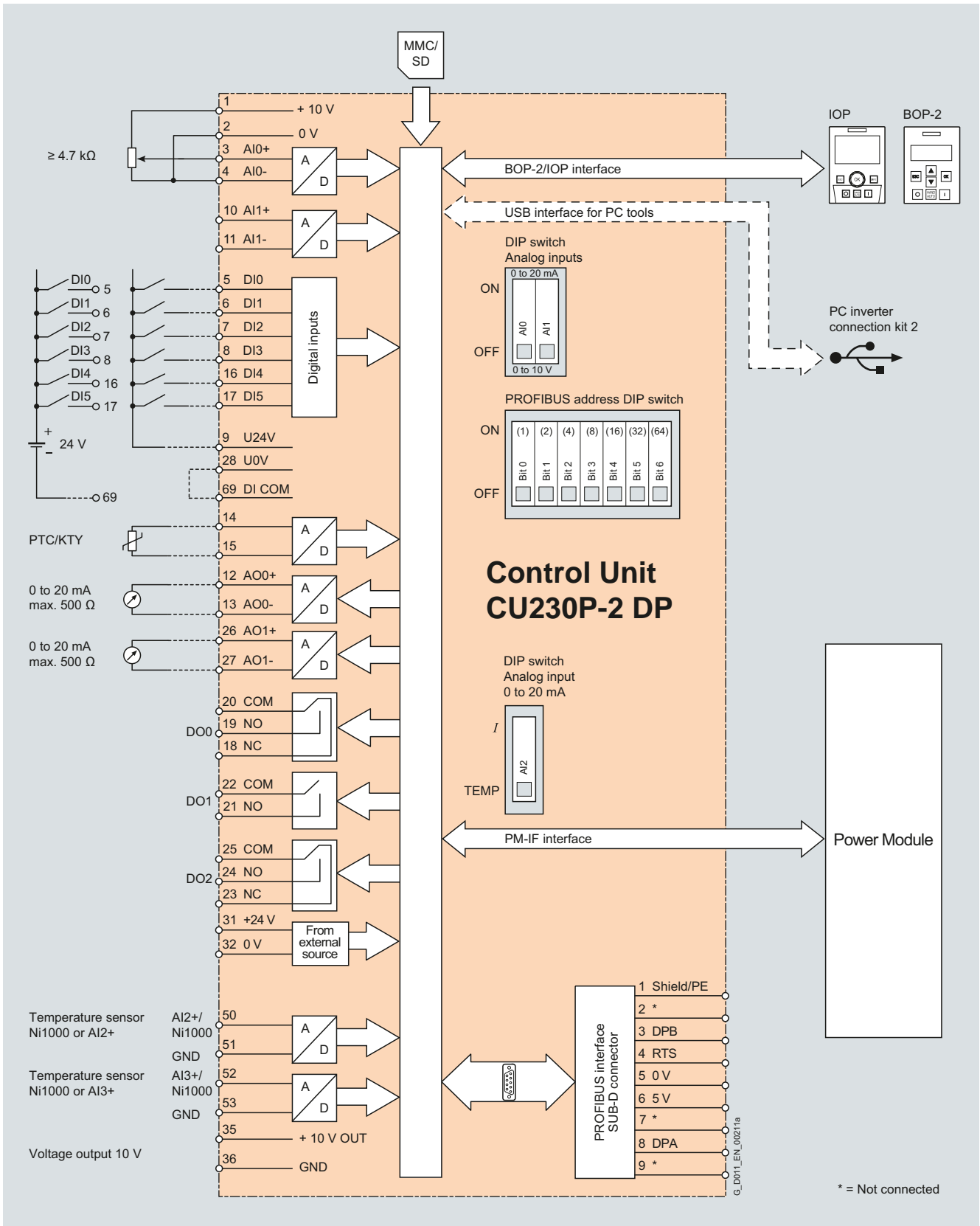
Connection diagram for CU230P-2 HVAC Control Unit

# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

CU230P-2 Control Units

## Integration



Connection diagram for CU230P-2 DP Control Unit

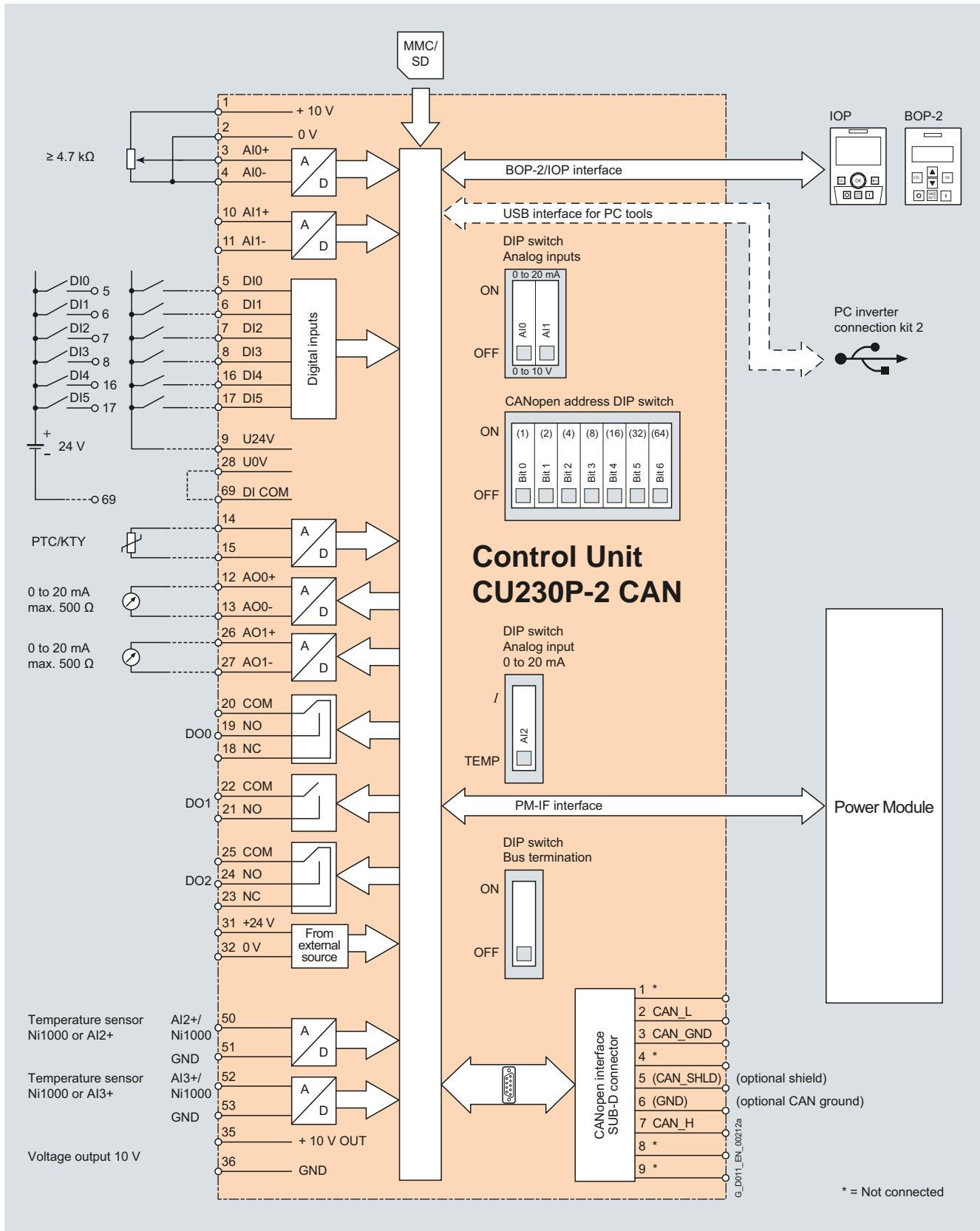
# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

## CU230P-2 Control Units

### Integration

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Connection diagram for CU230P-2 CAN Control Unit

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### CU230P-2 Control Units

#### Technical specifications

Control Unit	CU230P-2 HVAC	CU230P-2 DP	CU230P-2 CAN
	6SL3243-0BB30-1HA2	6SL3243-0BB30-1PA2	6SL3243-0BB30-1CA2
<b>Electrical specifications</b>			
<b>Operating voltage</b>	24 V DC via the Power Module or by connecting to an external 18 ... 30 V DC power supply		
<b>Current consumption, max.</b>	0.5 A		
<b>Protective insulation</b>	PELV according to EN 50178 Protective separation from the line supply using double/reinforced insulation		
<b>Power loss</b>	<5.5 W		
<b>Interfaces</b>			
<b>Digital inputs – Standard</b>	6 isolated inputs optically isolated; free reference potential (own potential group) NPN/PNP logic can be selected using the wiring		
• Switching level: 0 → 1	11 V		
• Switching level: 1 → 0	5 V		
• Input current, max.	15 mA		
<b>Digital outputs</b>	3 relays		
• 2 relay changeover contacts	250 V AC, 2 A (inductive load) 30 V DC, 5 A (ohmic load)		
• 1 relay NO contact	30 V DC, 0.5 A (ohmic load)		
<b>Analog inputs</b>	Analog inputs are protected against inputs in a voltage range of ± 30 V and have a common-mode voltage in the ± 15 V range		
• 2 differential inputs	Switchable with DIP switch between voltage and current: -10 ... +10 V, 0/4 ... 20 mA, 10-bit resolution These differential inputs can be configured as additional digital inputs. Switching thresholds: 0 → 1: Rated voltage 4 V 1 → 0: Rated voltage 1.6 V		
• 1 non-isolated input	Switchable with DIP switch between current and temperature sensor Ni1000/Pt1000, 0/4 ... 20 mA; 10-bit resolution		
• 1 non-isolated input	Temperature sensor type Ni1000/Pt1000, 10-bit resolution		
<b>Analog outputs</b>	The analog outputs have short circuit protection		
• 2 non-isolated outputs	Switchable between voltage and current using parameter setting: 0 ... 10 V, 0/4 ... 20 mA Voltage mode: 10 V, min. burden 10 kΩ Current mode: 20 mA, max. burden 500 Ω		
<b>PTC/KTY interface</b>	1 motor temperature sensor input, sensors that can be connected, PTC, KTY and Thermo-Click, accuracy ±5 °C		
<b>Bus interface</b>			
<b>Type</b>	<b>RS485</b>	<b>PROFIBUS DP</b>	<b>CANopen</b>
<b>Protocols</b>	USS Modbus RTU BACnet MS/TP (switchable using software)	PROFIdrive profile V4.1	CANopen
<b>Hardware</b>	Terminal, insulated, USS: max. 187.5 kBaud Modbus RTU: 19.2 kBaud, Bus terminating resistors that can be switched in	9-pin SUB-D connector, insulated, Max. 12 Mbit/s Slave address can be set using DIP switches	9-pin SUB-D socket, insulated, Max. 1 Mbit/s
<b>Tool interfaces</b>			
<b>Memory card</b>	1 SINAMICS micro memory card (MMC) or 1 SIMATIC memory card (SD card)		
<b>Operator panels</b>			
• Intelligent Operator Panel IOP	Can be directly plugged on		
• Basic Operator Panel BOP-2	Can be directly plugged on		
• Blanking cover	Necessary if an operator panel is not inserted in order to achieve degree of protection IP55		
<b>PC interface</b>	USB		

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### CU230P-2 Control Units

#### Technical specifications

Control Unit	CU230P-2 HVAC	CU230P-2 DP	CU230P-2 CAN
	6SL3243-0BB30-1HA2	6SL3243-0BB30-1PA2	6SL3243-0BB30-1CA2
<b>Open-loop/closed-loop control techniques</b>			
V/f linear/square/parameterizable	✓		
V/f with flux current control (FCC)	✓		
V/f ECO linear/square	✓		
Vector control, sensorless	✓		
Vector control, with sensor	–		
Torque control, sensorless	✓		
Torque control, with sensor	–		
<b>Software functions</b>			
Setpoint input	✓		
Fixed frequencies	16, parameterizable		
JOG	✓		
Digital motorized potentiometer (MOP)	✓		
Ramp smoothing	✓		
Extended ramp-function generator (with ramp smoothing Off3)	✓		
Positioning down ramp	–		
Slip compensation	✓		
Signal interconnection with BICO technology	✓		
Free function blocks (FFB) for logical and arithmetic operations	✓		
Switchable drive data sets (DDS)	✓ (4)		
Switchable command data sets (CDS)	✓ (4)		
Flying restart	✓		
Automatic restart after line supply failure or operational fault (AR)	✓		
Technology controller (internal PID)	✓		
Energy-saving function (hibernation) with internal PID controller	✓		
Energy-saving function (hibernation) with external PID controller	✓		
Belt monitoring with and without sensor (load torque monitoring)	✓		
Dry-running/overload protection monitoring (load torque monitoring)	✓		
Thermal motor protection	✓ ( $I^2t$ , sensor: PTC/KTY/Thermo-Click)		
Thermal inverter protection	✓		
Motor identification	✓		
Motor holding brake	–		
Auto-ramping ( $V_{dcmax}$ controller)	✓		
Kinetic buffering ( $V_{dcmin}$ controller)	✓		
<b>Braking functions</b>			
• DC braking	✓		
• Compound braking	– (not for PM230 Power Module)		
• Dynamic braking with integrated brake chopper	– (not for PM230 Power Module)		
<b>Mechanical specifications and ambient conditions</b>			
Degree of protection	IP20		
Signal cable cross-section	0.15 ... 1.5 mm <sup>2</sup> (AWG28 ... AWG16)		
Operating temperature	-10 ... +60 °C (14 ... 140 °F)		
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)		
Relative humidity	<95 % RH, condensation not permissible		
<b>Dimensions</b>			
• Width	73 mm (2.87 in)		
• Height	199 mm (7.83 in)		
• Depth	65.5 mm (2.58 in)		
<b>Weight, approx.</b>	0.61 kg (1.35 lb)		



# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

PM230 Power Modules

## Overview



PM230 Power Modules, frame sizes FSA to FSF



PM230 Power Module, frame size FSC, view from the rear



PM230 Power Module, frame size FSC, inside view (without Control Unit)

The PM230 Power Module only generates low line harmonics and apparent power losses. In addition to the energy-related advantages, environmental stressing is also reduced.

- Line harmonics are reduced significantly.
  - The harmonics and the THD (Total Harmonic Distortion) are below the limits required by the EN 61000-3-12 or IEC 61000-3-12 standards.
  - Additional components such as line reactors are not required. As a consequence, low envelope dimensions are obtained for space-saving designs.
- The active power component is very high, i.e. the devices consume less current from the supply for the same drive power. As a consequence, smaller supply cables can be used.

Frame sizes FSA to FSF of the PM230 Power Module in the degree of protection IP55/UL Type 12 are available with integrated line filter class A for C2 installations or integrated line filter class B for C1 installations.

In order to maintain EMC categories C2 (line filter A) or C1 table 14 (line filter B, conducted), the permissible shielded cable length between the inverter and motor is limited to max. 25 m (82 ft).

The line system configurations that are supported are symmetrical systems with grounded neutral point.

The PM230 Power Module is not approved for safety-oriented applications.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Design

PM230 Power Modules have the following connections and interfaces:

- PM-IF interface to connect the PM230 Power Module to the Control Unit. The PM230 Power Module also supplies power to the Control Unit using an integrated power supply.
- Motor connection using screw terminals or screw studs
- 2 PE/protective conductor connections

#### Selection and ordering data

To ensure that a suitable Power Module is selected, the following currents should be used for applications:

- **Rated output current for applications with low overload (LO)**
- **Base load current for applications with high overload (HO)**

The G120P drive supports most 2-pole, 4-pole and 6-pole motors rated up to 3.0 kW (4.0 hp). The drive should be selected by matching the output current to the motor FLA. For a description of the overload performance, please refer to the general technical specifications of the Power Modules.

Rated power <sup>1)</sup>		Rated output current $I_{rated}$ <sup>2)</sup>		Power based on the base load current $I_H$ <sup>3)</sup>		Base load current $I_H$ <sup>3)</sup>	Frame size	PM230 Power Module with integrated line filter class A	PM230 Power Module with integrated line filter class B
kW	hp	A	kW	hp	A			Order No.	Order No.
<b>380 ... 480 V 3 AC</b>									
0.37	0.5	1.3	0.25	0.33	0.9	FSA	6SL3223-0DE13-7AA0	6SL3223-0DE13-7BA0	
0.55	0.75	1.7	0.37	0.5	1.3	FSA	6SL3223-0DE15-5AA0	6SL3223-0DE15-5BA0	
0.75	1.0	2.2	0.55	0.75	1.7	FSA	6SL3223-0DE17-5AA0	6SL3223-0DE17-5BA0	
1.1	1.5	3.1	0.75	1.0	2.2	FSA	6SL3223-0DE21-1AA0	6SL3223-0DE21-1BA0	
1.5	2.0	4.1	1.1	1.5	3.1	FSA	6SL3223-0DE21-5AA0	6SL3223-0DE21-5BA0	
2.2	3.0	5.9	1.5	2.0	4.1	FSA	6SL3223-0DE22-2AA0	6SL3223-0DE22-2BA0	
3.0	4.0	7.7	2.2	3.0	5.9	FSA	6SL3223-0DE23-0AA0	6SL3223-0DE23-0BA0	
4.0	5.0	10.2	3.0	4.0	7.7	FSB	6SL3223-0DE24-0AA0	6SL3223-0DE24-0BA0	
5.5	7.5	13.2	4.0	5.0	10.2	FSB	6SL3223-0DE25-5AA0	6SL3223-0DE25-5BA0	
7.5	10	18	5.5	7.5	13.2	FSB	6SL3223-0DE27-5AA0	6SL3223-0DE27-5BA0	
11.0	15	26	7.5	10	18	FSC	6SL3223-0DE31-1AA0	6SL3223-0DE31-1BA0	
15.0	20	32	11.0	15	26	FSC	6SL3223-0DE31-5AA0	6SL3223-0DE31-5BA0	
18.5	25	38	15.0	20	32	FSC	6SL3223-0DE31-8AA0	–	
						FSD	–	6SL3223-0DE31-8BA0	
22	30	45	18.5	25	38	FSD	6SL3223-0DE32-2AA0	6SL3223-0DE32-2BA0	
30	40	60	22	30	45	FSD	6SL3223-0DE33-0AA0	6SL3223-0DE33-0BA0	
37	50	75	30	40	60	FSE	6SL3223-0DE33-7AA0	6SL3223-0DE33-7BA0	
45	60	90	37	50	75	FSE	6SL3223-0DE34-5AA0	6SL3223-0DE34-5BA0	
55	75	110	45	60	90	FSF	6SL3223-0DE35-5AA0	6SL3223-0DE35-5BA0	
75	100	145	55	75	110	FSF	6SL3223-0DE37-5AA0	6SL3223-0DE37-5BA0	
90	125	178	75	100	145	FSF	6SL3223-0DE38-8AA0	6SL3223-0DE38-8BA0	

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

<sup>2)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

<sup>3)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

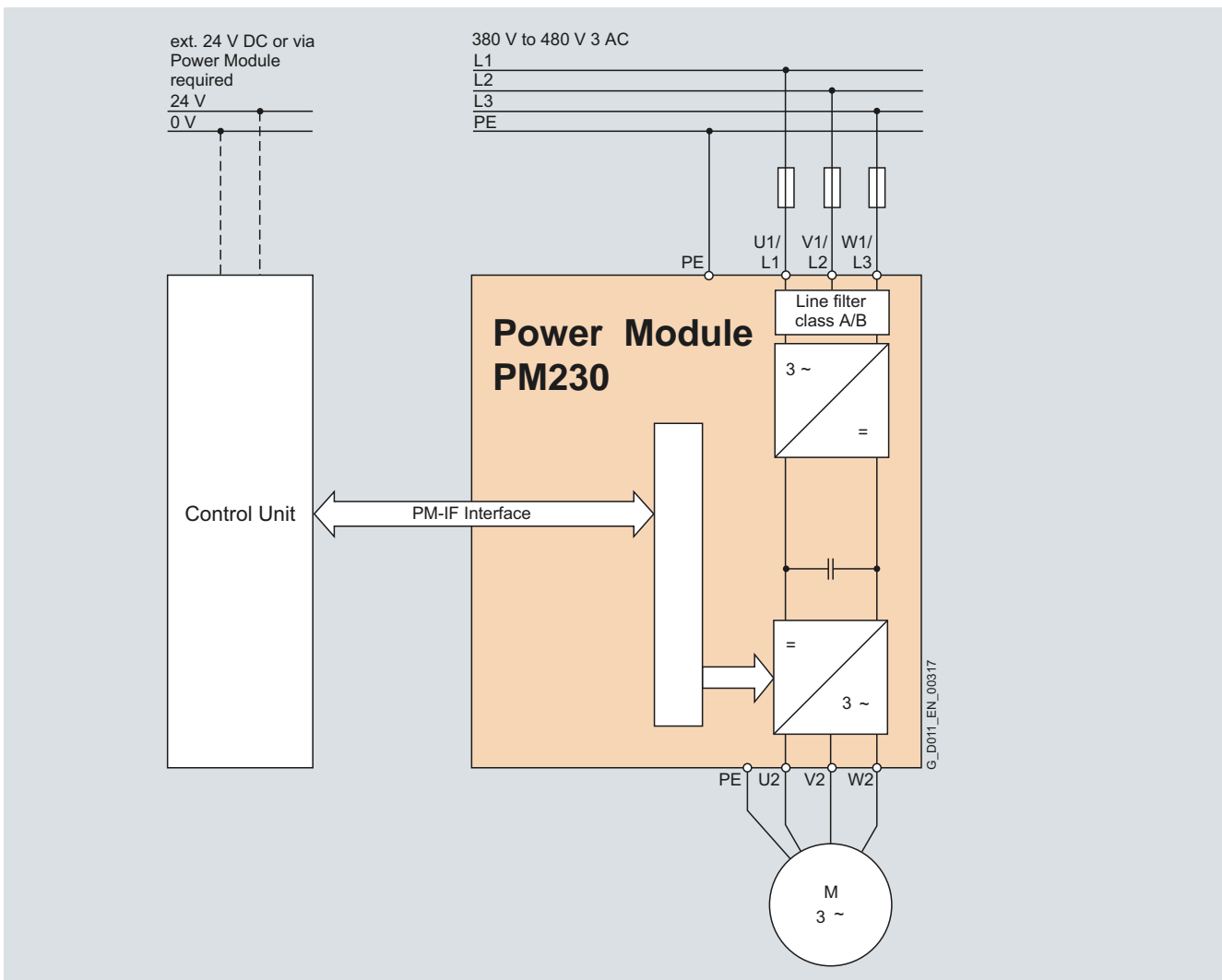
# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

**PM230 Power Modules**

## Integration

PM230 Power Modules communicate with the Control Unit via the PM-IF interface.



Connection diagram for PM230 Power Module with integrated line filter class A or B

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Technical specifications

##### General technical specifications

	PM230 Power Modules
<b>System operating voltage</b>	380 ... 480 V 3 AC ±10 %
<b>Line supply requirements</b> <b>Line short circuit voltage <math>u_K</math></b>	$R_{sc} > 100$ or $u_K < 1$ %
<b>Input frequency</b>	47 ... 63 Hz
<b>Output frequency</b>	
• Control type V/f	0 ... 650 Hz
• Control type Vector	0 ... 200 Hz
<b>Pulse frequency</b>	4 kHz for higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>
<b>Power factor</b>	0.9
<b>Output voltage, max.</b>	0 ... 95 % of input voltage
<b>Overload capability</b>	
• Low overload (LO) 0.37 ... 90 kW	1.1 × rated output current (i.e. 110 % overload) for 57 s with a cycle time of 300 s 1.5 × rated output current (i.e. 150 % overload) for 3 s with a cycle time of 300 s
• High overload (HO) 0.25 ... 75 kW	1.5 × rated output current (i.e. 150 % overload) for 57 s with a cycle time of 300 s 2 × rated output current (i.e. 200 % overload) for 3 s with a cycle time of 300 s
<b>Electromagnetic compatibility</b>	Integrated line filter according to EN 61800-3 C2 and EN 61800-3 C1 Table 14
<b>Possible braking methods</b>	DC braking
<b>Degree of protection</b>	IP55/UL Type 12
<b>Operating temperature</b>	
• Low overload (LO)	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (104 ... 140 °F) <a href="#">see derating characteristics</a>
• High overload (HO)	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (122 ... 140 °F) <a href="#">see derating characteristics</a>
<b>Storage temperature</b>	-40 ... +70 °C (-40 ... +158 °F)
<b>Relative humidity</b>	<95 % RH, condensation not permissible
<b>Cooling</b>	Power units with increased air cooling using integrated fans
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, >1000 m (3281 ft) <a href="#">see derating characteristics</a>
<b>Protection functions</b>	<ul style="list-style-type: none"> <li>• Undervoltage</li> <li>• Overvoltage</li> <li>• Overcontrol/overload</li> <li>• Ground fault</li> <li>• Short circuit</li> <li>• Stall protection</li> <li>• Motor blocking protection</li> <li>• Motor overtemperature</li> <li>• Inverter overtemperature</li> <li>• Parameter locking</li> </ul>
<b>Compliance with standards</b>	UL <sup>1)</sup> , CE, c-tick
<b>CE marking</b>	According to Low-Voltage Directive 2006/95/EC

<sup>1)</sup> UL approval for frame sizes FSD to FSF will be available soon.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules				
With integrated line filter class A		6SL3223-ODE13-7AA0	6SL3223-ODE15-5AA0	6SL3223-ODE17-5AA0	6SL3223-ODE21-1AA0	6SL3223-ODE21-5AA0
With integrated line filter class B		6SL3223-ODE13-7BA0	6SL3223-ODE15-5BA0	6SL3223-ODE17-5BA0	6SL3223-ODE21-1BA0	6SL3223-ODE21-5BA0
<b>Output current at 50 Hz 400 V 3 AC</b>						
• Rated current $I_{rated}^{1)}$	A	1.3	1.7	2.2	3.1	4.1
• Base load current $I_L^{1)}$	A	1.3	1.7	2.2	3.1	4.1
• Base load current $I_H^{2)}$	A	0.9	1.3	1.7	2.2	3.1
• $I_{max}$	A	2.0	2.6	3.4	4.7	6.2
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Based on $I_H$	kW (hp)	0.25 (0.33)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.86	0.90	0.92	0.94	0.95
<b>Power loss (at rated current)</b>	kW	0.06	0.06	0.06	0.07	0.08
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.007 (0.25)	0.007 (0.25)	0.007 (0.25)	0.007 (0.25)	0.007 (0.25)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	61.9	61.9	61.9	61.9	61.9
<b>24 V DC power supply for the Control Unit</b>	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	1.3	1.8	2.3	3.2	4.2
• Based on $I_H$	A	0.9	1.3	1.8	2.3	3.2
<b>Line supply connection U1/L1, V1/L2, W1/L3</b>		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>Motor connection U2, V2, W2</b>		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>Motor cable length, max. <sup>4)</sup></b>						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>						
• Width	mm (in)	154 (6.06)	154 (6.06)	154 (6.06)	154 (6.06)	154 (6.06)
• Height	mm (in)	460 (18.11)	460 (18.11)	460 (18.11)	460 (18.11)	460 (18.11)
• Depth						
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)
- With operator panel, max.	mm (in)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)
<b>Frame size</b>		FSA	FSA	FSA	FSA	FSA
<b>Weight, approx.</b>	kg (lb)	4.3 (9.5)	4.3 (9.5)	4.3 (9.5)	4.3 (9.5)	4.3 (9.5)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules				
With integrated line filter class A		6SL3223-ODE22-2AA0	6SL3223-ODE23-0AA0	6SL3223-ODE24-0AA0	6SL3223-ODE25-5AA0	6SL3223-ODE27-5AA0
With integrated line filter class B		6SL3223-ODE22-2BA0	6SL3223-ODE23-0BA0	6SL3223-ODE24-0BA0	6SL3223-ODE25-5BA0	6SL3223-ODE27-5BA0
<b>Output current at 50 Hz 400 V 3 AC</b>						
• Rated current $I_{rated}^{1)}$	A	5.9	7.7	10.2	13.2	18
• Base load current $I_L^{1)}$	A	5.9	7.7	10.2	13.2	18
• Base load current $I_H^{2)}$	A	4.1	5.9	7.7	10.2	13.2
• $I_{max}$	A	8.9	11.8	15.4	20.4	27
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	2.2 (3.0)	3 (4.0)	4 (5.0)	5.5 (7.5)	7.5 (10)
• Based on $I_H$	kW (hp)	1.5 (2.0)	2.2 (3.0)	3 (4.0)	4 (5.0)	5.5 (7.5)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.96	0.96	0.97	0.97	0.97
<b>Power loss (at rated current)</b>	kW	0.1	0.12	0.14	0.18	0.24
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.007 (0.25)	0.007 (0.25)	0.009 (0.32)	0.009 (0.32)	0.009 (0.32)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	61.9	61.9	62.8	62.8	62.8
<b>24 V DC power supply for the Control Unit</b>	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	6.1	8.0	11	14	19
• Based on $I_H$	A	4.2	6.1	8.0	11	14
<b>Line supply connection U1/L1, V1/L2, W1/L3</b>		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	2.5 ... 6	4 ... 6	4 ... 6
<b>Motor connection U2, V2, W2</b>		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	2.5 ... 6	4 ... 6	4 ... 6
<b>Motor cable length, max. <sup>4)</sup></b>						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>						
• Width	mm (in)	154 (6.06)	154 (6.06)	180 (7.09)	180 (7.09)	180 (7.09)
• Height	mm (in)	460 (18.11)	460 (18.11)	540 (21.26)	540 (21.26)	540 (21.26)
• Depth						
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)
- With operator panel, max.	mm (in)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)
<b>Frame size</b>		FSA	FSA	FSB	FSB	FSB
<b>Weight, approx.</b>	kg (lb)	4.3 (9.5)	4.3 (9.5)	6.3 (13.9)	6.3 (13.9)	6.3 (13.9)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules					
With integrated line filter class A		6SL3223-ODE31-1AA0	6SL3223-ODE31-5AA0	6SL3223-ODE31-8AA0	–	6SL3223-ODE32-2AA0	6SL3223-ODE33-0AA0
With integrated line filter class B		6SL3223-ODE31-1BA0	6SL3223-ODE31-5BA0	–	6SL3223-ODE31-8BA0	6SL3223-ODE32-2BA0	6SL3223-ODE33-0BA0
<b>Output current at 50 Hz 400 V 3 AC</b>							
• Rated current $I_{rated}^{1)}$	A	26	32	38	38	45	60
• Base load current $I_L^{1)}$	A	26	32	38	38	45	60
• Base load current $I_H^{2)}$	A	18	26	32	32	38	45
• $I_{max}$	A	39	52	64	64	76	90
<b>Rated power</b>							
• Based on $I_L$	kW (hp)	11 (15)	15 (20)	18.5 (25)	18.5 (25)	22 (30)	30 (40)
• Based on $I_H$	kW (hp)	7.5 (10)	11 (15)	15 (20)	15 (20)	18.5 (25)	22 (30)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.97	0.97	0.98	0.97	0.97	0.97
<b>Power loss (at rated current)</b>	kW	0.32	0.39	0.46	0.52	0.52	0.68
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.020 (0.71)	0.020 (0.71)	0.020 (0.71)	0.039 (1.38)	0.039 (1.38)	0.039 (1.38)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>	dB	66.1	66.1	66.1	56	56	56
<b>24 V DC power supply for the Control Unit</b>	A	1	1	1	1	1	1
<b>Input current <sup>3)</sup></b>							
• Rated current	A	27	33	39	39	42	56
• Based on $I_H$	A	19	27	33	33	36	42
<b>Line supply connection U1/L1, V1/L2, W1/L3</b>		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm <sup>2</sup>	6 ... 16	10 ... 16	10 ... 16	16 ... 35	16 ... 35	16 ... 35
<b>Motor connection U2, V2, W2</b>		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm <sup>2</sup>	6 ... 16	10 ... 16	10 ... 16	16 ... 35	16 ... 35	16 ... 35
<b>Motor cable length, max. <sup>4)</sup></b>							
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>							
• Width	mm (in)	230 (9.06)	230 (9.06)	230 (9.06)	320 (12.60)	320 (12.60)	320 (12.60)
• Height	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)	640 (25.20)	640 (25.20)	640 (25.20)
• Depth							
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	329 (12.95)	329 (12.95)	329 (12.95)
- With operator panel, max.	mm (in)	264 (10.39)	264 (10.39)	264 (10.39)	344 (13.54)	344 (13.54)	344 (13.54)
<b>Frame size</b>		FSC	FSC	FSC	FSD	FSD	FSD
<b>Weight, approx.</b>	kg (lb)	9.5 (21)	9.5 (21)	9.5 (21)	31 (68)	31 (68)	31 (68)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules				
With integrated line filter class A		6SL3223-ODE33-7AA0	6SL3223-ODE34-5AA0	6SL3223-ODE35-5AA0	6SL3223-ODE37-5AA0	6SL3223-ODE38-8AA0
With integrated line filter class B		6SL3223-ODE33-7BA0	6SL3223-ODE34-5BA0	6SL3223-ODE35-5BA0	6SL3223-ODE37-5BA0	6SL3223-ODE38-8BA0
<b>Output current at 50 Hz 400 V 3 AC</b>						
• Rated current $I_{rated}^{1)}$	A	75	90	110	145	178
• Base load current $I_L^{1)}$	A	75	90	110	145	178
• Base load current $I_H^{2)}$	A	60	75	90	110	145
• $I_{max}$	A	120	150	180	220	290
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)	90 (125)
• Based on $I_H$	kW (hp)	30 (40)	37 (50)	45 (60)	55 (75)	75 (100)
<b>Rated pulse frequency</b>						
	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>						
		0.97	0.97	0.97	0.97	0.97
<b>Power loss (at rated current)</b>						
	kW	0.99	1.2	1.4	1.9	2.3
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.039 (1.38)	0.039 (1.38)	0.117 (4.13)	0.117 (4.13)	0.117 (4.13)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>						
	dB	56	56	61	61	61
<b>24 V DC power supply for the Control Unit</b>						
	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	70	84	102	135	166
• Based on $I_H$	A	56	70	84	102	135
<b>Line supply connection U1/L1, V1/L2, W1/L3</b>						
• Conductor cross-section	mm <sup>2</sup>	25 ... 50	25 ... 50	35 ... 120	35 ... 120	35 ... 120
<b>Motor connection U2, V2, W2</b>						
• Conductor cross-section	mm <sup>2</sup>	25 ... 50	25 ... 50	35 ... 120	35 ... 120	35 ... 120
<b>Motor cable length, max. <sup>4)</sup></b>						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>						
		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>						
• Width	mm (in)	320 (12.60)	320 (12.60)	410 (16.14)	410 (16.14)	410 (16.14)
• Height	mm (in)	751 (29.57)	751 (29.57)	915 (36.02)	915 (36.02)	915 (36.02)
• Depth						
- Without operator panel	mm (in)	329 (12.95)	329 (12.95)	416 (16.38)	416 (16.38)	416 (16.38)
- With operator panel, max.	mm (in)	344 (13.54)	344 (13.54)	431 (16.97)	431 (16.97)	431 (16.97)
<b>Frame size</b>						
		FSE	FSE	FSF	FSF	FSF
<b>Weight, approx.</b>						
	kg (lb)	37 (82) (with filter A) 38 (84) (with filter B)	37 (82) (with filter A) 38 (84) (with filter B)	70 (154)	70 (154)	70 (154)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.



# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

PM230 Power Modules

### Characteristic curves

#### Derating data

##### Pulse frequency

Rated power <sup>1)</sup> at 50 Hz 400 V 3 AC		Rated output current in A for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.37	0.5	1.3	1.11	0.91	0.78	0.65	0.59	0.52
0.55	0.75	1.7	1.45	1.19	1.02	0.85	0.77	0.68
0.75	1.0	2.2	1.87	1.54	1.32	1.10	0.99	0.88
1.1	1.5	3.1	2.64	2.17	1.86	1.55	1.40	1.24
1.5	2.0	4.1	3.49	2.87	2.46	2.05	1.85	1.64
2.2	3.0	5.9	5.02	4.13	3.54	2.95	2.66	2.36
3.0	4.0	7.7	6.55	5.39	4.62	3.85	3.47	3.08
4.0	5.0	10.2	8.67	7.14	6.12	5.1	4.59	4.08
5.5	7.5	13.2	11.22	9.24	7.92	6.6	5.94	5.28
7.5	10	18.0	15.3	12.6	10.8	9.0	8.1	7.2
11.0	15	26.0	22.1	18.2	15.6	13.0	11.7	10.4
15.0	20	32.0	27.2	22.4	19.2	16.0	14.4	12.8
18.5	25	38.0	32.3	26.6	22.8	19.0	17.1	15.2
22	30	45.0	38.25	31.5	27.0	22.5	20.25	18.0
30	40	60.0	52.7	43.4	37.2	31.0	27.9	24.8
37	50	75.0	63.75	52.5	45.0	37.5	33.75	30.0
45	60	90.0	76.5	63.0	54.0	45.0	40.5	36.0
55	75	110	93.5	77.0	–	–	–	–
75	100	145	123.3	101.5	–	–	–	–
90	125	178	151.3	124.6	–	–	–	–

5

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

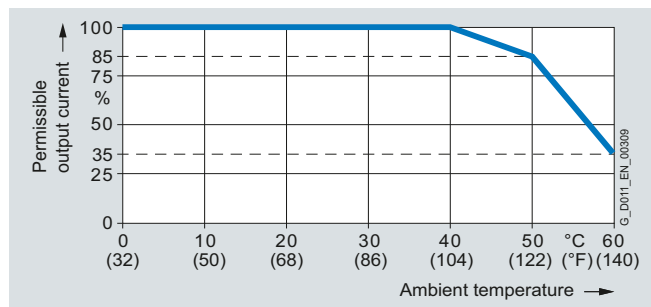
# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

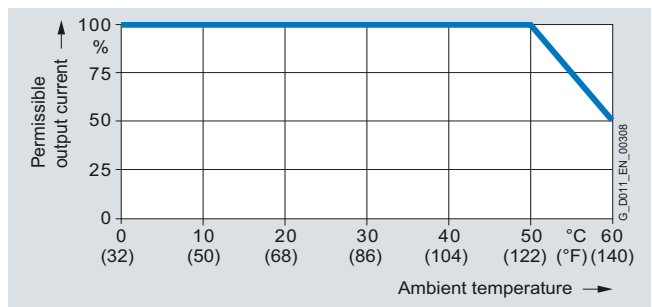
### PM230 Power Modules

#### Characteristic curves

##### Ambient temperature



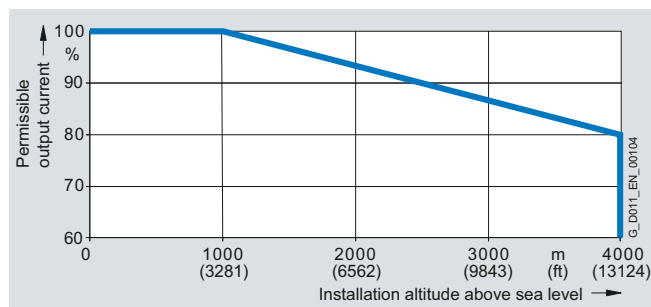
Low overload (LO) for PM230 Power Modules, frame sizes FSA to FSF



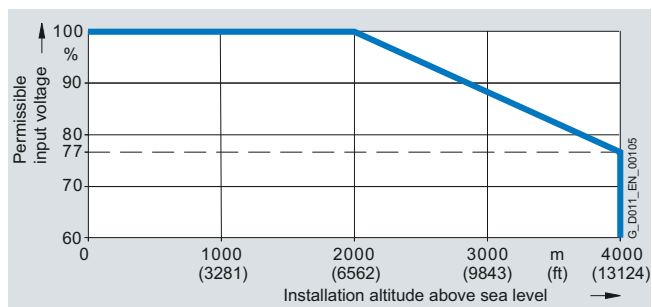
High overload (HO) for PM230 Power Modules, frame sizes FSA to FSF

5

##### Installation altitude

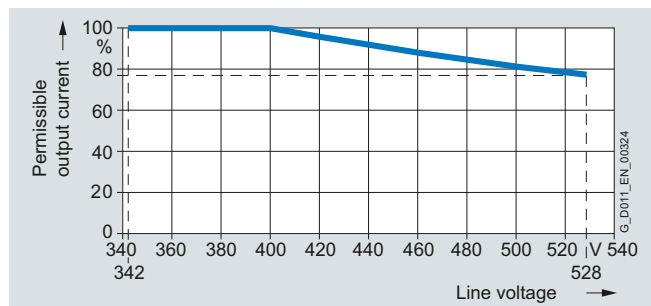


Permissible output current as a function of installation altitude

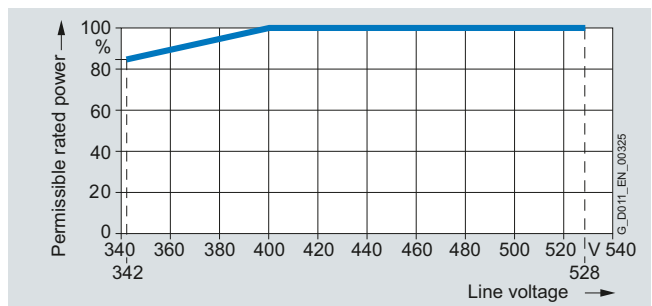


Permissible input voltage as a function of installation altitude

##### Line voltage



Permissible output current as a function of the line voltage



Permissible rated power as a function of the line voltage

#### Note:

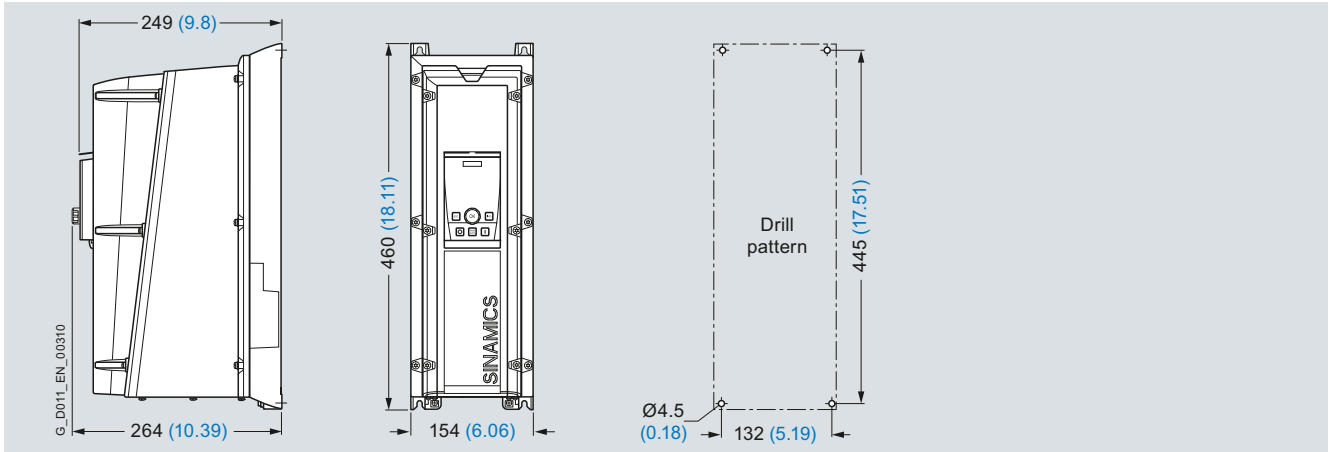
The operating temperature ranges of the Control Units should be taken into account. [The temperature ranges are specified in the section Technical specifications under Control Units.](#)

# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

PM230 Power Modules

## Dimensional drawings



PM230 Power Module, frame size FSA, with integrated line filter class A/B

Mounted with 4 M4 studs, 4 M4 nuts, 4 M4 washers.

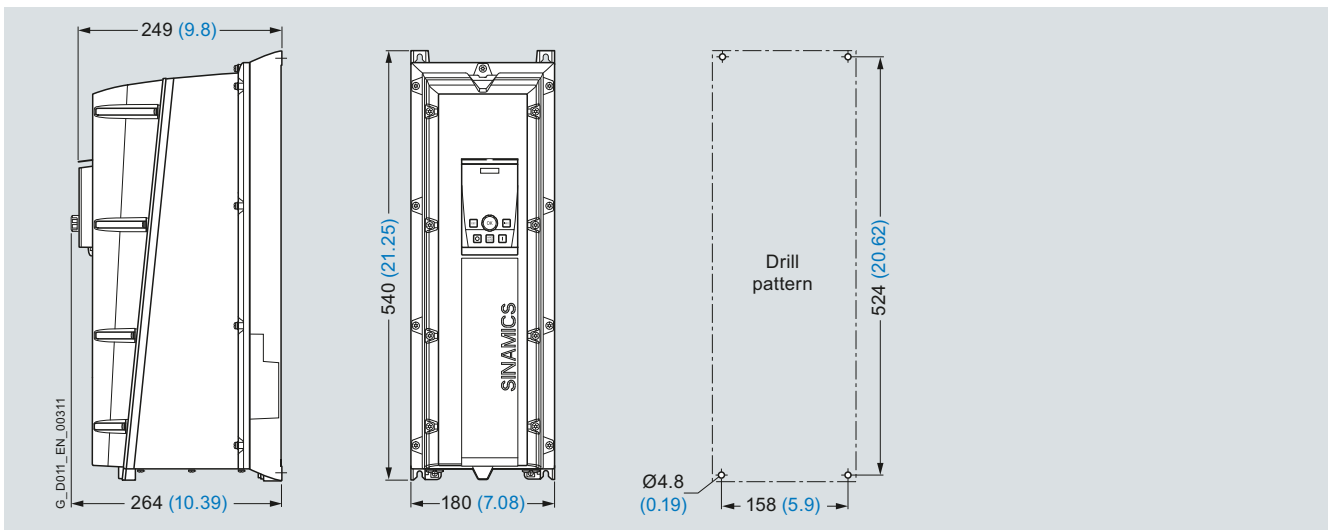
Ventilation clearance required at top and bottom: 100 mm (3.94 inches).

Ventilation clearance required at sides: 0 mm (0 inches).

When the IOP is plugged on, the mounting depth increases by 15 mm (0.59 inches).

When the BOP-2/blanking cover is plugged on, the mounting depth increases by 5 mm (0.2 inches).

All dimensions in mm (values in brackets are in inches).



PM230 Power Module, frame size FSB, with integrated line filter class A/B

Mounted with 4 M4 studs, 4 M4 nuts, 4 M4 washers.

Ventilation clearance required at top and bottom: 100 mm (3.94 inches).

Ventilation clearance required at sides: 0 mm (0 inches).

When the IOP is plugged on, the mounting depth increases by 15 mm (0.59 inches).

When the BOP-2/blanking cover is plugged on, the mounting depth increases by 5 mm (0.2 inches).

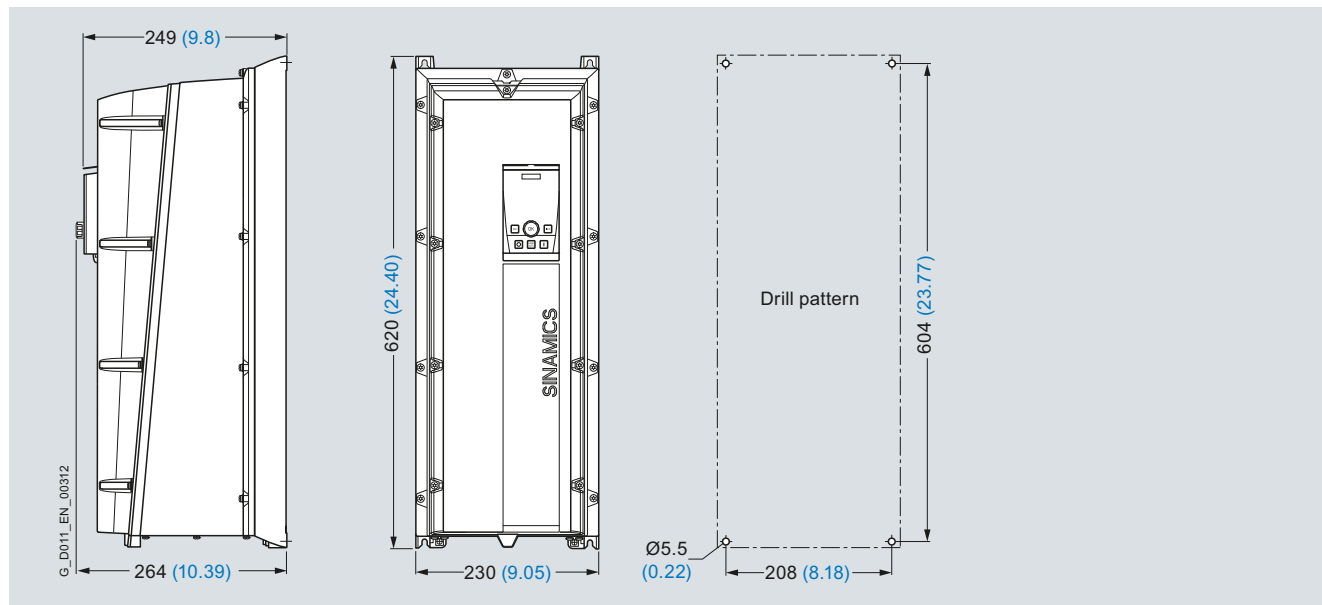
All dimensions in mm (values in brackets are in inches).

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Dimensional drawings



PM230 Power Module, frame size FSC, with integrated line filter class A/B

Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.

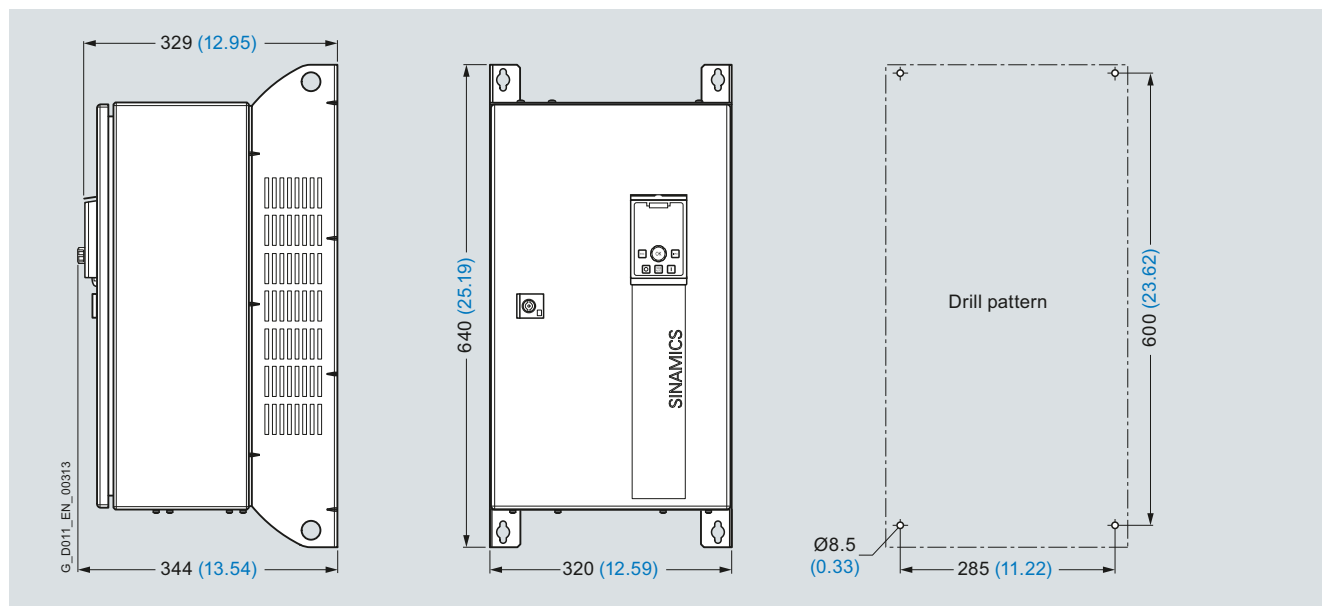
Ventilation clearance required at top and bottom: 125 mm (4.92 inches).

Ventilation clearance required at sides: 0 mm (0 inches).

When the IOP is plugged on, the mounting depth increases by 15 mm (0.59 inches).

When the BOP-2/blanking cover is plugged on, the mounting depth increases by 5 mm (0.2 inches).

All dimensions in mm (values in brackets are in inches).



PM230 Power Module, frame size FSD, with integrated line filter class A/B

Mounted with 4 M8 studs, 4 M8 nuts, 4 M8 washers.

Ventilation clearance required at top and bottom: 300 mm (11.81 inches).

Ventilation clearance required at sides:

- Ambient temperature  $\leq 40$  °C (104 °F): 0 mm (0 inches)
- Ambient temperature  $> 40$  °C (104 °F): 50 mm (1.97 inches)

When the IOP is plugged on, the mounting depth increases by 15 mm (0.59 inches).

When the BOP-2/blanking cover is plugged on, the mounting depth increases by 5 mm (0.2 inches).

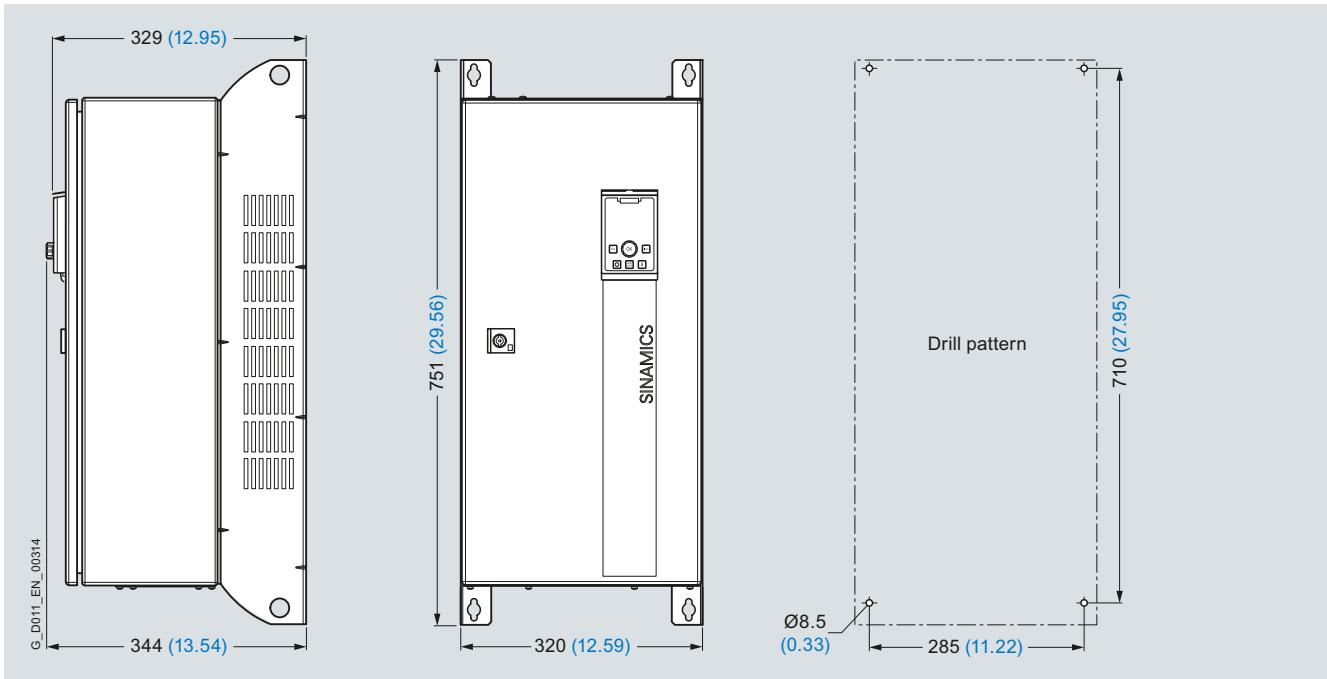
All dimensions in mm (values in brackets are in inches).

# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

PM230 Power Modules

## Dimensional drawings



PM230 Power Module, frame size FSE, with integrated line filter class A/B

Mounted with 4 M8 studs, 4 M8 nuts, 4 M8 washers.

Ventilation clearance required at top and bottom: 300 mm (11.81 inches).

Ventilation clearance required at sides:

- Ambient temperature  $\leq 40$  °C (104 °F): 0 mm (0 inches)
- Ambient temperature  $> 40$  °C (104 °F): 50 mm (1.97 inches)

When the IOP is plugged on, the mounting depth increases by 15 mm (0.59 inches).

When the BOP-2/blanking cover is plugged on, the mounting depth increases by 5 mm (0.2 inches).

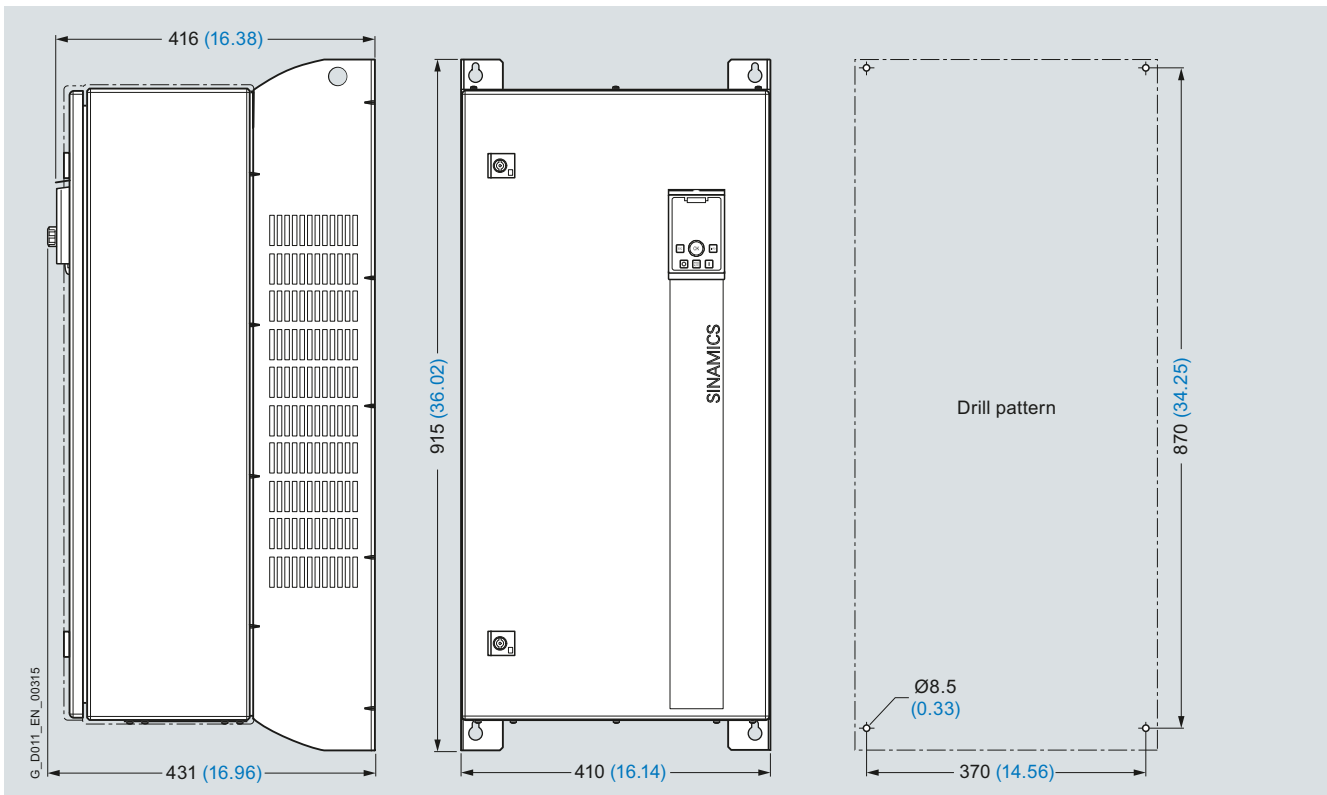
All dimensions in mm (values in brackets are in inches).

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### PM230 Power Modules

#### Dimensional drawings



PM230 Power Module, frame size FSF, with integrated line filter class A/B

Mounted with 4 M8 studs, 4 M8 nuts, 4 M8 washers.

Ventilation clearance required at top and bottom: 350 mm (13.78 inches).

Ventilation clearance required at sides:

- Ambient temperature  $\leq 40$  °C (104 °F): 0 mm (0 inches)
- Ambient temperature  $> 40$  °C (104 °F): 50 mm (1.97 inches)

When the IOP is plugged on, the mounting depth increases by 15 mm (0.59 inches).

When the BOP-2/blanking cover is plugged on, the mounting depth increases by 5 mm (0.2 inches).

All dimensions in mm (values in brackets are in inches).


# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### Recommended line-side power components


#### Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers (line-side components dimensioned in accordance with IEC standards). The specified circuit breakers are UL-certified.

3NA3 fuses are recommended for European countries. The 3NE1 fuses are UL-compliant (corresponds to ) . The values in the table take into account the overload capability of the inverter.

Fuses for use in North America must be UL-certified, such as the Class NON fuse series from Bussmann or approved circuit breakers from the SIRIUS 3RV and SENTRON 3VL series according to UL 489 (category control number CCN: DiV Q).

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 and IC 10.](#)

Rated power <sup>1)</sup>		Suitable for PM230 Power Module		Fuse Type 3NA3	Fuse Type 3NE1 (  )	Circuit breaker
kW	hp	Type 6SL3223-...	Frame size	Order No.	Order No.	Order No./type
<b>380 ... 480 V 3 AC</b>						
0.37	0.50	0DE13-7 . A0	FSA	<b>3NA3803</b>	<b>3NE1813-0</b>	<b>3RV1021-1CA10</b>
0.55	0.75	0DE15-5 . A0	FSA			<b>3RV1021-1DA10</b>
0.75	1.0	0DE17-5 . A0	FSA			<b>3RV1021-1FA10</b>
1.1	1.5	0DE21-1 . A0	FSA			<b>3RV1021-1GA10</b>
1.5	2.0	0DE21-5 . A0	FSA			<b>3RV1021-1JA10</b>
2.2	3.0	0DE22-2 . A0	FSA			<b>3RV1021-1KA10</b>
3.0	4.0	0DE23-0 . A0	FSA			<b>3RV1021-4AA10</b>
4.0	5.0	0DE24-0 . A0	FSB	<b>3NA3805</b>	<b>3RV1021-4BA10</b>	
5.5	7.5	0DE25-5 . A0	FSB	<b>3NA3807</b>	<b>3NE1814-0</b>	<b>3RV1021-4DA10</b>
7.5	10	0DE27-5 . A0	FSB	<b>3NA3810</b>	<b>3NE1815-0</b>	<b>3RV1031-4EA10</b>
11.0	15	0DE31-1 . A0	FSC	<b>3NA3814</b>	<b>3NE1803-0</b>	<b>3RV1031-4FA10</b>
15.0	20	0DE31-5 . A0	FSC	<b>3NA3820</b>	<b>3NE1817-0</b>	<b>3RV1031-4HA10</b>
18.5	25	0DE31-8 . A0	FSC/FSD			<b>3RV1042-4KA10</b>
22	30	0DE32-2 . A0	FSD	<b>3NA3822</b>	<b>3NE1818-0</b>	
30	40	0DE33-0 . A0	FSD	<b>3NA3824</b>	<b>3NE1820-0</b>	<b>3RV1042-4MA10</b>
37	50	0DE33-7 . A0	FSE	<b>3NA3830</b>	<b>3NE1021-0</b>	<b>3VL1712-.DD33-....</b>
45	60	0DE34-5 . A0	FSE	<b>3NA3832</b>	<b>3NE1022-0</b>	<b>3VL1716-.DD33-....</b>
55	75	0DE35-5 . A0	FSF	<b>3NA3836</b>	<b>3NE1224-0</b>	<b>3VL3720-.DC36-....</b>
75	100	0DE37-5 . A0	FSF	<b>3NA3140</b>	<b>3NE1225-0</b>	<b>3VL3725-.DC36-....</b>
90	125	0DE38-8 . A0	FSF	<b>3NA3144</b>	<b>3NE1227-0</b>	<b>3VL4731-.DC36-....</b>

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).



# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### Supplementary system components

#### Operator panels

#### Overview

Operator panel	Intelligent Operator Panel IOP	Basic Operator Panel BOP-2
		
Description	Thanks to the large plain text display, menu-based operation and the application wizards, commissioning of the standard drives is easy. Integrated application wizards guide the user interactively through the commissioning process for important applications such as pumps, fans, compressors and conveyor systems.	Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.
Possible applications	<ul style="list-style-type: none"> <li>• Directly mounted on SINAMICS G120P</li> <li>• Achievable degree of protection is IP54/UL Type 12</li> <li>• 5 languages available</li> </ul>	<ul style="list-style-type: none"> <li>• Directly mounted on SINAMICS G120P</li> <li>• Achievable degree of protection is IP55/UL Type 12</li> </ul>
Quick commissioning without expert knowledge	<ul style="list-style-type: none"> <li>• Standard commissioning using the clone function</li> <li>• User-defined parameter list with a reduced number of self-selected parameters</li> <li>• Simple commissioning of standard applications using application-specific wizards, it is not necessary to know the parameter structure</li> <li>• Commissioning largely without documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Standard commissioning using the clone function</li> </ul>
High degree of operator friendliness and intuitive operation	<ul style="list-style-type: none"> <li>• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes</li> <li>• Intuitive navigation using a rotary knob – just like in everyday applications</li> <li>• Graphic display to show status values such as pressure or flow in bar-type diagrams</li> <li>• Status display with freely selectable units to specify physical values</li> </ul>	<ul style="list-style-type: none"> <li>• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes</li> <li>–</li> <li>• 2-line display for showing up to 2 process values with text</li> <li>• Status display of predefined units</li> </ul>
Minimization of maintenance times	<ul style="list-style-type: none"> <li>• Diagnostics using plain text display, can be used locally on-site without documentation</li> <li>• Simple update of languages, wizards and firmware via USB</li> </ul>	<ul style="list-style-type: none"> <li>• Diagnostics with menu prompting with 7-segment display</li> </ul>



# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

Supplementary system components  
Intelligent Operator Panel IOP

### Overview



The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for the SINAMICS G120, SINAMICS G120D, SINAMICS G120P standard drives and SIMATIC ET 200 frequency converters.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors. There are quick commissioning wizards for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP has a dedicated switchover button to switch from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically at the same time. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP and downloaded into other drive units of the same type as required.

The IOP includes the following language packages: English, French, German, Italian and Spanish.

### Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP.

The IOP is supplied with power via the USB interface during an update.

### Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive; you can toggle between the automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive navigation using a wheel – just like in everyday applications
- Graphic display with bar charts e.g. for status values such as pressure or flowrate
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- 5 integrated languages
- Simple update of languages, wizards and firmware updates via USB

### Selection and ordering data

Description	Order No.
<b>Intelligent Operator Panel IOP</b>	<b>6SL3255-0AA00-4JA0</b>

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### Supplementary system components

#### Basic Operator Panel BOP-2

#### Overview



The Basic Operator Panel BOP-2 can be used to commission drives, monitor drives in operation and input individual parameter settings.

Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.

The drives are easily controlled manually using directly assigned navigation buttons. The BOP-2 has a dedicated switchover key to switch over from automatic to manual mode.

Diagnostics can easily be performed on the connected inverter by following the menus.

Up to 2 process values can be numerically visualized simultaneously.

BOP-2 supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the BOP-2 and when required, downloaded into other drive units of the same type.

#### Benefits

- Shorten commissioning times – Easy commissioning of standard drives using basic commissioning wizards (setup)
- Minimize standstill times – Fast detection and rectification of errors (Diagnostics)
- Greater transparency in the process – The status display of the BOP-2 makes process variable monitoring easy (Monitoring)
- Direct mounting on the inverter (see also IOP)
- User-friendly user interface:
  - Easy navigation using clear menu structure and clearly assigned control keys
  - Two-line display

#### Selection and ordering data

Description	Order No.
<b>Basic Operator Panel BOP-2</b>	<b>6SL3255-0AA00-4CA1</b>

# SINAMICS G120P pump, fan and compressor inverters

0.37 kW to 90 kW (0.5 hp to 125 hp)

## Supplementary system components Blanking cover

## Supplementary system components Memory cards

### Overview



SINAMICS G120P, frame size FSC, with blanking cover

The blanking cover is mounted on the inverter in place of an operator panel, if an operator panel is not required. When the blanking cover is plugged onto the PM230 Power Module, degree of protection IP55/UL Type 12 is achieved.

### Selection and ordering data

Description	Order No.
<b>Blanking cover</b> For PM230 Power Module	<b>6SL3256-1BA00-0AA0</b>

### Overview



SINAMICS micro memory card (MMC)/SIMATIC memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) or SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of an operator panel such as the BOP-2 or the STARTER commissioning tool.

#### Note:

The memory card is not required for operation and does not have to remain inserted.

### Selection and ordering data

Description	Order No.
<b>SINAMICS micro memory card (MMC)</b>	<b>6SL3254-0AM00-0AA0</b>
<b>SIMATIC memory card (SD card)</b> (for CU230P-2 and CU240 . -2 Control Units only)	<b>6ES7954-8LB01-0AA0</b>

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### Supplementary system components PC inverter connection kit 2

#### Overview

For CONTROLLING and commissioning an inverter directly from a PC, if the STARTER commissioning tool has been installed on the PC. With this, the inverter can be

- parameterized (commissioned, optimized),
- monitored (diagnostics)
- controlled (master control via the STARTER commissioning tool for test purposes).

A USB cable (3 m/9.84 ft) and the STARTER commissioning tool on DVD-ROM are included in the scope of delivery.

#### Selection and ordering data

Description	Order No.
<b>PC inverter connection kit 2</b> For Control Units	<b>6SL3255-0AA00-2CA0</b>
<ul style="list-style-type: none"> <li>• CU230P-2</li> <li>• CU240 . -2               <ul style="list-style-type: none"> <li>- CU240B-2</li> <li>- CU240B-2 DP</li> <li>- CU240E-2</li> <li>- CU240E-2 DP</li> <li>- CU240E-2 F</li> <li>- CU240E-2 DP-F</li> </ul> </li> </ul>	
Including USB cable (3 m/9.84 ft) and STARTER commissioning tool on DVD-ROM <sup>1)</sup>	

### Supplementary system components Shield connection kit 1

#### Overview

Shield connection kit 1 offers optimum shield connection and a strain relief for all signal and communication cables.

It includes a matching shield bonding plate and all of the necessary connecting and retaining elements for mounting.

Shield connection kit 1 is suitable for the following Control Units:

- CU230P-2 HVAC
- CU230P-2 DP
- CU230P-2 CAN

#### Selection and ordering data

Description	Order No.
<b>Shield connection kit 1</b> For CU230P-2 Control Units	<b>6SL3264-1EA00-0FA0</b>

<sup>1)</sup> The STARTER commissioning tool is also available on the Internet at <http://support.automation.siemens.com/WW/view/en/10804985/133100>

# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

Spare parts  
Mounting set

### Overview

The following parts are supplied from the factory for each PM230 Power Module in degree of protection IP55/UL Type 12:

#### Frame sizes FSA to FSC

- 1 SUB-D connector with mounting material for connecting the CU230P-2 HVAC/DP/CAN Control Units to the operator panel (e.g. IOP)
- 1 motor connector and 1 power supply connector
- 2 serrated strips including mounting material for connecting the shield
- 3 sleeves for inserting in the cutouts for the signal cables of the cable bonding plate
- Ferrite cores (only necessary for devices with integrated line filter class B)
- 2-page Quick Start Guide with mounting instructions

#### Frame sizes FSD to FSF

- 1 adapter cable for connecting the CU230P-2 HVAC/DP/CAN Control Units to the operator panel (e.g. IOP)
- 4 clips to connect the shields of signal cables
- 6 serrated strips including mounting material for the motor and supply cables
- 4 sleeves (pre-installed in the cutouts for the signal cables of the cable bonding plate)
- 1 cable bonding plate without cutouts for customers to configure their own connection system
- 1 cabinet key
- 2-page Quick Start Guide with mounting instructions

A mounting set can be ordered for every frame size in degree of protection IP55/UL Type 12. It contains the following parts:

#### Frame sizes FSA to FSC

- 1 SUB-D connector with mounting material
- 1 motor connector and 1 power supply connector
- 2 serrated strips including mounting material for connecting the shield
- 3 sleeves for inserting in the cutouts for the signal cables of the cable bonding plate
- Ferrite cores (only necessary for devices with integrated line filter class B)
- Screws for fixing the cable bonding plate and the cover

#### Frame sizes FSD to FSF

- 1 adapter cable including mounting material
- 6 serrated strips including mounting material for the motor and supply cables
- 1 cabinet key

### Selection and ordering data

Mounting set For PM230 Power Modules, degree of protection IP55/ UL Type 12	Order No.
• Frame size FSA	<b>6SL3200-0SK02-0AA0</b>
• Frame size FSB	<b>6SL3200-0SK03-0AA0</b>
• Frame size FSC	<b>6SL3200-0SK04-0AA0</b>
• Frame size FSD	<b>6SL3200-0SK05-0AA0</b>
• Frame size FSE	<b>6SL3200-0SK06-0AA0</b>
• Frame size FSF	<b>6SL3200-0SK07-0AA0</b>

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# SINAMICS G120P pump, fan and compressor inverters

## 0.37 kW to 90 kW (0.5 hp to 125 hp)

### Spare parts

#### Fan units

#### Overview

The Power Module fans are designed for extra long service life. For special requirements, replacement fans are available that can be exchanged quickly and easily. The following pictures show the mounting location of the internal or external fan units as an example:



Example of PM230 Power Module, frame size FSC, with external fan unit in heat sink



Example of PM230 Power Module, frame size FSC, with internal fan unit above the CU230P-2 Control Unit

#### Selection and ordering data

Rated power		PM230 Power Module		External fan unit	Internal fan unit
kW (LO)	hp (LO)	Type 6SL3223-...	Frame size	Order No.	Order No.
<b>380 ... 480 V 3 AC ±10 %</b>					
0.37	0.50	0DE13-7 . A0	FSA	<b>6SL3200-0SF21-0AA0</b>	<b>6SL3200-0SF31-0AA0</b>
0.55	0.75	0DE15-5 . A0			
0.75	1.0	0DE17-5 . A0			
1.1	1.5	0DE21-1 . A0			
1.5	2.0	0DE21-5 . A0			
2.2	3.0	0DE22-2 . A0			
3.0	4.0	0DE23-0 . A0			
4.0	5.0	0DE24-0 . A0	FSB	<b>6SL3200-0SF22-0AA0</b>	
5.5	7.5	0DE25-5 . A0			
7.5	10	0DE27-5 . A0			
11.0	15	0DE31-1 . A0	FSC	<b>6SL3200-0SF23-0AA0</b>	
15.0	20	0DE31-5 . A0			
18.5	25	0DE31-8AA0			
18.5	25	0DE31-8BA0	FSD	<b>6SL3200-0SF24-0AA0</b>	<b>6SL3200-0SF32-0AA0</b>
22	30	0DE32-2 . A0			
30	40	0DE33-0 . A0			
37	50	0DE33-7 . A0	FSE		
45	60	0DE34-5 . A0		<b>6SL3200-0SF26-0AA0</b>	
55	75	0DE35-5 . A0	FSF		
75	100	0DE37-5 . A0			
90	125	0DE38-8 . A0			

# SINAMICS G120

## standard inverters

### 0.37 kW to 250 kW (0.5 hp to 400 hp)

# 6



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6/92	Intelligent Operator Panel IOP
6/95	Basic Operator Panel BOP-2
6/97	Blanking cover for PM230 Power Module
6/97	Memory cards
6/98	Brake Relay
6/99	Adapter for mounting on DIN rails
6/99	PC inverter connection kit 2
6/100	Shield connection kits for Power Modules
6/100	Shield connection kits for Control Units
<b>6/101</b>	<b>Spare parts</b>
6/101	Mounting set
6/102	Replacement door for PM240, frame size FSGX
6/102	Replacement connector
6/102	Terminal cover kit for FSD and FSE
6/102	Terminal cover kit for FSF
6/103	Fan units

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Introduction

### Application

Application	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality			Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality		
<b>Pumping, ventilating, compressing</b> 	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
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)
<b>Moving</b> 	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
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (GM150)
<b>Processing</b> 	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
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)
<b>Machining</b> 	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
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>

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

The standard SINAMICS G120 inverter is especially well-suited

- as a universal drive in all industrial and commercial applications
- e.g. in the automotive, textile, printing and chemical industries
- for higher-level applications, e.g. in conveyor systems

### More information

You may also be interested in these inverters/converters:

- Increased functional scope ⇒ SINAMICS S110 ([chapter 9](#))
- Higher degree of protection ⇒ SINAMICS G110D ([chapter 7](#)), SINAMICS G120D ([chapter 8](#))
- Special functions for pumps, fans, and compressors ⇒ SINAMICS G120P ([chapter 5](#))



# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

## SINAMICS G120 standard inverters

### Overview

The SINAMICS G120 inverter is designed to provide precise and cost-effective speed/torque control of three-phase motors.

With different device versions (frame sizes FSA to FSGX) in an output range of 0.37 kW to 250 kW (0.5 hp to 400 hp), it is suitable for a wide variety of drive solutions.



SINAMICS G120, frame sizes FSA, FSB and FSC; each with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2



SINAMICS G120, frame sizes FSD, FSE and FSF; each with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Overview



SINAMICS G120, frame size FSGX; with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

#### Operator-friendly design

SINAMICS G120 is a modular inverter system that essentially comprises two function units:

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor in several different modes. It supports communication with a local or central controller and monitoring devices.

The Power Module supplies the motor in the power range 0.37 kW to 250 kW (0.5 hp to 400 hp). It features state-of-the-art IGBT technology with pulse-width-modulated motor voltage and selectable pulse frequency. It also features a range of functions offering a high degree of protection for the Power Module and motor.

#### Safety Integrated

SINAMICS G120 standard inverters are available in different versions for safety-related applications. The PM240, PM250 and PM260 Power Modules are prepared for Safety Integrated. In conjunction with a fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive.

The SINAMICS G120 fail-safe inverter provides 5 safety functions, certified in accordance with EN 954-1, Category 3 and IEC 61508 SIL 2 as well as ISO 13849-1 PLD:

- Safe Torque Off (STO)  
to protect against active movement of the drive
- Safe Stop 1 (SS1)  
for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS)  
for protection against dangerous movements on exceeding a speed limit
- Safe direction (SDI)  
This function ensures that the drive can only rotate in the selected direction
- Safe speed monitoring (SSM)  
This function signals if a drive operates below a specific speed/feed velocity.

The Safe Stop 1 (SS1) and Safely Limited Speed functions can both be implemented without having to use a motor encoder; the implementation cost is minimal. Existing plants in particular can be updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SSM and SDI functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

[Additional information is provided in the chapter Highlights, section Safety Integrated.](#)

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Overview

##### Efficient Infeed Technology

The advanced Efficient Infeed Technology is employed in PM250 and PM260 Power Modules. This technology allows the energy produced by motors operating in generator mode connected to standard inverters to be fed back into the supply system. For control cabinets, an additional temperature rise can be avoided and the amount of space required can be reduced due to the fact that components such as braking resistors, braking choppers and line reactors can be eliminated. Further, wiring and engineering costs are significantly reduced. At the same time, energy consumption can be reduced and ongoing operating costs noticeably reduced.

Additional information is included in the chapter Highlights, section Efficient Infeed Technology.

##### Innovative cooling concept and varnishing of electronic modules

The new cooling system and varnishing of the electronic modules significantly increases the service life or useful life of the device.

- Disposal of all heat losses via an external heat sink
- Consequential convection cooling of the Control Unit, electronic modules are not located in the air duct
- All cooling air from the fan is directed through the heat sink

##### Energy efficiency

Integrated technologies help when optimizing the energy usage of the plant or system referred to the particular application:

- Energy-efficient, sensorless vector control
- Automatic flux reduction with V/f ECO mode
- Integrated energy saving computer

#### Benefits

- Modularity ensures flexibility for a drive concept that is fit for the future
  - Module replacement under voltage (hot swapping)
  - Pluggable terminals
  - The modules can be easily replaced, which makes the system extremely service friendly
- The integrated safety functions significantly reduce the costs when integrating drives into safety-oriented machines or systems
- Communications-capable via PROFINET or PROFIBUS with PROFIdrive Profile 4.0
  - Reduced number of interfaces
  - Plant-wide engineering
  - Easy to handle
- The innovative circuit design (bidirectional input rectifier with "pared-down" DC link) allows the kinetic energy of a load to be fed back into the supply system when PM250 and PM260 Power Modules are used. This feedback capability provides enormous potential for savings because generated energy no longer has to be converted into heat in a braking resistor
- Integrated USB interface for simplified, local commissioning and diagnostics
- Application-specific modules for pumps, fans and compressors are integrated, e.g.:
  - 4 freely-programmable PID controllers
  - Application-specific wizards
  - Ni1000/Pt1000 temperature sensor interface
  - 230 V relay
  - 3 freely-programmable digital time switches
- Integrated control functionality by using Bico technology
- Innovative SiC semiconductor technology ensures that when a PM260 Power Module is used, the inverter is more compact than a comparable standard inverter with an optional sine-wave filter for the same power rating
- An innovative cooling concept and coated electronic modules increase robustness and service life
  - External heat sink
  - Electronic components are not located in air duct
  - Control Unit that is completely cooled by convection
  - Additional coating of the most important components
- Simple unit replacement and quick copying of parameters using the optional Basic Operator Panel or the optional MMC memory card
- Quiet motor operation as a result of the high pulse frequency
- Compact, space-saving design
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- 2/3-wire control for static/pulsed signals for universal control via digital inputs
- Fast engineering and commissioning by using standard engineering tools such as SIZER for Siemens Drives, STARTER and Drive ES – STARTER is integrated into STEP 7 using Drive ES Basic, with all of the benefits of central data management and totally integrated communication
- Certified worldwide for compliance with CE, UL, cUL, c-tick and Safety Integrated IEC 61508 SIL 2

# SINAMICS G120 standard inverters

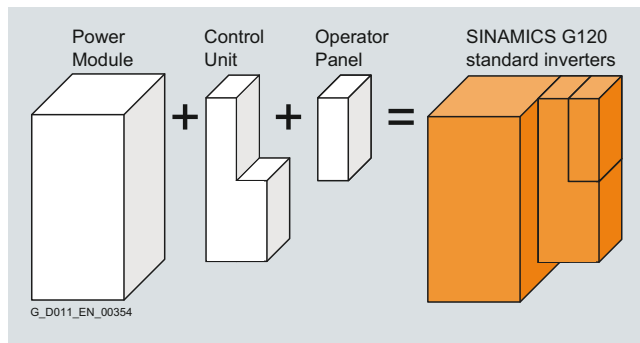
## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Design

##### Application-orientated design of SINAMICS G120

SINAMICS G120 standard inverters are modular inverters for standard drives. Selection of the SINAMICS G120 is reduced to two or three steps thanks to the modular system used.



##### Selecting the Control Unit

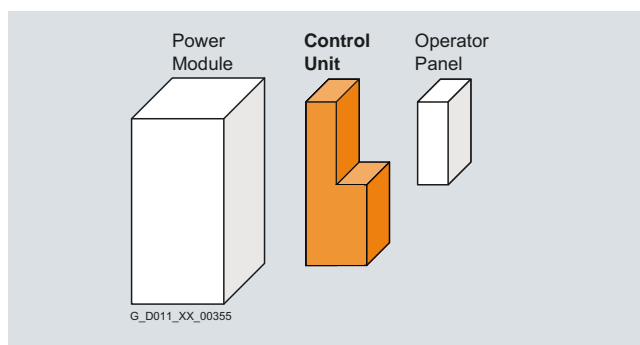
The optimum Control Unit is selected first, based on the number of I/Os and any additional functions required such as Safety Integrated or HVAC. The communication options are already integrated and do not have to be additionally ordered or plugged in. Two product series are available corresponding to the particular application.

###### CU230 Control Units

The CU230 Control Units have been specifically designed for pump, fan and compressor applications.

###### CU240 Control Units

The CU240 Control Units are suitable for a wide range of applications in general machine construction, such as conveyor belts, mixers and extruders.



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Technology functions (selection)	Inputs	Outputs	Integrated safety technology	Digital inputs, fail-safe	Communication	Designation	Control Unit Order No.
<b>CU230 series – the specialist for pumps, fans, compressors, water, buildings</b>							
<ul style="list-style-type: none"> <li>Free function blocks (FFB)</li> <li>4 x PID controllers</li> <li>Pump staging</li> <li>Hibernation</li> <li>Essential service mode</li> <li>2-zone control</li> </ul>	6 digital 4 analog	3 digital 2 analog	–	–	RS485/USS / Modbus RTU / BACnet MS/TP	CU230P-2 HVAC	<b>6SL3243-0BB30-1HA2</b>
					PROFIBUS DP	CU230P-2 DP	<b>6SL3243-0BB30-1PA2</b>
					CANopen	CU230P-2 CAN	<b>6SL3243-0BB30-1CA2</b>
<b>CU240 series – for basic applications with variable-speed drives</b>							
<ul style="list-style-type: none"> <li>Free function blocks (FFB)</li> <li>1 x PID controller</li> <li>Motor holding brake</li> </ul>	4 digital 1 analog	1 digital 1 analog	–	–	RS485/USS / Modbus RTU	CU240B-2	<b>6SL3244-0BB00-1BA1</b>
					PROFIBUS DP	CU240B-2 DP	<b>6SL3244-0BB00-1PA1</b>
<b>CU240 series – for standard applications in general machinery construction, such as conveyor belts, mixers and extruders</b>							
<ul style="list-style-type: none"> <li>Free function blocks (FFB)</li> <li>1 x PID controller</li> <li>Motor holding brake</li> </ul>	6 digital 2 analog	3 digital 2 analog	STO	1 F-DI (opt. for each 2 DI)	RS485/USS / Modbus RTU	CU240E-2	<b>6SL3244-0BB12-1BA1</b>
					PROFIBUS DP PROFIsafe	CU240E-2 DP	<b>6SL3244-0BB12-1PA1</b>
			STO, SS1, SLS, SSM, SDI	3 F-DI (opt. for each 2 DI)	RS485/USS / Modbus RTU	CU240E-2 -F	<b>6SL3244-0BB13-1BA1</b>
					PROFIBUS DP PROFIsafe	CU240E-2 DP-F	<b>6SL3244-0BB13-1PA1</b>

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

## Design

### Selecting the Power Module

The optimum power unit can be quickly selected based on the required motor power, the supply voltage and the braking cycles to be expected.

#### PM230 Power Modules – degree of protection IP55

PM230 Power Modules are designed for applications involving pumps, fans and compressors with a square characteristic. They do not have an integrated braking chopper (single-quadrant applications).

#### PM240 Power Modules – degree of protection IP20

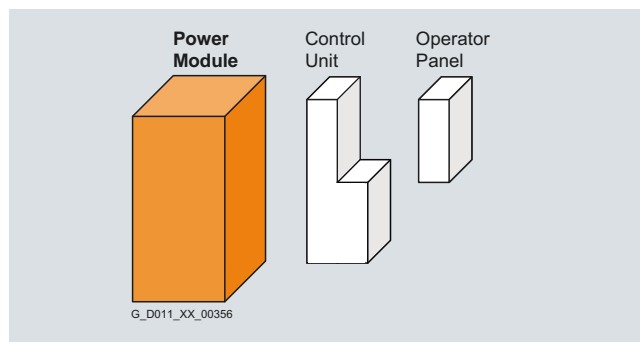
PM240 Power Modules have a braking chopper (four-quadrant applications) and are suitable for a large number of applications in general machinery construction.

#### PM250 Power Modules – degree of protection IP20

PM250 Power Modules are suitable for the same applications as the PM240. Any braking energy is directly fed back into the line supply (four-quadrant applications – a braking chopper is not required).

#### PM260 Power Modules – degree of protection IP20

PM260 Power Modules are designed for applications from 500 V to 690 V, are capable of energy recovery and include a sine-wave filter to reduce the stress on the motor and for long cable lengths.



		380 ... 480 V 3 AC				500 ... 690 V 3 AC	
Rated power <sup>1)</sup>		Rated output current <sub>I<sub>rated</sub></sub> <sup>2)</sup>	SINAMICS G120P PM230 Power Module degree of protection IP55, only CU230P-2 pluggable	SINAMICS G120 PM240 Power Module degree of protection IP20, all CUs pluggable	SINAMICS G120 PM250 Power Module degree of protection IP20, all CUs pluggable	Rated output current <sub>I<sub>rated</sub></sub> <sup>2)</sup>	SINAMICS G120 PM260 Power Module degree of protection IP20, all CUs pluggable
kW	hp	A	Order No.	Order No.	Order No.	A	Order No.
0.37	0.50	1.3	6SL3223-0DE13-7A0	6SL3224-0BE13-7UA0	–	–	–
0.55	0.75	1.7	6SL3223-0DE15-5A0	6SL3224-0BE15-5UA0	–	–	–
0.75	1.0	2.2	6SL3223-0DE17-5A0	6SL3224-0BE17-5UA0	–	–	–
1.1	1.5	3.1	6SL3223-0DE21-1A0	6SL3224-0BE21-1UA0	–	–	–
1.5	2.0	4.1	6SL3223-0DE21-5A0	6SL3224-0BE21-5UA0	–	–	–
2.2	3.0	5.9	6SL3223-0DE22-2A0	6SL3224-0BE22-2UA0	–	–	–
3.0	4.0	7.7	6SL3223-0DE23-0A0	6SL3224-0BE23-0UA0	–	–	–
4.0	5.0	10.2	6SL3223-0DE24-0A0	6SL3224-0BE24-0UA0	–	–	–
5.5	7.5	13.2	6SL3223-0DE25-5A0	–	–	–	–
7.5	10	18	6SL3223-0DE27-5A0	6SL3224-0BE25-5UA0	6SL3225-0BE25-5AA1	–	–
11.0	15	25	6SL3223-0DE31-1A0	6SL3224-0BE27-5UA0	6SL3225-0BE27-5AA1	14	6SL3225-0BH27-5A1
15.0	20	32	6SL3223-0DE31-5A0	6SL3224-0BE31-1UA0	6SL3225-0BE31-1AA1	19	6SL3225-0BH31-1A1
18.5	25	38	6SL3223-0DE31-8A0	6SL3224-0BE31-5UA0	6SL3225-0BE31-5AA1	23	6SL3225-0BH31-5A1
22	30	45	6SL3223-0DE32-2A0	6SL3224-0BE31-8UA0	6SL3225-0BE31-8AA1	–	–
30	40	60	6SL3223-0DE33-0A0	6SL3224-0BE32-2UA0	6SL3225-0BE32-2AA1	35	6SL3225-0BH32-2A1
37	50	75	6SL3223-0DE33-7A0	6SL3224-0BE33-0UA0	6SL3225-0BE33-0AA1	42	6SL3225-0BH33-0A1
45	60	90	6SL3223-0DE34-5A0	6SL3224-0BE33-7UA0	6SL3225-0BE33-7AA1	–	–
55	75	110	6SL3223-0DE35-5A0	6SL3224-0BE34-5UA0	6SL3225-0BE34-5AA1	62	6SL3225-0BH33-7A1
75	100	145	6SL3223-0DE37-5A0	6SL3224-0BE35-5UA0	6SL3225-0BE35-5AA1	–	–
90	125	178	6SL3223-0DE38-8A0	6SL3224-0BE37-5UA0	6SL3225-0BE37-5AA1	–	–
110	150	205	–	6SL3224-0BE38-8UA0	–	–	–
132	200	250	–	6SL3224-0BE41-1UA0	–	–	–
160	250	302	–	6SL3224-0XE41-3UA0	–	–	–
200	300	370	–	6SL3224-0XE41-6UA0	–	–	–
250	400	477	–	6SL3224-0XE42-0UA0	–	–	–
<b>Integrated line filter</b>			↑	↑	↑		↑
<b>Without</b> (for IT systems)		Not supported		<b>U</b>	<b>U</b>		<b>U</b>
<b>Class A</b> (for TN systems)			<b>A</b>	<b>A</b>	<b>A</b>		<b>A</b>
<b>Class B</b> (for TN systems)			<b>B</b>	Are not available integrated	Are not available integrated		Not supported

Data based on a duty cycle with low overload (LO). High overload (HO) see Power Modules from page 6/32 on.

<sup>1)</sup> The LO duty cycle is generally used for applications with square torque characteristic such as for pumps, fans and compressors; the HO duty cycle for constant torque characteristics, for example conveyor belts.

<sup>2)</sup> These current values are applicable for 400 V (for PM230, PM240 and PM250 Power Modules) and for 690 V (for PM260 Power Modules).

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Design

##### Selecting optional system components

###### Intelligent Operator Panel IOP

Graphic display with bar-type diagrams, e.g. for status values such as pressure or flowrate.

User-friendly commissioning, diagnostics and local operator control using a large plain text display, clear menu navigation and integrated application wizards.

###### Intelligent Operator Panel IOP Handheld

A handheld version of the IOP can be ordered for mobile use. In addition to the IOP, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable.

###### Basic Operator Panel BOP-2

Menu navigation and 2-line display permit fast and user-friendly commissioning of the inverter.

Simple basic commissioning by simultaneously displaying parameter and parameter value, as well as the option of filtering parameters.

###### Door mounting kit for IOP/BOP-2

Using the optionally available door mounting kit, the IOP/BOP-2 can be mounted in a control cabinet door with just a few manual operations (IP54/UL Type 12 degree of protection is achieved).

###### Memory cards

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) or SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced, the drive system is immediately ready for use again.

###### Brake Relay

The Brake Relay allows the Power Module to be connected to an electromechanical motor brake, thereby allowing the motor brake to be driven directly by the Control Unit.

###### Adapter for mounting on DIN rails

The adapter for DIN rail mounting can be used to mount inverters, frame sizes FSA and FSB, on DIN mounting rails (2 units with a center-to-center distance of 100 mm/3.94 in).

###### PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool) has been installed.

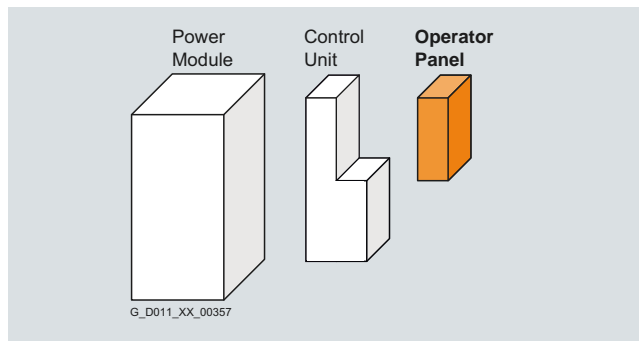
The STARTER commissioning tool on DVD-ROM is included in the scope of delivery of the PC inverter connection kit 2.

###### Shield connection kit for Power Modules

The shield connection kit makes it easier to connect the shields of supply and control cables, provides mechanical strain relief and thus ensures optimum EMC performance.

###### Shield connection kit for Control Units

The shield connection kit offers optimum shield connection and strain relief for all signal and communication cables. It includes a matching shield bonding plate and all of the necessary connecting and retaining elements for mounting.



Description	Order No.
<b>Operator Panel IOP</b>	<b>6SL3255-0AA00-4JA0</b>
<b>Operator Panel IOP Handheld <sup>1)</sup></b>	<b>6SL3255-0AA00-4HA0</b>
<b>Operator Panel BOP-2</b>	<b>6SL3255-0AA00-4CA1</b>
<b>Door mounting kit <sup>1)</sup> for IOP/BOP-2</b>	<b>6SL3256-0AP00-0JA0</b>
<b>Blanking cover for PM230</b>	<b>6SL3256-1BA00-0AA0</b>
<b>Memory cards <sup>2)</sup></b>	
• SINAMICS micro memory card (MMC)	<b>6SL3254-0AM00-0AA0</b>
• SIMATIC memory card (SD card)	<b>6ES7954-8LB01-0AA0</b>
<b>Brake Relay <sup>1)</sup></b>	<b>6SL3252-0BB00-0AA0</b>
<b>Adapter for mounting on DIN rails</b>	
• For Power Modules, frame size FSA	<b>6SL3262-1BA00-0BA0</b>
• For Power Modules, frame size FSB	<b>6SL3262-1BB00-0BA0</b>
<b>PC inverter connection kit 2</b>	<b>6SL3255-0AA00-2CA0</b>
<b>Shield connection kits</b> for PM240 and PM250 Power Modules	
• Frame size FSA	<b>6SL3262-1AA00-0BA0</b>
• Frame size FSB	<b>6SL3262-1AB00-0DA0</b>
• Frame size FSC	<b>6SL3262-1AC00-0DA0</b>
• Frame sizes FSD and FSE	<b>6SL3262-1AD00-0DA0</b>
• Frame size FSF	<b>6SL3262-1AF00-0DA0</b>
<b>Shield connection kits</b> for PM260 Power Modules	
• Frame size FSD	<b>6SL3262-1FD00-0CA0</b>
• Frame size FSF	<b>6SL3262-1FF00-0CA0</b>
<b>Shield connection kits</b> for Control Units	
• For CU230P-2	<b>6SL3264-1EA00-0FA0</b>
• For CU240 . -2	<b>6SL3264-1EA00-0HA0</b>
<b>STARTER commissioning tool</b> on DVD-ROM	<b>6SL3072-0AA00-0AG0</b>

<sup>1)</sup> Not possible in conjunction with the PM230 Power Module.

<sup>2)</sup> Alternatively, an MMC or an SD card can be used.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

## Design

### Line-side power components

The following line-side power components are available for SINAMICS G120 standard inverters:

#### Line filters

With one of the additional line filters, the Power Module reaches a higher radio interference class.

#### Line reactors

(for PM240 Power Modules only)

Line reactors are used to smooth voltage peaks or to bridge commutating dips.

Line reactors also reduce the effects of harmonics on the inverter and the line supply.

If the ratio of the rated inverter power to the line supply short-circuit power is less than 1 %, then it is recommended to use a line reactor to reduce the current peaks.

#### Recommended line-side power components

This is a recommendation for additional line-side components, such as fuses and circuit breakers (line-side components must be dimensioned in accordance with IEC standards).

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 and IC 10.](#)

### DC link components

The following DC link components are available for the SINAMICS G120 standard inverters:

#### Braking Modules

(only for PM240 Power Modules, frame size FSGX)

A Braking Module and the matching external braking resistor are required to bring drives with a PM240 Power Module, frame size FSGX, to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP Category 1) or to limit the DC link voltage during a short period of generator operation. The Braking Module includes the power electronics and the associated control circuit.

#### Braking resistors

(for PM240 Power Modules only)

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are designed for use with PM240 Power Modules. They are equipped with an integrated braking chopper (electronic switch). There is an optional plug-in Braking Module for frame size FSGX.

### Load-side power components

The following load-side power components are available for the SINAMICS G120 standard inverters. This means that during operation with output reactors or sine-wave filters, longer, shielded motor cables are possible and the motor service life can be extended:

#### Output reactors

(for PM240 and PM250 Power Modules only)

Output reactors reduce the voltage stress on the motor windings. At the same time, the capacitive charging/discharging currents, which place an additional load on the power unit when long motor cables are used, are reduced.

#### Sine-wave filters

(not for PM260 Power Modules)

The sine-wave filter limits the rate of rise of voltage and the capacitive charging/discharging currents that usually occur with inverter operation. An output reactor is not required.

### Spare parts

#### Terminal cover kit

The kit includes a replacement cover for the terminals. The kit can be ordered for PM240/PM250 Power Modules, frame sizes FSD, FSE and FSF, as well as for the PM260, frame size FSF.

#### PM260 replacement connector

This spare part includes a connector for the input and output sides of the PM260 Power Module, frame size FSD.

#### SINAMICS G120 PM240 FSGX replacement door

A complete replacement door can be ordered for the PM240 Power Module, frame size FSGX.

#### Replacement fan

The Power Module fans are designed for extra long service life. Replacement fans can be ordered for special applications.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G120 standard inverters:

##### *Selection guide DT Configurator*

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 DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. It is provided on a DVD-ROM.

##### *Online DT Configurator*

In addition, the DT Configurator can be used in the Internet without requiring any installation  
[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

##### *SIZER for Siemens Drives engineering tool*

The PC-based SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

##### *STARTER commissioning tool*

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. In addition to SINAMICS drives, STARTER is also suitable for MICROMASTER 4 units and the drive converters for the distributed I/O SIMATIC ET 200S FC and SIMATIC ET 200pro FC.

##### *SINAMICS StartDrive commissioning tool*

SINAMICS StartDrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. The engineering tool has been optimized with regard to user friendliness and consistent use of the TIA Portal technologies. The two Control Units CU240B-2 DP and CU240E-2 DP of the SINAMICS G120 standard inverter are supported in the SINAMICS StartDrive V11 version.

##### *Drive ES engineering system*

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7.1.



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS G120 standard inverters.

Mechanical specifications	
<b>Vibratory load</b>	
<ul style="list-style-type: none"> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2               <ul style="list-style-type: none"> <li>- All units and components with the exception of frame size FSGX</li> <li>- Units, frame size FSGX</li> </ul> </li> <li>• Operation               <ul style="list-style-type: none"> <li>Test values acc. to EN 60068-2-6</li> </ul> </li> </ul>	Class 2M3 Class 2M2 Test Fc: 10 ... 58 Hz: Constant deflection 0.075 mm 58 ... 200 Hz: Constant acceleration = 9.81 m/s <sup>2</sup> (1 × g)
<b>Shock load</b>	
<ul style="list-style-type: none"> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2               <ul style="list-style-type: none"> <li>- All units and components with the exception of frame size FSGX</li> <li>- Units, frame size FSGX</li> </ul> </li> <li>• Operation               <ul style="list-style-type: none"> <li>Test values acc. to EN 60068-2-27</li> <li>- Frame sizes FSA to FSC</li> <li>- Frame sizes FSD to FSF</li> <li>- Frame size FSGX</li> </ul> </li> </ul>	Class 2M3 Class 2M2 Test Ea: 147 m/s <sup>2</sup> (15 × g)/11 ms 49 m/s <sup>2</sup> (5 × g)/30 ms 98 m/s <sup>2</sup> (10 × g)/20 ms
Ambient conditions	
<b>Protection class</b> acc. to EN 61800-5-1	Class I (with protective conductor system) and class III (PELV)
<b>Touch protection</b> acc. to EN 61800-5-1	For the intended purpose
<b>Permissible ambient and coolant temperature (air) during operation for line-side power components and Power Modules</b>	<ul style="list-style-type: none"> <li>• Low overload (LO)               <ul style="list-style-type: none"> <li>0 ... 40 °C (32 ... 104 °F) without derating</li> <li>&gt;40 ... 60 °C (&gt;104 ... 140 °F) <a href="#">see derating characteristics</a></li> </ul> </li> <li>• High overload (HO)               <ul style="list-style-type: none"> <li>0 ... 50 °C (32 ... 122 °F) without derating</li> <li>(for PM240 frame size FSGX: 0 ... 40 °C, 32 ... 104 °F),</li> <li>&gt;50 ... 60 °C (&gt;104 ... 140 °F) <a href="#">see derating characteristics</a></li> </ul> </li> </ul>
<b>Permissible ambient and coolant temperature (air) during operation for Control Units, additional system components and DC-link components</b>	0 ... 50 °C (32 ... 122 °F) Exception: CU230P-2: 0 ... 60 °C (32 ... 140 °F) Up to 2000 m (6562 ft) above sea level
<b>Climatic ambient conditions</b>	
<ul style="list-style-type: none"> <li>• Storage <sup>1)</sup> acc. to EN 60721-3-1</li> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2</li> <li>• Operation acc. to EN 60721-3-3</li> </ul>	Class 1K3 Temperature -25 ... +55 °C (-13 ... +131 °F) Class 2K4 Temperature -40 ... +70 °C (-40 ... +158 °F) Max. air humidity 95 % at 40 °C (104 °F) Class 3K5 <sup>2)</sup> Condensation, splashwater, and ice formation not permitted (EN 60204, Part 1)
<b>Environmental class/harmful chemical substances</b>	
<ul style="list-style-type: none"> <li>• Storage <sup>1)</sup> acc. to EN 60721-3-1</li> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2</li> <li>• Operation acc. to EN 60721-3-3</li> </ul>	Class 1C2 Class 2C2 Class 3C2
<b>Organic/biological influences</b>	
<ul style="list-style-type: none"> <li>• Storage <sup>1)</sup> acc. to EN 60721-3-1</li> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2</li> <li>• Operation acc. to EN 60721-3-3</li> </ul>	Class 1B1 Class 2B1 Class 3B1
<b>Degree of pollution</b> acc. to EN 61800-5-1	2

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

<sup>2)</sup> For Intelligent Operator Panel IOP, class 3K3

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Technical specifications

Standards	
<b>Compliance with standards</b>	UL <sup>1)</sup> , cUL <sup>2)</sup> , CE, c-tick
<b>CE marking</b>	According to Low-Voltage Directive 2006/95/EC
<b>EMC Directive</b> acc. to EN 61800-3	
<ul style="list-style-type: none"> <li>• Frame sizes FSA to FSGX without integrated line filter class A</li> <li>• Frame sizes FSB to FSF with integrated line filter class A</li> </ul>	Category C3 <sup>3)</sup>
<ul style="list-style-type: none"> <li>• Frame size FSA without integrated line filter and with additional line filter class A</li> </ul>	Category C2 <sup>4)</sup> (corresponds to class A acc. to EN 55011 for conducted interference emission)
<ul style="list-style-type: none"> <li>• Frame size FSA with additional line filter class A and with additional line filter class B</li> </ul>	Category C2 <sup>4)</sup> (corresponds to class A acc. to EN 55011 for conducted interference emission)
<ul style="list-style-type: none"> <li>• Frame sizes FSB and FSC with additional line filter class A and with additional line filter class B</li> </ul>	Category C2 <sup>4)</sup> (corresponds to class B acc. to EN 55011 for conducted interference emission)
<ul style="list-style-type: none"> <li>• PM230: Frame sizes FSA to FSF with integrated line filter class A</li> </ul>	Category C2 <sup>4)</sup> (corresponds to class A acc. to EN 55011)
<ul style="list-style-type: none"> <li>• PM230: Frame sizes FSA to FSF with integrated line filter class B</li> </ul>	Category C1 <sup>4)</sup> (corresponds to class B acc. to EN 55011 for conducted interference emission)

#### Note:

The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

<sup>1)</sup> UL approval for frame sizes FSD to FSF will be available soon.

<sup>2)</sup> Applies to PM240 and PM250 Power Modules.

<sup>3)</sup> Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side. As a consequence, a PDS (Power Drive System) can be installed according to category C3.

<sup>4)</sup> With shielded motor cable up to 25 m (82 ft).

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### SINAMICS G120 standard inverters

#### Technical specifications

##### Compliance with standards

##### CE marking



The SINAMICS G120 inverters meet the requirements of the Low-Voltage Directive 2006/95/EC.

##### Low-Voltage Directive

The inverters comply with the following standards listed in the official journal of the EU:

- EN 60204-1  
Safety of machinery, electrical equipment of machines
- EN 61800-5-1  
Electrical power drive systems with variable speed – Part 5-1: Requirements regarding safety – electrical, thermal, and energy requirements

##### UL listing



Inverter devices in UL category NMMS certified to UL and cUL, in compliance with UL508C. UL list numbers E121068 and E192450. This data is applicable for the PM240 and PM250 Power Modules.

For use in environments with pollution degree 2.

On the Internet at [www.ul.com](http://www.ul.com)

##### Machinery Directive

The inverters are suitable for installation in machines. Compliance with the Machinery Directive 2006/42/EC requires a separate certificate of conformity. This must be provided by the plant construction company or the organization marketing the machine.

##### EMC Directive

- EN 61800-3  
Variable-speed electric drives  
Part 3: EMC product standard including specific test methods

The EMC product standard EN 61800-3 for electric drive systems has been valid since July 1, 2005. The transition period for the predecessor standard EN 61800-3/A11 dated February 2001 ended on October 1, 2007. The following information applies to the Siemens SINAMICS G120 inverters:

- The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter.
- Frequency inverters are normally only supplied to experts for installation in machines or systems. A frequency inverter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The inverter's operating instructions, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to become a PDS. For a PDS, the EMC Directive in the EU is complied with by observing the product standard EN 61800-3 for variable-speed electric drive systems. The frequency inverters on their own do not generally require identification according to the EMC Directive.

- In the Standard EN 61800-3 of July 2005, a distinction is no longer made between "general availability" and "restricted availability". Instead, different categories C1 to C4 have been defined in accordance with the environment of the PDS at the operating location:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in the first environment
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in the first environment, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning note is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment. A warning note is required.
  - **Category C4:** Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A or for use in complex systems in the second environment. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for the "second environment" (= industrial power supply systems that do not supply households). These limit values are below the limit values of filter class A to EN 55011. Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side.
- With SINAMICS G120, Power Drive Systems (PDS) that fulfill the EMC product standard EN 61800-3 can be configured when observing the installation instructions in the product documentation.
- A differentiation must be made between the product standards for electrical drive systems (PDS) of the range of standards EN 61800 (of which Part 3 covers EMC topics) and the product standards for the devices/systems/machines, etc. This will probably not result in any changes in the practical use of frequency inverters. Since frequency inverters are always part of a PDS and these are part of a machine, the machine manufacturer must observe various standards depending on their type and environment (e.g. EN 61000-3-2 for line harmonics and EN 55011 for radio interference). The product standard for PDS on its own is, therefore, either insufficient or irrelevant.
- With respect to the compliance with limits for line supply harmonics, the EMC product standard EN 61800-3 for PDS refers to compliance with the EN 61000-3-2 and EN 61000-3-12 standards.
- Regardless of the configuration with SINAMICS G120 and its components, the machine construction company (OEM) can also apply other measures to ensure that the machine complies with the EU EMC Directive. The EU EMC Directive is generally fulfilled when the relevant EMC product standards are observed. If they are not available, the generic standards (e.g. DIN EN 61000-x-x) can be used instead. It is important that the conducted and emitted interference at the line connection point and outside the machine remain below the relevant limit values. Any suitable technical measures can be applied to ensure this.

##### SEMI F47

SEMI F47 is an industry standard relating to the immunity to voltage dips. This includes the requirement that industrial equipment must be able to tolerate defined dips or drops of the line supply voltage. As a result, industrial equipment that fulfills this standard is more reliable and productive. In the SINAMICS G120 product family, the PM240 and PM250 Power Modules fulfill the latest SEMI F47-0706 standard. In the case of a voltage dip defined in accordance with SEMI F47-0607, these drives either continue to supply a defined output current, or automatically restart and continue to operate as expected.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Overview

##### CU230P-2 Control Units



CU230P-2 HVAC Control Unit

The Control Unit performs closed-loop control functions for the inverter.

The CU230P-2 Control Units are designed for drives with integrated technological functions for pump, fan and compressor applications.

The I/O interface, the fieldbus interfaces and the additional software functions optimally support these applications. The integration of technological functions is a significant differentiating feature to the other Control Units of the SINAMICS G120 drive family.

The CU230P-2 Control Units can be operated with the following Power Modules:

- PM230
- PM240
- PM250
- PM260

##### Typical, integrated HVAC/HLK functions

- Linear and square torque characteristic for fluid flow and positive displacement machines
- ECO mode for additional energy saving
- 2 analog inputs (current/voltage can be selected) to directly connect pressure/level sensors
- 2 additional analog inputs to connect Ni1000/Pt1000 temperature sensors
- Direct control of valves and flaps using two 230 V relays
- Automatic restart function after power failure
- Flying restart
- Skippable frequencies
- Energy saving through "hibernation"
- Load check function to monitor belts and flow
- Motor staging
- 4 integrated PID controllers (e.g. for temperature, pressure, air quality, level)
- Multi-zone controller
- Extended emergency mode
- Real time clock with three time generators

##### IOP wizards for special applications

- Pumps: Positive displacement (constant load torque) and centrifugal pumps (square load torque) with and without PID controller
- Fans: Radial and axial fans (square load torque) with and without PID controller
- Compressors: Positive displacement (constant load torque) and fluid flow machines (square load torque) with and without PID controller

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Overview

##### CU240B-2 and CU240E-2 Control Units



CU240E-2 DP-F Control Unit

The Control Unit performs closed-loop control functions for the inverter.

The CU240B-2 and CU240E-2 Control Units are designed as standard Control Units for all of the usual applications involving *V/f* or vector control.

- CU240B-2 series with basic I/O quantity structure, ideal for a large number of applications
- CU240E-2 series with standard I/O quantity structure and integrated safety technology

The CU240B-2 and CU240E-2 Control Units can be operated with the following Power Modules:

- PM240
- PM250
- PM260

##### Safety Integrated functions

The Safety function "Safe Torque Off" (STO) (certified according to EN 954-1, Category 3 and IEC 61508 SIL 2 – as well as ISO 13849-1 PLd) is already integrated into the basic versions of the CU240E-2 series (CU240E-2 and CU240E-2 DP). The following extended Safety Integrated functions have been integrated into the CU240E-2 F and CU240E-2 DP-F Control Units.

- Safe Torque Off (STO)  
to protect against active movement of the drive
- Safe Stop 1 (SS1)  
for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS)  
for protection against dangerous movements when a speed limit is exceeded (CU240E-2 DP-F Control Unit has up to 4 selectable SLS limit values)
- Safe direction (SDI)  
This function ensures that the drive can only rotate in the selected direction.
- Safe speed monitoring (SSM)  
This function signals if a drive operates below a specific speed/feed velocity (only CU240E-2 DP-F with PROFI-safe).

All integrated Safety functions can be implemented without having to use a motor encoder or encoder; implementation costs are minimal. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The STO function can be used without restriction for all applications. The SS1, SLS, SDI and SSM functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

[Additional information is provided in the chapter Highlights, section Safety Integrated.](#)

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Selection and ordering data

Technology functions (selection)	Inputs	Outputs	Integrated safety technology	Digital inputs, fail-safe	Communication	Designation	Control Unit Order No.
<b>CU230 series – the specialist for pumps, fans, compressors, water, buildings</b>							
<ul style="list-style-type: none"> <li>• Free function blocks (FFB)</li> <li>• 4 x PID controllers</li> <li>• Pump staging</li> <li>• Hibernation</li> <li>• Essential service mode</li> <li>• 2-zone control</li> </ul>	6 digital 4 analog	3 digital 2 analog	–	–	RS485/USS / Modbus RTU / BACnet MS/TP	CU230P-2 HVAC	<b>6SL3243-0BB30-1HA2</b>
					PROFIBUS DP	CU230P-2 DP	<b>6SL3243-0BB30-1PA2</b>
					CANopen	CU230P-2 CAN	<b>6SL3243-0BB30-1CA2</b>
<b>CU240 series – for basic applications with variable-speed drives</b>							
<ul style="list-style-type: none"> <li>• Free function blocks (FFB)</li> <li>• 1 x PID controller</li> <li>• Motor holding brake</li> </ul>	4 digital 1 analog	1 digital 1 analog	–	–	RS485/USS / Modbus RTU	CU240B-2	<b>6SL3244-0BB00-1BA1</b>
					PROFIBUS DP	CU240B-2 DP	<b>6SL3244-0BB00-1PA1</b>
<b>CU240 series – for standard applications in general machinery construction, such as conveyor belts, mixers and extruders</b>							
<ul style="list-style-type: none"> <li>• Free function blocks (FFB)</li> <li>• 1 x PID controller</li> <li>• Motor holding brake</li> </ul>	6 digital 2 analog	3 digital 2 analog	STO	1 F-DI (opt. for each 2 DI)	RS485/USS / Modbus RTU	CU240E-2	<b>6SL3244-0BB12-1BA1</b>
					PROFIBUS DP PROFIsafe	CU240E-2 DP	<b>6SL3244-0BB12-1PA1</b>
			STO, SS1, SLS, SSM, SDI	3 F-DI (opt. for each 2 DI)	RS485/USS / Modbus RTU	CU240E-2 -F	<b>6SL3244-0BB13-1BA1</b>
					PROFIBUS DP PROFIsafe	CU240E-2 DP-F	<b>6SL3244-0BB13-1PA1</b>

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Design

#### CU230P-2 HVAC, CU230P-2 DP and CU230P-2 CAN Control Units



CU230P-2 DP Control Unit with open terminal covers

Terminal No.	Signal	Features
<b>Digital inputs (DI) – Standard</b>		
69	DI Com	Reference potential for digital inputs
5 ... 8, 16, 17	DI0 ... DI5	Freely programmable isolated, inputs in compliance with IEC 61131-2
<b>Digital outputs (DO)</b>		
18	DO0, NC	Relay output 1 NC contact (2 A, 230 V AC)
19	DO0, NO	Relay output 1 NO contact (2 A, 230 V AC)
20	DO0, COM	Relay output 1 Common contact (2 A, 230 V AC)
21	DO1, NO	Relay output 2 NO contact (0.5 A, 30 V DC)
22	DO1, COM	Relay output 2 Common contact (0.5 A, 30 V DC)
23	DO2, NC	Relay output 3 NC contact (2 A, 230 V AC)
24	DO2, NO	Relay output 3 NO contact (2 A, 230 V AC)
25	DO2, COM	Relay output 3 Common contact (2 A, 230 V AC)

Terminal No.	Signal	Features
<b>Analog inputs (AI)</b>		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
10	AI1+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
11	AI1-	
50	AI2+/ Ni1000	Non-isolated input, switchable between current, temperature sensors, type Ni1000/Pt1000 Value range: 0/4 ... 20 mA, Pt1000: -50 ... +250 °C (-58 ... +482 °F) Ni1000: -50 ... +150 °C (-58 ... +302 °F)
51	GND	Reference potential of the AI2/internal electronics ground
52	AI3+/ Ni1000	Non-isolated input for temperature sensors, type Ni1000/Pt1000 Value range: Pt1000: -50 ... +250 °C (-58 ... +482 °F) Ni1000: -50 ... +150 °C (-58 ... +302 °F)
53	GND	Reference potential of the AI3/internal electronics ground
<b>Analog outputs (AO)</b>		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	AO0-	Reference potential of the AO0/internal electronics ground
26	AO1+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
27	AO1-	Reference potential of the AO1/internal electronics ground
<b>Motor temperature sensor interface</b>		
14	T1 motor	Positive input for motor temperature sensor Type: PTC, KTY sensor, Thermo-Click
15	T2 motor	Negative input for motor temperature sensor
<b>Power supply</b>		
9	+24 V OUT	Power supply output 24 V DC, max. 200 mA
28	GND	Reference potential of the power supply/internal electronics ground
1	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/internal electronics ground
31	+24 V IN	Power supply input 18 ... 30 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input
35	+10 V OUT	Power supply output 10 V DC ±0.5 V, max. 10 mA
36	GND	Reference potential of the power supply/internal electronics ground

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Design

##### CU240B-2, CU240B-2 DP Control Units



CU240B-2 Control Unit with open and closed terminal covers

Terminal No.	Signal	Features
<b>Digital inputs (DI)</b>		
5 ... 8	DI0 ... DI3	Freely programmable (isolated) 5.5 mA/24 V
69	DI COM	Reference potential for digital inputs
<b>Digital output (DO)</b>		
18	DO0, NC	Relay output DO0 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output DO0 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output DO0 Common contact (0.5 A, 30 V DC)
<b>Analog input (AI)</b>		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
<b>Analog output (AO)</b>		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	AO0-	Reference potential of the AO0/internal electronics ground
<b>Motor temperature sensor interface</b>		
14	T1 motor	Positive input for motor temperature sensor Type: PTC, KTY sensor, Thermo-Click
15	T2 motor	Negative input for motor temperature sensor
<b>Power supply</b>		
9	+24 V OUT	Power supply output 24 V DC, max. 200 mA
28	GND	Reference potential of the power supply/internal electronics ground
1	+10 V OUT	Power supply output 10 V DC $\pm$ 0.5 V, max. 10 mA
2	GND	Reference potential of the power supply/internal electronics ground
31	+24 V IN	Power supply input 18 ... 30 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Control Units

## Design

## CU240E-2, CU240E-2 DP, CU240E-2-F and CU240E-2 DP-F Control Units



CU240E-2 Control Unit with open and closed terminal covers

Terminal No.	Signal	Features
<b>Digital inputs (DI) – Standard</b>		
5 ... 8, 16, 17	DI0 ... DI5	Freely programmable (isolated) 5.5 mA/24 V
69	DI COM1	Reference potential for digital inputs 0, 2, 4, 6
34	DI COM2	Reference potential for digital inputs 1, 3, 5, 7
<b>Digital inputs (DI) – Fail-safe (formed from two standard inputs using the appropriate parameter setting)</b>		
16, 17	F-DI0	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
The following are only available for CU240E-2 F and CU240E-2 DP-F		
5, 6	F-DI1	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
7, 8	F-DI2	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
<b>Digital outputs (DO)</b>		
18	DO0, NC	Relay output DO0 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output DO0 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output DO0 Common contact (0.5 A, 30 V DC)
21	DO1+	Transistor output DO1 Positive (0.5 A, 30 V DC)
22	DO1-	Transistor output DO1 Negative (0.5 A, 30 V DC)
23	DO2, NC	Relay output DO2 NC contact (0.5 A, 30 V DC)
24	DO2, NO	Relay output DO2 NO contact (0.5 A, 30 V DC)
25	DO2, COM	Relay output DO2 Common contact (0.5 A, 30 V DC)

Terminal No.	Signal	Features
<b>Analog inputs (AI)</b>		
3	AI0+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
4	AI0-	
10	AI1+	Differential input, switchable between current, voltage Value range: 0 ... 10 V, -10 ... +10 V, 0/2 ... 10 V, 0/4 ... 20 mA
11	AI1-	
<b>Analog outputs (AO)</b>		
12	AO0+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
13	AO0-	Reference potential of the AO0/internal electronics ground
26	AO1+	Non-isolated output Freely programmable Value range: 0 ... 10 V; 0/4 ... 20 mA
27	AO1-	Reference potential of the AO1/internal electronics ground
<b>Motor temperature sensor interface</b>		
14	T1 motor	Positive input for motor temperature sensor Type: PTC, KTY sensor, Thermo-Click
15	T2 motor	Negative input for motor temperature sensor
<b>Power supply</b>		
9	+24 V OUT	Power supply output 24 V DC, max. 200 mA
28	GND	Reference potential of the power supply/internal electronics ground
1	+10 V OUT	Power supply output 10 V DC $\pm 0.5$ V, max. 10 mA
2	GND	Reference potential of the power supply/internal electronics ground
31	+24 V IN	Power supply input 18 ... 30 V DC, max. 1500 mA
32	GND IN	Reference potential of the power supply input

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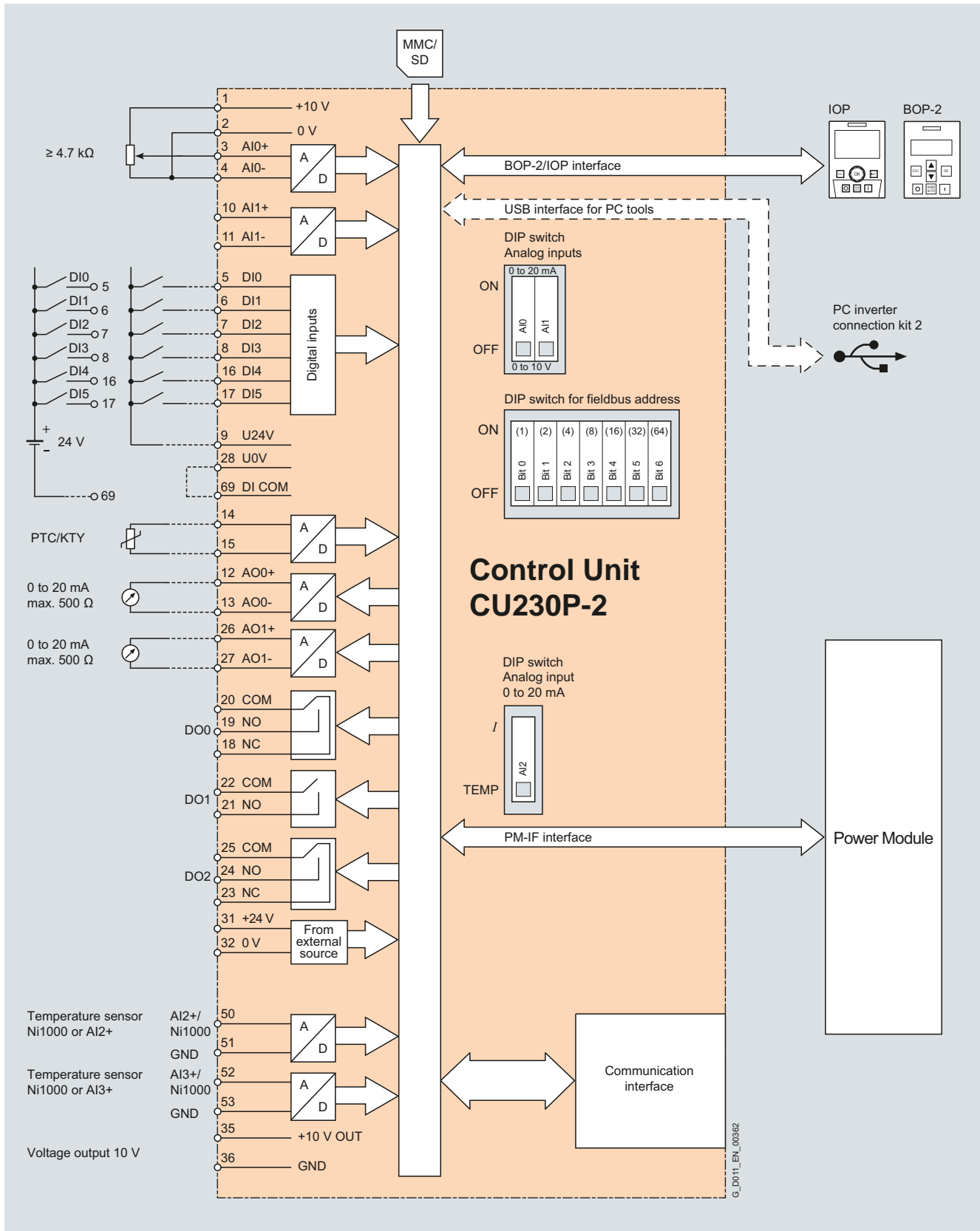
# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

## Control Units

### Integration

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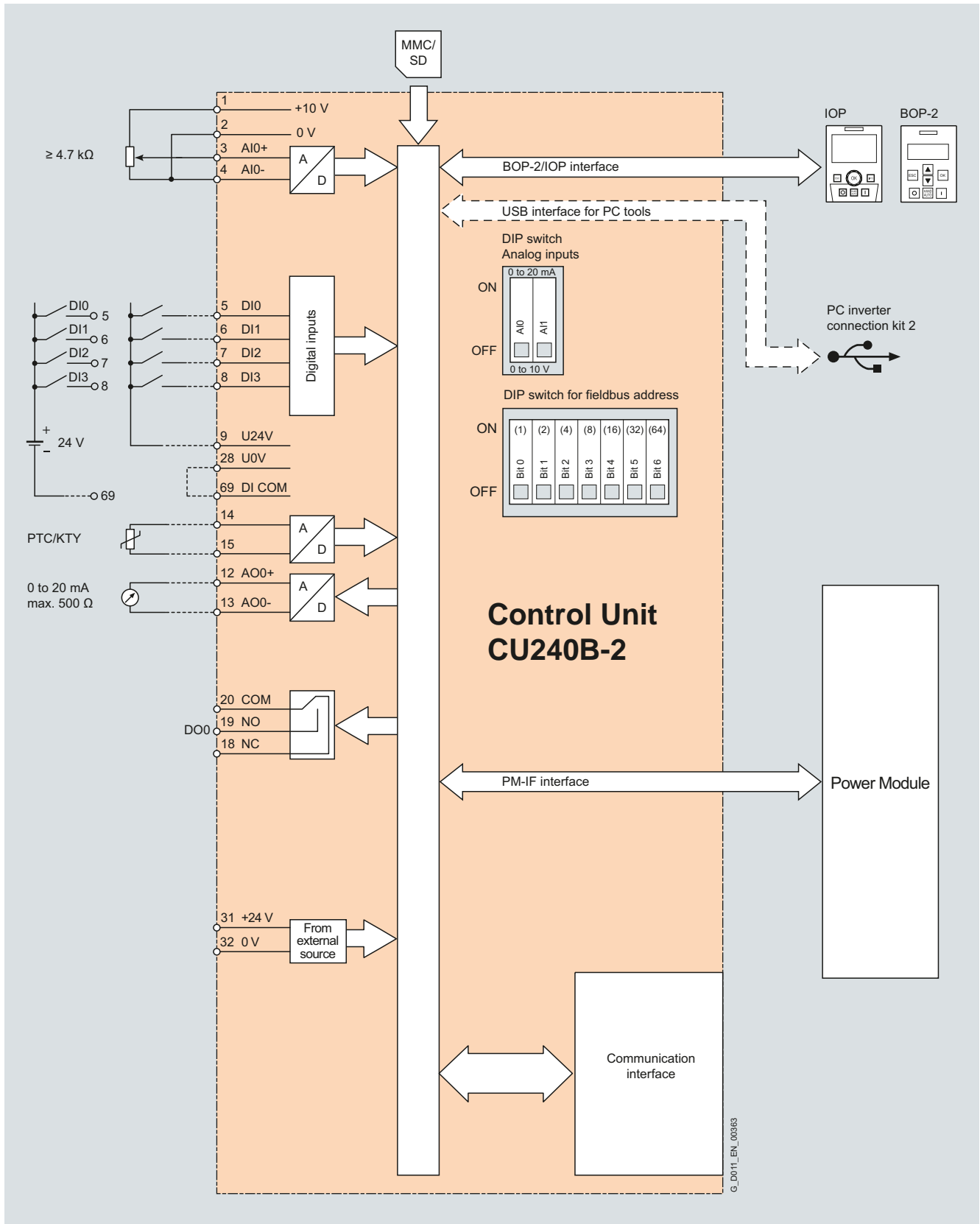
Connection diagram for the CU230P-2 Control Unit series

# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

Control Units

## Integration



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Connection diagram for the CU240B-2 Control Unit series

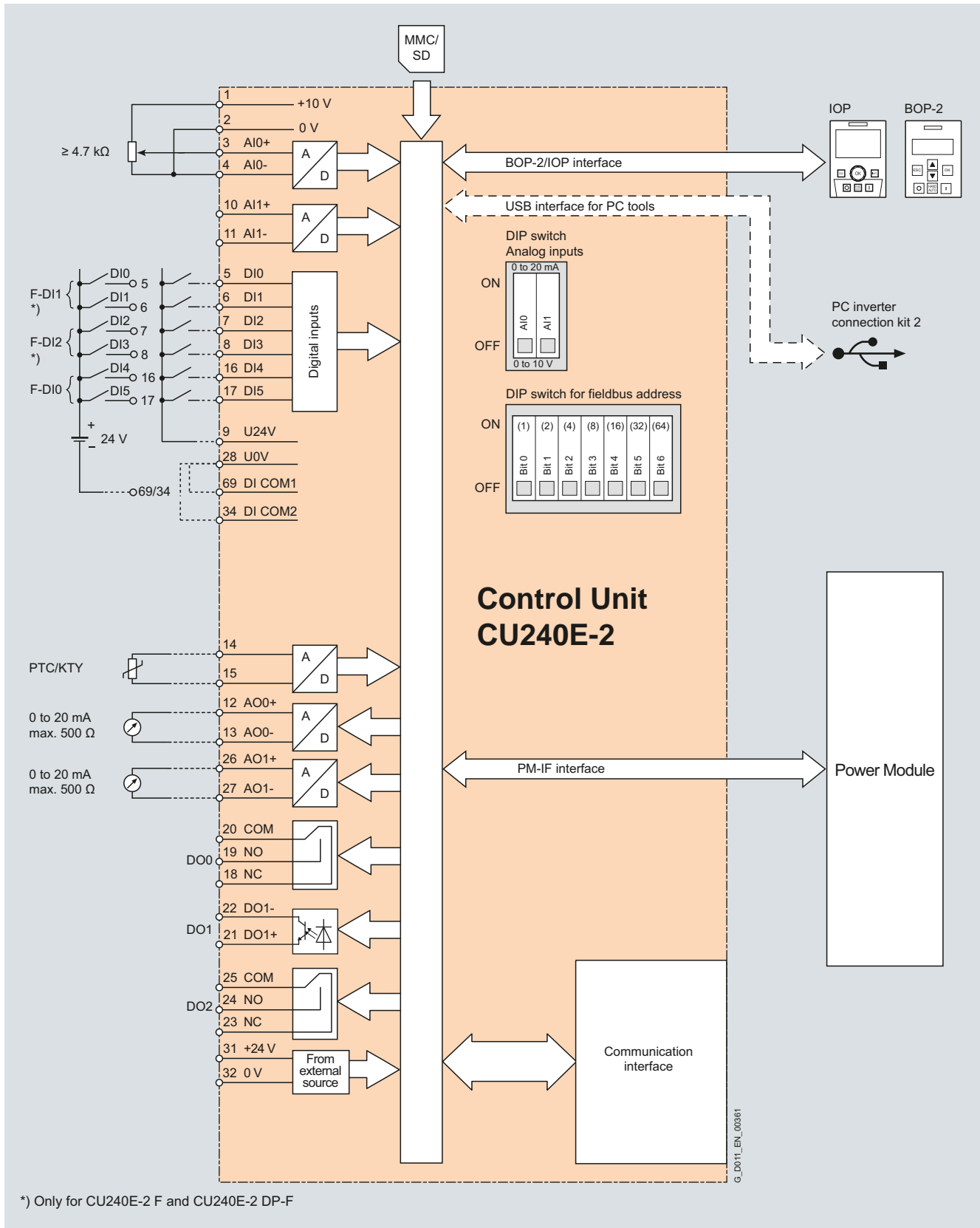
# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

## Control Units

### Integration

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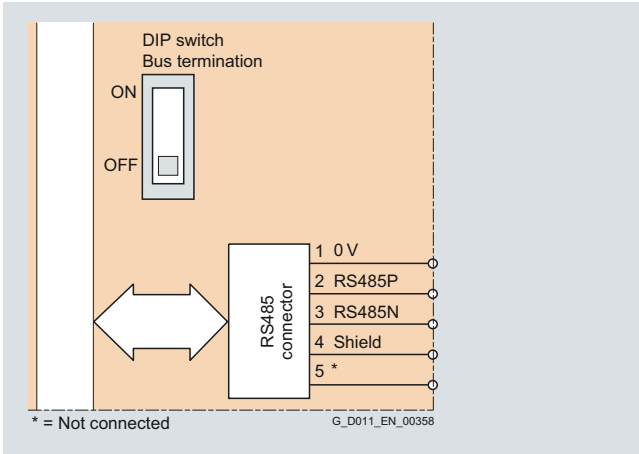
Connection diagram for the CU240E-2 Control Unit series

# SINAMICS G120 standard inverters

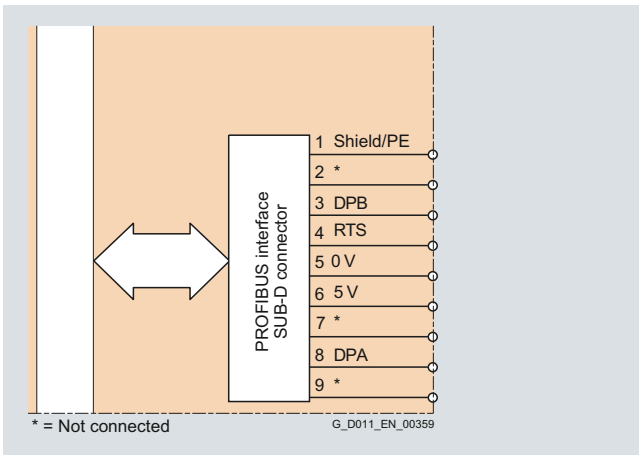
0.37 kW to 250 kW (0.5 hp to 400 hp)

Control Units

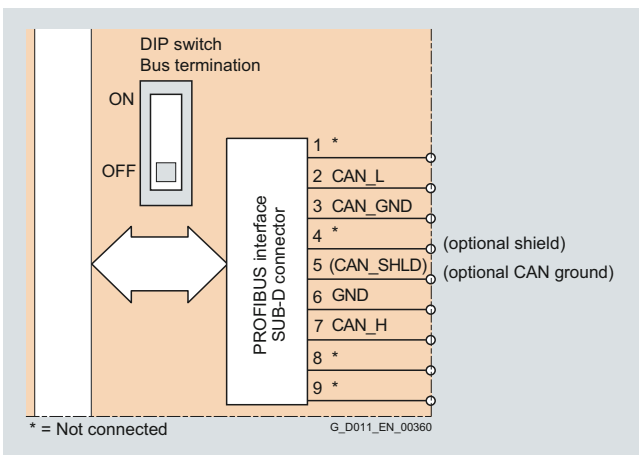
## Integration



Communication interface  
RS485 USS/Modbus RTU/BACnet MS/TP



Communication interface  
PROFIBUS DP



Communication interface  
CANopen

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# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A2	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1
<b>Electrical specifications</b>			
<b>Operating voltage</b>	24 V DC via the Power Module or by connecting to an external 18 ... 30 V DC power supply		
<b>Current consumption, max.</b>	0.5 A		
<b>Protective insulation</b>	PELV according to EN 50178 Protective separation from the line supply using double/reinforced insulation		
<b>Power loss</b>	<5.5 W		
<b>Interfaces</b>			
<b>Digital inputs – Standard</b>	6 isolated inputs Optically isolated, free reference potential (own potential group), max. input current 15 mA NPN/PNP logic can be selected using the wiring Switching level: 0 → 1: 11 V Switching level: 1 → 0: 5 V	4 isolated inputs	6 isolated inputs
<b>Digital inputs – Fail-safe</b>	–	–	1 (use of 2 × DI standard) Max. 3 (use of 6 × DI standard) for CU240E-2 F and CU240E-2 DP-F
<b>Digital outputs</b>	2 relay change-over contacts 250 V AC, 2 A (inductive load), 30 V DC, 5 A (ohmic load) 1 relay NO contact 30 V DC, 0.5 A (ohmic load)	1 transistor 30 V DC, 0.5 A (ohmic load)	1 transistor 30 V DC, 0.5 A (ohmic load) 2 relay change-over contacts 30 V DC, 0.5 A (ohmic load)
<b>Analog inputs – Standard</b>	2 differential inputs Switchable using DIP switch between voltage and current: -10 ... +10 V, 0/4 ... 20 mA, 10-bit resolution The differential analog inputs can be configured as additional digital inputs. Switching thresholds: 0 → 1: Rated voltage 4 V 1 → 0: Rated voltage 1.6 V Analog inputs are protected against inputs in a voltage range of ± 30 V and have a common-mode voltage in the ± 15 V range		1 differential input
<b>Analog inputs – Expanded</b>	1 non-isolated input, switchable using DIP switch between current and temperature sensor, type Ni1000/Pt1000, 0/4 ... 20 mA; 10-bit resolution 1 non-isolated input, temperature sensor, type Ni1000/Pt1000, 10-bit resolution	–	–
<b>Analog outputs</b>	2 non-isolated outputs Switchable between voltage and current using parameter setting: 0 ... 10 V, 0/4 ... 20 mA Voltage mode: 10 V, min. burden 10 kΩ Current mode: 20 mA, max. burden 500 Ω The analog outputs have short circuit protection		2 non-isolated outputs
<b>PTC/KTY interface</b>	1 motor temperature sensor input, sensors that can be connected: PTC, KTY and Thermo-Click, accuracy ±5 °C		
<b>Removable terminal connector for I/O interface</b>	–	✓	✓

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A2	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1
<b>Integrated bus interface</b>			
<b>USS/Modbus RTU</b> RS485 connected at a terminal, isolated, bus terminating resistors can be switched in, slave address can be set using DIP switches USS: max. 187.5 kBaud Modbus RTU: 19.2 kBaud	CU230P-2 HVAC 6SL3243-0BB30-1HA2	CU240B-2 6SL3244-0BB00-1BA1	CU240E-2 6SL3244-0BB12-1BA1  CU240E-2 F 6SL3244-0BB13-1BA1
<b>BACnet MS/TP</b> RS485 connected to a terminal, isolated, bus terminating resistors can be switched in Max. 187.5 kBaud	CU230P-2 HVAC 6SL3243-0BB30-1HA2	–	–
<b>PROFIBUS DP</b> 9-pin SUB-D connector, isolated, PROFIdrive profile V4.1, slave address can be set using DIP switches Max. 12 Mbit/s	CU230P-2 DP 6SL3243-0BB30-1PA2	CU240B-2 DP 6SL3244-0BB00-1PA1	CU240E-2 DP 6SL3244-0BB12-1PA1  CU240E-2 DP-F 6SL3244-0BB13-1PA1
<b>CANopen</b> 9-pin SUB-D socket, isolated, slave address can be set using DIP switches Max. 1 Mbit/s	CU230P-2 HVAC 6SL3243-0BB30-1CA2	–	–
<b>Tool interfaces</b>			
<b>Memory card</b>	1 SINAMICS micro memory card (MMC) or 1 SIMATIC memory card (SD card)		
<b>Operator panels</b>	<ul style="list-style-type: none"> <li>• IOP Supported connection options between CU230P-2 and IOP: can be directly plugged on, door mounting or handheld (IOP Handheld not possible in combination with PM230)</li> <li>• BOP-2 Supported connection options between CU230P-2 and BOP-2: can be directly plugged on or door-mounted</li> </ul>		
<b>PC interface</b>	USB (connection via PC inverter connection kit 2)		
<b>Open-loop/closed-loop control techniques</b>			
<b>V/f linear/square/parameterizable</b>	✓		
<b>V/f with flux current control (FCC)</b>	✓		
<b>V/f ECO linear/square</b>	✓		
<b>Vector control, sensorless</b>	✓		
<b>Vector control, with sensor</b>	–		
<b>Torque control, sensorless</b>	✓		
<b>Torque control, with sensor</b>	–		

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A2	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1
<b>Software functions</b>			
Application macro	✓		
Setpoint input, can be parameterized	✓		
Fixed frequencies	16, parameterizable		
JOG	✓		
Digital motorized potentiometer (MOP)	✓		
Ramp smoothing	✓		
Extended ramp-function generator (with ramp smoothing Off3)	✓		
Slip compensation	✓		
Signal interconnection with BICO technology	✓		
Trace	✓		
Energy saving display	✓		
Switchable drive data sets (DDS)	✓ (4)		
Switchable command data sets (CDS)	✓ (4)		
Free function blocks (FFB) for logical and arithmetic operations	✓		
Technology controller (internal PID)	✓		
3 additional, free PID controllers	✓	–	–
2-zone controller	✓	–	–
Flying restart	✓		
Automatic restart after line supply failure or operating fault (AR)	✓		
Energy-saving function (hibernation) with internal PID controller	✓	–	–
Energy-saving function (hibernation) with external PID controller	✓	–	–
Belt monitoring with and without sensor (load torque monitoring)	✓	–	–
Dry-running/overload protection monitoring (load torque monitoring)	✓	–	–
Thermal motor protection	✓ ( $I^2t$ , sensor: PTC/KTY/Thermo-Click)		
Thermal inverter protection	✓		
Motor identification	✓		
Motor holding brake	–	✓	✓
Auto-ramping ( $V_{dcmax}$ controller)	✓		
Kinetic buffering ( $V_{dcmin}$ controller)	✓		
<b>Braking functions for PM240</b>	✓		
<ul style="list-style-type: none"> <li>• DC braking</li> <li>• Compound braking</li> <li>• Dynamic braking with integrated braking chopper</li> </ul>			
<b>Braking functions for PM250/PM250-2</b> Regenerative feedback	✓		



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Control Units

#### Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A2	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1
<b>Mechanical specifications and ambient conditions</b>			
<b>Degree of protection</b>	IP20		
<b>Signal cable cross-section</b>			
• Min.	0.15 mm <sup>2</sup> (AWG28)	0.05 mm <sup>2</sup> (AWG30)	0.05 mm <sup>2</sup> (AWG30)
• Max.	1.5 mm <sup>2</sup> (AWG16)	1.5 mm <sup>2</sup> (AWG16)	1.5 mm <sup>2</sup> (AWG16)
<b>Operating temperature</b>	0 ... 60 °C (32 ... 140 °F)	0 ... 50 °C (32 ... 122 °F)	0 ... 50 °C (32 ... 122 °F)
<b>Storage temperature</b>	-40 ... +70 °C (-40 ... +158 °F)		
<b>Relative humidity</b>	<95 % RH, condensation not permissible		
<b>Dimensions</b>			
• Width	73 mm (2.87 in)	73 mm (2.87 in)	73 mm (2.87 in)
• Height	199 mm (7.83 in)	199 mm (7.83 in)	199 mm (7.83 in)
• Depth	65.5 mm (2.58 in)	46 mm (1.81 in)	46 mm (1.81 in)
<b>Weight, approx.</b>	0.61 kg (1.35 lb)	0.49 kg (1.08 lb)	0.49 kg (1.08 lb)

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Overview

**PM230 Power Modules – 0.37 kW to 90 kW (0.5 hp to 125 hp), IP54/IP55 degree of protection**



PM230 Power Modules, frame sizes FSA to FSF

PM230 Power Modules are designed for applications involving pumps, fans and compressors. They do not have an integrated braking chopper (single-quadrant applications).

The PM230 Power Module only generates low line harmonics and apparent power losses. In addition to the energy-related advantages, environmental stressing is also reduced.

- Line harmonics are reduced significantly.
  - The harmonics and the THD (Total Harmonic Distortion) are below the limits required by the EN 61000-3-12 or IEC 61000-3-12 standards.
  - Additional components such as line reactors are not required. As a consequence, low envelope dimensions are obtained for space-saving designs.
- The active power component is very high, i.e. the devices draw less current from the supply for the same drive power. As a consequence, smaller supply cables can be used.

Frame sizes FSA to FSF of the PM230 Power Module in the degree of protection IP55/UL Type 12 are available with integrated line filter class A for C2 installations or integrated line filter class B for C1 installations.

In order to maintain EMC categories C2 (line filter A) or C1 table 14 (line filter B, conducted), the permissible shielded cable length between the inverter and motor is limited to max. 25 m (82 ft).

The line system configurations that are supported are symmetrical systems with grounded neutral point.

The PM230 Power Module is not approved for safety-oriented applications.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Overview

**PM240 Power Modules – 0.37 kW to 250 kW (0.5 hp to 400 hp), IP20 degree of protection**



PM240 Power Modules, frame sizes FSA to FSGX

PM240 Power Modules have a braking chopper (four-quadrant applications) and are suitable for a large number of applications in general machinery construction.

The braking chopper is already integrated in frame sizes FSA up to FSF. For frame size FSGX, an optional pluggable Braking Module can be ordered ([see DC link components](#)).

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected ([see load-side power components](#)).

Line reactors are available to minimize line harmonics as well as voltage and current peaks ([see line-side components](#)).

Frame size FSA of the PM240 Power Module is available only without integrated line filter class A. A base filter is therefore available so that class A can be achieved. A class B base filter is also available so that class B can be achieved ([see line-side components](#)).

Frame sizes FSB and FSC of the PM240 Power Module are available both with and without integrated line filter to class A. To achieve class B, PM240 Power Modules with integrated line filter class A must be additionally equipped with a base filter class B ([see line-side components](#)).

The PM240 Power Module is suitable for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated drive ([see Control Units](#)).

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

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Overview

**PM250 Power Modules – 7.5 kW to 75 kW (10 hp to 100 hp), IP20 degree of protection**



PM250 Power Modules, frame sizes FSC to FSF

PM250 Power Modules are suitable for many applications in general machinery construction, the same as for the PM240. Any braking energy is directly fed back into the line supply (four quadrant applications – a braking chopper is not required).

The PM250 Power Module features an absolutely unique technology – Efficient Infeed Technology. This feature provides the ability to feed energy back into the supply system in the generator mode (electronic braking) so that the energy is not wasted in a braking resistor. This saves space in the control cabinet. The time-consuming process of dimensioning the braking resistor and the expense of the extra wiring are eliminated. Furthermore, heat losses in the control cabinet are reduced.

[Additional information is included in the chapter Highlights, section Efficient Infeed Technology.](#)

Further, the innovative circuit design reduces the line harmonics. There is no need to use an optional line reactor at the supply infeed. This saves space and costs for engineering and procurement.

The permissible cable lengths between inverter and motor are limited. Longer cables can be used if output reactors are connected ([see load-side power components](#)).

Frame sizes FSD to FSF of the PM250 Power Modules are available both with as well as without integrated line filter class A.

For frame size FSC of the PM250 Power Module with an integrated line filter class A, an additional base filter class B is available for achieving class B ([see line-side components](#)).

The PM250 Power Module is also designed for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated drive ([see Control Units](#)).

The PM250 Power Modules with integrated line filter class A are suitable for connection to TN supply systems. Power Modules without integrated line filter can be connected to grounded TN/TT systems and non-grounded IT systems.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Overview

**PM260 Power Modules – 11 kW to 55 kW (15 hp to 75 hp), IP20 degree of protection**



PM260 Power Module, frame size FSD

PM260 Power Modules have been designed for applications from 500 V to 690 V. They are capable of energy recovery and include a sine-wave filter to reduce the stress on the motor and for long cable lengths.

The PM260 Power Module features an absolutely unique technology – Efficient Infeed Technology. This feature provides the ability to feed energy back into the supply system in the generator mode (electronic braking) so that the energy is not wasted in a braking resistor. This saves space in the control cabinet. The time-consuming process of dimensioning the braking resistor and the expense of the extra wiring are eliminated. Furthermore, heat losses in the control cabinet are reduced.

Additional information is included in the chapter Highlights, section Efficient Infeed Technology.

The innovative circuit design used in Efficient Infeed Technology reduces the line harmonics. There is no need to use an optional line reactor at the supply infeed. This saves space and costs for engineering and procurement.

The PM260 Power Modules are also characterized by a higher rated pulse frequency combined with a high efficiency and an integrated sine-wave filter. The integrated sine-wave filter ensures that the inverter output current is sinusoidal and supports cable lengths of up to 200 m (656 ft) shielded and 300 m (984 ft) unshielded. An output reactor is therefore not required. Furthermore, lower bearing currents flow and there is a lower voltage stress that reduces the overall stress on the motor.

The use of SiC free-wheeling diodes – an absolutely unique innovation – makes the PM260 Power Module extremely compact. It is also highly resistant to thermal loading and operates very quietly as a result of the high clock frequencies.

Standard motors can be used in conjunction with the PM260 Power Module. The winding system insulation strength does not have to be increased.

The PM260 Power Module is suitable for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated drive (see Control Units).

The PM260 Power Modules with integrated line filter class A are suitable for connection to TN supply systems. Power Modules without integrated line filter can be connected to grounded TN/TT systems and non-grounded IT systems.

#### Customer benefits

- Low switching losses at high fundamental frequency
- High speeds possible
- Quiet operation thanks to the 16 kHz pulse frequency
- High thermal load capacity (small heat sinks)
- Very compact units
- Increased ruggedness
- High efficiency
- Low forward losses
- Integrated sine-wave filter, so that long unshielded cables can be used
- Can be used with motors without a special insulation
- Very low bearing currents, no bearing insulation required

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Selection and ordering data

To ensure that a suitable Power Module is selected, the following currents should be used for applications:

- **Rated output current for applications with low overload (LO)**
- **Base load current for applications with high overload (HO)**

With reference to the rated output current, the modules support at least 2-pole to 6-pole low-voltage motors, e.g. the new 1LE1 motor series. The rated power is merely a guide value. For a description of the overload performance, please refer to the general technical specifications of the Power Modules.

#### PM230 Power Modules

Rated power <sup>1)</sup>		Rated output current $I_{rated}$ <sup>2)</sup> A	Power based on the base load current <sup>3)</sup>		Base load current $I_H$ <sup>3)</sup> A	Frame size	PM230 Power Module with integrated line filter class A	PM230 Power Module with integrated line filter class B
kW	hp		kW	hp			Order No.	Order No.
<b>380 ... 480 V 3 AC</b>								
0.37	0.5	1.3	0.25	0.33	0.9	FSA	6SL3223-0DE13-7AA0	6SL3223-0DE13-7BA0
0.55	0.75	1.7	0.37	0.5	1.3	FSA	6SL3223-0DE15-5AA0	6SL3223-0DE15-5BA0
0.75	1.0	2.2	0.55	0.75	1.7	FSA	6SL3223-0DE17-5AA0	6SL3223-0DE17-5BA0
1.1	1.5	3.1	0.75	1.0	2.2	FSA	6SL3223-0DE21-1AA0	6SL3223-0DE21-1BA0
1.5	2.0	4.1	1.1	1.5	3.1	FSA	6SL3223-0DE21-5AA0	6SL3223-0DE21-5BA0
2.2	3.0	5.9	1.5	2.0	4.1	FSA	6SL3223-0DE22-2AA0	6SL3223-0DE22-2BA0
3.0	4.0	7.7	2.2	3.0	5.9	FSA	6SL3223-0DE23-0AA0	6SL3223-0DE23-0BA0
4.0	5.0	10.2	3.0	4.0	7.7	FSB	6SL3223-0DE24-0AA0	6SL3223-0DE24-0BA0
5.5	7.5	13.2	4.0	5.0	10.2	FSB	6SL3223-0DE25-5AA0	6SL3223-0DE25-5BA0
7.5	10	18	5.5	7.5	13.2	FSB	6SL3223-0DE27-5AA0	6SL3223-0DE27-5BA0
11.0	15	26	7.5	10	18	FSC	6SL3223-0DE31-1AA0	6SL3223-0DE31-1BA0
15.0	20	32	11.0	15	26	FSC	6SL3223-0DE31-5AA0	6SL3223-0DE31-5BA0
18.5	25	38	15.0	20	32	FSC	6SL3223-0DE31-8AA0	–
						FSD	–	6SL3223-0DE31-8BA0
22	30	45	18.5	25	38	FSD	6SL3223-0DE32-2AA0	6SL3223-0DE32-2BA0
30	40	60	22	30	45	FSD	6SL3223-0DE33-0AA0	6SL3223-0DE33-0BA0
37	50	75	30	40	60	FSE	6SL3223-0DE33-7AA0	6SL3223-0DE33-7BA0
45	60	90	37	50	75	FSE	6SL3223-0DE34-5AA0	6SL3223-0DE34-5BA0
55	75	110	45	60	90	FSF	6SL3223-0DE35-5AA0	6SL3223-0DE35-5BA0
75	100	145	55	75	110	FSF	6SL3223-0DE37-5AA0	6SL3223-0DE37-5BA0
90	125	178	75	100	145	FSF	6SL3223-0DE38-8AA0	6SL3223-0DE38-8BA0

#### PM250 Power Modules

Rated power <sup>1)</sup>		Rated output current $I_{rated}$ <sup>2)</sup> A	Power based on the base load current <sup>3)</sup>		Base load current $I_H$ <sup>3)</sup> A	Frame size	PM250 Power Module without integrated line filter	PM250 Power Module with integrated line filter class A
kW	hp		kW	hp			Order No.	Order No.
<b>380 ... 480 V 3 AC</b>								
7.5	10	18	5.5	7.5	13.2	FSC	–	6SL3225-0BE25-5AA1
11.0	15	25	7.5	10	19	FSC	–	6SL3225-0BE27-5AA1
15.0	20	32	11.0	15	26	FSC	–	6SL3225-0BE31-1AA1
18.5	25	38	15.0	20	32	FSD	6SL3225-0BE31-5UA0	6SL3225-0BE31-5AA0
22	30	45	18.5	25	38	FSD	6SL3225-0BE31-8UA0	6SL3225-0BE31-8AA0
30	40	60	22	30	45	FSD	6SL3225-0BE32-2UA0	6SL3225-0BE32-2AA0
37	50	75	30	40	60	FSE	6SL3225-0BE33-0UA0	6SL3225-0BE33-0AA0
45	60	90	37	50	75	FSE	6SL3225-0BE33-7UA0	6SL3225-0BE33-7AA0
55	75	110	45	60	90	FSF	6SL3225-0BE34-5UA0	6SL3225-0BE34-5AA0
75	100	145	55	75	110	FSF	6SL3225-0BE35-5UA0	6SL3225-0BE35-5AA0
90	125	178	75	100	145	FSF	6SL3225-0BE37-5UA0	6SL3225-0BE37-5AA0

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

<sup>2)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

<sup>3)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

## Selection and ordering data

## PM240 Power Modules

Rated power <sup>1)</sup>		Rated output current $I_{rated}$ <sup>2)</sup> A	Power based on the base load current <sup>3)</sup>		Base load current $I_H$ <sup>3)</sup> A	Frame size	PM240 Power Module without integrated line filter	PM240 Power Module with integrated line filter class A
kW	hp		kW	hp			Order No.	Order No.
<b>380 ... 480 V 3 AC</b>								
0.37	0.50	1.3	0.37	0.50	1.3	FSA	6SL3224-0BE13-7UA0	–
0.55	0.75	1.7	0.55	0.75	1.7	FSA	6SL3224-0BE15-5UA0	–
0.75	1.0	2.2	0.75	1.0	2.2	FSA	6SL3224-0BE17-5UA0	–
1.1	1.5	3.1	1.1	1.5	3.1	FSA	6SL3224-0BE21-1UA0	–
1.5	2.0	4.1	1.5	2.0	4.1	FSA	6SL3224-0BE21-5UA0	–
2.2	3.0	5.9	2.2	3.0	5.9	FSB	6SL3224-0BE22-2UA0	6SL3224-0BE22-2AA0
3.0	4.0	7.7	3.0	4.0	7.7	FSB	6SL3224-0BE23-0UA0	6SL3224-0BE23-0AA0
4.0	5.0	10.2	4.0	5.0	10.2	FSB	6SL3224-0BE24-0UA0	6SL3224-0BE24-0AA0
7.5	10	18	5.5	7.5	13.2	FSC	6SL3224-0BE25-5UA0	6SL3224-0BE25-5AA0
11.0	15	25	7.5	10	19	FSC	6SL3224-0BE27-5UA0	6SL3224-0BE27-5AA0
15.0	20	32	11.0	15	26	FSC	6SL3224-0BE31-1UA0	6SL3224-0BE31-1AA0
18.5	25	38	15.0	20	32	FSD	6SL3224-0BE31-5UA0	6SL3224-0BE31-5AA0
22	30	45	18.5	25	38	FSD	6SL3224-0BE31-8UA0	6SL3224-0BE31-8AA0
30	40	60	22	30	45	FSD	6SL3224-0BE32-2UA0	6SL3224-0BE32-2AA0
37	50	75	30	40	60	FSE	6SL3224-0BE33-0UA0	6SL3224-0BE33-0AA0
45	60	90	37	50	75	FSE	6SL3224-0BE33-7UA0	6SL3224-0BE33-7AA0
55	75	110	45	60	90	FSF	6SL3224-0BE34-5UA0	6SL3224-0BE34-5AA0
75	100	145	55	75	110	FSF	6SL3224-0BE35-5UA0	6SL3224-0BE35-5AA0
90	125	178	75	100	145	FSF	6SL3224-0BE37-5UA0	6SL3224-0BE37-5AA0
110	150	205	90	125	178	FSF	6SL3224-0BE38-8UA0	–
132	200	250	110	150	205	FSF	6SL3224-0BE41-1UA0	–
160	250	302	132	200	250	FSGX	6SL3224-0XE41-3UA0	–
200	300	370	160	250	302	FSGX	6SL3224-0XE41-6UA0	–
250	400	477	200	300	370	FSGX	6SL3224-0XE42-0UA0	–

## PM260 Power Modules

Rated power <sup>1)</sup>		Rated output current $I_{rated}$ <sup>4)</sup> A	Power based on the base load current <sup>3)</sup>		Base load current $I_H$ <sup>3)</sup> A	Frame size	PM260 Power Module without integrated line filter	PM260 Power Module with integrated line filter class A
kW	hp		kW	hp			Order No.	Order No.
<b>500 ... 690 V 3 AC</b>								
11.0	15	14	7.5	10	10	FSD	6SL3225-0BH27-5UA1	6SL3225-0BH27-5AA1
15.0	20	19	11	15	14	FSD	6SL3225-0BH31-1UA1	6SL3225-0BH31-1AA1
18.5	25	23	15	20	19	FSD	6SL3225-0BH31-5UA1	6SL3225-0BH31-5AA1
30	40	35	22	30	26	FSF	6SL3225-0BH32-2UA1	6SL3225-0BH32-2AA1
37	50	42	30	40	35	FSF	6SL3225-0BH33-0UA1	6SL3225-0BH33-0AA1
55	75	62	37	50	42	FSF	6SL3225-0BH33-7UA1	6SL3225-0BH33-7AA1

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

<sup>2)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

<sup>3)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>4)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO). These current values are valid for 690 V and are specified on the rating plate of the Power Module.

# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

## Power Modules

### Integration

All Power Modules have the following connections and interfaces:

- PM-IF interface to connect the Power Module to the Control Unit. The Power Module also supplies power to the Control Unit using an integrated power supply
- Motor connection using screw terminals or screw studs
- 2 PE/protective conductor connections

Specific PM240 Power Module interfaces are:

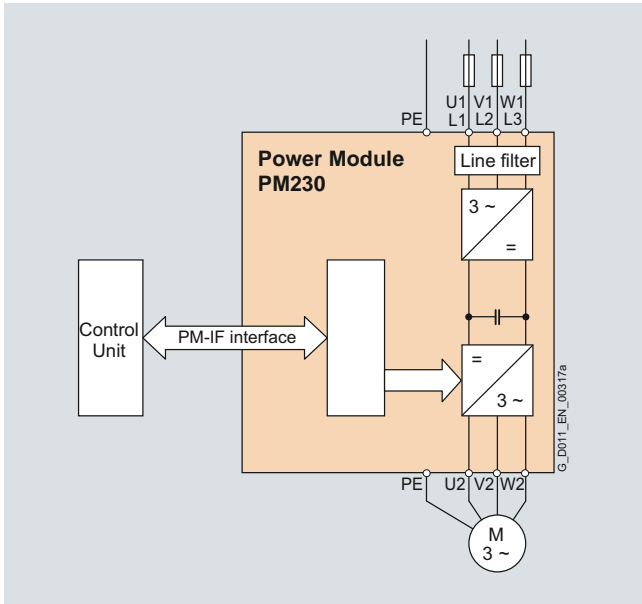
- Terminals DCP/R1 and R2 to connect an external braking resistor, applicable for frame sizes FSA to FSF. For frame size FSGX, an external plug-in braking unit (Braking Module) is required to connect a braking resistor

- Control for the Brake Relay for controlling a motor brake

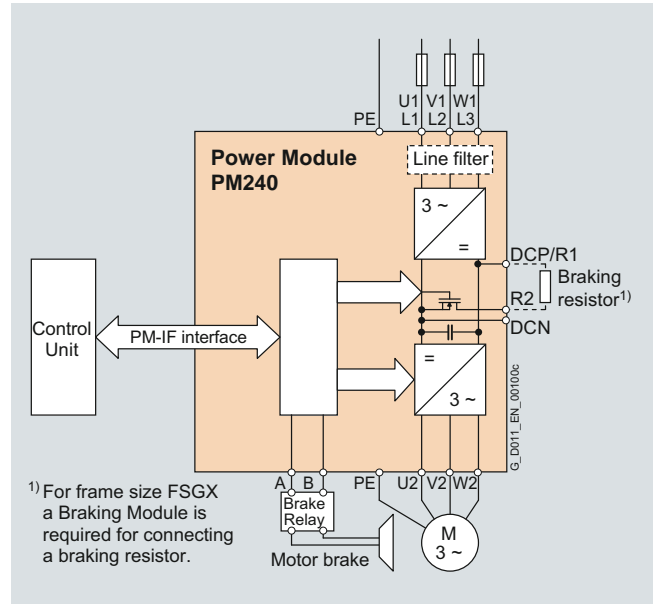
Specific PM250 and PM260 Power Module interface is:

- Control for the Brake Relay for controlling a motor brake

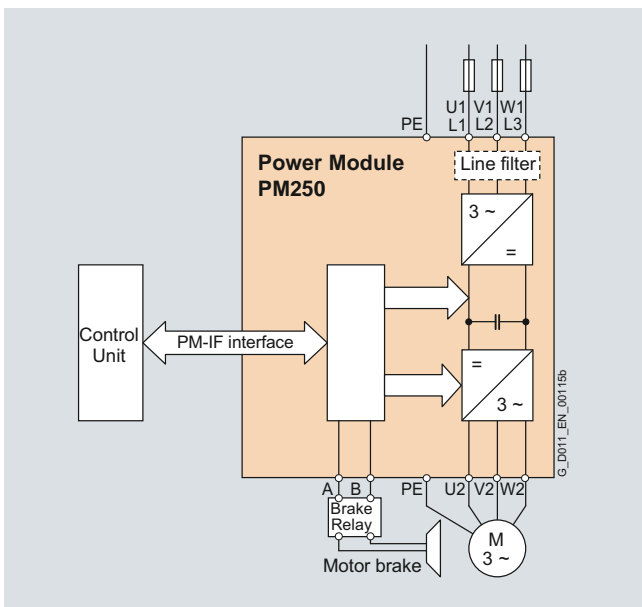
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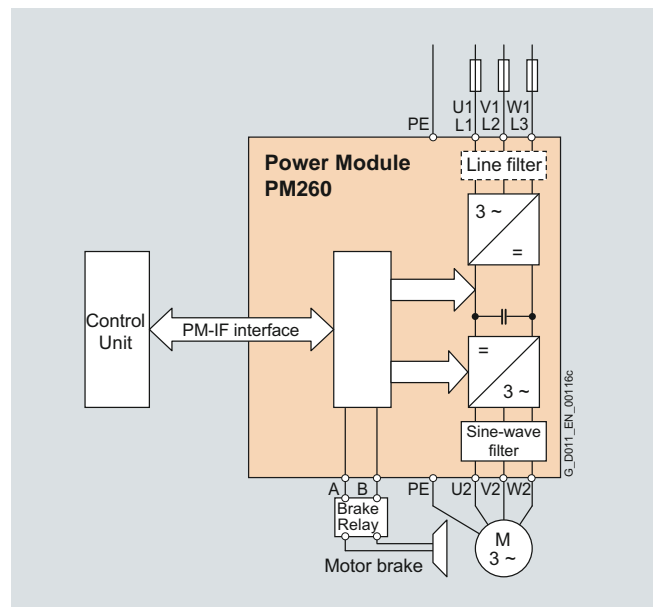
PM230 Power Module connection diagram with integrated line filter class A or B



PM240 Power Module connection diagram with or without integrated line filter class A



PM250 Power Module connection diagram with or without integrated line filter class A



PM260 Power Module connection diagram with or without integrated line filter class A



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Integration

#### Power and DC link components that are optionally available depending on the Power Module used

The following line-side power components, DC link components and load-side power components are optionally available in the appropriate frames sizes for the Power Modules:

	Frame size						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM230 Power Module (IP54/IP55)</b>							
Line filter class A	I	I	I	I	I	I	I
Line filter class B	I	I	I	I	I	I	I
<b>PM240 Power Module with integrated braking chopper</b>							without integrated braking chopper
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>Line-side power components</b>							
Line filter class A	U	F	F	F	F	F/S <sup>3)</sup>	S <sup>3)</sup>
Line filter class B	U	U	U	–	–	–	–
Line reactor	U	U	U	U	U	S	S
<b>DC link components</b>							
Braking resistor	U	U	S	S	S	S	S
Braking Module	–	–	–	–	–	–	I (option)
<b>Load-side power components</b>							
Output reactor	U	U	U	S	S	S	S
Sine-wave filter	U	U	U	S	S	S	S
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	–	–	✓	✓	✓	✓	–
<b>Line-side power components</b>							
Line filter class A	–	–	I	F	F	F	–
Line filter class B	–	–	U	–	–	–	–
Line reactor <sup>1)</sup>	–	–	– <sup>1)</sup>	– <sup>1)</sup>	– <sup>1)</sup>	– <sup>1)</sup>	–
<b>DC link components</b>							
Braking resistor <sup>2)</sup>	–	–	– <sup>2)</sup>	– <sup>2)</sup>	– <sup>2)</sup>	– <sup>2)</sup>	–
<b>Load-side power components</b>							
Output reactor	–	–	U	S	S	S	–
Sine-wave filter	–	–	U	S	S	S	–
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	–	–	–	✓	–	✓	–
<b>Line-side power components</b>							
Line filter class A	–	–	–	F	–	F	–
Line filter class B	–	–	–	–	–	–	–
Line reactor <sup>1)</sup>	–	–	–	– <sup>1)</sup>	–	– <sup>1)</sup>	–
<b>DC link components</b>							
Braking resistor <sup>2)</sup>	–	–	–	– <sup>2)</sup>	–	– <sup>2)</sup>	–
<b>Load-side power components</b>							
Output reactor	–	–	–	–	–	–	–
Sine-wave filter	–	–	–	I	–	I	–

U = Base component

S = Lateral mounting

I = Integrated

– = Not possible

F = Power Modules available with and without integrated filter class A

<sup>1)</sup> A line reactor is not required and must not be used in conjunction with a Power Module of type PM250 or PM260.

<sup>2)</sup> PM250 and PM260 Power Modules are capable of line-commutated energy feedback. A braking resistor cannot be connected and is not necessary.

<sup>3)</sup> PM240 FSF Power Modules from 110 kW and higher and FSGX, are available only without an integrated filter class A. An optional line filter class A for lateral mounting is available instead.

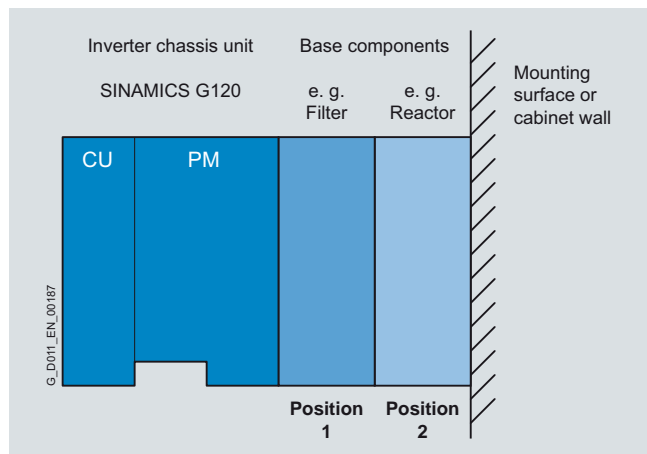
# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Integration

##### General design information



- A maximum of two base components plus inverter are possible.
- If at all possible, the line filter should be mounted directly below the inverter (position 1).
- With lateral mounting, the line-side components have to be mounted on the left side of the inverter, and the load-side components on the right side.
- Braking resistors have to be mounted directly on the control cabinet wall due to heating issues.
- This mounting type is always used for the PM240 and PM250 built-in units.

6

Inverter comprising a Power Module (PM) and a Control Unit (CU) and two base components at position 1 and position 2 (side view)

##### Recommended installation combinations of the inverter and optional power and DC link components

Power Module Frame size	Base		Lateral mounting	
	Position 1	Position 2	Left of the inverter (for line-side power components)	Right of the inverter (for load-side power components and DC link components)
FSA	Line filter	Line reactor	–	Output reactor or sine-wave filter and/or braking resistor
	Line filter or line reactor	Output reactor or sine-wave filter	–	Braking resistor
	Line filter or line reactor	Braking resistor	–	–
	Line filter or line reactor or braking resistor	–	–	–
FSA and FSB	Line filter	Line reactor	–	Output reactor or sine-wave filter and/or braking resistor
	Line filter or line reactor	Output reactor	–	Braking resistor
	Line filter or line reactor	Braking resistor	–	–
	Line filter or line reactor or braking resistor or sine-wave filter	–	–	–
FSC	Line filter	Line reactor	–	Output reactor or sine-wave filter and/or braking resistor
	Line filter or line reactor	Output reactor	–	Braking resistor
FSD and FSE	Line reactor	–	Line filter	Output reactor or sine-wave filter and/or braking resistor
FSF	–	–	Line filter and/or line reactor	Output reactor or sine-wave filter and/or braking resistor
FSGX	–	–	Line filter and/or line reactor	Output reactor or sine-wave filter and/or braking resistor

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Integration

**Maximum permissible cable lengths from the motor to the inverter when using output reactors or sine-wave filters depending on the voltage range and the Power Module being used**

The following load-side power components in the appropriate frame sizes are optionally available for the Power Modules and result in the following maximum cable lengths:

Frame size	Maximum permissible motor cable lengths (shielded/unshielded) in m (ft)						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM240 Power Module with integrated braking chopper</b>							<b>without integrated braking chopper</b>
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>Without output reactor/sine-wave filter</b>	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	100/100 (328/328)	150/150 (492/492)	300/450 (984/1476)
<b>With optional output reactor</b>							
• At 380 -10 % ... 400 V 3 AC	150/225 (492/738)	150/225 (492/738)	150/225 (492/738)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/340 (984/1116)
• At 401 ... 480 V 3 AC +10 %	100/150 (328/492)	100/150 (328/492)	100/150 (328/492)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/340 (984/1116)
<b>With optional sine-wave filter</b>							
• At 380 -10 % ... 400 V 3 AC	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/340 (984/1116)
• At 401 ... 480 V 3 AC +10 %	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	300/340 (984/1116)
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	–	–	✓	✓	✓	✓	–
<b>Without output reactor/sine-wave filter</b>	–	–	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	–
<b>With optional output reactor</b>							
• At 380 -10 % ... 400 V 3 AC	–	–	150/225 (492/738)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
• At 401 ... 480 V 3 AC +10 %	–	–	100/150 (328/492)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
<b>With optional sine-wave filter</b>							
• At 380 -10 % ... 400 V 3 AC	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
• At 401 ... 480 V 3 AC +10 %	–	–	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	200/300 (656/984)	–
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	–	–	–	✓	–	✓	–
<b>With integrated sine-wave filter</b>							
• At 500 ... 690 V 3 AC ±10 %	–	–	–	200/300 (656/984)	–	200/300 (656/984)	–

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

##### General technical specifications

Power Modules	PM230	PM240	PM250	PM260
<b>System operating voltage</b>	380 ... 480 V 3 AC $\pm 10\%$	380 ... 480 V 3 AC $\pm 10\%$	380 ... 480 V 3 AC $\pm 10\%$	500 ... 690 V 3 AC $\pm 10\%$ For operation with 500 V -10 % linearly reduced – <a href="#">see derating characteristics</a>
<b>Line supply requirements</b> <b>Line short circuit voltage <math>u_K</math></b>	$u_K < 1\%$ or $R_{sc} > 100$	For $u_K < 1\%$ , a line reactor is recommended	$u_K < 1\%$	$u_K < 1\%$
<b>Input frequency</b>	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz
<b>Output frequency</b>				
• Control type V/f	0 ... 650 Hz	0 ... 650 Hz	0 ... 650 Hz	0 ... 200 Hz
• Control type Vector	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz	0 ... 200 Hz
<b>Pulse frequency</b>	4 kHz Higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>	Up to 75 kW HO: 4 kHz From 90 kW HO: 2 kHz Higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>	4 kHz (standard) Higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>	16 kHz (standard)
<b>Power factor</b>	0.9	0.7 ... 0.85	0.9	0.95
<b>cos <math>\varphi</math></b>	0.95	0.95	1.05	1.05
<b>Inverter efficiency</b>	86 ... 98 %	95 ... 98 %	95 ... 97 %	95 ... 97 %
<b>Output voltage, max.</b>	0 ... 95 % of input voltage	0 ... 95 % of input voltage	0 ... 87 % of input voltage	0 ... 87 % of input voltage
<b>Overload capability</b>				
• Low overload (LO)	1.1 x rated output current (i.e. 110 % overload) for 57 s with a cycle time of 300 s 1.5 x rated output current (i.e. 150 % overload) for 3 s with a cycle time of 300 s	1.1 x rated output current (i.e. 110 % overload) for 57 s with a cycle time of 300 s 1.5 x rated output current (i.e. 150 % overload) for 3 s with a cycle time of 300 s	1.1 x rated output current (i.e. 110 % overload) for 57 s with a cycle time of 300 s 1.5 x rated output current (i.e. 150 % overload) for 3 s with a cycle time of 300 s	1.1 x rated output current (i.e. 110 % overload) for 57 s with a cycle time of 300 s 1.4 x rated output current (i.e. 140 % overload) for 3 s with a cycle time of 300 s
• High overload (HO)	1.5 x rated output current (i.e. 150 % overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200 % overload) for 3 s with a cycle time of 300 s	Up to 75 kW (HO): 1.5 x rated output current (i.e. 150 % overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200 % overload) for 3 s with a cycle time of 300 s From 90 kW (HO): 1.36 x rated output current (i.e. 136 % overload) for 57 s with a cycle time of 300 s 1.6 x rated output current (i.e. 160 % overload) for 3 s with a cycle time of 300 s	1.5 x rated output current (i.e. 150 % overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200 % overload) for 3 s with a cycle time of 300 s	1.5 x rated output current (i.e. 150 % overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200 % overload) for 3 s with a cycle time of 300 s
<b>Electromagnetic compatibility</b>	Integrated line filter class A or B acc. to EN 61800-3 C2 and EN 61800-3 C1 Table 14	Optional line filter class A or B acc. to EN 55011 is available	Optional line filter class A or B acc. to EN 55011 is available	Optional line filter class A acc. to EN 55011 is available
<b>Possible braking methods</b>	DC braking	DC braking Compound braking Dynamic braking with integrated braking chopper (optional for frame size FSGX)	Regenerative feedback in generator mode	Regenerative feedback in generator mode
<b>Degree of protection</b>	IP55/UL Type 12	IP20	IP20	IP20

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

#### General technical specifications

Power Modules	PM230	PM240	PM250	PM260
<b>Operating temperature</b>				
• Low overload (LO)	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) <a href="#">see derating characteristics</a>	Frame sizes FSA to FSF: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) <a href="#">see derating characteristics</a>  Frame size FSGX: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 55 °C (>104 ... 131 °F) <a href="#">see derating characteristics</a>	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) <a href="#">see derating characteristics</a>	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) <a href="#">see derating characteristics</a>
• High overload (HO)	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) <a href="#">see derating characteristics</a>	Frame sizes FSA to FSF: 0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) <a href="#">see derating characteristics</a>  Frame size FSGX: 0 ... 40 °C (32 ... 104 °F) without derating >40 ... 55 °C (>104 ... 131 °F) <a href="#">see derating characteristics</a>	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) <a href="#">see derating characteristics</a>	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) <a href="#">see derating characteristics</a>
<b>Storage temperature</b>	-40 ... +70 °C (-40 ... +158 °F)			
<b>Relative humidity</b>	<95 % RH, condensation not permissible			
<b>Cooling</b>	Power units with increased air cooling using integrated fans	Internal ventilation, power units with increased air cooling by built-in fans	Internal ventilation, power units with increased air cooling by built-in fans	Internal ventilation, power units with increased air cooling by built-in fans
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without power reduction, > 1000 m (3281 ft) <a href="#">see derating characteristics</a>			
<b>Protection functions</b>	<ul style="list-style-type: none"> <li>• Undervoltage</li> <li>• Overvoltage</li> <li>• Overcontrol/overload</li> <li>• Ground fault</li> <li>• Short circuit</li> <li>• Stall protection</li> <li>• Motor blocking protection</li> <li>• Motor overtemperature</li> <li>• Inverter overtemperature</li> <li>• Parameter locking</li> </ul>			
<b>Standard SCCR (Short Circuit Current Rating)<sup>1)</sup></b>	–	65 kA	Frame size FSC 10 kA Frame sizes FSD up to FSF 42 kA	42 kA
<b>Compliance with standards</b>	UL <sup>2)</sup> , CE, c-tick	UL, cUL, CE, c-tick, SEMI F47	UL, cUL, CE, c-tick	CE
<b>CE marking</b>	According to Low-Voltage Directive 2006/95/EC			

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<sup>1)</sup> Applies to industrial control cabinet installations to NEC article 409/UL 508A.

<sup>2)</sup> UL approval for frame sizes FSD to FSF will be available soon.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

##### PM230 Power Modules

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules 6SL3223-...				
With integrated line filter class A		ODE13-7AA0	ODE15-5AA0	ODE17-5AA0	ODE21-1AA0	ODE21-5AA0
With integrated line filter class B		ODE13-7BA0	ODE15-5BA0	ODE17-5BA0	ODE21-1BA0	ODE21-5BA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{rated}^{1)}$	A	1.3	1.7	2.2	3.1	4.1
• Base load current $I_L^{1)}$	A	1.3	1.7	2.2	3.1	4.1
• Base load current $I_H^{2)}$	A	0.9	1.3	1.7	2.2	3.1
• $I_{max}$	A	2.0	2.6	3.4	4.7	6.2
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Based on $I_H$	kW (hp)	0.25 (0.33)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.86	0.90	0.92	0.94	0.95
<b>Power loss</b> at rated current	kW	0.06	0.06	0.06	0.07	0.08
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>2</sup> /s)	0.007 (0.25)	0.007 (0.25)	0.007 (0.25)	0.007 (0.25)	0.007 (0.25)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	61.9	61.9	61.9	61.9	61.9
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	1.3	1.8	2.3	3.2	4.2
• Based on $I_H$	A	0.9	1.3	1.8	2.3	3.2
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>Motor connection</b> U2, V2, W2		Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in	Screw terminals, plug-in
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>Motor cable length, max.<sup>4)</sup></b>						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>						
• Width	mm (in)	154 (6.06)	154 (6.06)	154 (6.06)	154 (6.06)	154 (6.06)
• Height	mm (in)	460 (18.11)	460 (18.11)	460 (18.11)	460 (18.11)	460 (18.11)
• Depth						
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)
- With operator panel, max.	mm (in)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)
<b>Frame size</b>		FSA	FSA	FSA	FSA	FSA
<b>Weight, approx.</b> With integrated line filter	kg (lb)	4.3 (9.48)	4.3 (9.48)	4.3 (9.48)	4.3 (9.48)	4.3 (9.48)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not maintained.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules 6SL3223-...				
With integrated line filter class A		0DE22-2AA0	0DE23-0AA0	0DE24-0AA0	0DE25-5AA0	0DE27-5AA0
With integrated line filter class B		0DE22-2BA0	0DE23-0BA0	0DE24-0BA0	0DE25-5BA0	0DE27-5BA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{rated}^{1)}$	A	5.9	7.7	10.2	13.2	18
• Base load current $I_L^{1)}$	A	5.9	7.7	10.2	13.2	18
• Base load current $I_H^{2)}$	A	4.1	5.9	7.7	10.2	13.2
• $I_{max}$	A	8.9	11.8	15.4	20.4	27
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	2.2 (3.0)	3 (4.0)	4 (5.0)	5.5 (7.5)	7.5 (10)
• Based on $I_H$	kW (hp)	1.5 (2.0)	2.2 (3.0)	3 (4.0)	4 (5.0)	5.5 (7.5)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.96	0.96	0.97	0.97	0.97
<b>Power loss</b> at rated current	kW	0.1	0.12	0.14	0.18	0.24
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.007 (0.25)	0.007 (0.25)	0.009 (0.32)	0.009 (0.32)	0.009 (0.32)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	61.9	61.9	62.8	62.8	62.8
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	6.1	8.0	11	14	19
• Based on $I_H$	A	4.2	6.1	8.0	11	14
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3						
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	2.5 ... 6	4 ... 6	4 ... 6
<b>Motor connection</b> U2, V2, W2						
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	2.5 ... 6	4 ... 6	4 ... 6
<b>Motor cable length, max.<sup>4)</sup></b>						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>						
		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>						
• Width	mm (in)	154 (6.06)	154 (6.06)	180 (7.09)	180 (7.09)	180 (7.09)
• Height	mm (in)	460 (18.11)	460 (18.11)	540 (21.26)	540 (21.26)	540 (21.26)
• Depth						
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)	249 (9.80)
- With operator panel, max.	mm (in)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)	264 (10.39)
<b>Frame size</b>						
		FSA	FSA	FSB	FSB	FSB
<b>Weight, approx.</b> With integrated line filter						
	kg (lb)	4.3 (9.48)	4.3 (9.48)	6.3 (13.9)	6.3 (13.9)	6.3 (13.9)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO)

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not maintained.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules 6SL3223-...					
With integrated line filter class A		0DE31-1AA0	0DE31-5AA0	0DE31-8AA0	–	0DE32-2AA0	0DE33-0AA0
With integrated line filter class B		0DE31-1BA0	0DE31-5BA0	–	0DE31-8BA0	0DE32-2BA0	0DE33-0BA0
<b>Output current</b> at 50 Hz 400 V 3 AC							
• Rated current $I_{rated}^{1)}$	A	26	32	38	38	45	60
• Base load current $I_L^{1)}$	A	26	32	38	38	45	60
• Base load current $I_H^{2)}$	A	18	26	32	32	38	45
• $I_{max}$	A	39	52	64	64	76	90
<b>Rated power</b>							
• Based on $I_L$	kW (hp)	11 (15)	15 (20)	18.5 (25)	18.5 (25)	22 (30)	30 (40)
• Based on $I_H$	kW (hp)	7.5 (10)	11 (15)	15 (20)	15 (20)	18.5 (25)	22 (30)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.97	0.97	0.98	0.97	0.97	0.97
<b>Power loss</b> at rated current	kW	0.32	0.39	0.46	0.52	0.52	0.68
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.020 (0.71)	0.020 (0.71)	0.020 (0.71)	0.039 (1.38)	0.039 (1.38)	0.039 (1.38)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	66.1	66.1	66.1	56	56	56
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1	1	1	1
<b>Input current <sup>3)</sup></b>							
• Rated current	A	27	33	39	39	42	56
• Based on $I_H$	A	19	27	33	33	36	42
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3							
• Conductor cross-section	mm <sup>2</sup>	6 ... 16	10 ... 16	10 ... 16	16 ... 35	16 ... 35	16 ... 35
<b>Motor connection</b> U2, V2, W2							
• Conductor cross-section	mm <sup>2</sup>	6 ... 16	10 ... 16	10 ... 16	16 ... 35	16 ... 35	16 ... 35
<b>Motor cable length, max.<sup>4)</sup></b>							
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>							
• Width	mm (in)	230 (9.06)	230 (9.06)	230 (9.06)	320 (12.60)	320 (12.60)	320 (12.60)
• Height	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)	640 (25.20)	640 (25.20)	640 (25.20)
• Depth							
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	329 (12.95)	329 (12.95)	329 (12.95)
- With operator panel, max.	mm (in)	264 (10.39)	264 (10.39)	264 (10.39)	344 (13.54)	344 (13.54)	344 (13.54)
<b>Frame size</b>		FSC	FSC	FSC	FSD	FSD	FSD
<b>Weight, approx.</b> With integrated line filter	kg (lb)	9.5 (20.9)	9.5 (20.9)	9.5 (20.9)	31 (68.4)	31 (68.4)	31 (68.4)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_k = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not maintained.



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules 6SL3223-...				
With integrated line filter class A		0DE33-7AA0	0DE34-5AA0	0DE35-5AA0	0DE37-5AA0	0DE38-8AA0
With integrated line filter class B		0DE33-7BA0	0DE34-5BA0	0DE35-5BA0	0DE37-5BA0	0DE38-8BA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{rated}^{1)}$	A	75	90	110	145	178
• Base load current $I_L^{1)}$	A	75	90	110	145	178
• Base load current $I_H^{2)}$	A	60	75	90	110	145
• $I_{max}$	A	120	150	180	220	290
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)	90 (125)
• Based on $I_H$	kW (hp)	30 (40)	37 (50)	45 (60)	55 (75)	75 (100)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.97	0.97	0.97	0.97	0.97
<b>Power loss</b> at rated current	kW	0.99	1.2	1.4	1.9	2.3
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.039 (1.38)	0.039 (1.38)	0.117 (4.13)	0.117 (4.13)	0.117 (4.13)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	56	56	61	61	61
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	70	84	102	135	166
• Based on $I_H$	A	56	70	84	102	135
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3						
• Conductor cross-section	mm <sup>2</sup>	25 ... 50	25 ... 50	35 ... 120	35 ... 120	35 ... 120
<b>Motor connection</b> U2, V2, W2						
• Conductor cross-section	mm <sup>2</sup>	25 ... 50	25 ... 50	35 ... 120	35 ... 120	35 ... 120
<b>Motor cable length, max.<sup>4)</sup></b>						
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>						
		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
<b>Dimensions</b>						
• Width	mm (in)	320 (12.60)	320 (12.60)	410 (16.14)	410 (16.14)	410 (16.14)
• Height	mm (in)	751 (29.57)	751 (29.57)	915 (36.02)	915 (36.02)	915 (36.02)
• Depth						
- Without operator panel	mm (in)	329 (12.95)	329 (12.95)	416 (16.38)	416 (16.38)	416 (16.38)
- With operator panel, max.	mm (in)	344 (13.54)	344 (13.54)	431 (16.97)	431 (16.97)	431 (16.97)
<b>Frame size</b>						
		FSE	FSE	FSF	FSF	FSF
<b>Weight, approx.</b> With integrated line filter	kg (lb)	37 (81.6) (with filter class A) 38 (83.8) (with filter class B)	37 (81.6) (with filter class A) 38 (83.8) (with filter class B)	70 (154)	70 (154)	70 (154)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_k = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not maintained.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

##### PM240 Power Modules

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules 6SL3224-				
Without integrated line filter		OBE13-7UA0	OBE15-5UA0	OBE17-5UA0	OBE21-1UA0	OBE21-5UA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{rated}^{1)}$	A	1.3	1.7	2.2	3.1	4.1
• Base load current $I_L^{1)}$	A	1.3	1.7	2.2	3.1	4.1
• Base load current $I_H^{2)}$	A	1.3	1.7	2.2	3.1	4.1
• $I_{max}$	A	2.6	3.4	4.4	6.2	8.2
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Based on $I_H$	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>		0.97	0.97	0.97	0.97	0.97
<b>Power loss</b> at rated current	kW	0.09	0.1	0.1	0.1	0.11
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	<45	<45	<45	<45	<45
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1	1	1
<b>Rated input current <sup>3)</sup></b>						
• With line reactor	A	1.4	1.8	2.3	3.2	4.3
• Without line reactor	A	1.7	2.1	2.6	3.9	4.9
<b>Length of cable to braking resistor, max.</b>	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>Motor connection</b> U2, V2, W2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>DC link connection, con- nection for the braking resistor</b> DCP/R1, DCN, R2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
<b>PE connection</b>		On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw	On housing with M4 screw
<b>Motor cable length <sup>4)</sup>, max.</b>						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth						
- Without Control Unit	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)
- With Control Unit	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)
<b>Frame size</b>		FSA	FSA	FSA	FSA	FSA
<b>Weight, approx.</b>	kg (lb)	1.1 (2.43)	1.1 (2.43)	1.1 (2.43)	1.1 (2.43)	1.1 (2.43)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_K = 1\%$ . These current values without line reactor are specified on the rating plate of the Power Module.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules 6SL3224-...				
Without integrated line filter		0BE22-2UA0	0BE23-0UA0	0BE24-0UA0	0BE25-5UA0	0BE27-5UA0
With integrated line filter		0BE22-2AA0	0BE23-0AA0	0BE24-0AA0	0BE25-5AA0	0BE27-5AA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{rated}^{1)}$	A	5.9	7.7	10.2	18	25
• Base load current $I_L^{1)}$	A	5.9	7.7	10.2	18	25
• Base load current $I_H^{2)}$	A	5.9	7.7	10.2	13.2	19
• $I_{max}$	A	11.8	15.4	20.4	26.4	38
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	2.2 (3.0)	3 (4)	4 (5)	7.5 (10)	11 (15)
• Based on $I_H$	kW (hp)	2.2 (3.0)	3 (4)	4 (5)	5.5 (7.5)	7.5 (10)
<b>Rated pulse frequency</b>						
	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>						
		0.95	0.95	0.95	0.95	0.95
<b>Power loss</b> at rated current						
	kW	0.14	0.16	0.18	0.24	0.30
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.024 (0.85)	0.024 (0.85)	0.024 (0.85)	0.055 (1.94)	0.055 (1.94)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)						
	dB	<50	<50	<50	<60	<60
<b>24 V DC power supply</b> for the Control Unit						
	A	1	1	1	1	1
<b>Rated input current <sup>3)</sup></b>						
• With line reactor	A	6.1	8	10.4	18.7	26
• Without line reactor	A	7.6	10.2	13.4	21.9	31.5
<b>Length of cable to braking resistor, max.</b>						
	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3						
• Conductor cross-section	mm <sup>2</sup>	1 ... 6	1 ... 6	1 ... 6	2.5 ... 10	2.5 ... 10
<b>Motor connection</b> U2, V2, W2						
• Conductor cross-section	mm <sup>2</sup>	1 ... 6	1 ... 6	1 ... 6	2.5 ... 10	2.5 ... 10
<b>DC link connection, connection for the braking resistor</b> DCP/R1, DCN, R2						
• Conductor cross-section	mm <sup>2</sup>	1 ... 6	1 ... 6	1 ... 6	2.5 ... 10	2.5 ... 10
<b>PE connection</b>						
		On housing with M5 screw	On housing with M5 screw	On housing with M5 screw	On housing with M5 screw	On housing with M5 screw
<b>Motor cable length <sup>4)</sup>, max.</b>						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>						
		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	153 (6.02)	153 (6.02)	153 (6.02)	189 (7.44)	189 (7.44)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	334 (13.15)	334 (13.15)
• Depth						
- Without Control Unit	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	185 (7.28)	185 (7.28)
- With Control Unit	mm (in)	230 (9.06)	230 (9.06)	230 (9.06)	250 (9.84)	250 (9.84)
<b>Frame size</b>						
		FSB	FSB	FSB	FSC	FSC
<b>Weight, approx.</b>						
	kg (lb)	4 (8.8)	4 (8.8)	4 (8.8)	7 (15.4)	7 (15.4)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line impedance corresponding to  $u_K = 1\%$ . These current values without line reactor are specified on the rating plate of the Power Module.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules 6SL3224-...				
Without integrated line filter		OBE31-1UA0	OBE31-5UA0	OBE31-8UA0	OBE32-2UA0	OBE33-0UA0
With integrated line filter		OBE31-1AA0	OBE31-5AA0	OBE31-8AA0	OBE32-2AA0	OBE33-0AA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{\text{rated}}^{1)}$	A	32	38	45	60	75
• Base load current $I_{\text{L}}^{1)}$	A	32	38	45	60	75
• Base load current $I_{\text{H}}^{2)}$	A	26	32	38	45	60
• $I_{\text{max}}$	A	52	64	76	90	124
<b>Rated power</b>						
• Based on $I_{\text{L}}$	kW (hp)	15 (20)	18.5 (25)	22 (30)	30 (40)	37 (50)
• Based on $I_{\text{H}}$	kW (hp)	11 (15)	15 (20)	18.5 (25)	22 (30)	30 (40)
<b>Rated pulse frequency</b>		kHz	4	4	4	4
<b>Efficiency <math>\eta</math></b>			>0.97	>0.97	>0.97	>0.97
<b>Power loss</b> at rated current		kW	0.4	0.42	0.52	0.69
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.055 (1.94)	0.055 (1.94)	0.055 (1.94)	0.055 (1.94)
<b>Sound pressure level <math>L_{\text{pA}}</math> (1 m)</b>		dB	<60	<60	<60	<60
<b>24 V DC power supply</b> for the Control Unit		A	1	1	1	1
<b>Rated input current <sup>3)</sup></b>						
• With line reactor	A	33	40	47	63	78
• Without line reactor	A	39	46	53	72	88
<b>Length of cable to braking resistor, max.</b>		m (ft)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3			Screw terminals	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 10	10 ... 50	10 ... 50	10 ... 50	10 ... 50
<b>Motor connection</b> U2, V2, W2			Screw terminals	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 10	10 ... 50	10 ... 50	10 ... 50	10 ... 50
<b>DC link connection, connection for the braking resistor</b> DCP/R1, DCN, R2			Screw terminals	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 10	10 ... 50	10 ... 50	10 ... 50	10 ... 50
<b>PE connection</b>			On housing with M5 screw	On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
<b>Motor cable length <sup>4)</sup>, max.</b>						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	100 (328)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>			IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	189 (7.44)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)
• Height						
- Without integrated line filter	mm (in)	334 (13.15)	419 (16.50)	419 (16.50)	419 (16.50)	499 (19.65)
- With integrated line filter	mm (in)	334 (13.15)	512 (20.16)	512 (20.16)	512 (20.16)	635 (25.0)
• Depth						
- Without Control Unit	mm (in)	185 (7.28)	204 (8.03)	204 (8.03)	204 (8.03)	204 (8.03)
- With Control Unit	mm (in)	250 (9.84)	260 (10.24)	260 (10.24)	260 (10.24)	260 (10.24)
<b>Frame size</b>			FSC	FSD	FSD	FSE
<b>Weight, approx.</b>						
• Without integrated line filter	kg (lb)	7 (15.4)	13 (28.7)	13 (28.7)	13 (28.7)	16 (35.3)
• With integrated line filter	kg (lb)	7 (15.4)	16 (35.3)	16 (35.3)	16 (35.3)	23 (50.7)

<sup>1)</sup> The rated output current  $I_{\text{rated}}$  and the base load current  $I_{\text{L}}$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_{\text{H}}$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on  $I_{\text{rated}}$ ) for a line

impedance corresponding to  $u_{\text{K}} = 1\%$ . These current values without line reactor are specified on the rating plate of the Power Module.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules 6SL3224-...					
Without integrated line filter		OBE33-7UA0	OBE34-5UA0	OBE35-5UA0	OBE37-5UA0	OBE38-8UA0	OBE41-1UA0
With integrated line filter		OBE33-7AA0	OBE34-5AA0	OBE35-5AA0	OBE37-5AA0	–	–
<b>Output current</b> at 50 Hz 400 V 3 AC							
• Rated current $I_{rated}^{1)}$	A	90	110	145	178	205	250
• Base load current $I_L^{1)}$	A	90	110	145	178	205	250
• Base load current $I_H^{2)}$	A	75	90	110	145	178	205
• $I_{max}$	A	150	180	220	290	308	375
<b>Rated power</b>							
• Based on $I_L$	kW (hp)	45 (60)	55 (75)	75 (100)	90 (125)	110 (150)	132 (200)
• Based on $I_H$	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)	90 (125)	110 (150)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	2	2
<b>Efficiency <math>\eta</math></b>		>0.97	>0.97	>0.97	>0.97	>0.97	>0.97
<b>Power loss</b> at rated current	kW	1.21	1.42	1.93	2.31	2.43	2.53
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	2 × 0.055 (1.94)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	<62	<60	<60	<65	<65	<65
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1	1	1	1
<b>Rated input current <sup>3)</sup></b>							
• With line reactor	A	94	115	151	186	210	250
• Without line reactor	A	105	129	168	204	245	299
<b>Length of cable to braking resistor, max.</b>	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3							
• Conductor cross-section	mm <sup>2</sup>	10 ... 50	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
<b>Motor connection</b> U2, V2, W2							
• Conductor cross-section	mm <sup>2</sup>	10 ... 50	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
<b>DC link connection, connection for the braking resistor</b> DCP/R1, DCN, R2							
• Conductor cross-section	mm <sup>2</sup>	10 ... 50	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
<b>PE connection</b>							
		On housing with M6 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
<b>Motor cable length <sup>4)</sup>, max.</b>							
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>							
		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)	275 (10.83)	350 (13.78)	350 (13.78)	350 (13.78)	350 (13.78)	350 (13.78)
• Height							
- Without integrated line filter	mm (in)	499 (19.65)	634 (24.96)	634 (24.96)	634 (24.96)	634 (24.96)	634 (24.96)
- With integrated line filter	mm (in)	635 (25.0)	934 (36.77)	934 (36.77)	934 (36.77)	–	–
• Depth							
- Without Control Unit	mm (in)	204 (8.03)	316 (12.44)	316 (12.44)	316 (12.44)	316 (12.44)	316 (12.44)
- With Control Unit	mm (in)	260 (10.24)	372 (14.65)	372 (14.65)	372 (14.65)	372 (14.65)	372 (14.65)
<b>Frame size</b>							
		FSE	FSF	FSF	FSF	FSF	FSF
<b>Weight, approx.</b>							
• Without integrated line filter	kg (lb)	16 (35.3)	36 (79.4)	36 (79.4)	36 (79.4)	39 (86)	39 (86)
• With integrated line filter	kg (lb)	23 (50.7)	52 (115)	52 (115)	52 (115)	–	–

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on  $I_{rated}$ ) for a line

impedance corresponding to  $u_K = 1\%$ . These current values without line reactor are specified on the rating plate of the Power Module.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules 6SL3224-...		
Without integrated line filter		0XE41-3UA0	0XE41-6UA0	0XE42-0UA0
<b>Output current</b> at 50 Hz 400 V 3 AC				
• Rated current $I_{\text{rated}}^{1)}$	A	302	370	477
• Base load current $I_{\text{L}}^{1)}$	A	302	370	477
• Base load current $I_{\text{H}}^{2)}$	A	250	302	370
• $I_{\text{max}}$	A	400	483	592
<b>Rated power</b>				
• Based on $I_{\text{L}}$	kW (hp)	160 (250)	200 (300)	250 (400)
• Based on $I_{\text{H}}$	kW (hp)	132 (200)	160 (215)	200 (300)
<b>Rated pulse frequency</b>	kHz	2	2	2
<b>Efficiency <math>\eta</math></b>		>0.98	>0.98	>0.98
<b>Power loss</b> at rated current	kW	3.9	4.4	5.5
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.36 (12.7)	0.36 (12.7)	0.36 (12.7)
<b>Sound pressure level <math>L_{\text{pA}}</math></b> (1 m)	dB	<69	<69	<69
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1
<b>Rated input current <sup>3)</sup></b>				
• With line reactor	A	245	297	354
• Without line reactor	A	297	354	442
<b>Length of cable to braking resistor, max.</b>	m (ft)	50 (164)	50 (164)	50 (164)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3				
• Conductor cross-section	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240
<b>Motor connection</b> U2, V2, W2				
• Conductor cross-section	mm <sup>2</sup>	2 × 240	2 × 240	2 × 240
<b>PE connection</b>		On housing with M10 screw	On housing with M10 screw	On housing with M10 screw
<b>Motor cable length <sup>4)</sup>, max.</b>				
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	326 (12.83)	326 (12.83)	326 (12.83)
• Height	mm (in)	1533 (60.35)	1533 (60.35)	1533 (60.35)
• Depth	mm (in)	547 (21.54)	547 (21.54)	547 (21.54)
<b>Frame size</b>		FSGX	FSGX	FSGX
<b>Weight, approx.</b>	kg (lb)	174 (384)	174 (384)	174 (384)

<sup>1)</sup> The rated output current  $I_{\text{rated}}$  and the base load current  $I_{\text{L}}$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_{\text{H}}$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance. The input currents apply for rated power loading (based on  $I_{\text{rated}}$ ) for a line impedance corresponding to  $u_{\text{K}} = 1\%$ . These current values without line reactor are specified on the rating plate of the Power Module.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values acc. to EN 61800-3 Category C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

#### PM250 Power Modules

Line voltage 380 ... 480 V 3 AC		PM250 Power Modules 6SL3225-...		
With integrated line filter		OBE25-5AA1	OBE27-5AA1	OBE31-1AA1
<b>Output current</b> at 50 Hz 400 V 3 AC				
• Rated current $I_{rated}^{1)}$	A	18	25	32
• Base load current $I_L^{1)}$	A	18	25	32
• Base load current $I_H^{2)}$	A	13.2	19	26
• $I_{max}$	A	26.4	38	52
<b>Rated power</b>				
• Based on $I_L$	kW (hp)	7.5 (10)	11 (15)	15 (20)
• Based on $I_H$	kW (hp)	5.5 (7.5)	7.5 (10)	11 (15)
<b>Rated pulse frequency</b>	kHz	4	4	4
<b>Efficiency <math>\eta</math></b>		0.95	0.95	0.95
<b>Power loss</b> at rated current	kW	0.26	0.28	0.31
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.038 (1.34)	0.038 (1.34)	0.038 (1.34)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	<60	<60	<60
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1
<b>Input current <sup>3)</sup></b>				
• Rated current	A	18	25	32
• Current based on $I_H$	A	13.2	19	26
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3				
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>Motor connection</b> U2, V2, W2				
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>PE connection</b>				
		On housing with M5 screw	On housing with M5 screw	On housing with M5 screw
<b>Motor cable length, max.</b>				
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>				
		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	189 (7.44)	189 (7.44)	189 (7.44)
• Height	mm (in)	334 (13.15)	334 (13.15)	334 (13.15)
• Depth				
- Without Control Unit	mm (in)	185 (7.28)	185 (7.28)	185 (7.28)
- With Control Unit	mm (in)	250 (9.84)	250 (9.84)	250 (9.84)
<b>Frame size</b>				
		FSC	FSC	FSC
<b>Weight, approx.</b>	kg (lb)	7.5 (16.5)	7.5 (16.5)	7.5 (16.5)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_k = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM250 Power Modules 6SL3225-...		
Without integrated line filter		OBE31-5UA0	OBE31-8UA0	OBE32-2UA0
With integrated line filter		OBE31-5AA0	OBE31-8AA0	OBE32-2AA0
<b>Output current</b> at 50 Hz 400 V 3 AC				
• Rated current $I_{rated}^{1)}$	A	38	45	60
• Base load current $I_L^{1)}$	A	38	45	60
• Base load current $I_H^{2)}$	A	32	38	45
• $I_{max}$	A	64	76	90
<b>Rated power</b>				
• Based on $I_L$	kW (hp)	18.5 (25)	22 (30)	30 (40)
• Based on $I_H$	kW (hp)	15 (20)	18.5 (25)	22 (30)
<b>Rated pulse frequency</b>	kHz	4	4	4
<b>Efficiency <math>\eta</math></b>		>0.97	>0.97	>0.97
<b>Power loss</b> at rated current	kW	0.42	0.52	0.68
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.022 (0.78)	0.022 (0.78)	0.039 (1.38)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	<60	<60	<61
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1
<b>Input current <sup>3)</sup></b>				
• Rated current	A	36	42	56
• Based on $I_H$	A	30	36	42
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3				
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35
<b>Motor connection</b> U2, V2, W2				
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35
<b>PE connection</b>				
		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
<b>Motor cable length <sup>4)</sup>, max.</b>				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>				
		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)
• Height				
- Without integrated line filter	mm (in)	419 (16.50)	419 (16.50)	419 (16.50)
- With integrated line filter	mm (in)	512 (20.16)	512 (20.16)	512 (20.16)
• Depth				
- Without Control Unit	mm (in)	204 (8.03)	204 (8.03)	204 (8.03)
- With Control Unit	mm (in)	260 (10.24)	260 (10.24)	260 (10.24)
<b>Frame size</b>				
		FSD	FSD	FSD
<b>Weight, approx.</b>				
• Without integrated line filter	kg (lb)	13 (28.7)	13 (28.7)	13 (28.7)
• With integrated line filter	kg (lb)	15 (33.1)	15 (33.1)	16 (35.3)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_k = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM250 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

Line voltage 380 ... 480 V 3 AC		PM250 Power Modules 6SL3225-...				
Without integrated line filter		OBE33-0UA0	OBE33-7UA0	OBE34-5UA0	OBE35-5UA0	OBE37-5UA0
With integrated line filter		OBE33-0AA0	OBE33-7AA0	OBE34-5AA0	OBE35-5AA0	OBE37-5AA0
<b>Output current</b> at 50 Hz 400 V 3 AC						
• Rated current $I_{rated}^{1)}$	A	75	90	110	145	178
• Base load current $I_L^{1)}$	A	75	90	110	145	178
• Base load current $I_H^{2)}$	A	60	75	90	110	145
• $I_{max}$	A	120	150	180	220	290
<b>Rated power</b>						
• Based on $I_L$	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)	90 (125)
• Based on $I_H$	kW (hp)	30 (40)	37 (50)	45 (60)	55 (75)	75 (100)
<b>Rated pulse frequency</b>						
	kHz	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>						
		>0.97	>0.97	>0.97	>0.97	>0.97
<b>Power loss</b> at rated current						
	kW	0.99	1.21	1.42	1.93	2.31
<b>Cooling air requirement</b>						
	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.022 (0.78)	0.039 (1.38)	0.094 (3.32)	0.094 (3.32)	0.117 (4.13)
<b>Sound pressure level <math>L_{pA}</math> (1 m)</b>						
	dB	<60	<62	<60	<60	<65
<b>24 V DC power supply</b> for the Control Unit						
	A	1	1	1	1	1
<b>Input current <sup>3)</sup></b>						
• Rated current	A	70	84	102	135	166
• Based on $I_H$	A	56	70	84	102	135
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3						
• Conductor cross-section, max.	mm <sup>2</sup>	10 ... 50	10 ... 50	25 ... 120	25 ... 120	25 ... 120
<b>Motor connection</b> U2, V2, W2						
• Conductor cross-section, max.	mm <sup>2</sup>	10 ... 50	10 ... 50	25 ... 120	25 ... 120	25 ... 120
<b>PE connection</b>						
		On housing with M6 screw	On housing with M6 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
<b>Motor cable length <sup>4)</sup>, max.</b>						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>						
		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	275 (10.83)	275 (10.83)	350 (13.78)	350 (13.78)	350 (13.78)
• Height						
- Without integrated line filter	mm (in)	499 (19.65)	499 (19.65)	634 (24.96)	634 (24.96)	634 (24.96)
- With integrated line filter	mm (in)	635 (25.0)	635 (25.0)	934 (36.77)	934 (36.77)	934 (36.77)
• Depth						
- Without Control Unit	mm (in)	204 (8.03)	204 (8.03)	316 (12.44)	316 (12.44)	316 (12.44)
- With Control Unit	mm (in)	260 (10.24)	260 (10.24)	372 (14.65)	372 (14.65)	372 (14.65)
<b>Frame size</b>						
		FSE	FSE	FSF	FSF	FSF
<b>Weight, approx.</b>						
• Without integrated line filter	kg (lb)	14 (30.9)	14 (30.9)	35 (77.2)	35 (77.2)	35 (77.2)
• With integrated line filter	kg (lb)	21 (46.3)	21 (46.3)	51 (112)	51 (112)	51 (112)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Max. motor cable length 25 m (82 ft) (shielded) for PM250 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Technical specifications

##### PM260 Power Modules

Line voltage 500 ... 690 V 3 AC		PM260 Power Modules 6SL3225-...		
Without integrated line filter		0BH27-5UA1	0BH31-1UA1	0BH31-5UA1
With integrated line filter		0BH27-5AA1	0BH31-1AA1	0BH31-5AA1
<b>Output current</b> at 50 Hz 690 V 3 AC				
• Rated current $I_{rated}$ <sup>1)</sup>	A	14	19	23
• Base load current $I_L$ <sup>1)</sup>	A	14	19	23
• Base load current $I_H$ <sup>2)</sup>	A	10	14	19
• $I_{max}$	A	20	28	38
<b>Rated power</b>				
• Based on $I_L$	kW (hp)	11 (15)	15 (20)	18.5 (25)
• Based on $I_H$	kW (hp)	7.5 (10)	11 (15)	15 (20)
<b>Rated pulse frequency</b>		kHz	16	16
<b>Efficiency <math>\eta</math></b>			0.95	0.95
<b>Power loss</b> at rated current		kW	0.58	0.72
<b>Cooling air requirement</b>		m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.044 (1.55)	0.044 (1.55)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)		dB	<64	<64
<b>24 V DC power supply</b> for the Control Unit		A	1	1
<b>Input current <sup>3)</sup></b>				
• Rated current	A	13	18	22
• Based on $I_H$	A	10	13	18
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3			Terminal strip	Terminal strip
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 16	2.5 ... 16	2.5 ... 16
<b>Motor connection</b> U2, V2, W2			Terminal strip	Terminal strip
• Conductor cross-section	mm <sup>2</sup>	2.5 ... 16	2.5 ... 16	2.5 ... 16
<b>PE connection</b>			On housing with M6 screw	On housing with M6 screw
<b>Motor cable length, max. <sup>4)</sup></b>				
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
<b>Degree of protection</b>			IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)
• Height	mm (in)	512 (20.16)	512 (20.16)	512 (20.16)
• Depth				
- Without Control Unit	mm (in)	204 (8.03)	204 (8.03)	204 (8.03)
- With Control Unit	mm (in)	260 (10.24)	260 (10.24)	260 (10.24)
<b>Frame size</b>			FSD	FSD
<b>Weight, approx.</b>				
• Without integrated line filter	kg (lb)	22 (48.5)	22 (48.5)	22 (48.5)
• With integrated line filter	kg (lb)	23 (50.7)	23 (50.7)	23 (50.7)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_k = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Shielded motor cables must be used in order to maintain the limit values for field-conducted disturbances according to EN 61800-3 Class C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Technical specifications

Line voltage 500 ... 690 V 3 AC		PM260 Power Modules 6SL3225-...		
Without integrated line filter		0BH32-2UA1	0BH33-0UA1	0BH33-7UA1
With integrated line filter		0BH32-2AA1	0BH33-0AA1	0BH33-7AA1
<b>Output current</b> at 50 Hz 690 V 3 AC				
• Rated current $I_{rated}^{1)}$	A	35	42	62
• Base load current $I_L^{1)}$	A	35	42	62
• Base load current $I_H^{2)}$	A	26	35	42
• $I_{max}$	A	52	70	84
<b>Rated power</b>				
• Based on $I_L$	kW (hp)	30 (40)	37 (50)	55 (75)
• Based on $I_H$	kW (hp)	22 (30)	30 (40)	37 (50)
<b>Rated pulse frequency</b>	kHz	16	16	16
<b>Efficiency <math>\eta</math></b>		0.95	0.95	0.95
<b>Power loss</b> at rated current	kW	1.13	1.29	1.73
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.131 (4.63)	0.131 (4.63)	0.131 (4.63)
<b>Sound pressure level <math>L_{pA}</math></b> (1 m)	dB	<70	<70	<70
<b>24 V DC power supply</b> for the Control Unit	A	1	1	1
<b>Input current <sup>3)</sup></b>				
• Rated current	A	34	41	60
• Based on $I_H$	A	26	34	41
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3				
• Conductor cross-section	mm <sup>2</sup>	10 ... 50	10 ... 50	10 ... 50
<b>Motor connection</b> U2, V2, W2				
• Conductor cross-section	mm <sup>2</sup>	10 ... 50	10 ... 50	10 ... 50
<b>PE connection</b>				
		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
<b>Motor cable length, max. <sup>4)</sup></b>				
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
<b>Degree of protection</b>				
		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	350 (13.78)	350 (13.78)	350 (13.78)
• Height	mm (in)	634 (24.96)	634 (24.96)	634 (24.96)
• Depth				
- Without Control Unit	mm (in)	316 (12.44)	316 (12.44)	316 (12.44)
- With Control Unit	mm (in)	372 (14.65)	372 (14.65)	372 (14.65)
<b>Frame size</b>				
		FSF	FSF	FSF
<b>Weight, approx.</b>				
• Without integrated line filter	kg (lb)	56 (123)	56 (123)	56 (123)
• With integrated line filter	kg (lb)	58 (128)	58 (128)	58 (128)

<sup>1)</sup> The rated output current  $I_{rated}$  and the base load current  $I_L$  are based on the duty cycle for low overload (LO).

<sup>2)</sup> The base load current  $I_H$  is based on the duty cycle for high overload (HO).

<sup>3)</sup> The input current depends on the motor load and line impedance and applies for a line impedance corresponding to  $u_K = 1\%$ . The rated input currents apply for a load at rated power (based on  $I_{rated}$ ) – these current values are specified on the rating plate.

<sup>4)</sup> Shielded motor cables must be used in order to maintain the limit values for field-conducted disturbances according to EN 61800-3 Class C2.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Characteristic curves

##### Derating data, PM230 Power Modules

##### Pulse frequency

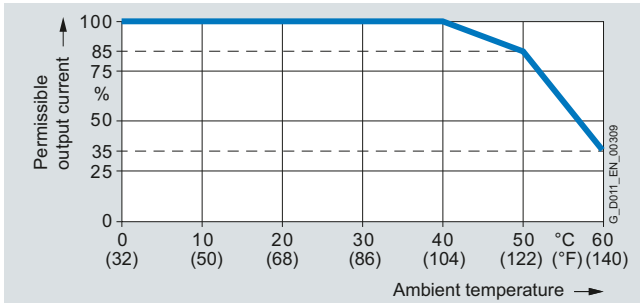
Rated power <sup>1)</sup> at 50 Hz 400 V 3 AC		Rated output current in A for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.37	0.5	1.3	1.11	0.91	0.78	0.65	0.59	0.52
0.55	0.75	1.7	1.45	1.19	1.02	0.85	0.77	0.68
0.75	1.0	2.2	1.87	1.54	1.32	1.10	0.99	0.88
1.1	1.5	3.1	2.64	2.17	1.86	1.55	1.40	1.24
1.5	2.0	4.1	3.49	2.87	2.46	2.05	1.85	1.64
2.2	3.0	5.9	5.02	4.13	3.54	2.95	2.66	2.36
3.0	4.0	7.7	6.55	5.39	4.62	3.85	3.47	3.08
4.0	5.0	10.2	8.67	7.14	6.12	5.1	4.59	4.08
5.5	7.5	13.2	11.22	9.24	7.92	6.6	5.94	5.28
7.5	10	18.0	15.3	12.6	10.8	9.0	8.1	7.2
11.0	15	26.0	22.1	18.2	15.6	13.0	11.7	10.4
15.0	20	32.0	27.2	22.4	19.2	16.0	14.4	12.8
18.5	25	38.0	32.3	26.6	22.8	19.0	17.1	15.2
22	30	45.0	38.25	31.5	27.0	22.5	20.25	18.0
30	40	60.0	52.7	43.4	37.2	31.0	27.9	24.8
37	50	75.0	63.75	52.5	45.0	37.5	33.75	30.0
45	60	90.0	76.5	63.0	54.0	45.0	40.5	36.0
55	75	110	93.5	77.0	–	–	–	–
75	100	145	123.3	101.5	–	–	–	–
90	125	178	151.3	124.6	–	–	–	–

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

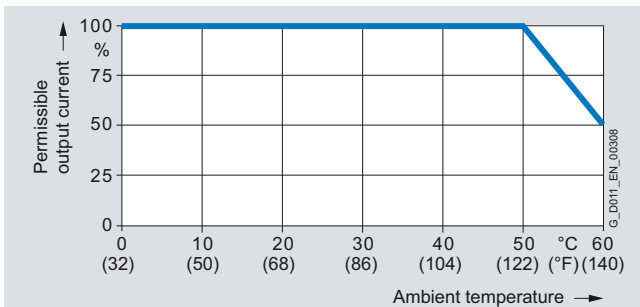
### Characteristic curves

#### Derating data, PM230 Power Modules

##### Ambient temperature



Low overload (LO) for PM230 Power Modules, frame sizes FSA to FSF

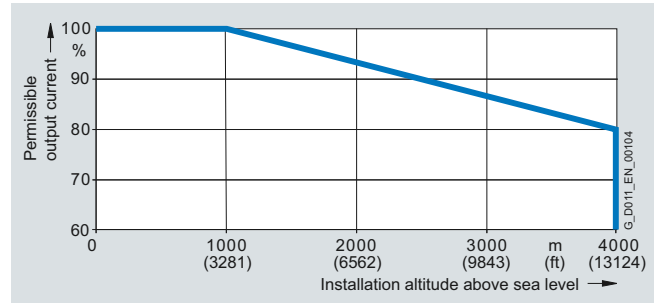


High overload (HO) for PM230 Power Modules, frame sizes FSA to FSF

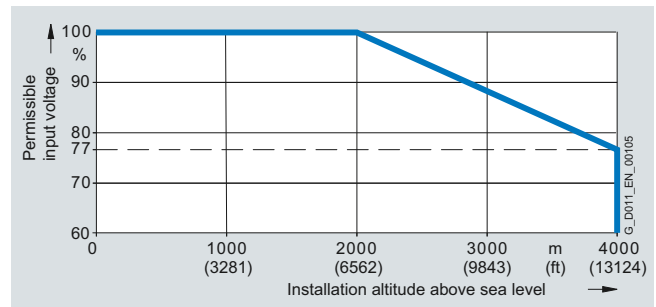
##### Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the section Technical specifications under Control Units.

##### Installation altitude

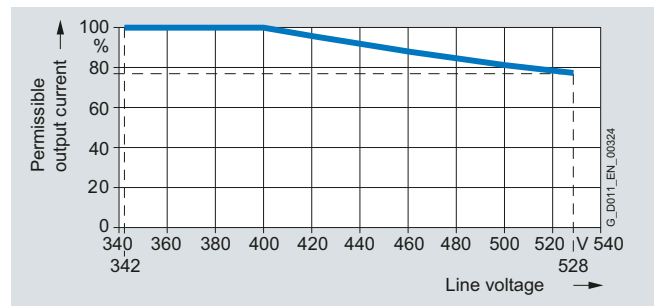


Permissible output current as a function of installation altitude

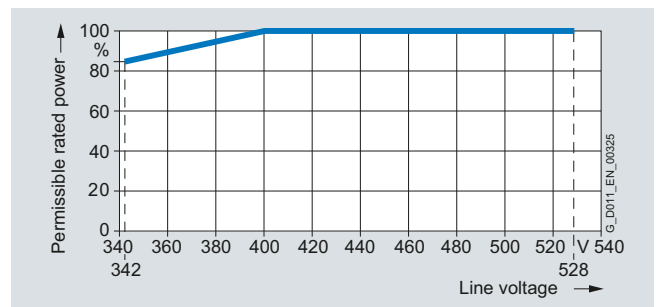


Permissible input voltage as a function of installation altitude

##### System operating voltage



Permissible output current as a function of the line voltage



Permissible rated power as a function of the line voltage

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Characteristic curves

##### Derating data, PM240 Power Modules

###### Pulse frequency

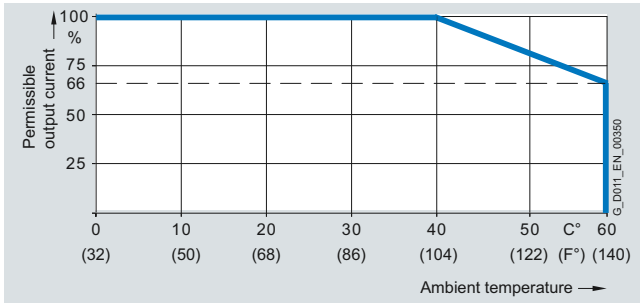
Rated power at 400 V 3 AC		Rated output current in A for a pulse frequency of							
kW	hp	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.37	0.50	–	1.3	1.1	0.9	0.8	0.7	0.6	0.5
0.55	0.75	–	1.7	1.4	1.2	1.0	0.9	0.8	0.7
0.75	1.0	–	2.2	1.9	1.5	1.3	1.1	1.0	0.9
1.1	1.5	–	3.1	2.6	2.2	1.9	1.6	1.4	1.2
1.5	2.0	–	4.1	3.5	2.9	2.5	2.1	1.8	1.6
2.2	3.0	–	5.9	5.0	4.1	3.5	3.0	2.7	2.4
3.0	4.0	–	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4.0	5.0	–	10.2	8.7	7.1	6.1	5.1	4.6	4.1
7.5	10	–	18.0	16.2	13.3	11.4	9.5	8.6	7.6
11.0	15	–	25.0	22.1	18.2	15.6	13.0	11.7	10.4
15.0	20	–	32.0	27.2	22.4	19.2	16.0	14.4	12.8
18.5	25	–	38.0	32.3	26.6	22.8	19.0	17.1	15.2
22.0	30	–	45.0	38.3	31.5	27.0	22.5	20.3	18.0
30.0	40	–	62.0	52.7	43.4	37.2	31.0	27.9	24.8
37.0	50	–	75.0	63.8	52.5	45.0	37.5	33.8	30.0
45.0	60	–	90.0	76.5	63.0	54.0	45.0	40.5	36.0
55.0	75	–	110.0	93.5	77.0	–	–	–	–
75.0	100	–	145.0	123.3	101.5	–	–	–	–
90.0	125	–	178.0	151.3	124.6	–	–	–	–
110.0	150	205.0 <sup>1)</sup>	178.0	–	–	–	–	–	–
132.0	200	250.0 <sup>1)</sup>	202.0	–	–	–	–	–	–
160.0	250	302.0 <sup>1)</sup>	250.0	–	–	–	–	–	–
200.0	300	370.0 <sup>1)</sup>	302.0	–	–	–	–	–	–
250.0	400	477.0 <sup>1)</sup>	370.0	–	–	–	–	–	–

<sup>1)</sup> The pulse frequency can only be switched over from 4 kHz (default) to 2 kHz for the low overload (LO) duty cycle.

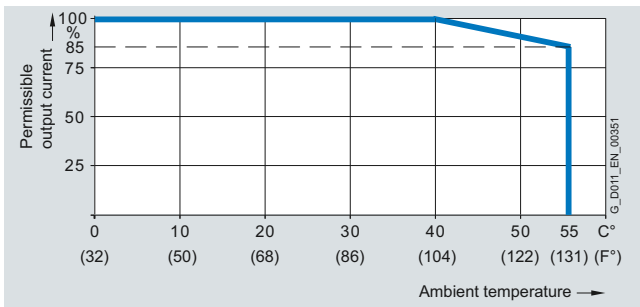
### Characteristic curves

#### Derating data, PM240 Power Modules

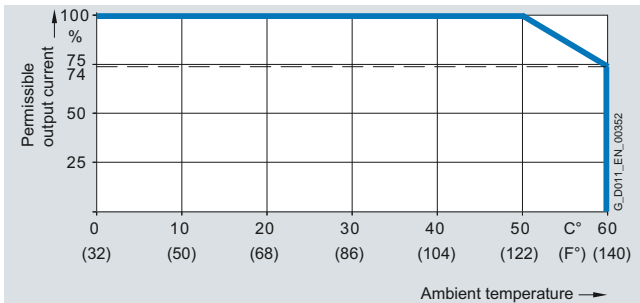
##### Ambient temperature



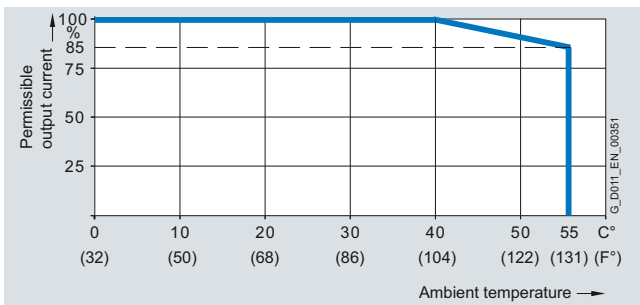
Low overload (LO) for PM240 Power Modules, frame sizes FSA to FSF



Low overload (LO) for PM240 Power Modules, frame size FSGX



High overload (HO) for PM240 Power Modules, frame sizes FSA to FSF

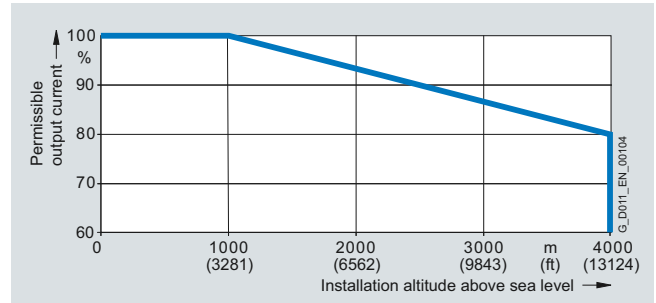


High overload (HO) for PM240 Power Modules, frame size FSGX

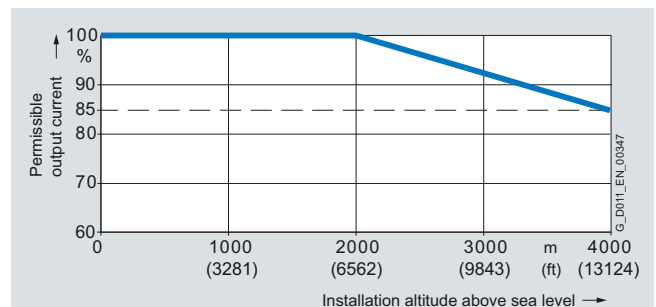
#### Note:

The operating temperature ranges of the Control Units should be taken into account. [The temperature ranges are specified in the section Technical specifications under Control Units.](#)

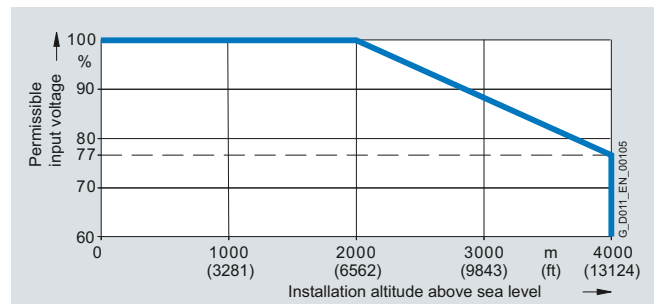
##### Installation altitude



Permissible output current as a function of the installation altitude for PM240 Power Modules, frame sizes FSA to FSF



Permissible output current as a function of the installation altitude for PM240 Power Modules, frame size FSGX



Permissible input voltage as a function of the installation altitude for PM240 Power Modules, frame sizes FSA to FSGX

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Power Modules

#### Characteristic curves

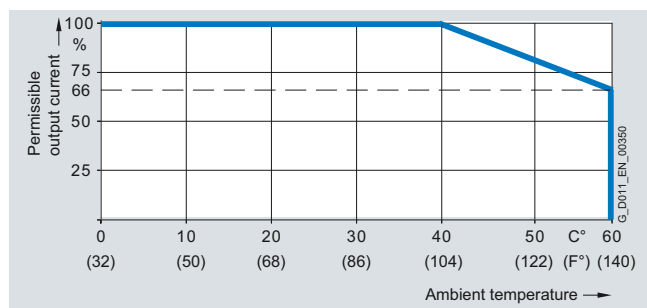
##### Derating data, PM250 Power Modules

###### Pulse frequency

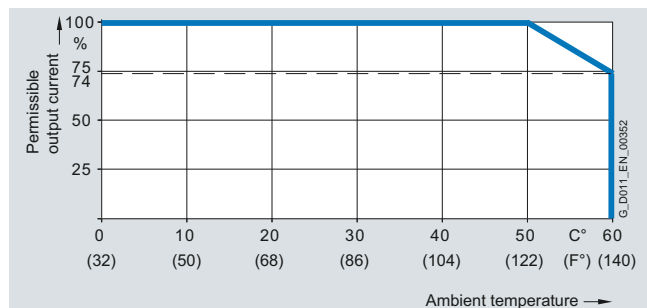
Rated power at 400 V 3 AC		Rated output current in A for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
7.5	10	18	12.5	11.9	10.6	9.2	7.9	6.6
11.0	15	25	18.1	17.1	15.2	13.3	11.4	9.5
15.0	20	32	24.7	23.4	20.8	18.2	15.6	13
18.5	25	38	32	27	23	19	17	15
22.0	30	45	38	32	27	23	20	18
30.0	40	60	51	42	36	30	27	24
37.0	50	75	64	53	45	38	34	30
45.0	60	90	77	63	54	45	41	36
55.0	75	110	94	77	-	-	-	-
75.0	100	145	123	102	-	-	-	-
90.0	125	178	151	125	-	-	-	-

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###### Ambient temperature



Low overload (LO) for PM250 Power Modules, frame sizes FSC to FSF

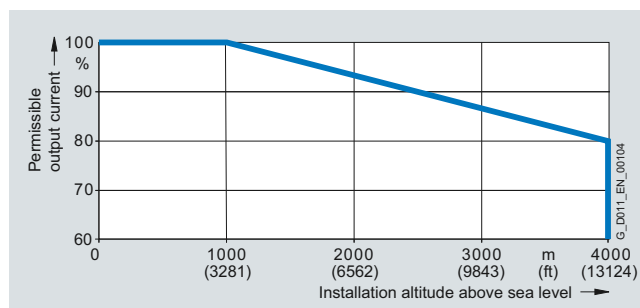


High overload (HO) for PM250 Power Modules, frame sizes FSC to FSF

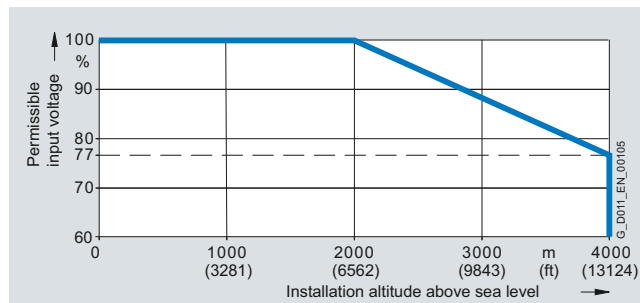
###### Note:

The operating temperature ranges of the Control Units should be taken into account. [The temperature ranges are specified in the section Technical specifications under Control Units.](#)

###### Installation altitude



Permissible output current as a function of the installation altitude for PM250 Power Modules, frame sizes FSC to FSF



Permissible input voltage as a function of the installation altitude for PM250 Power Modules, frame sizes FSC to FSF



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

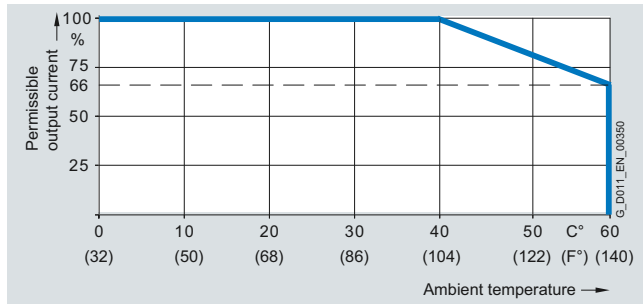
### Characteristic curves

#### Derating data, PM260 Power Modules

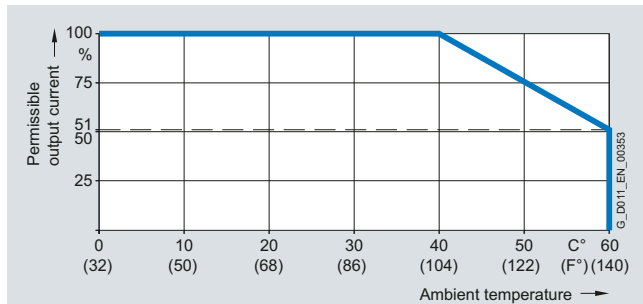
##### Pulse frequency

No pulse frequency derating, as the PM260 Power Modules continuously operate with 16 kHz.

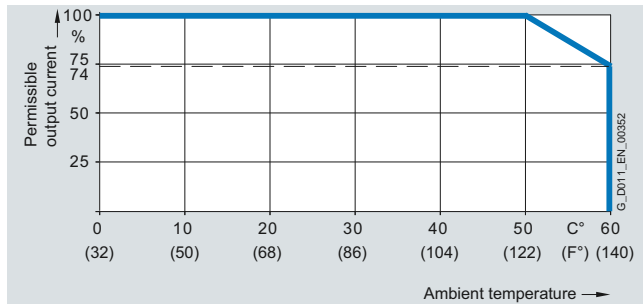
##### Ambient temperature



Low overload (LO) for PM260 Power Modules, frame size FSD



Low overload (LO) for PM260 Power Modules, frame size FSF

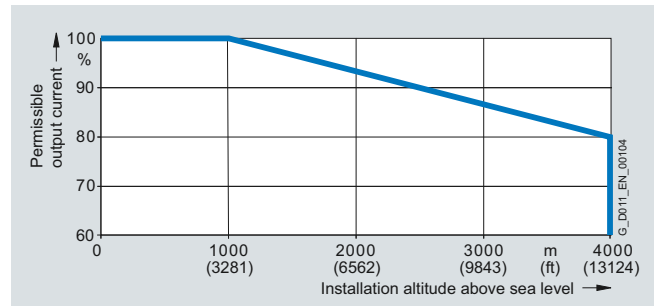


High overload (HO) for PM260 Power Modules, frame sizes FSD and FSF

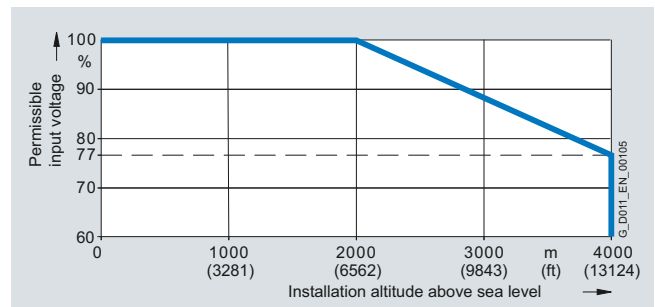
##### Note:

The operating temperature ranges of the Control Units should be taken into account. The temperature ranges are specified in the section Technical specifications under Control Units.

##### Installation altitude

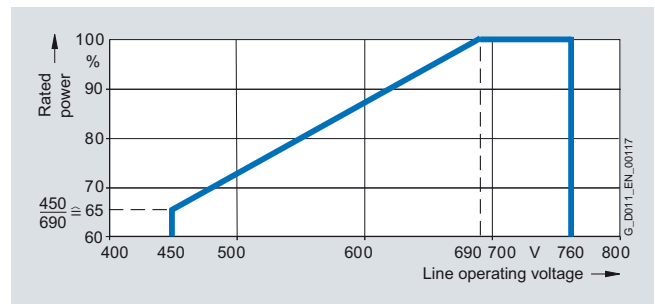


Permissible output current as a function of the installation altitude for PM260 Power Modules, frame sizes FSD and FSF



Permissible input voltage as a function of the installation altitude for PM260 Power Modules, frame sizes FSD and FSF

##### System operating voltage



Permissible rated power as a function of the system operating voltage for PM260 Power Modules, frame sizes FSD and FSF

##### Note:

The power units can be operated with 500 V - 10%. In this case, the power is correspondingly linearly reduced.

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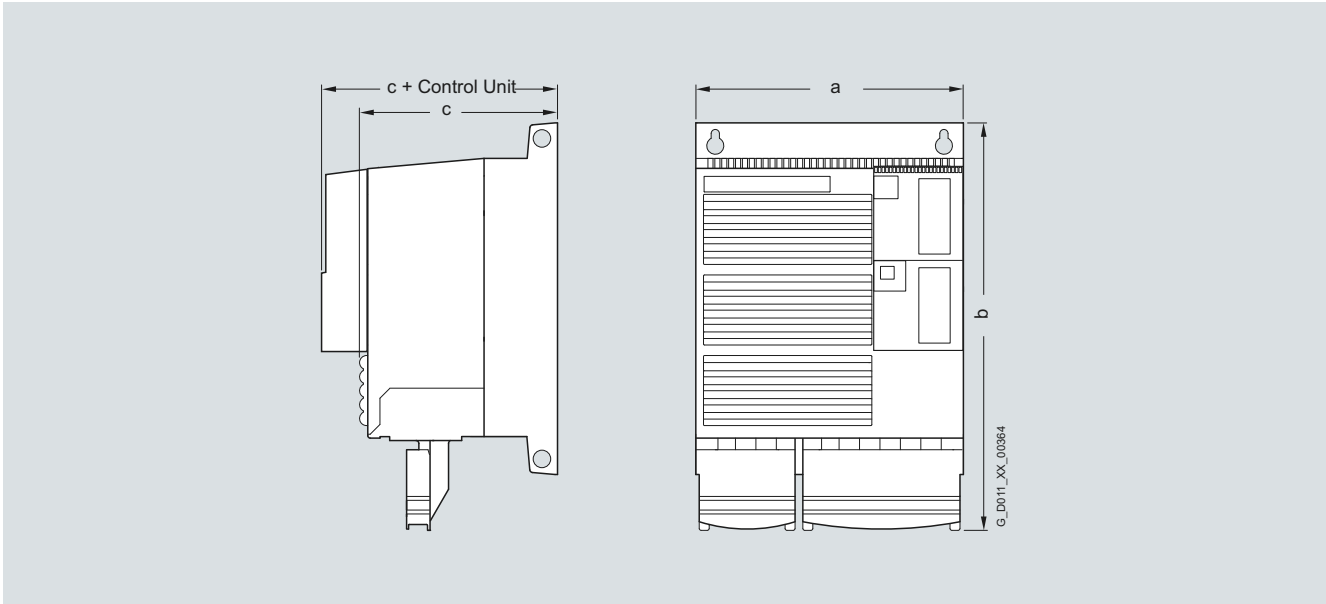
# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

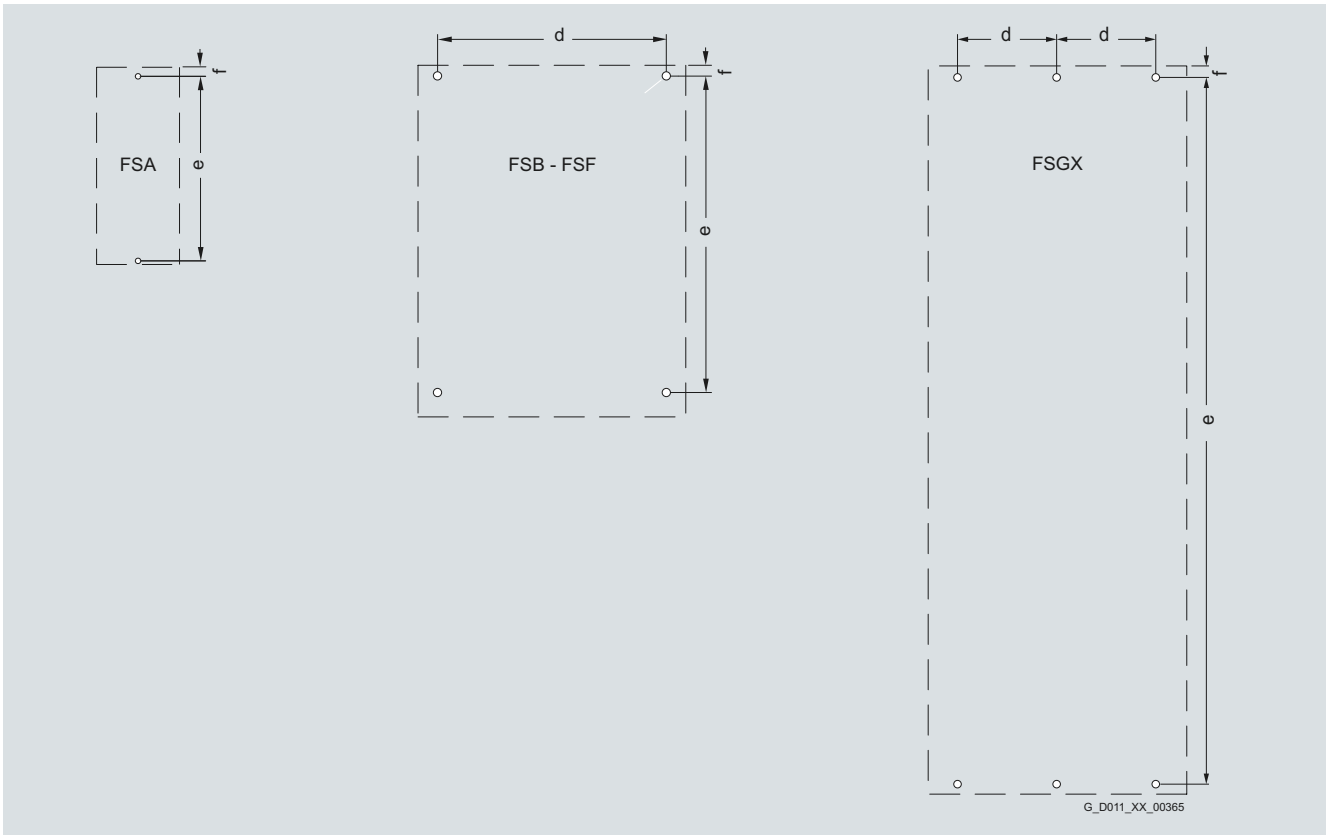
## Power Modules

### Dimensional drawings

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Principle dimension drawing



Drill pattern

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Power Modules

### Dimensional drawings

#### PM230 Power Modules – IP54/IP55 degree of protection

Frame size	Line filter		Dimensions in mm (inches)			Drilling dimensions in mm (inches)			Cooling clearance in mm (inches)			Mounting With bolts, nuts and washers
	With-out	With	a (width)	b (height)	c (depth)	d	e	f	top/bottom	front	side	
FSA	✓	✓	154 (6.06)	460 (18.11)	249 (9.8)	132 (5.19)	445 (17.51)	11 (0.43)	100 (3.94)	0 (0)	0 (0)	4 × M4
FSB	✓	✓	180 (7.08)	540 (21.25)	249 (9.8)	158 (5.9)	524 (20.62)	11 (0.43)	100 (3.94)	0 (0)	0 (0)	4 × M4
FSC	✓	✓	230 (9.05)	620 (24.4)	249 (9.8)	208 (8.18)	604 (23.77)	11 (0.43)	125 (4.92)	0 (0)	0 (0)	4 × M5
FSD	✓	✓	320 (12.59)	640 (25.19)	329 (12.95)	285 (11.22)	600 (23.62)	17.5 (0.69)	300 (11.81)	0 (0)	50 (1.97) <sup>1)</sup>	4 × M8
FSE	✓	✓	320 (12.59)	751 (29.56)	329 (12.95)	285 (11.22)	710 (27.95)	17.5 (0.69)	300 (11.81)	0 (0)	50 (1.97) <sup>1)</sup>	4 × M8
FSF	✓	✓	410 (16.14)	915 (36.02)	416 (16.38)	370 (14.56)	870 (34.25)	20 (0.79)	350 (13.78)	0 (0)	50 (1.97) <sup>1)</sup>	4 × M8

#### PM240 and PM250 Power Modules – IP20 degree of protection

Frame size	Line filter		Dimensions in mm (inches)			Drilling dimensions in mm (inches)			Cooling clearance in mm (inches)			Mounting With bolts, nuts and washers
	With-out	With	a (width)	b (height)	c (depth)	d	e	f	top/bottom	front	side	
FSA	✓	✓	73 (2.87)	173 (6.81)	145 (5.71)	36.5 (1.44)	160 (6.3)	6 (0.24)	100 (3.94)	0 (0)	30 (1.18) <sup>1)</sup>	2 × M4
FSB	✓	✓	153 (6.02)	270 (10.63)	165 (6.5)	133 (5.24)	258 (10.16)	6 (0.24)	100 (3.94)	0 (0)	40 (1.57) <sup>1)</sup>	4 × M4
FSC	✓	✓	189 (7.44)	334 (13.15)	185 (7.28)	167 (6.57)	323 (12.72)	6 (0.24)	125 (4.92)	0 (0)	50 (1.97) <sup>1)</sup>	4 × M5
FSD	✓	–	275 (10.83)	419 (16.5)	204 (8.03)	235 (9.25)	325 (12.8)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSD	–	✓	275 (10.83)	512 (20.16)	204 (8.03)	235 (9.25)	419 (16.5)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSE	✓	–	275 (10.83)	499 (19.65)	204 (8.03)	235 (9.25)	405 (15.94)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSE	–	✓	275 (10.83)	635 (25)	204 (8.03)	235 (9.25)	541 (21.3)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSF	✓	–	350 (13.78)	634 (24.96)	316 (12.44)	300 (11.81)	598 (23.54)	11 (0.43)	350 (13.78)	0 (0)	0 (0)	4 × M8
FSF	–	✓	350 (13.78)	934 (36.77)	316 (12.44)	300 (11.81)	899 (35.39)	11 (0.43)	350 (13.78)	0 (0)	0 (0)	4 × M8
FSGX	✓	–	326 (12.9)	1533 (60.35)	547 (21.6)	125 (4.92)	1506 (59.29)	14.5 (0.57)	250/150 (9.84/5.91)	50 (1.97)	0 (0)	6 × M8

#### PM260 Power Modules – IP20 degree of protection

Frame size	Line filter		Dimensions in mm (inches)			Drilling dimensions in mm (inches)			Cooling clearance in mm (inches)			Mounting With bolts, nuts and washers
	With-out	With	a (width)	b (height)	c (depth)	d	e	f	top/bottom	front	side	
FSD	✓	✓	275 (10.83)	512 (20.16)	204 (8.03)	235 (9.25)	419 (16.5)	11 (0.43)	300 (11.81)	0 (0)	0 (0)	4 × M8
FSF	✓	✓	350 (13.78)	634 (24.96)	316 (12.44)	300 (11.81)	598 (23.54)	11 (0.43)	350 (13.78)	0 (0)	0 (0)	4 × M8

#### Increased mounting depth

##### PM230 Power Modules

When the IOP is plugged on, the depth increases by 15 mm (0.59 inches).

When the BOP-2 or a blanking cover is mounted, the depth increases by 5 mm (0.2 inches).

##### PM240, PM250 and PM260 Power Modules

When the CU230 Control Unit is mounted, the depth increases by 65 mm (2.56 inches).

When the CU240 Control Unit is mounted, the depth increases by 46 mm (1.81 inches).

When the IOP is plugged on, the depth increases by an additional 22 mm (0.87 inches).

When the BOP-2 or a blanking cover is mounted, the depth increases by an additional 12 mm (0.47 inches).

For the PM240 Power Module, frame size FSGX, the mounting depth does not increase when devices are plugged on.

<sup>1)</sup> Up to 40 °C (104 °F) without any lateral clearance.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Line-side components

#### Line filters

#### Overview



Line filter for Power Modules, frame size FSA



Line filter for PM240 Power Modules, frame size FSGX

With one of the additional line filters, the Power Module reaches a higher radio interference class.

#### Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		Line filter class A according to EN 55011
kW	hp	Type 6SL3224-...	Frame size	
<b>380 ... 480 V 3 AC</b>				
0.37	0.50	0BE13-7UA0	FSA	<b>6SE6400-2FA00-6AD0</b>
0.55	0.75	0BE15-5UA0		
0.75	1.0	0BE17-5UA0		
1.1	1.5	0BE21-1UA0		
1.5	2.0	0BE21-5UA0		
110	150	0BE38-8UA0	FSF	<b>6SL3203-0BE32-5AA0</b>
132	200	0BE41-1UA0		
160	250	0XE41-3UA0	FSGX	<b>6SL3000-0BE34-4AA0</b>
200	300	0XE41-6UA0		
250	400	0XE42-0UA0	FSGX	<b>6SL3000-0BE36-0AA0</b>

Rated power		SINAMICS G120 PM240 Power Module		Line filter class B according to EN 55011
kW	hp	Type 6SL3224-...	Frame size	
<b>380 ... 480 V 3 AC</b>				
0.37	0.50	0BE13-7UA0	FSA	<b>6SE6400-2FB00-6AD0</b>
0.55	0.75	0BE15-5UA0		
0.75	1.0	0BE17-5UA0		
1.1	1.5	0BE21-1UA0		
1.5	2	0BE21-5UA0		
2.2	3	0BE22-2AA0	FSB	<b>6SL3203-0BE21-6SA0</b>
3.0	4	0BE23-0AA0		
4.0	5	0BE24-0AA0		
7.5	10	0BE25-5AA0	FSC	<b>6SL3203-0BD23-8SA0</b>
11	15	0BE27-5AA0		
15	20	0BE31-1AA0		

Rated power		SINAMICS G120 PM250 Power Module		Line filter class B according to EN 55011
kW	hp	Type 6SL3225-...	Frame size	
<b>380 ... 480 V 3 AC</b>				
7.5	10	0BE25-5AA1	FSC	<b>6SL3203-0BD23-8SA0</b>
11	15	0BE27-5AA1		
15	20	0BE31-1AA1		

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Line-side components  
Line filters

### Integration

Frame size FSA of the PM240 Power Module is available only without integrated line filter class A. A base filter is therefore available so that class A can be achieved. A base filter class B is also available so that class B can be achieved.

Frame sizes FSB and FSC of the PM240 Power Module are available both with and without integrated line filter class A. For compliance with class B, PM240 Power Modules with integrated line filter class A must be fitted additionally with a base filter class B.

An external line filter class A is available for frame size FSGX of the PM240 Power Module.

Frame sizes FSC of the PM250 Power Module are available only with integrated line filter class A. To achieve class B, PM250 Power Modules must be additionally fitted with a base filter class B.

No additional line filters class B are available for the PM260 Power Module.

### Line filters that are optionally available depending on the Power Module used

	Frame size						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM240 Power Module with integrated braking chopper</b>							without integrated braking chopper
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>Line-side power components</b>							
Line filter class A	U	F	F	F	F	F/S <sup>1)</sup>	S <sup>1)</sup>
Line filter class B	U	U	U	–	–	–	–
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	–	–	✓	✓	✓	✓	–
<b>Line-side power components</b>							
Line filter class A	–	–	I	F	F	F	–
Line filter class B	–	–	U	–	–	–	–
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	–	–	–	✓	–	✓	–
<b>Line-side power components</b>							
Line filter class A	–	–	–	F	–	F	–
Line filter class B	–	–	–	–	–	–	–

U = Base component

S = Lateral mounting

I = Integrated

– = Not possible

F = Power Modules available with and without integrated filter class A

<sup>1)</sup> PM240 FSF Power Modules from 110 kW and higher and FSGX, are available only without an integrated filter class A. An optional line filter class A for lateral mounting is available instead.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Line-side components

#### Line filters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Line filter class A			
		6SE6400-2FA00-6AD0	6SL3203-0BE32-5AA0	6SL3000-0BE34-4AA0	6SL3000-0BE36-0AA0
<b>Rated current</b>	A	6	250	440	600
<b>Line supply connection</b> L1, L2, L3		Screw terminals	On housing with M8 screw stud	1 x hole for M10 Provided for busbar connection	1 x hole for M10 Provided for busbar connection
• Conductor cross-section	mm <sup>2</sup>	2.5	–	–	–
<b>Load connection</b> U, V, W		Shielded cable	On housing with M8 screw stud	On housing with M10 screw stud	On housing with M10 screw stud
• Conductor cross-section	mm <sup>2</sup>	3 × 2.5	–	–	–
• Length	m (ft)	0.4 (1.31)	–	–	–
<b>PE connection</b>		On housing with M4 screw stud	Flat connector for M10 screw	1 x hole for M8	1 x hole for M10
<b>Degree of protection</b>		IP20	IP00	IP00	IP00
<b>Dimensions</b>					
• Width	mm (in)	73 (2.87)	240 (9.45)	360 (14.17)	400 (15.75)
• Height	mm (in)	200 (7.87)	360 (14.17)	240 (9.45)	265 (10.43)
• Depth	mm (in)	42.5 (1.67)	116 (4.57)	116 (4.57)	140 (5.51)
<b>Possible as base component</b>		Yes	No	No	No
<b>Weight, approx.</b>	kg (lb)	0.5 (1.10)	12.4 (27.3)	12.3 (27.1)	19 (41.9)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE13-7UA0 6SL3224-0BE15-5UA0 6SL3224-0BE17-5UA0 6SL3224-0BE21-1UA0 6SL3224-0BE21-5UA0	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0	6SL3224-0XE41-3UA0 6SL3224-0XE41-6UA0	6SL3224-0XE42-0UA0
<b>Suitable for PM250 Power Module</b>		–	–	–	–
• Frame size		FSA	FSF	FSGX	FSGX

Line voltage 380 ... 480 V 3 AC		Line filter class B		
		6SE6400-2FB00-6AD0	6SL3203-0BE21-6SA0	6SL3203-0BD23-8SA0
<b>Rated current</b>	A	6	10.2	39.4
<b>Line supply connection</b> L1, L2, L3		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	2.5	2.5	4
<b>Load connection</b> U, V, W		Shielded cable	Shielded cable	Shielded cable
• Conductor cross-section	mm <sup>2</sup>	3 × 2.5	3 × 2.5	3 × 4
• Length	m (ft)	0.4 (1.31)	0.4 (1.31)	0.4 (1.31)
<b>PE connection</b>		On housing with M4 screw stud	On housing with M4 screw stud	On housing with M4 screw stud
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	73 (2.87)	153 (6.02)	190 (7.48)
• Height	mm (in)	200 (7.87)	296 (11.65)	362 (14.25)
• Depth	mm (in)	42.5 (1.67)	50 (1.97)	55 (2.17)
<b>Possible as base component</b>		Yes	Yes	Yes
<b>Weight, approx.</b>	kg (lb)	0.5 (1.10)	1.5 (3.31)	2.3 (5.07)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE13-7UA0 6SL3224-0BE15-5UA0 6SL3224-0BE17-5UA0 6SL3224-0BE21-1UA0 6SL3224-0BE21-5UA0	6SL3224-0BE22-2AA0 6SL3224-0BE23-0AA0 6SL3224-0BE24-0AA0	6SL3224-0BE25-5AA0 6SL3224-0BE27-5AA0 6SL3224-0BE31-1AA0
<b>Suitable for PM250 Power Module</b>		–	–	6SL3225-0BE25-5AA1 6SL3225-0BE27-5AA1 6SL3225-0BE31-1AA1
• Frame size		FSA	FSB	FSC

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Line-side components  
Line reactors

### Overview



Line reactors for Power Modules, frame sizes FSA to FSE



Line reactor for PM240 Power Modules, frame size FSGX

Line reactors are used to smooth voltage peaks or to bridge commutating dips. Line reactors also reduce the effects of harmonics on the inverter and the line supply.

#### Note:

A line reactor must not be used in combination with a PM250 or PM260 Power Module.



Power Module, frame size FSB, with base line reactor and shield connection plate

### Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		Line reactor
kW	hp	Type 6SL3224-...	Frame size	Order No.
<b>380 ... 480 V 3 AC</b>				
0.37	0.50	0BE13-7UA0	FSA	<b>6SE6400-3CC00-2AD3</b>
0.55	0.75	0BE15-5UA0		
0.75	1.0	0BE17-5UA0	FSA	<b>6SE6400-3CC00-4AD3</b>
1.1	1.5	0BE21-1UA0		
1.5	2	0BE21-5UA0	FSA	<b>6SE6400-3CC00-6AD3</b>
2.2	3	0BE22-2 . A0	FSB	<b>6SL3203-0CD21-0AA0</b>
3.0	4	0BE23-0 . A0		
4.0	5	0BE24-0 . A0	FSB	<b>6SL3203-0CD21-4AA0</b>
7.5	10	0BE25-5 . A0	FSC	<b>6SL3203-0CD22-2AA0</b>
11.0	15	0BE27-5 . A0		
15.0	20	0BE31-1 . A0	FSC	<b>6SL3203-0CD23-5AA0</b>
18.5	25	0BE31-5 . A0	FSD	<b>6SL3203-0CJ24-5AA0</b>
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0	FSD	<b>6SL3203-0CD25-3AA0</b>
37	50	0BE33-0 . A0	FSE	<b>6SL3203-0CJ28-6AA0</b>
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	<b>6SE6400-3CC11-2FD0</b>
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0	FSF	<b>6SE6400-3CC11-7FD0</b>
110	150	0BE38-8UA0	FSF	<b>6SL3000-0CE32-3AA0</b>
132	200	0BE41-1UA0	FSF	<b>6SL3000-0CE32-8AA0</b>
160	250	0XE41-3UA0	FSGX	<b>6SL3000-0CE33-3AA0</b>
200	300	0XE41-6UA0	FSGX	<b>6SL3000-0CE35-1AA0</b>
250	400	0XE42-0UA0		

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Line-side components Line reactors

#### Benefits

- Only AC reactors are available as reactors for the inverter.
- Only an AC reactor provides protection for the input rectifier of the inverter.
- The capacitor lifetime of the inverter increases by a factor of 2 when using an AC reactor instead of a DC reactor.
- The harmonic behavior of AC reactors remains almost constant over the complete lifetime. Over time (months), the harmonic behavior of DC reactors changes.
- An AC reactor reduces possible asymmetries between the current phases. In this case, a DC reactor would not be effective.

#### Integration

The line reactors for PM240 Power Modules of frame sizes FSA to FSE are designed as base components. The line reactor is attached to the mounting surface and the Power Module is mounted directly on the line reactor.

The cables to the Power Module are already connected at the line reactor.

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

#### Line reactors that are optionally available depending on the Power Module used

	Frame size						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM240 Power Module with integrated braking chopper</b>							without integrated braking chopper
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>Line-side power components</b>							
Line reactor	U	U	U	U	U	S	S
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	–	–	✓	✓	✓	✓	–
<b>Line-side power components</b>							
Line reactor <sup>1)</sup>	–	–	– <sup>1)</sup>	– <sup>1)</sup>	– <sup>1)</sup>	– <sup>1)</sup>	–
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	–	–	–	✓	–	✓	–
<b>Line-side power components</b>							
Line reactor <sup>1)</sup>	–	–	–	– <sup>1)</sup>	–	– <sup>1)</sup>	–

U = Base component  
S = Lateral mounting  
– = Not possible

<sup>1)</sup> A line reactor is not required and must not be used in conjunction with a PM250 or PM260 Power Module.



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Line-side components  
Line reactors

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor			
		6SE6400-3CC00-2AD3	6SE6400-3CC00-4AD3	6SE6400-3CC00-6AD3	6SL3203-0CD21-0AA0
<b>Rated current</b>	A	1.9	3.5	4.8	9
<b>Power loss</b> at 50/60 Hz, approx.	W	6/7	12.5/15	7.5/9	9/11
<b>Line supply connection</b> U1, V1, W1		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6
<b>Load connection</b>		Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )
• Length, approx.	m (ft)	0.38 (1.25)	0.38 (1.25)	0.38 (1.25)	0.46 (1.51)
<b>PE connection</b>		On housing with M5 screw stud	On housing with M5 screw stud	On housing with M5 screw stud	On housing with M5 screw stud
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	153 (6.02)
• Height	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	290 (11.42)
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	50 (1.97)
<b>Possible as base component</b>		Yes	Yes	Yes	Yes
<b>Weight, approx.</b>	kg (lb)	0.6 (1.32)	0.8 (1.76)	0.6 (1.32)	3.4 (7.5)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE13-7UA0 6SL3224-0BE15-5UA0	6SL3224-0BE17-5UA0 6SL3224-0BE21-1UA0	6SL3224-0BE21-5UA0	6SL3224-0BE22-2 . A0 6SL3224-0BE23-0 . A0
• Frame size		FSA	FSA	FSA	FSB

Line voltage 380 ... 480 V 3 AC		Line reactor			
		6SL3203-0CD21-4AA0	6SL3203-0CD22-2AA0	6SL3203-0CD23-5AA0	6SL3203-0CJ24-5AA0
<b>Rated current</b>	A	11.6	25	31.3	47
<b>Power loss</b> at 50/60 Hz, approx.	W	27/32	98/118	37/44	90/115
<b>Line supply connection</b> U1, V1, W1		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	16	16
<b>Load connection</b>		Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG10 (2.5 mm <sup>2</sup> )	4 × AWG10 (2.5 mm <sup>2</sup> )	4 × 16 mm <sup>2</sup>
• Length, approx.	m (ft)	0.46 (1.51)	0.49 (1.61)	0.49 (1.61)	0.7 (2.3)
<b>PE connection</b>		On housing with M5 screw stud	On housing with M5 screw stud	On housing with M5 screw stud	On housing with M8 screw
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Dimensions</b>					
• Width	mm (in)	153 (6.02)	189 (7.44)	189 (7.44)	275 (10.83)
• Height	mm (in)	290 (11.42)	371 (14.61)	371 (14.61)	455 (17.91)
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	84 (3.31)
<b>Possible as base component</b>		Yes	Yes	Yes	Yes
<b>Weight, approx.</b>	kg (lb)	3.4 (7.5)	5.2 (11.5)	5.9 (13)	13 (28.7)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE24-0 . A0	6SL3224-0BE25-5 . A0 6SL3224-0BE27-5 . A0	6SL3224-0BE31-1 . A0	6SL3224-0BE31-5 . A0 6SL3224-0BE31-8 . A0
• Frame size		FSB	FSC	FSC	FSD

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Line-side components

#### Line reactors

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor					
		6SL3203-0CD25-3AA0	6SL3203-0CJ28-6AA0	6SE6400-3CC11-2FD0	6SE6400-3CC11-7FD0	6SL3000-0CE32-3AA0	6SL3000-0CE32-8AA0
<b>Rated current</b>	A	63	94	151	186	224	278
<b>Power loss</b> at 50/60 Hz, approx.	W	90/115	170/215	280/360	280/360	240/270	210/250
<b>Line supply connection</b> U1, V1, W1		Screw terminals	Screw terminals	Flat connector for M10 cable lug	Flat connector for M10 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm <sup>2</sup>	16	50	–	–	–	–
<b>Load connection</b>		Cable	Cable	Flat connector for M10 cable lug	Flat connector for M10 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm <sup>2</sup>	4 × 16	4 × 35	–	–	–	–
• Length, approx.	m (ft)	0.7 (2.3)	0.7 (2.3)	–	–	–	–
<b>PE connection</b>		On housing with M8 screw	On housing with M8 screw	On housing with M8 screw stud	On housing with M8 screw stud	M6 screw	M6 screw
<b>Degree of protection</b>		IP20	IP20	IP00	IP00	IP00	IP00
<b>Dimensions</b>							
• Width	mm (in)	275 (10.83)	275 (10.83)	240 (9.45)	240 (9.45)	270 (10.63)	270 (10.63)
• Height	mm (in)	455 (17.91)	577 (22.72)	228 (8.98)	228 (8.98)	248 (9.76)	248 (9.76)
• Depth	mm (in)	84 (3.31)	94 (3.70)	141 (5.55)	141 (5.55)	200 (7.87)	200 (7.87)
<b>Possible as base component</b>		Yes	Yes	No	No	No	No
<b>Weight, approx.</b>	kg (lb)	13 (28.7)	19 (41.9)	25 (55.1)	25 (55.1)	24 (52.9)	24 (52.9)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE32-2 . A0	6SL3224-0BE33-0 . A0 6SL3224-0BE33-7 . A0	6SL3224-0BE34-5 . A0 6SL3224-0BE35-5 . A0	6SL3224-0BE37-5 . A0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
• Frame size		FSD	FSE	FSF	FSF	FSF	FSF

Line voltage 380 ... 480 V 3 AC		Line reactor	
		6SL3000-0CE33-3AA0	6SL3000-0CE35-1AA0
<b>Rated current</b>	A	331	508
<b>Power loss</b> at 50/60 Hz, approx.	W	267	365
<b>Line supply connection</b> U1, V1, W1		1 × hole for M10 Provided for busbar connection	1 × hole for M12 Provided for busbar connection
<b>Load connection</b>		Provided for busbar connection	Provided for busbar connection
<b>PE connection</b>		M6 screw	M6 screw
<b>Degree of protection</b>		IP00	IP00
<b>Dimensions</b>			
• Width	mm (in)	270 (10.63)	300 (11.81)
• Height	mm (in)	248 (9.76)	269 (10.59)
• Depth	mm (in)	200 (7.87)	212 (8.35)
<b>Possible as base component</b>		No	No
<b>Weight, approx.</b>	kg (lb)	27.8 (61.3)	38.0 (83.8)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0 6SL3224-0XE42-0UA0
• Frame size		FSGX	FSGX

# SINAMICS G120 standard inverters


## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Line-side components  
Recommended line-side power components

### Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers


Note for use in compliance with IEC standards:

3NA3 fuses are recommended for European countries. The 3NE1 fuses are UL-compliant (corresponds to ). The values in the table take into account the overload capability of the inverter.

Note for use in compliance with UL regulations:

Fuses for use in North America must be UL-certified, such as the Class NON fuse series from Bussmann or approved circuit breakers from the SIRIUS 3RV and SENTRON 3VL series according to UL 489 (category control number CCN: DiV Q).

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 and IC 10.](#)

Rated power <sup>1)</sup>		SINAMICS G120 PM230 Power Modules IP55/UL Type 12		Fuse		Circuit breaker
kW	hp	Type 6SL3223-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (  ) Order No.	Order No.
<b>380 ... 480 V 3 AC</b>						
0.37	0.50	ODE13-7 . A0	FSA	<b>3NA3803</b>	<b>3NE1813-0</b>	<b>3RV1021-1CA10</b>
0.55	0.75	ODE15-5 . A0	FSA			<b>3RV1021-1DA10</b>
0.75	1.0	ODE17-5 . A0	FSA			<b>3RV1021-1FA10</b>
1.1	1.5	ODE21-1 . A0	FSA			<b>3RV1021-1GA10</b>
1.5	2	ODE21-5 . A0	FSA			<b>3RV1021-1JA10</b>
2.2	3	ODE22-2 . A0	FSA			<b>3RV1021-1KA10</b>
3.0	4	ODE23-0 . A0	FSA			<b>3RV1021-4AA10</b>
4.0	5	ODE24-0 . A0	FSB			<b>3NA3805</b>
5.5	7.5	ODE25-5 . A0	FSB	<b>3NA3807</b>	<b>3NE1814-0</b>	<b>3RV1021-4BA10</b>
7.5	10	ODE27-5 . A0	FSB	<b>3NA3810</b>	<b>3NE1815-0</b>	<b>3RV1031-4EA10</b>
11.0	15	ODE31-1 . A0	FSC	<b>3NA3814</b>	<b>3NE1803-0</b>	<b>3RV1031-4FA10</b>
15.0	20	ODE31-5 . A0	FSC	<b>3NA3820</b>	<b>3NE1817-0</b>	<b>3RV1031-4HA10</b>
18.5	25	ODE31-8AA0	FSC			<b>3RV1042-4KA10</b>
22	30	ODE32-2 . A0	FSD	<b>3NA3822</b>	<b>3NE1818-0</b>	
30	40	ODE33-0 . A0	FSD	<b>3NA3824</b>	<b>3NE1820-0</b>	<b>3RV1042-4MA10</b>
37	50	ODE33-7 . A0	FSE	<b>3NA3830</b>	<b>3NE1021-0</b>	<b>3VL1712-.DD33-....</b>
45	60	ODE34-5 . A0	FSE	<b>3NA3832</b>	<b>3NE1022-0</b>	<b>3VL1716-.DD33-....</b>
55	75	ODE35-5 . A0	FSF	<b>3NA3836</b>	<b>3NE1224-0</b>	<b>3VL3720-.DC36-....</b>
75	100	ODE37-5 . A0	FSF	<b>3NA3140</b>	<b>3NE1225-0</b>	<b>3VL3725-.DC36-....</b>
90	125	ODE38-8 . A0	FSF	<b>3NA3144</b>	<b>3NE1227-0</b>	<b>3VL4731-.DC36-....</b>

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Line-side components  
Recommended line-side power components

### Selection and ordering data

Rated power <sup>1)</sup>		SINAMICS G120 PM240 Power Modules		Fuse		Circuit breaker
kW	hp	Type 6SL3224-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (UL) Order No.	Order No.
<b>380 ... 480 V 3 AC</b>						
0.37	0.50	OBE13-7UA0	FSA	<b>3NA3803</b>	UL-listed fuses such as the Class NON fuse series from Bussmann are required for North America.	<b>3RV1021-1CA10</b>
0.55	0.75	OBE15-5UA0	FSA			<b>3RV1021-1DA10</b>
0.75	1.0	OBE17-5UA0	FSA			<b>3RV1021-1FA10</b>
1.1	1.5	OBE21-1UA0	FSA			<b>3RV1021-1GA10</b>
1.5	2	OBE21-5UA0	FSA			<b>3RV1021-1JA10</b>
2.2	3	OBE22-2 . A0	FSB	<b>3NA3805</b>		<b>3RV1021-1KA10</b>
3.0	4	OBE23-0 . A0	FSB			<b>3RV1021-4AA10</b>
4.0	5	OBE24-0 . A0	FSB	<b>3NA3807</b>		<b>3RV1021-4BA10</b>
7.5	10	OBE25-5 . A0	FSC			<b>3RV1031-4EA10</b>
11.0	15	OBE27-5 . A0	FSC	<b>3NA3812</b>		<b>3RV1031-4FA10</b>
15.0	20	OBE31-1 . A0	FSC	<b>3NA3814</b>		<b>3RV1031-4HA10</b>
18.5	25	OBE31-5 . A0	FSD	<b>3NA3820</b>	<b>3NE1817-0</b>	<b>3RV1042-4KA10</b>
22	30	OBE31-8 . A0	FSD	<b>3NA3822</b>	<b>3NE1818-0</b>	
30	40	OBE32-2 . A0	FSD	<b>3NA3824</b>	<b>3NE1820-0</b>	<b>3RV1042-4MA10</b>
37	50	OBE33-0 . A0	FSE	<b>3NA3830</b>	<b>3NE1021-0</b>	<b>3VL1712-.DD33-....</b>
45	60	OBE33-7 . A0	FSE	<b>3NA3832</b>	<b>3NE1022-0</b>	<b>3VL1716-.DD33-....</b>
55	75	OBE34-5 . A0	FSF	<b>3NA3836</b>	<b>3NE1224-0</b>	<b>3VL3720-.DC36-....</b>
75	100	OBE35-5 . A0	FSF	<b>3NA3140</b>	<b>3NE1225-0</b>	<b>3VL3725-.DC36-....</b>
90	125	OBE37-5 . A0	FSF	<b>3NA3144</b>	<b>3NE1227-0</b>	<b>3VL4731-.DC36-....</b>
110	150	OBE38-8UA0	FSF	–		
132	200	OBE41-1UA0	FSF	–	<b>3NE1230-0</b>	
160	250	OXE41-3UA0	FSGX	<b>3NA3254</b>	<b>3NE1333-2</b>	<b>3VL4740-.DC36-....</b>
200	300	OBE41-6UA0	FSGX	<b>3NA3260</b>		<b>3VL5750-.DC36-....</b>
250	400	OBE42-0UA0	FSGX	<b>3NA3372</b>	<b>3NE1436-2</b>	

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Line-side components  
Recommended line-side power components

### Selection and ordering data

Rated power <sup>1)</sup>		SINAMICS G120 PM250 Power Modules		Fuse		Circuit breaker
kW	hp	Type 6SL3225-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (UL) Order No.	Order No.
<b>380 ... 480 V 3 AC</b>						
7.5	10	OBE25-5AA1	FSC	<b>3NA3807</b>	UL-listed fuses such as the Class NON fuse series from Bussmann are required for North America.	<b>3RV1031-4EA10</b>
11.0	15	OBE27-5AA1	FSC	<b>3NA3812</b>		<b>3RV1031-4FA10</b>
15.0	20	OBE31-1AA1	FSC	<b>3NA3814</b>		<b>3RV1031-4HA10</b>
18.5	25	OBE31-5 . A0	FSD	<b>3NA3820</b>	<b>3NE1817-0</b>	<b>3RV1042-4KA10</b>
22	30	OBE31-8 . A0	FSD	<b>3NA3822</b>	<b>3NE1818-0</b>	
30	40	OBE32-2 . A0	FSD	<b>3NA3824</b>	<b>3NE1820-0</b>	<b>3RV1042-4MA10</b>
37	50	OBE33-0 . A0	FSE	<b>3NA3830</b>	<b>3NE1021-0</b>	<b>3VL1712-.DD33-....</b>
45	60	OBE33-7 . A0	FSE	<b>3NA3832</b>	<b>3NE1022-0</b>	<b>3VL1716-.DD33-....</b>
55	75	OBE34-5 . A0	FSF	<b>3NA3836</b>	<b>3NE1224-0</b>	<b>3VL3720-.DC36-....</b>
75	100	OBE35-5 . A0	FSF	<b>3NA3140</b>	<b>3NE1225-0</b>	<b>3VL3725-.DC36-....</b>
90	125	OBE37-5 . A0	FSF	<b>3NA3144</b>	<b>3NE1227-0</b>	<b>3VL4731-.DC36-....</b>

Rated power <sup>1)</sup>		SINAMICS G120 PM260 Power Modules		Fuse		Circuit breaker
kW	hp	Type 6SL3225-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (UL) Order No.	Order No.
<b>500 ... 690 V 3 AC</b>						
11.0	15	OBH27-5 . A1	FSD	<b>3NA3120-6</b>	-	<b>3RV1041-4FA10</b>
15.0	20	OBH31-1 . A1	FSD			
18.5	25	OBH31-5 . A1	FSD			
30	40	OBH32-2 . A1	FSF	<b>3NA3122-6</b>		<b>3RV1041-4JA10</b>
37	50	OBH33-0 . A1	FSF			<b>3RV1041-4KA10</b>
55	75	OBH33-7 . A1	FSF	<b>3NA3130-6</b>		<b>3RV1041-4MA10</b>

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for low overload (LO).

# SINAMICS G120 standard inverters

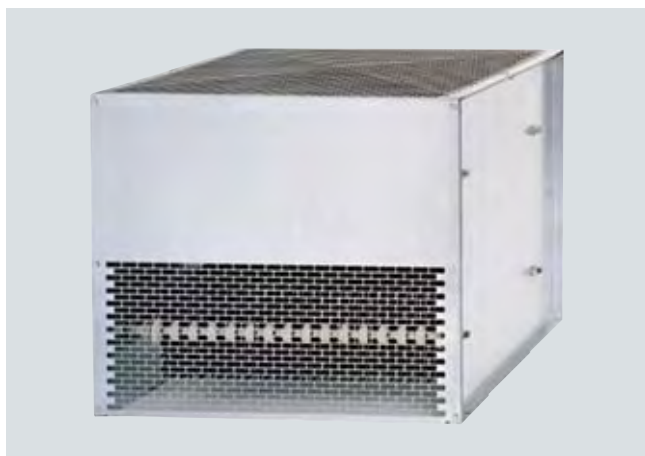
## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### DC link components Braking resistors

#### Overview



Braking resistors for Power Modules, frame sizes FSA and FSC



Braking resistor for PM240 Power Modules, frame size FSGX

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are intended for use with PM240 Power Modules which feature an integrated braking chopper, but cannot regenerate energy to the supply system. There is an optional plug-in Braking Module for frame size FSGX. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors can be installed at the side next to the PM240 Power Modules. The braking resistors for the FSA and FSB frame sizes are designed as base components. If the PM240 Power Modules of the FSA or FSB frame size are operated without line reactor, the braking resistors can also be installed under the Power Modules.

The braking resistors for the Power Modules, frame sizes FSC to FSGX, should be placed outside the control cabinet or outside the switchgear room so that the heat is dissipated away from the Power Modules. The level of air conditioning required is therefore reduced.

Every braking resistor has a temperature switch (UL-listed). The temperature switch can be evaluated to prevent consequential damage if the braking resistor overheats.

#### Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		Braking resistor
kW	hp	Type 6SL3224-...	Frame size	Order No.
<b>380 ... 480 V 3 AC</b>				
0.37	0.50	0BE13-7UA0	FSA	<b>6SE6400-4BD11-0AA0</b>
0.55	0.75	0BE15-5UA0		
0.75	1.0	0BE17-5UA0		
1.1	1.5	0BE21-1UA0		<b>6SL3201-0BE12-0AA0</b>
1.5	2	0BE21-5UA0		
2.2	3	0BE22-2 . A0	FSB	
3.0	4	0BE23-0 . A0		<b>6SE6400-4BD16-5CA0</b>
4.0	5	0BE24-0 . A0		
7.5	10	0BE25-5 . A0	FSC	
11.0	15	0BE27-5 . A0		<b>6SE6400-4BD21-2DA0</b>
15.0	20	0BE31-1 . A0		
18.5	25	0BE31-5 . A0	FSD	
22	30	0BE31-8 . A0		<b>6SE6400-4BD22-2EA1</b>
30	40	0BE32-2 . A0		
37	50	0BE33-0 . A0	FSE	
45	60	0BE33-7 . A0		<b>6SE6400-4BD24-0FA0</b>
55	75	0BE34-5 . A0	FSF	
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0		<b>6SE6400-4BD26-0FA0</b>
110	150	0BE38-8UA0	FSF	
132	200	0BE41-1UA0		
160	250	0XE41-3UA0	FSGX <sup>1)</sup>	<b>6SL3000-1BE31-3AA0</b>
200	300	0XE41-6UA0	FSGX <sup>1)</sup>	<b>6SL3000-1BE32-5AA0</b>
250	400	0XE42-0UA0		

<sup>1)</sup> A Braking Module must be additionally ordered for connection.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

DC link components  
Braking resistors

### Integration

*Braking resistors that are optionally available depending on the Power Module used*

	Frame size						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM240 Power Module with integrated braking chopper</b>							without integrated braking chopper
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>DC link components</b>							
Braking resistor	U	U	S	S	S	S	S
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	–	–	✓	✓	✓	✓	–
<b>DC link components</b>							
Braking resistor <sup>1)</sup>	–	–	– <sup>1)</sup>	– <sup>1)</sup>	– <sup>1)</sup>	– <sup>1)</sup>	–
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	–	–	–	✓	–	✓	–
<b>DC link components</b>							
Braking resistor <sup>1)</sup>	–	–	–	– <sup>1)</sup>	–	– <sup>1)</sup>	–

U = Base component

S = Lateral mounting

– = Not possible

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### Technical specifications

Line voltage 380 V ... 480 V 3 AC		Braking resistor		
		6SE6400-4BD11-0AA0	6SL3201-0BE12-0AA0	6SE6400-4BD16-5CA0
<b>Resistance</b>	Ω	390	160	56
<b>Rated power <math>P_{DB}</math></b>	kW	0.1	0.2	0.65
<b>Peak power <math>P_{max}</math></b> (cycle time 12 s)	kW	2	4	11
<b>Power connections</b>		Shielded cable	Shielded cable	Shielded cable
• Conductor cross-section	mm <sup>2</sup>	3 × 2.5	3 × 2.5	3 × 2.5
• Length	m (ft)	0.5 (1.64)	0.5 (1.64)	0.9 (2.95)
<b>Thermostatic switch</b>		NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Frame size</b>		FSA	FSB	FSC
<b>Dimensions</b>				
• Width	mm (in)	72 (2.83)	153 (6.02)	185 (7.28)
• Height	mm (in)	230 (9.06)	329 (12.95)	285 (11.22)
• Depth	mm (in)	43.5 (1.71)	43.5 (1.71)	150 (5.91)
<b>Possible as base component</b>		Yes	Yes	No
<b>Weight, approx.</b>	kg (lb)	1 (2.21)	2 (4.41)	3.8 (8.38)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE13-7UA0 6SL3224-0BE15-5UA0 6SL3224-0BE17-5UA0 6SL3224-0BE21-1UA0 6SL3224-0BE21-5UA0	6SL3224-0BE22-2.A0 6SL3224-0BE23-0.A0 6SL3224-0BE24-0.A0	6SL3224-0BE25-5.A0 6SL3224-0BE27-5.A0 6SL3224-0BE31-1.A0
• Frame size		FSA	FSB	FSC

<sup>1)</sup> PM250 and PM260 Power Modules are capable of line-commutated energy feedback. A braking resistor cannot be connected and is not necessary.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### DC link components Braking resistors

#### Technical specifications

Line voltage 380 V ... 480 V 3 AC		Braking resistor			
		6SE6400-4BD21-2DA0	6SE6400-4BD22-2EA1	6SE6400-4BD24-0FA0	6SE6400-4BD26-0FA0
<b>Resistance</b>	Ω	27	15	8.2	5.5
<b>Rated power <math>P_{DB}</math></b>	kW	1.2	2.2	4	5.6
<b>Peak power <math>P_{max}</math></b> (cycle time 12 s)	kW	24	44	80	120
<b>Power connections</b>		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
<b>Thermostatic switch</b>		NC contact	NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
<b>Degree of protection</b>		IP20	IP20	IP20	IP20
<b>Frame size</b>		FSD	FSE	FSF	FSF
<b>Dimensions</b>					
• Width	mm (in)	270 (10.63)	326 (12.83)	395 (15.55)	526 (20.71)
• Height	mm (in)	515 (20.28)	301 (11.85)	650 (25.59)	301 (11.85)
• Depth	mm (in)	175 (6.89)	484 (19.06)	315 (12.40)	484 (19.06)
<b>Possible as base component</b>		No	No	No	No
<b>Weight, approx.</b>	kg (lb)	7.4 (16.3)	11 (24.3)	16.7 (36.8)	17.5 (38.6)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE31-5.A0 6SL3224-0BE31-8.A0 6SL3224-0BE32-2.A0	6SL3224-0BE33-0.A0 6SL3224-0BE33-7.A0	6SL3224-0BE34-5.A0 6SL3224-0BE35-5.A0 6SL3224-0BE37-5.A0	6SL3224-0BE38-8.UA0 6SL3224-0BE41-1.UA0
• Frame size		FSD	FSE	FSF	FSF

Line voltage 380 V ... 480 V 3 AC		Braking resistor	
		6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
<b>Resistance</b>	Ω	4.4	2.2
<b>Rated power <math>P_{DB}</math></b>	kW	25	50
<b>Peak power <math>P_{max}</math></b> (cycle time 12 s every 90 s)	kW	125	250
<b>Power connections</b>		M10 screw stud	M10 screw stud
<b>Thermostatic switch</b>		NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A
<b>Degree of protection</b>		IP20	IP20
<b>Frame size</b>		FSGX	FSGX
<b>Dimensions</b>			
• Width	mm (in)	740 (29.13)	810 (31.89)
• Height	mm (in)	605 (23.82)	1325 (52.17)
• Depth	mm (in)	485 (19.09)	485 (19.09)
<b>Possible as base component</b>		No	No
<b>Weight, approx.</b>	kg (lb)	50 (110)	120 (265)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0 6SL3224-0XE42-0UA0
• Frame size		FSGX	FSGX

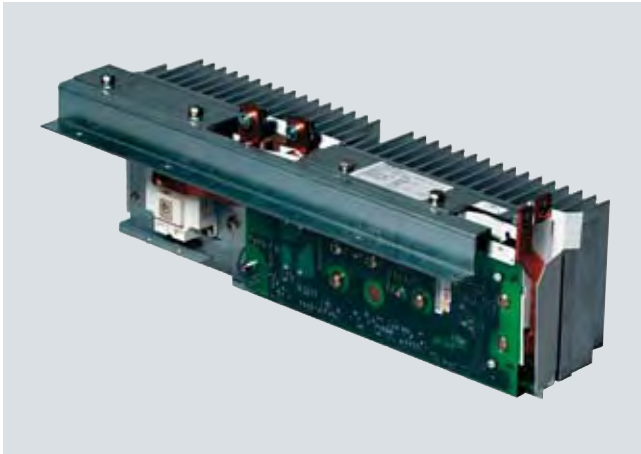


# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

DC link components  
Braking Modules

### Overview



A Braking Module and the matching external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP Category 1) or to limit the DC link voltage during a short period of generator operation. The Braking Module includes the power electronics and the associated control circuit. During operation, the DC link power is converted into heat loss in an external braking resistor. Braking Modules function autonomously.

The Braking Module is designed for installation in the PM240 Power Modules, frame size FSGX, and is cooled using the Power Module fan. The supply voltage for the electronics is taken from the DC link. The Braking Module is connected to the DC link using the busbar sets included in the scope of delivery.

The activation threshold of the Braking Module can be adjusted by means of a DIP switch. The braking power values specified in the technical specifications apply to the upper activation threshold.

### Design

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

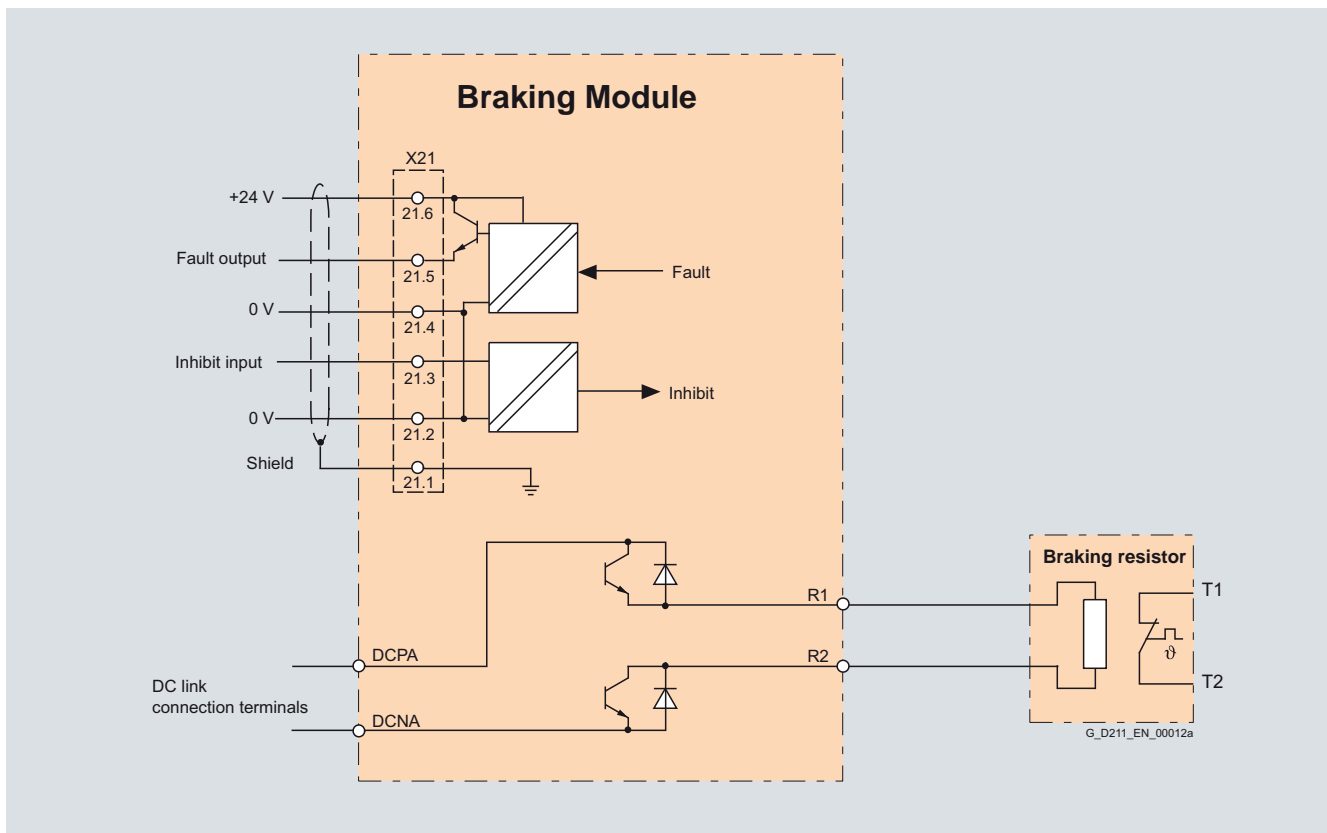
- 1 DC link connection
- 1 braking resistor connection
- 1 digital input (inhibit Braking Module/acknowledge fault)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the application threshold

### Selection and ordering data

Description	Order No.
DC link voltage 510 ... 720 V DC	
<b>Braking Module 50 kW/250 kW</b>	<b>6SL3300-1AE32-5AA0</b>

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### Integration



Connection example of a Braking Module

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### DC link components Braking Modules

#### Technical specifications

DC link voltage 510 ... 720 V DC	Braking Module
	6SL3300-1AE32-5AA0
<b>Power</b>	
• Rated power $P_{DB}$	50 kW
• Peak power $P_{15}$	250 kW
• Power $P_{20}$	200 kW
• Power $P_{40}$	100 kW
<b>Activation thresholds</b> Adjustable via DIP switch	774 V (factory setting) or 673 V
<b>Cable length</b> to braking resistor, max.	50 m (164 ft)
<b>Digital inputs</b> In accordance with IEC 61131-2 Type 1	
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>Digital outputs</b> continuously short-circuit-proof	
• Voltage	24 V DC
• Load current per digital output, max.	500 mA
• Conductor cross-section, max.	1.5 mm <sup>2</sup>
<b>R1/R2 connection</b>	M8 screw
• Conductor cross-section, max.	50 mm <sup>2</sup>
<b>Weight, approx.</b>	7.3 kg (16.1 lb)
<b>Approvals</b>	cURus
<b>Suitable for installation in a PM240 Power Module</b>	Frame size FSGX

# SINAMICS G120 standard inverters

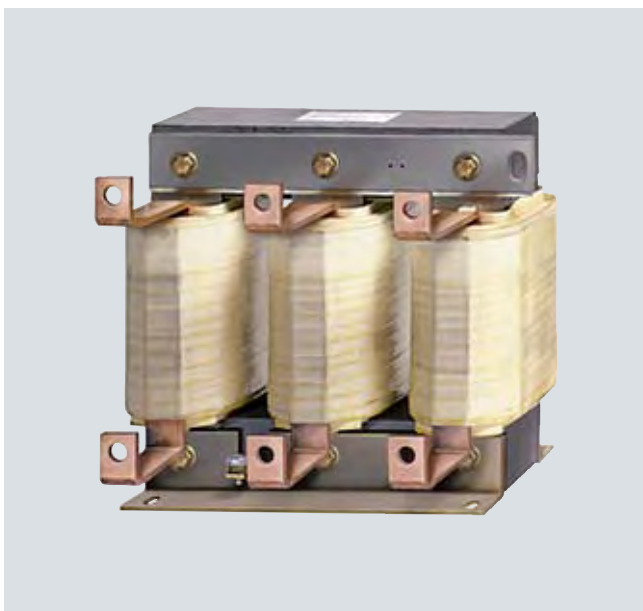
## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Output reactors

### Overview



Output reactors for Power Modules, frame sizes FSA and FSB



Output reactor for PM240 Power Modules, frame size FSGX

Output reactors reduce the voltage stress on the motor windings. At the same time, the capacitive charging/discharging currents, which place an additional load on the power unit when long motor cables are used, are reduced.

Output reactors are only provided for the PM240 and PM250 Power Modules. An output reactor is not required for the PM260 Power Module due to its integrated sine-wave filter.

The maximum permissible output frequency is 150 Hz when an output reactor is used – the pulse frequency must not exceed 4 kHz.

The output reactor must be installed as close as possible to the Power Module.

Output reactors are approved for use only in conjunction with "Vector" and "V/f control" modes.

### Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Modules		Output reactor
kW	hp	Type 6SL3224-...	Frame size	Order No.
<b>380 ... 480 V 3 AC</b>				
0.37	0.50	0BE13-7UA0	FSA	<b>6SE6400-3TC00-4AD2</b>
0.55	0.75	0BE15-5UA0		
0.75	1.0	0BE17-5UA0		
1.1	1.5	0BE21-1UA0		
1.5	2	0BE21-5UA0		
2.2	3	0BE22-2 . A0	FSB	<b>6SL3202-0AE21-0CA0</b>
3.0	4	0BE23-0 . A0		
4.0	5	0BE24-0 . A0		
7.5	10	0BE25-5 . A0	FSC	<b>6SL3202-0AJ23-2CA0</b>
11.0	15	0BE27-5 . A0		
15.0	20	0BE31-1 . A0		
18.5	25	0BE31-5 . A0	FSD	<b>6SE6400-3TC05-4DD0</b>
22	30	0BE31-8 . A0	FSD	<b>6SE6400-3TC03-8DD0</b>
30	40	0BE32-2 . A0	FSD	<b>6SE6400-3TC05-4DD0</b>
37	50	0BE33-0 . A0	FSE	<b>6SE6400-3TC08-0ED0</b>
45	60	0BE33-7 . A0	FSE	<b>6SE6400-3TC07-5ED0</b>
55	75	0BE34-5 . A0	FSF	<b>6SE6400-3TC14-5FD0</b>
75	100	0BE35-5 . A0	FSF	<b>6SE6400-3TC15-4FD0</b>
90	125	0BE37-5 . A0	FSF	<b>6SE6400-3TC14-5FD0</b>
110	150	0BE38-8UA0	FSF	<b>6SL3000-2BE32-1AA0</b>
132	200	0BE41-1UA0	FSF	<b>6SL3000-2BE32-6AA0</b>
160	250	0XE41-3UA0	FSGX	<b>6SL3000-2BE33-2AA0</b>
200	300	0XE41-6UA0	FSGX	<b>6SL3000-2BE33-8AA0</b>
250	400	0XE42-0UA0	FSGX	<b>6SL3000-2BE35-0AA0</b>

Rated power		SINAMICS G120 PM250 Power Module		Output reactor
kW	hp	Type 6SL3225-...	Frame size	Order No.
<b>380 ... 480 V 3 AC</b>				
7.5	10	0BE25-5AA1	FSC	<b>6SL3202-0AJ23-2CA0</b>
11.0	15	0BE27-5AA1		
15.0	20	0BE31-1AA1		
18.5	25	0BE31-5 . A0	FSD	<b>6SE6400-3TC05-4DD0</b>
22	30	0BE31-8 . A0	FSD	<b>6SE6400-3TC03-8DD0</b>
30	40	0BE32-2 . A0	FSD	<b>6SE6400-3TC05-4DD0</b>
37	50	0BE33-0 . A0	FSE	<b>6SE6400-3TC08-0ED0</b>
45	60	0BE33-7 . A0	FSE	<b>6SE6400-3TC07-5ED0</b>
55	75	0BE34-5 . A0	FSF	<b>6SE6400-3TC14-5FD0</b>
75	100	0BE35-5 . A0	FSF	<b>6SE6400-3TC15-4FD0</b>
90	125	0BE37-5 . A0	FSF	<b>6SE6400-3TC14-5FD0</b>

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Load-side power components Output reactors

#### Integration

##### Output reactors that are optionally available depending on the Power Module used

The following line-side power components, DC link components and load-side power components are optionally available in the appropriate frame sizes for the Power Modules:

	Frame size						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM240 Power Module with integrated braking chopper</b>							without integrated braking chopper
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>Load-side power components</b>							
Output reactor	U	U	U	S	S	S	S
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	-	-	✓	✓	✓	✓	-
<b>Load-side power components</b>							
Output reactor	-	-	U	S	S	S	-
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	-	-	-	✓	-	✓	-
<b>Load-side power components</b>							
Output reactor <sup>1)</sup>	-	-	-	-	-	-	-

U = Base component  
S = Lateral mounting  
- = Not possible

<sup>1)</sup> PM260 Power Modules do not require output reactors as they are already equipped with sine-wave filters.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Output reactors

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)				
		6SE6400-3TC00-4AD2				
<b>Rated current</b>	A	4	4	4	4	4
<b>Power loss</b>	kW	0.005	0.005	0.005	0.005	0.005
<b>Connection to the Power Module</b>		Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )	4 × AWG16 (1.5 mm <sup>2</sup> )
• Length, approx.	m (ft)	0.3 (0.98)	0.3 (0.98)	0.3 (0.98)	0.3 (0.98)	0.3 (0.98)
<b>Motor connection</b>		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6
<b>PE connection</b>		M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs
<b>Cable length, max.</b> between output reactor and motor						
• 380 -10 % ... 400 V 3 AC						
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)	225 (738)	225 (738)
• 401 ... 480 V 3 AC +10 %						
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)	150 (492)
<b>Dimensions</b>						
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)
• Height	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)
• Depth	mm (in)	110 (4.33)	110 (4.33)	110 (4.33)	110 (4.33)	110 (4.33)
<b>Possible as base component</b>		Yes	Yes	Yes	Yes	Yes
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	2 (4.41)	2 (4.41)	2 (4.41)	2 (4.41)	2 (4.41)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE13-7UA0	6SL3224-0BE15-5UA0	6SL3224-0BE17-5UA0	6SL3224-0BE21-1UA0	6SL3224-0BE21-5UA0
• Rated power of the Power Module	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Rated current $I_{rated}$ of the Power Module	A	1.3	1.7	2.2	3.1	4.1
• Frame size		FSA	FSA	FSA	FSA	FSA

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Load-side power components

#### Output reactors

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)					
		6SL3202-0AE21-0CA0			6SL3202-0AJ23-2CA0		
<b>Rated current</b>	A	9.4	9.4	9.4	32	32	32
<b>Power loss</b>	kW	0.02	0.02	0.02	0.06	0.06	0.06
<b>Connection to the Power Module</b>		Cable	Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG14 (1.5 mm <sup>2</sup> )	4 × AWG14 (1.5 mm <sup>2</sup> )	4 × AWG14 (1.5 mm <sup>2</sup> )	4 × AWG14 (1.5 mm <sup>2</sup> )	4 × AWG14 (1.5 mm <sup>2</sup> )	4 × AWG14 (1.5 mm <sup>2</sup> )
• Length, approx.	m (ft)	0.4 (1.31)	0.4 (1.31)	0.4 (1.31)	0.35 (1.15)	0.35 (1.15)	0.35 (1.15)
<b>Motor connection</b>		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6	6
<b>PE connection</b>		M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs
<b>Cable length, max.</b> between output reactor and motor							
• 380 -10 % ... 400 V 3 AC							
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)	225 (738)	225 (738)	225 (738)
• 401 ... 480 V 3 AC +10 %							
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)	150 (492)	150 (492)
<b>Dimensions</b>							
• Width	mm (in)	154 (6.06)	154 (6.06)	154 (6.06)	189 (7.44)	189 (7.44)	189 (7.44)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	334 (13.15)	334 (13.15)	334 (13.15)
• Depth	mm (in)	70 (2.76)	70 (2.76)	70 (2.76)	80 (3.15)	80 (3.15)	80 (3.15)
<b>Possible as base component</b>		Yes	Yes	Yes	Yes	Yes	Yes
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	4.4 (9.7)	4.4 (9.7)	4.4 (9.7)	9.1 (20.1)	9.1 (20.1)	9.1 (20.1)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE22-2UA0 6SL3224-0BE22-2AA0	6SL3224-0BE23-0UA0 6SL3224-0BE23-0AA0	6SL3224-0BE24-0UA0 6SL3224-0BE24-0AA0	6SL3224-0BE25-5UA0 6SL3224-0BE25-5AA0	6SL3224-0BE27-5UA0 6SL3224-0BE27-5AA0	6SL3224-0BE31-1UA0 6SL3224-0BE31-1AA0
<b>Suitable for PM250 Power Module</b>	Type	–	–	–	6SL3225-0BE25-5AA1	6SL3225-0BE27-5AA1	6SL3225-0BE31-1AA1
• Rated power of the Power Module	kW (hp)	2.2 (3.0)	3 (4)	4 (5)	7.5 (10)	11 (15)	15 (20)
• Rated current $I_{rated}$ of the Power Module	A	5.9	7.7	10.2	18	25	32
• Frame size		FSB	FSB	FSB	FSC	FSC	FSC

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Output reactors

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)				
		6SE6400-3TC05-4DD0	6SE6400-3TC03-8DD0	6SE6400-3TC05-4DD0	6SE6400-3TC08-0ED0	6SE6400-3TC07-5ED0
<b>Rated current</b>	A	68 <sup>1)</sup>	45 <sup>1)</sup>	68 <sup>1)</sup>	104 <sup>1)</sup>	90 <sup>1)</sup>
<b>Power loss</b>	kW	0.2	0.2	0.2	0.17	0.27
<b>Connection to the Power Module</b>		Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug
<b>Motor connection</b>		Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug	Flat connector for M6 cable lug
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Cable length, max.</b> between output reactor and motor						
• 380 -10 % ... 400 V 3 AC						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
• 401 ... 480 V 3 AC +10 %						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Dimensions</b>						
• Width	mm (in)	225 (8.86)	225 (8.86)	225 (8.86)	225 (8.86)	270 (10.63)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	248 (9.76)
• Depth	mm (in)	150 (5.91)	179 (7.05)	150 (5.91)	150 (5.91)	209 (8.23)
<b>Possible as base component</b>		No	No	No	No	No
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	10.7 (23.6)	16.1 (35.5)	10.7 (23.6)	10.4 (22.9)	24.9 (54.9)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE31-5UA0 6SL3224-0BE31-5AA0	6SL3224-0BE31-8UA0 6SL3224-0BE31-8AA0	6SL3224-0BE32-2UA0 6SL3224-0BE32-2AA0	6SL3224-0BE33-0UA0 6SL3224-0BE33-0AA0	6SL3224-0BE33-7UA0 6SL3224-0BE33-7AA0
<b>Suitable for PM250 Power Module</b>	Type	6SL3225-0BE31-5 . A0	6SL3225-0BE31-8 . A0	6SL3225-0BE32-2 . A0	6SL3225-0BE33-0 . A0	6SL3225-0BE33-7 . A0
• Rated power of the Power Module	kW (hp)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Rated current $I_{rated}$ of the Power Module	A	38	45	60	75	90
• Frame size		FSD	FSD	FSD	FSE	FSE

<sup>1)</sup> On the rating plate of the reactor the current is specified according to high overload HO, which is lower than the indicated value for the low overload current of the Power Module.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Load-side power components

#### Output reactors

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)				
		6SE6400-3TC14-5FD0	6SE6400-3TC15-4FD0	6SE6400-3TC14-5FD0	6SL3000-2BE32-1AA0	6SL3000-2BE32-6AA0
<b>Rated current</b>	A	178 <sup>1)</sup>	178 <sup>1)</sup>	178 <sup>1)</sup>	210	260
<b>Power loss</b>	kW	0.47	0.25	0.47	0.49	0.5
<b>Connection to the Power Module</b>		Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
<b>Motor connection</b>		Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M8 cable lug	Flat connector for M10 screw	Flat connector for M10 screw
<b>PE connection</b>		M8 screw	M6 screw	M8 screw	M8 screw	M8 screw
<b>Cable length, max.</b> between output reactor and motor						
• 380 -10 % ... 400 V 3 AC						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
• 401 ... 480 V 3 AC +10 %						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Dimensions</b>						
• Width	mm (in)	350 (13.78)	270 (10.63)	350 (13.78)	300 (11.81)	300 (11.81)
• Height	mm (in)	321 (12.64)	248 (9.76)	321 (12.64)	285 (11.22)	315 (12.40)
• Depth	mm (in)	288 (11.34)	209 (8.23)	288 (11.34)	257 (10.12)	277 (10.91)
<b>Possible as base component</b>		No	No	No	No	No
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	51.5 (114)	24 (52.9)	51.5 (114)	60 (132)	66 (146)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE34-5UA0 6SL3224-0BE34-5AA0	6SL3224-0BE35-5UA0 6SL3224-0BE35-5AA0	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
<b>Suitable for PM250 Power Module</b>	Type	6SL3225-0BE34-5 . A0	6SL3225-0BE35-5 . A0	6SL3225-0BE37-5 . A0	–	–
• Rated power of the Power Module	kW (hp)	55 (75)	75 (100)	90 (125)	110 (150)	132 (200)
• Rated current $I_{rated}$ of the Power Module	A	110	145	178	205	250
• Frame size		FSF	FSF	FSF	FSF	FSF

<sup>1)</sup> On the rating plate of the reactor the current is specified according to high overload HO, which is lower than the indicated value for the low overload current of the Power Module.



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Output reactors

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)		
		6SL3000-2BE33-2AA0	6SL3000-2BE33-8AA0	6SL3000-2BE35-0AA0
<b>Rated current</b>	A	310	380	490
<b>Power loss</b>	kW	0.470	0.500	0.500
<b>Connection to the Power Module</b>		1 x hole for M10	1 x hole for M10	1 x hole for M12
<b>Motor connection</b>		1 x hole for M10	1 x hole for M10	1 x hole for M12
<b>PE connection</b>		M6 screw	M6 screw	M6 screw
<b>Cable length, max.</b> between output reactor and motor				
• 380 -10 % ... 400 V 3 AC				
- Shielded	m (ft)	300 (984)	300 (984)	300 (984)
- Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
• 401 ... 480 V 3 AC +10 %				
- Shielded	m (ft)	300 (984)	300 (984)	300 (984)
- Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
<b>Dimensions</b>				
• Width	mm (in)	300 (11.81)	300 (11.81)	300 (11.81)
• Height	mm (in)	285 (11.22)	285 (11.22)	365 (14.37)
• Depth	mm (in)	257 (10.12)	277 (10.91)	277 (10.91)
<b>Possible as base component</b>		No	No	No
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	66 (146)	73 (161)	100 (221)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0XE41-3UAA0	6SL3224-0XE41-6UAA0	6SL3224-0XE42-0UAA0
<b>Suitable for PM250 Power Module</b>	Type	–	–	–
• Rated power of the Power Module	kW (hp)	160 (250)	200 (300)	250 (400)
• Rated current $I_{rated}$ of the Power Module	A	302	370	477
• Frame size		FSGX	FSGX	FSGX

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Sine-wave filters

### Overview



Sine-wave filter for PM240 Power Modules, frame size FSGX

A sine-wave filter limits the rate of rise of voltage and the capacitive charging/discharging currents that usually occur with inverter operation. An output reactor is not required. Sine-wave filters are only provided for the PM240 and PM250 Power Modules. PM260 Power Modules already have an integrated sine-wave filter and an additional sine-wave filter is not required.

The sine-wave filter at the inverter output supplies almost perfect sinusoidal voltages at the motor so that standard motors can be used without special cables. Standard cables can be used. The maximum permissible motor feeder cable length is 300 m (984 ft). The maximum output frequency is 150 Hz at 380 V to 480 V.

When using sine-wave filters, the following should be observed:

- Operation permissible with pulse frequencies from 4 kHz to 8 kHz (sine-wave filter from 160 kW (250 hp), only for 4 kHz)
- It must be ensured that the automatic pulse frequency reduction functions are also deactivated
- A derating of 5 % must be observed when selecting a suitable inverter
- The output frequency is limited to 150 Hz.
- Operation and commissioning may only be performed with the motor connected as the sine-wave filter is not no-load proof

### Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		Sine-wave filter
kW	hp	Type 6SL3224-...	Frame size	Order No.
<b>380 ... 480 V 3 AC</b>				
0.37	0.50	0BE13-7UAA0	FSA	<b>6SL3202-0AE20-3SA0</b>
0.55	0.75	0BE15-5UAA0		
0.75	1.0	0BE17-5UAA0		
1.1	1.5	0BE21-1UAA0	FSA	<b>6SL3202-0AE20-6SA0</b>
1.5	2.0	0BE21-5UAA0		
2.2	3.0	0BE22-2 . A0	FSB	<b>6SL3202-0AE21-1SA0</b>
3.0	4.0	0BE23-0 . A0		
4.0	5.0	0BE24-0 . A0	FSB	<b>6SL3202-0AE21-4SA0</b>
7.5	10	0BE25-5 . A0	FSC	<b>6SL3202-0AE22-0SA0</b>
11.0	15	0BE27-5 . A0	FSC	<b>6SL3202-0AE23-3SA0</b>
15.0	20	0BE31-1 . A0		
18.5	25	0BE31-5 . A0	FSD	<b>6SL3202-0AE24-6SA0</b>
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0	FSD	<b>6SL3202-0AE26-2SA0</b>
37	50	0BE33-0 . A0	FSE	<b>6SL3202-0AE28-8SA0</b>
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	<b>6SL3202-0AE31-5SA0</b>
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0	FSF	<b>6SL3202-0AE31-8SA0</b>
110	150	0BE38-8UAA0	FSF	<b>6SL3000-2CE32-3AA0</b>
132	200	0BE41-1UAA0		
160	250	0XE41-3UAA0	FSGX	<b>6SL3000-2CE32-8AA0</b>
200	300	0XE41-6UAA0	FSGX	<b>6SL3000-2CE33-3AA0</b>
250	400	0XE42-0UAA0	FSGX	<b>6SL3000-2CE34-1AA0</b>

Rated power		SINAMICS G120 PM250 Power Module		Sine-wave filter
kW	hp	Type 6SL3225-...	Frame size	Order No.
<b>380 ... 480 V 3 AC</b>				
7.5	10	0BE25-5AA1	FSC	<b>6SL3202-0AE22-0SA0</b>
11.0	15	0BE27-5AA1	FSC	<b>6SL3202-0AE23-3SA0</b>
15.0	20	0BE31-1AA1		
18.5	25	0BE31-5 . A0	FSD	<b>6SL3202-0AE24-6SA0</b>
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0	FSD	<b>6SL3202-0AE26-2SA0</b>
37	50	0BE33-0 . A0	FSE	<b>6SL3202-0AE28-8SA0</b>
45	60	0BE33-7 . A0		
55	75	0BE34-5 . A0	FSF	<b>6SL3202-0AE31-5SA0</b>
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0	FSF	<b>6SL3202-0AE31-8SA0</b>

# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Sine-wave filters

## Integration

*Sine-wave filters that are optionally available depending on the Power Module used*

	Frame size						
	FSA	FSB	FSC	FSD	FSE	FSF	FSGX
<b>PM240 Power Module with integrated braking chopper</b>							without integrated braking chopper
Available frame sizes	✓	✓	✓	✓	✓	✓	✓
<b>Load-side power components</b>							
Sine-wave filter	U	U	U	S	S	S	S
<b>PM250 Power Module with line-commutated energy recovery</b>							
Available frame sizes	–	–	✓	✓	✓	✓	–
<b>Load-side power components</b>							
Sine-wave filter	–	–	U	S	S	S	–
<b>PM260 Power Module with line-commutated energy recovery and integrated sine-wave filter</b>							
Available frame sizes	–	–	–	✓	–	✓	–
<b>Load-side power components</b>							
Sine-wave filter	–	–	–	I	–	I	–

U = Base component

S = Lateral mounting

I = Integrated

– = Not possible

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Load-side power components Sine-wave filters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter (for pulse frequencies 4 kHz ... 8 kHz)				
		6SL3202-0AE20-3SA0			6SL3202-0AE20-6SA0	
<b>Rated current</b>	A	3.5	3.5	3.5	6.0	6.0
<b>Power loss</b>	kW	0.027	0.027	0.027	0.049	0.049
<b>Connection to the Power Module</b>		Cable	Cable	Cable	Cable	Cable
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6
• Length, approx.	m (ft)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)
<b>Motor connection</b>		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6
<b>PE connection</b>		M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs
<b>Cable length, max.</b> between sine-wave filter and motor						
• 380 ... 480 V 3 AC ±10 %						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Dimensions</b>						
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)
• Height	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)
• Depth	mm (in)	110 (4.33)	110 (4.33)	110 (4.33)	110 (4.33)	110 (4.33)
<b>Possible as base component</b>		Yes	Yes	Yes	Yes	Yes
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Weight, approx.</b>	kg (lb)	2.6 (5.73)	2.6 (5.73)	2.6 (5.73)	3.0 (6.62)	3.0 (6.62)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE13-7UA0	6SL3224-0BE15-5UA0	6SL3224-0BE17-5UA0	6SL3224-0BE21-1UA0	6SL3224-0BE21-5UA0
• Rated power of the Power Module	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Rated current $I_{rated}$ of the Power Module	A	1.3	1.7	2.2	3.1	4.1
• Frame size		FSA	FSA	FSA	FSA	FSA

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Sine-wave filters

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter (for pulse frequencies 4 kHz ... 8 kHz)					
		6SL3202-0AE21-1SA0	6SL3202-0AE21-4SA0	6SL3202-0AE22-0SA0	6SL3202-0AE23-3SA0	6SL3202-0AE23-3SA0	6SL3202-0AE23-3SA0
<b>Rated current</b>	A	9.0	9.0	14.0	20.0	33.0	33.0
<b>Power loss</b>	kW	0.052	0.052	0.085	0.099	0.151	0.151
<b>Connection to the Power Module</b>		Cable	Cable	Cable	Cable	Cable	Cable
• Conductor cross-section	mm <sup>2</sup>	6	6	6	10	10	10
• Length, approx.	m (ft)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)	0.5 (1.64)
<b>Motor connection</b>		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6	6
<b>PE connection</b>		M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs	M5 screw studs
<b>Cable length, max.</b> between sine-wave filter and motor							
• 380 ... 480 V 3 AC ±10 %							
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Dimensions</b>							
• Width	mm (in)	153 (6.02)	153 (6.02)	153 (6.02)	189 (7.44)	189 (7.44)	189 (7.44)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	336 (13.23)	336 (13.23)	336 (13.23)
• Depth	mm (in)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)	140 (5.51)	140 (5.51)
<b>Possible as base component</b>		Yes	Yes	Yes	Yes	Yes	Yes
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Weight, approx.</b>	kg (lb)	6 (13.2)	6 (13.2)	10 (22.1)	12 (26.5)	23 (50.7)	23 (50.7)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE22-2UA0 6SL3224-0BE22-2AA0	6SL3224-0BE23-0UA0 6SL3224-0BE23-0AA0	6SL3224-0BE24-0UA0 6SL3224-0BE24-0AA0	6SL3224-0BE25-5UA0 6SL3224-0BE25-5AA0	6SL3224-0BE27-5UA0 6SL3224-0BE27-5AA0	6SL3224-0BE31-1UA0 6SL3224-0BE31-1AA0
<b>Suitable for PM250 Power Module</b>	Type	–	–	–	6SL3225-0BE25-5AA1	6SL3225-0BE27-5AA1	6SL3225-0BE31-1AA1
• Rated power of the Power Module	kW (hp)	2.2 (3)	3 (4)	4 (5)	7.5 (10)	11 (15)	15 (20)
• Rated current $I_{rated}$ of the Power Module	A	5.9	7.7	10.2	18	25	32
• Frame size		FSB	FSB	FSB	FSC	FSC	FSC

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Load-side power components

#### Sine-wave filters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter (for pulse frequencies 4 kHz ... 8 kHz)				
		6SL3202-0AE24-6SA0	6SL3202-0AE26-2SA0	6SL3202-0AE28-8SA0	6SL3202-0AE28-8SA0	6SL3202-0AE28-8SA0
<b>Rated current</b>	A	47	47	61.8	92	92
<b>Power loss</b>	kW	0.185	0.185	0.152	0.251	0.251
<b>Connection to the Power Module</b>		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	50	50	50	95	95
<b>Motor connection</b>		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm <sup>2</sup>	50	50	50	95	95
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M8 screw	M8 screw
<b>Cable length, max.</b> between sine-wave filter and motor						
• 380 ... 480 V 3 AC ±10 %						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Dimensions</b>						
• Width	mm (in)	250 (9.84)	250 (9.84)	250 (9.84)	275 (10.83)	275 (10.83)
• Height	mm (in)	315 (12.40)	315 (12.40)	305 (12.01)	368 (14.49)	368 (14.49)
• Depth	mm (in)	262 (10.31)	262 (10.31)	262 (10.31)	275 (10.83)	275 (10.83)
<b>Possible as base component</b>		No	No	No	No	No
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	24.0 (52.9)	24.0 (52.9)	34.0 (75)	45.0 (99.2)	45.0 (99.2)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE31-5UA0 6SL3224-0BE31-5AA0	6SL3224-0BE31-8UA0 6SL3224-0BE31-8AA0	6SL3224-0BE32-2UA0 6SL3224-0BE32-2AA0	6SL3224-0BE33-0UA0 6SL3224-0BE33-0AA0	6SL3224-0BE33-7UA0 6SL3224-0BE33-7AA0
<b>Suitable for PM250 Power Module</b>	Type	6SL3225-0BE31-5 . A0	6SL3225-0BE31-8 . A0	6SL3225-0BE32-2 . A0	6SL3225-0BE33-0 . A0	6SL3225-0BE33-7 . A0
• Rated power of the Power Module	kW (hp)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Rated current $I_{rated}$ of the Power Module	A	38	45	60	75	90
• Frame size		FSD	FSD	FSD	FSE	FSE

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Load-side power components  
Sine-wave filters

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter (for pulse frequencies 4 kHz ... 8 kHz, from 160 kW (250 hp), only 4 kHz)				
		6SL3202-0AE31-5SA0	6SL3202-0AE31-8SA0	6SL3000-2CE32-3AA0		
<b>Rated current</b>	A	150	150	182	225	225
<b>Power loss</b>	kW	0.43	0.43	0.47	0.221	0.221
<b>Connection to the Power Module</b>		Screw terminals	Screw terminals	Screw terminals	1 x hole for M10	1 x hole for M10
• Conductor cross-section	mm <sup>2</sup>	150	150	150		
<b>Motor connection</b>		Screw terminals	Screw terminals	Screw terminals	1 x hole for M10	1 x hole for M10
• Conductor cross-section	mm <sup>2</sup>	150	150	150		
<b>PE connection</b>		M8 screw	M6 screw	M8 screw	1 x hole for M10	1 x hole for M10
<b>Cable length, max.</b> between sine-wave filter and motor						
• 380 ... 480 V 3 AC ±10 %						
- Shielded	m (ft)	200 (656)	200 (656)	200 (656)	300 (984)	300 (984)
- Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	450 (1476)	450 (1476)
<b>Dimensions</b>						
• Width	mm (in)	350 (13.78)	350 (13.78)	350 (13.78)	620 (24.41)	620 (24.41)
• Height	mm (in)	440 (17.32)	440 (17.32)	468 (18.43)	300 (11.81)	300 (11.81)
• Depth	mm (in)	305 (12.01)	305 (12.01)	305 (12.01)	320 (12.60)	320 (12.60)
<b>Possible as base component</b>		No	No	No	No	No
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	63.0 (139)	63.0 (139)	80.0 (176)	124 (273)	124 (273)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0BE34-5UA0 6SL3224-0BE34-5AA0	6SL3224-0BE35-5UA0 6SL3224-0BE35-5AA0	6SL3224-0BE37-5UA0 6SL3224-0BE37-5AA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
<b>Suitable for PM250 Power Module</b>	Type	6SL3225-0BE34-5 . A0	6SL3225-0BE35-5 . A0	6SL3225-0BE37-5 . A0	–	–
• Rated power of the Power Module	kW (hp)	55 (75)	75 (100)	90 (125)	110 (150)	132 (200)
• Rated current $I_{rated}$ of the Power Module	A	110	145	178	205	250
• Frame size		FSF	FSF	FSF	FSF	FSF

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Load-side power components

#### Sine-wave filters

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Sine-wave filter (for pulse frequencies 4 kHz ... 8 kHz, from 160 kW (250 hp), only 4 kHz)		
		6SL3000-2CE32-8AA0	6SL3000-2CE33-3AA0	6SL3000-2CE34-1AA0
<b>Rated current</b>	A	276	333	408
<b>Power loss</b>	kW	0.235	0.245	0.34
<b>Connection to the Power Module</b>		1 x hole for M10	1 x hole for M10	1 x hole for M10
<b>Motor connection</b>		1 x hole for M10	1 x hole for M10	1 x hole for M10
<b>PE connection</b>		1 x hole for M10	1 x hole for M10	1 x hole for M10
<b>Cable length, max.</b> between sine-wave filter and motor				
• 380 ... 480 V 3 AC ±10 %				
- Shielded	m (ft)	300 (984)	300 (984)	300 (984)
- Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)
<b>Dimensions</b>				
• Width	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)
• Height	mm (in)	300 (11.81)	370 (14.57)	370 (14.57)
• Depth	mm (in)	320 (12.60)	360 (14.17)	360 (14.17)
<b>Possible as base component</b>		No	No	No
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Weight, approx.</b>	kg (lb)	127 (280)	136 (300)	198 (437)
<b>Suitable for PM240 Power Module</b>	Type	6SL3224-0XE41-3UA0	6SL3224-0XE41-6UA0	6SL3224-0XE42-0UA0
<b>Suitable for PM250 Power Module</b>	Type	–	–	–
• Rated power of the Power Module	kW (hp)	160 (250)	200 (300)	250 (400)
• Rated current $I_{rated}$ of the Power Module	A	302	370	477
• Frame size		FSGX	FSGX	FSGX



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components

#### Operator panels

#### Overview

Operator panel	Intelligent Operator Panel IOP and IOP Handheld	Basic Operator Panel BOP-2
		
Description	<p>Thanks to the large plain text display, menu-based operation and the application wizards, commissioning of the standard drives is easy. Integrated application wizards guide the user interactively through the commissioning process for important applications such as pumps, fans, compressors and conveyor systems.</p>	<p>Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.</p>
Possible applications	<ul style="list-style-type: none"> <li>• Directly mounted on SINAMICS G120</li> <li>• Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP54/UL Type 12)</li> <li>• Available as handheld version</li> <li>• 5 languages available</li> </ul>	<ul style="list-style-type: none"> <li>• Directly mounted on SINAMICS G120</li> <li>• Can be mounted in the control cabinet door using a door mounting kit (achievable degree of protection is IP55/UL Type 12)</li> </ul>
Quick commissioning without expert knowledge	<ul style="list-style-type: none"> <li>• Standard commissioning using the clone function</li> <li>• User-defined parameter list with a reduced number of self-selected parameters</li> <li>• Simple commissioning of standard applications using application-specific wizards, it is not necessary to know the parameter structure</li> <li>• Simple local commissioning using the handheld version</li> <li>• Commissioning largely without documentation</li> </ul>	<ul style="list-style-type: none"> <li>• Standard commissioning using the clone function</li> </ul>
High degree of operator friendliness and intuitive operation	<ul style="list-style-type: none"> <li>• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes</li> <li>• Intuitive navigation using a rotary knob – just like in everyday applications</li> <li>• Graphic display to show status values such as pressure or flow in bar-type diagrams</li> <li>• Status display with freely selectable units to specify physical values</li> </ul>	<ul style="list-style-type: none"> <li>• Direct manual operation of the drive – you can simply toggle between the automatic and manual modes</li> <li>–</li> <li>• 2-line display for showing up to 2 process values with text</li> <li>• Status display of predefined units</li> </ul>
Minimization of maintenance times	<ul style="list-style-type: none"> <li>• Diagnostics using plain text display, can be used locally on-site without documentation</li> <li>• Simple update of languages, wizards and firmware via USB</li> </ul>	<ul style="list-style-type: none"> <li>• Diagnostics with menu prompting with 7-segment display</li> </ul>

# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

Supplementary system components  
Intelligent Operator Panel IOP

## Overview

### Intelligent Operator Panel IOP



The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for the SINAMICS G120, SINAMICS G120C, SINAMICS G120D, SINAMICS G120P standard drives and SIMATIC ET 200 frequency converters.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives.

A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors. There are quick commissioning wizards for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP has a dedicated switchover button to switch from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically on the status screen/status display. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP and downloaded into other drive units of the same type as required.

The IOP includes the following language packages: English, French, German, Italian and Spanish.

The IOP can be installed in control cabinet doors using the optionally available door mounting kit (not possible in conjunction with the PM230 Power Module).

The operating temperature of the IOP is 0 ... 50 °C (32 ... 122 °F).

### IOP Handheld



A handheld version of the IOP can be ordered for mobile use. In addition to the IOP, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP Handheld to SINAMICS G110D and SINAMICS G120D, the RS232 connecting cable with optical interface is required in addition.

The IOP Handheld cannot be used in conjunction with the PM230 Power Module.

### Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP via drag & drop. Further, the USB interface allows user languages and wizards that become available in the future to be subsequently downloaded and the firmware to be updated for the IOP.

The IOP is supplied with power via the USB interface during an update.

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components Intelligent Operator Panel IOP

#### Selection and ordering data

Description	Order No.
<b>Intelligent Operator Panel IOP</b>	<b>6SL3255-0AA00-4JA0</b>
<b>IOP Handheld</b> For use with SINAMICS G120, SINAMICS G110D, SINAMICS G120D, SIMATIC ET 200S FC or SIMATIC ET 200pro FC Included in the scope of delivery: <ul style="list-style-type: none"> <li>• IOP</li> <li>• Handheld housing</li> <li>• Rechargeable batteries (4 × AA)</li> <li>• Charging unit (international)</li> <li>• RS232 connecting cable (3 m/9.84 ft long, can only be used for SINAMICS G120 and SIMATIC ET 200S FC)</li> <li>• USB cable (1 m/3.28 ft long)</li> </ul>	<b>6SL3255-0AA00-4HA0</b>
<b>Accessories</b>	
<b>Door mounting kit</b> IP54 degree of protection for mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: <ul style="list-style-type: none"> <li>• Seal</li> <li>• Mounting material</li> <li>• Connecting cable (5 m/16.41 ft long)</li> </ul>	<b>6SL3256-0AP00-0JA0</b>
<b>RS232 connecting cable</b> With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SIMATIC ET 200pro FC inverters to the IOP Handheld (2.5 m/8.2 ft long)	<b>3RK1922-2BP00</b>

#### Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive; you can toggle between the automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive navigation using a wheel – just like in everyday applications
- Graphic display with bar charts e.g. for status values such as pressure or flowrate
- Quickly and simply mounted in the door – mechanically and electrically
- Simple local commissioning on-site using the handheld version
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- 5 integrated languages
- Simple update of languages, wizards and firmware updates via USB

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components Intelligent Operator Panel IOP

#### Integration

##### Using the IOP with the inverters

	SINAMICS G120 with CU230P-2, CU240B-2 or CU240E-2 Control Units	SINAMICS G120P (PM230) with CU230P-2 Control Unit	SINAMICS G110D and SINAMICS G120D
Plugging the IOP onto the inverter (power supply from the Control Unit)	✓	✓	–
Door mounting with door mounting kit (power supply from the Control Unit)	✓	–	–
Mobile use of the IOP Handheld (supplied from rechargeable batteries)	✓	–	✓ (RS232 connecting cable with optical interface required)

##### Mounting the IOP on a Control Unit

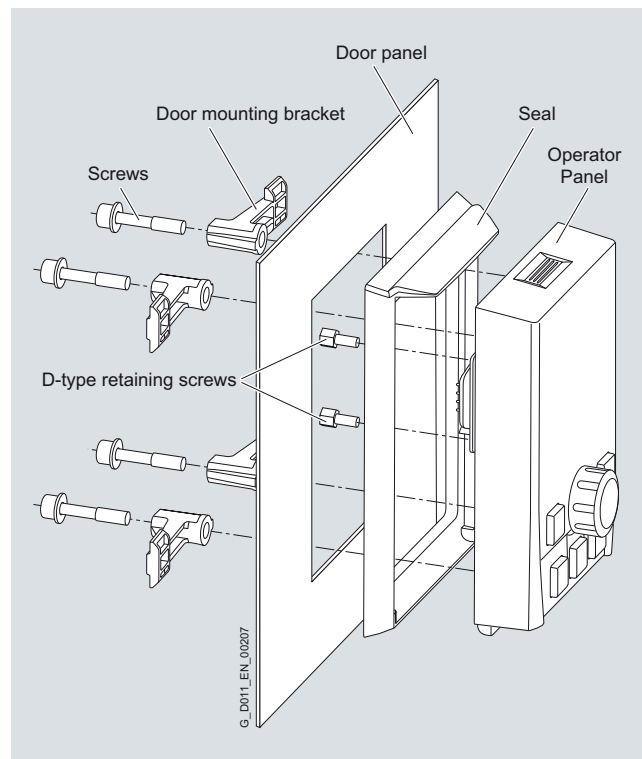
The IOP can be directly plugged onto the Control Unit.



CU230P-2 Control Unit with plugged-on IOP

##### Door mounting

Using the optionally available door mounting kit, the IOP can be simply mounted in a control cabinet door with just a few manual operations (presently only available in conjunction with SINAMICS G 120 and CU230P-2, CU240B-2, CU240E-2 Control Units). Degree of protection IP54/UL Type 12 is achieved for door mounting.



Door mounting kit with plugged-on IOP

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Supplementary system components  
Basic Operator Panel BOP-2

### Overview



Basic Operator Panel BOP-2

The Basic Operator Panel BOP-2 can be used to commission drives, monitor drives in operation and input individual parameter settings.

Commissioning of standard drives is easy with the menu-prompted dialog on a 2-line display. Simultaneous display of the parameter and parameter value, as well as parameter filtering, means that basic commissioning of a drive can be performed easily and, in most cases, without a printed parameter list.

The drives are easily controlled manually using directly assigned navigation buttons. The BOP-2 has a dedicated switchover button to switch from automatic to manual mode.

Diagnostics can easily be performed on the connected inverter by following the menus.

Up to two process values can be numerically visualized simultaneously.

BOP-2 supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the BOP-2 and when required, downloaded into other drive units of the same type.

The operating temperature of the BOP-2 is 0 ... 50 °C (32 ... 122 °F).

### Selection and ordering data

Description	Order No.
<b>Basic Operator Panel BOP-2</b>	<b>6SL3255-0AA00-4CA1</b>

#### Accessories

<b>Door mounting kit</b> For mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: <ul style="list-style-type: none"> <li>• Seal</li> <li>• Mounting material</li> <li>• Connecting cable (5 m/16.41 ft long)</li> </ul>	<b>6SL3256-0AP00-0JA0</b>
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### Benefits

- Shorten commissioning times – Easy commissioning of standard drives using basic commissioning wizards (setup)
- Minimize standstill times – Fast detection and rectification of errors (Diagnostics)
- Greater transparency in the process – The status display of the BOP-2 makes process variable monitoring easy (Monitoring)
- Direct mounting on the inverter ([also see IOP](#))
- User-friendly user interface:
  - Easy navigation using clear menu structure and clearly assigned control keys
  - Two-line display

# SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

Supplementary system components  
Basic Operator Panel BOP-2

## Integration

### Using the BOP-2 with SINAMICS G120 inverters

	CU230P-2	CU240B-2	CU240E-2
Plugging the BOP-2 onto the inverter	✓	✓	✓
Door mounting with door mounting kit	✓	✓	✓

### Mounting a BOP-2 on a CU240E-2 Control Unit

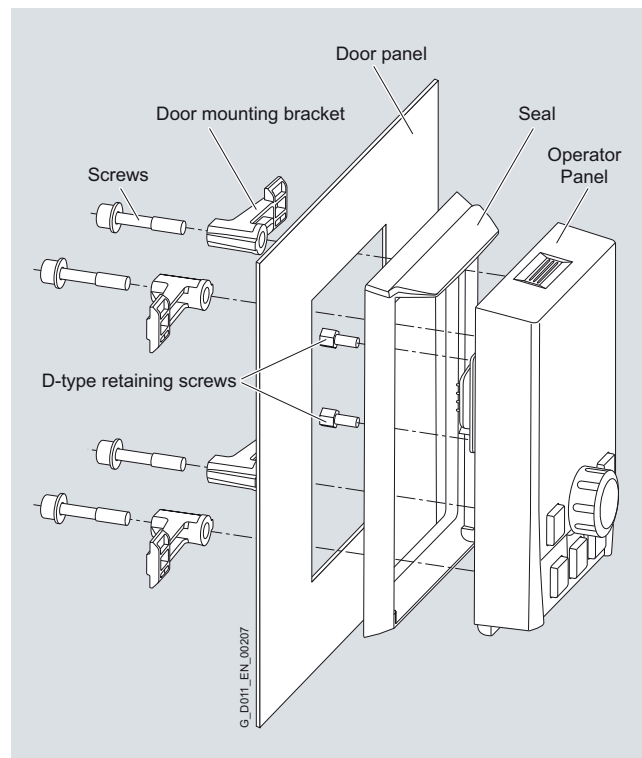
The BOP-2 can be directly plugged onto a Control Unit "-2" (e.g. CU230P-2, CU240B-2, CU240E-2).



CU240E-2 Control Unit with plugged-on BOP-2

### Door mounting

Using the optionally available door mounting kit, the BOP-2 can be simply mounted in a control cabinet door with just a few manual operations (presently only available in conjunction with SINAMICS G120 and CU230P-2, CU240B-2, CU240E-2 Control Units). Degree of protection IP55 is achieved for door mounting.



Door mounting kit with plugged-on operator panel

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components Blanking cover for PM230 Power Module

### Supplementary system components Memory cards

#### Overview



SINAMICS G120P, frame size FSC, with blanking cover

The blanking cover is mounted on the inverter in place of an operator panel, if an operator panel is not required. When the blanking cover is plugged onto the PM230 Power Module, degree of protection IP55/UL Type 12 is achieved.

#### Selection and ordering data

Description	Order No.
<b>Blanking cover</b> For PM230 Power Module	<b>6SL3256-1BA00-0AA0</b>

#### Overview



SINAMICS micro memory card (MMC)/SIMATIC memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) or SIMATIC memory card (SD card). When service is required, e.g. after the converter has been replaced and the data has been downloaded from the memory card, the drive system is immediately ready for use once more.

- Parameter settings can be written from the memory card to the inverter or saved from the inverter to the memory card.
- Up to 100 parameter sets can be stored.
- The memory card supports standard commissioning without the use of an operator panel such as the BOP-2 or the STARTER commissioning tool.

#### Note:

The memory card is not required for operation and does not have to remain inserted.

#### Selection and ordering data

Description	Order No.
<b>SINAMICS micro memory card (MMC)</b>	<b>6SL3254-0AM00-0AA0</b>
<b>SIMATIC memory card (SD card)</b> For SINAMICS G120C and the SINAMICS G120 CU2 . 0 . -2 Control Units	<b>6ES7954-8LB01-0AA0</b>

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components

#### Brake Relay

#### Overview



The Brake Relay allows the Power Module to be connected to an electromechanical motor brake, thereby allowing the motor brake to be driven directly by the Control Unit.

#### Selection and ordering data

Description	Order No.
<b>Brake Relay</b> Including cable harness for connection with the Power Module	<b>6SL3252-0BB00-0AA0</b>

#### Technical specifications

Brake Relay	
	6SL3252-0BB00-0AA0
<b>Switching capability of the NO contact, max.</b>	440 V AC / 3.5 A 30 V DC / 12 A
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Degree of protection</b>	IP20
<b>Dimensions</b>	
• Width	68 mm (2.68 in)
• Height	63 mm (2.48 in)
• Depth	33 mm (1.30 in)
<b>Weight, approx.</b>	0.17 kg (0.37 lb)

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#### Integration

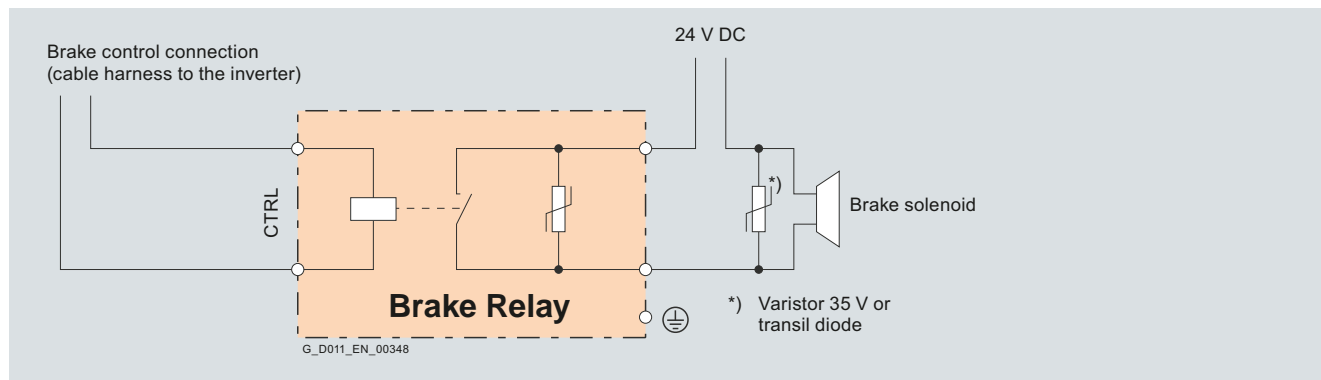
The Brake Relay has the following interfaces:

- A switch contact (NO contact) to control the motor brake solenoid
- A connection for the cable harness (CTRL) for connection to the Power Module

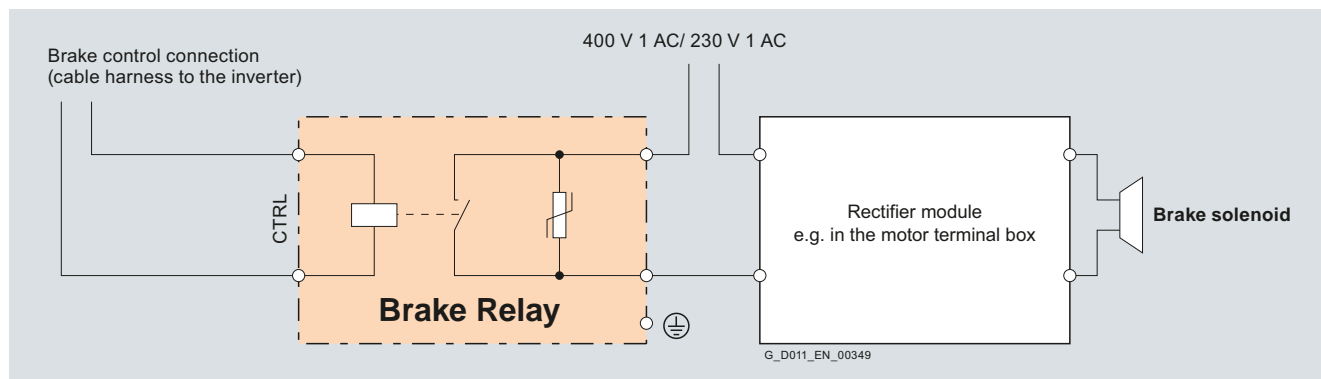
The Brake Relay can be installed on the shield bonding plate near the power terminals of the Power Module.

The supplied Brake Relay includes the cable harness for connection with the Power Module.

The 24 V DC solenoid of the motor brake is connected via an external power supply. For 24 V DC, external surge arrestors are required (e.g. varistor, transil diode).



Connection example of 24 V DC Brake Relay



Connection example of 230 ... 400 V 1 AC Brake Relay



# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components Adapter for mounting on DIN rails

#### Overview

The adapter for DIN rail mounting can be used to mount inverters, frame sizes FSA and FSB, on DIN mounting rails (2 units with a center-to-center distance of 100 mm/3.94 in).

Furthermore, the motor cable shield connection and other cable shields required for mounting inverters on DIN rails comply with the same standards for emissions and conducted emissions as if the inverter were directly installed in a control cabinet.

The adapter for inverter frame size FSA can be used to mount converters singly or with matching line filter.

The adapter for inverter frame size FSB can be used to mount inverters with or without an integrated line filter.

#### Selection and ordering data

Description	Order No.
<b>Adapter for mounting on DIN rails</b>	
• For Power Module, frame size FSA	<b>6SL3262-1BA00-0BA0</b>
• For Power Module, frame size FSB	<b>6SL3262-1BB00-0BA0</b>

### Supplementary system components PC inverter connection kit 2

#### Overview

For controlling and commissioning an inverter directly from a PC if the STARTER commissioning tool has been installed on the PC. With this, the inverter can be

- parameterized (commissioning, optimization)
- monitored (diagnostics)
- controlled (master control via the STARTER commissioning tool for test purposes).

A USB cable (3 m/9.84 ft) and the STARTER commissioning tool <sup>1)</sup> on DVD-ROM are included in the scope of delivery.

The PC inverter connection kit 2 is suitable for the following SINAMICS G120 Control Units:

- CU230P-2 HVAC
- CU230P-2 DP
- CU230P-2 CAN
- CU240B-2
- CU240B-2 DP
- CU240E-2
- CU240E-2 DP
- CU240E-2 F
- CU240E-2 DP-F

#### Selection and ordering data

Description	Order No.
<b>PC inverter connection kit 2</b> For CU2.0.-2 Control Units Including USB cable (3 m/9.84 ft) and STARTER commissioning tool <sup>1)</sup> on DVD-ROM	<b>6SL3255-0AA00-2CA0</b>

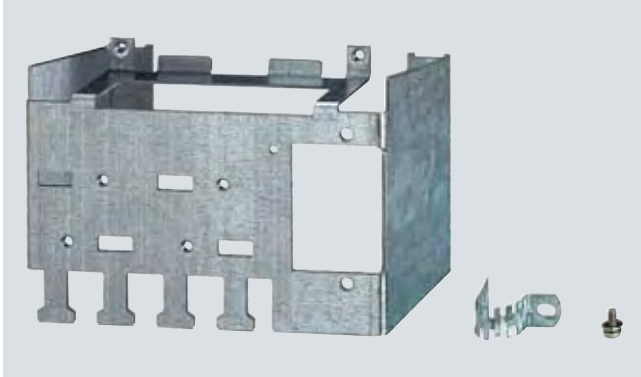
<sup>1)</sup> The STARTER commissioning tool is also available on the Internet at <http://support.automation.siemens.com/WW/view/en/10804985/133100>

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Supplementary system components Shield connection kits for Power Modules

#### Overview



Shield connection kit for Power Module, frame size FSB

The shield connection kit

- makes it easier to connect the shields of supply and control cables
- provides mechanical strain relief
- ensures optimum EMC performance
- is used to attach the Brake Relay

The shield connection kit includes

- a shield bonding plate for the required Power Module
- a shield bonding plate for a CU240E Control Unit (exception: CU240E-2)
- connection elements and clamps for mounting
- Mounting device for Brake Relay, frame sizes FSB to FSF

#### Selection and ordering data

Description	Order No.
<b>Shield connection kit</b> For PM240 and PM250 Power Modules	
• Frame size FSA	<b>6SL3262-1AA00-0BA0</b>
• Frame size FSB	<b>6SL3262-1AB00-0DA0</b>
• Frame size FSC	<b>6SL3262-1AC00-0DA0</b>
• Frame sizes FSD and FSE	<b>6SL3262-1AD00-0DA0</b>
• Frame size FSF	<b>6SL3262-1AF00-0DA0</b>
<b>Shield connection kit</b> For PM260 Power Modules	
• Frame size FSD	<b>6SL3262-1FD00-0CA0</b>
• Frame size FSF	<b>6SL3262-1FF00-0CA0</b>

### Supplementary system components Shield connection kits for Control Units

#### Overview

The shield connection kits offer for all signal and communication cables

- Optimum shield connection
- Strain relief

A shield connection kit contains the following:

- A matching shield bonding plate
- All of the necessary connecting and retaining elements for mounting

The shield connection kit 1 is suitable for the following SINAMICS G120 Control Units:

- CU230P-2 HVAC
- CU230P-2 DP
- CU230P-2 CAN

The shield connection kit 2 is suitable for the following SINAMICS G120 Control Units:

- CU240B-2
- CU240B-2 DP
- CU240E-2
- CU240E-2 DP
- CU240E-2 F
- CU240E-2 DP-F

#### Selection and ordering data

Description	Order No.
<b>Shield connection kit 1</b> For CU230P-2 Control Units	<b>6SL3264-1EA00-0FA0</b>
<b>Shield connection kit 2</b> For CU240 . -2 Control Units	<b>6SL3264-1EA00-0EA0</b>

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

Spare parts  
Mounting set

### Overview

The following parts are supplied from the factory for each PM230 Power Module in degree of protection IP55/UL Type 12:

#### Frame sizes FSA to FSC

- 1 SUB-D connector with mounting material for connecting the CU230P-2 HVAC/DP/CAN Control Units to the operator panel (e.g. IOP)
- 1 motor connector and 1 power supply connector
- 2 serrated strips including mounting material for connecting the shield
- 3 sleeves for inserting in the cutouts for the signal cables of the cable bonding plate
- Ferrite cores (only necessary for devices with integrated line filter class B)
- 2-page Quick Start Guide with mounting instructions

#### Frame sizes FSD to FSF

- 1 adapter cable for connecting the CU230P-2 HVAC/DP/CAN Control Units to the operator panel (e.g. IOP)
- 4 clips to connect the shields of signal cables
- 6 serrated strips including mounting material for the motor and supply cables
- 4 sleeves (pre-installed in the cutouts for the signal cables of the cable bonding plate)
- 1 cable bonding plate without cutouts for customers to configure their own connection system
- 1 cabinet key
- 2-page Quick Start Guide with mounting instructions

A mounting set can be ordered for every frame size in degree of protection IP55/UL Type 12. It contains the following parts:

#### Frame sizes FSA to FSC

- 1 SUB-D connector with mounting material
- 1 motor connector and 1 power supply connector
- 2 serrated strips including mounting material for connecting the shield
- 3 sleeves for inserting in the cutouts for the signal cables of the cable bonding plate
- Ferrite cores (only necessary for devices with integrated line filter class B)
- Screws for fixing the cable bonding plate and the cover

#### Frame sizes FSD to FSF

- 1 adapter cable including mounting material
- 6 serrated strips including mounting material for the motor and supply cables
- 1 cabinet key

### Selection and ordering data

Description	Order No.
<b>Mounting set</b> For PM230 Power Modules, degree of protection IP55/UL Type 12	
• Frame size FSA	<b>6SL3200-0SK02-0AA0</b>
• Frame size FSB	<b>6SL3200-0SK03-0AA0</b>
• Frame size FSC	<b>6SL3200-0SK04-0AA0</b>
• Frame size FSD	<b>6SL3200-0SK05-0AA0</b>
• Frame size FSE	<b>6SL3200-0SK06-0AA0</b>
• Frame size FSF	<b>6SL3200-0SK07-0AA0</b>

6

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Spare parts Replacement door for PM240, frame size FSGX

#### Overview

Complete replacement door for the PM240 Power Module, frame size FSGX

#### Selection and ordering data

Description	Order No.
<b>Replacement door</b> For PM240 Power Modules, frame size FSGX	<b>6SL3200-0SM10-0AA0</b>

### Spare parts Terminal cover kit for frame sizes FSD and FSE

#### Overview

The terminal cover kit includes a replacement cover for the connecting terminals.

The terminal cover kit is suitable for the following SINAMICS G120 Power Modules:

- PM240, frame sizes FSD and FSE
- PM250, frame sizes FSD and FSE

#### Selection and ordering data

Description	Order No.
<b>Terminal cover kit</b> For frame sizes FSD and FSE	<b>6SL3200-0SM11-0AA0</b>

### Spare parts Replacement connector

#### Overview

Replacement connector for the input and output sides.

The replacement connector is suitable for SINAMICS G120 PM260 Power Modules, frame size FSD.

#### Selection and ordering data

Description	Order No.
<b>Replacement connector</b> For PM260 Power Modules, frame size FSD	<b>6SL3200-0ST04-0AA1</b>

### Spare parts Terminal cover kit for frame size FSF

#### Overview

The terminal cover kit includes a replacement cover for the connecting terminals.

The terminal cover kit is suitable for the following SINAMICS G120 Power Modules:

- PM240, frame size FSF
- PM250, frame size FSF
- PM260, frame size FSF

#### Selection and ordering data

Description	Order No.
<b>Terminal cover kit</b> For frame size FSF	<b>6SL3200-0SM12-0AA0</b>

**Overview**

The Power Module fans are designed for extra long service life. For special requirements, replacement fans are available that can be exchanged quickly and easily. The following pictures show the mounting location of the internal or external fan units as an example:



PM230 Power Module, frame size FSC, with external fan unit in the heat sink



PM230 Power Module, frame size FSC, with internal fan unit above the CU230P-2 Control Unit

**6****Selection and ordering data**

Rated power (LO)		PM230 Power Module		External fan unit	Internal fan unit
kW	hp	Type 6SL3223-...	Frame size	Order No.	Order No.
<b>380 ... 480 V 3 AC ±10 %</b>					
0.37	0.50	ODE13-7 . A0	FSA	<b>6SL3200-0SF21-0AA0</b>	<b>6SL3200-0SF31-0AA0</b>
0.55	0.75	ODE15-5 . A0			
0.75	1.0	ODE17-5 . A0			
1.1	1.5	ODE21-1 . A0			
1.5	2.0	ODE21-5 . A0			
2.2	3.0	ODE22-2 . A0			
3.0	4.0	ODE23-0 . A0			
4.0	5.0	ODE24-0 . A0	FSB	<b>6SL3200-0SF22-0AA0</b>	
5.5	7.5	ODE25-5 . A0			
7.5	10	ODE27-5 . A0			
11.0	15	ODE31-1 . A0	FSC	<b>6SL3200-0SF23-0AA0</b>	
15.0	20	ODE31-5 . A0			
18.5	25	ODE31-8AA0			
22	30	ODE32-2 . A0	FSD	<b>6SL3200-0SF24-0AA0</b>	<b>6SL3200-0SF32-0AA0</b>
30	40	ODE33-0 . A0			
37	50	ODE33-7 . A0	FSE	<b>6SL3200-0SF26-0AA0</b>	
45	60	ODE34-5 . A0			
55	75	ODE35-5 . A0	FSF		
75	100	ODE37-5 . A0			
90	125	ODE38-8UA0			

# SINAMICS G120 standard inverters

## 0.37 kW to 250 kW (0.5 hp to 400 hp)

### Spare parts Replacement fans

#### Overview

The Power Module fans are designed for extra long service life. Replacement fans can be ordered.

#### Selection and ordering data

Rated power		SINAMICS G120 PM240 Power Module		Replacement fan	
kW	hp	Type 6SL3224-...	Frame size and number of fans	Order No.	
<b>380 ... 480 V 3 AC</b>					
0.37	0.50	OBE13-7UA0	FSA, 1 fan	<b>6SL3200-0SF01-0AA0</b> (includes 1 replacement fan)	
0.55	0.75	OBE15-5UA0			
0.75	1.0	OBE17-5UA0			
1.1	1.5	OBE21-1UA0			
1.5	2	OBE21-5UA0			
2.2	3	OBE22-2 . A0	FSB, 2 fans <sup>1)</sup>		
3.0	4	OBE23-0 . A0			
4.0	5	OBE24-0 . A0			
7.5	10	OBE25-5 . A0	FSC, 2 fans <sup>1)</sup>	<b>6SL3200-0SF03-0AA0</b> (includes 1 replacement fan)	
11.0	15	OBE27-5 . A0			
15.0	20	OBE31-1 . A0			
18.5	25	OBE31-5 . A0	FSD, 2 fans	<b>6SL3200-0SF04-0AA0</b> (includes 2 replacement fans)	
22	30	OBE31-8 . A0			
30	40	OBE32-2 . A0		<b>6SL3200-0SF05-0AA0</b> (includes 2 replacement fans)	
37	50	OBE33-0 . A0	FSE, 2 fans	<b>6SL3200-0SF04-0AA0</b> (includes 2 replacement fans)	
45	60	OBE33-7 . A0		<b>6SL3200-0SF05-0AA0</b> (includes 2 replacement fans)	
55	75	OBE34-5 . A0	FSF, 2 fans	<b>6SL3200-0SF06-0AA0</b> (includes 2 replacement fans)	
75	100	OBE35-5 . A0			
90	125	OBE37-5 . A0		<b>6SL3200-0SF07-0AA0</b> (includes 2 replacement fans)	
110	150	OBE38-8UA0		<b>6SL3200-0SF08-0AA0</b> (includes 2 replacement fans)	
132	200	OBE41-1UA0			
160	250	OXE41-3UA0	FSGX, 2 fans	<b>6SL3362-0AG00-0AA1</b> (includes 2 replacement fans)	
200	300	OXE41-6UA0			
250	400	OXE42-0UA0			

Rated power		SINAMICS G120 PM250 Power Module		Replacement fan	
kW	hp	Type 6SL3225-...	Frame size and number of fans	Order No.	
<b>380 ... 480 V 3 AC</b>					
7.5	10	OBE25-5AA1	FSC, 2 fans <sup>1)</sup>	<b>6SL3200-0SF03-0AA0</b> (includes 1 replacement fan)	
11.0	15	OBE27-5AA1			
15.0	20	OBE31-1AA1			
18.5	25	OBE31-5 . A0	FSD, 2 fans	<b>6SL3200-0SF04-0AA0</b> (includes 2 replacement fans)	
22	30	OBE31-8 . A0			
30	40	OBE32-2 . A0		<b>6SL3200-0SF05-0AA0</b> (includes 2 replacement fans)	
37	50	OBE33-0 . A0	FSE, 2 fans	<b>6SL3200-0SF04-0AA0</b> (includes 2 replacement fans)	
45	60	OBE33-7 . A0		<b>6SL3200-0SF05-0AA0</b> (includes 2 replacement fans)	
55	75	OBE34-5 . A0	FSF, 2 fans	<b>6SL3200-0SF06-0AA0</b> (includes 2 replacement fans)	
75	100	OBE35-5 . A0			
90	125	OBE37-5 . A0		<b>6SL3200-0SF08-0AA0</b> (includes 2 replacement fans)	

Rated power		SINAMICS G120 PM260 Power Module		Replacement fan	
kW	hp	Type 6SL3225-...	Frame size and number of fans	Order No.	
<b>660 ... 690 V 3 AC</b>					
11.0	15	OBH27-5 . A1	FSD, 2 fans	<b>6SL3200-0SF11-0AA0</b> (includes 2 replacement fans)	
15.0	20	OBH31-1 . A1			
18.5	25	OBH31-5 . A1			
30	40	OBH32-2 . A1	FSF, 2 fans	<b>6SL3200-0SF07-0AA0</b> (includes 2 replacement fans)	
37	50	OBH33-0 . A1			
55	75	OBH33-7 . A1			

<sup>1)</sup> Recommendation: Even if only one fan on the Power Module is defective, it is advisable to replace both. In this case, the order quantity must be doubled.

# SINAMICS G110D

## distributed inverters

### 0.75 kW to 7.5 kW (1.0 hp to 10 hp)




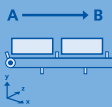
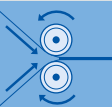

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7/17	Memory cards
7/18	Card holder for memory card
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7/18	Adapter for mounting SINAMICS G110D instead of SIRIUS M200D motor starter
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7/19	Protection bar
7/19	Connecting cable and socket for AS-Interface
7/19	Connecting cables and connectors for digital inputs
7/19	Connecting cables pre-assembled at one end and connector sets to connect to the line supply
7/20	Motor cables pre-assembled at one end and connector sets to connect the inverter to the motor
7/20	Power bus distribution 400 V in IP65 degree of protection
7/20	Additional information
<b>7/21</b>	<b>Spare parts</b>
7/21	Spare Parts Kit
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# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Introduction

### Application

Application	Continuous motion			Non-continuous motion		
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality	Basic	Medium	High	Basic	Medium
<b>Pumping, ventilating, compressing</b>	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
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)
<b>Moving</b>	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
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (DCM)
<b>Processing</b>	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
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)
<b>Machining</b>	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
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>

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

SINAMICS G110D is ideally suited for basic conveyor system applications in the industrial environment for which a distributed drive with communications capability is required. This applies in particular to distribution logistics and airports.

SINAMICS G110D is also suitable for many additional low-performance applications in many sectors, e.g. in the automotive sector, in the food and beverage industry (without surfactants) and in the packaging industry.

### More information

You may also be interested in these inverters/converters:

- Increased functional scope ⇒ SINAMICS G120D ([chapter 8](#))
- More performance, higher functionality for the control cabinet in IP20 degree of protection ⇒ SINAMICS G120 ([chapter 6](#))  
SINAMICS G120C ([chapter 4](#))
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110 ([chapter 9](#))
- For more axes in a small space ⇒ SIMATIC ET200S FC, SIMATIC ET200pro FC ([Catalog ST 70](#))



# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Overview

The SINAMICS G110D distributed inverter series is the solution for basic drive tasks, especially in the field of conveyor systems. The inverter allows the speed of three-phase asynchronous (induction) motors to be continually controlled and fulfills the requirements of conveyor-related applications with open-loop frequency control. It can be optimally integrated into the system thanks to its compact and low-profile design in an IP65 degree of protection. It can be optimally integrated into the Siemens TIA world of automation via AS-Interface.

With its wide power range from 0.75 kW to 7.5 kW (1.0 hp to 10 hp), it is suitable for a wide range of distributed drive solutions.



Example: SINAMICS G110D, frame size FSA

#### Reasons for using distributed drive systems

- Modular drive solutions – therefore standardized mechatronic elements that can be individually tested
- A control cabinet is not required, resulting in a smaller space requirement and lower cooling requirements
- Long cables between the inverter and motor can be avoided (which means lower power losses, reduced noise emission and lower costs for shielded cables and additional filters)
- Distributed configurations offer considerable benefits for conveyor systems with their extensive coverage (e.g. in the automotive and logistics sectors)

#### Siemens family of distributed drives

Siemens offers an innovative portfolio of inverters to optimally implement distributed drive solutions. The strengths of the individual members of the drive family permit simple adaptation to the widest range of application demands:

- Identical connection systems
- Identical mounting dimensions for SINAMICS G110D and SINAMICS G120D
- Standard commissioning and configuration tool

Products from the family of distributed drives:

- SINAMICS G110D inverters
- SINAMICS G120D inverters
- SIMATIC ET 200S FC drive converters
- SIMATIC ET 200pro FC drive converters
- SIRIUS M200D motor starters

#### Device design

SINAMICS G110D is a compact inverter in IP65 degree of protection where the Control Unit (CU) and Power Module (PM) function units are combined in one device.

The closed-loop control electronics controls and monitors the power electronics and the connected motor in several different control types that can be selected. The digital inputs and analog inputs on the device mean that sensors can be simply and directly connected at the drive. The input signals can either be directly linked within the closed-loop control or they can be transferred to the central control via AS-Interface for further processing within the context of the overall plant.

The power electronics supplies the motor in the power range from 0.75 kW to 7.5 kW (1.0 hp to 10 hp). It is controlled (open-loop) from the microprocessor-based control. State-of-the-art IGBT technology with pulse-width-modulation is used for highly reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the inverter and motor. The unusually low profile mechanical design is optimized so that the device can be directly used in the plant or system. The compact inverter has the same drilling dimensions for all power ratings (standard footprint). Further, the dimensions are identical to those of the SINAMICS G120D inverter. This significantly simplifies the mechanical design, installation and retrofit of a system.

The latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions), are available on the Internet at the following address:

[www.siemens.com/sinamics-g110d/documentation](http://www.siemens.com/sinamics-g110d/documentation)

and offline on the DVD-ROM CA 01 in the DT Configurator. In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

#### STARTER commissioning tool

The STARTER commissioning tool (V4.1.3 and higher) allows menu-prompted commissioning and maintenance of SINAMICS G110D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Selection and ordering data

Rated power <sup>1)</sup>		Rated output current <sup>2)</sup> A	Input current A	Frame size	SINAMICS G110D with integrated line filter class A	SINAMICS G110D with integrated line filter class A and integrated maintenance switch
kW	hp				Order No.	Order No.
380 ... 500 V 3 AC <sup>3)</sup>						
0.75	1.0	2.3	2.0	FSA	<b>6SL3511-OPE17-5AM0</b>	<b>6SL3511-1PE17-5AM0</b>
1.5	1.5 <sup>4)</sup>	4.3	3.8	FSA	<b>6SL3511-OPE21-5AM0</b>	<b>6SL3511-1PE21-5AM0</b>
3.0	4.0	7.7	7.0	FSA	<b>6SL3511-OPE23-0AM0</b>	<b>6SL3511-1PE23-0AM0</b>
4.0	5.0	10.2	9.1	FSB	<b>6SL3511-OPE24-0AM0</b>	<b>6SL3511-1PE24-0AM0</b>
5.5	7.5	13.2	12.2	FSC	<b>6SL3511-OPE25-5AM0</b>	<b>6SL3511-1PE25-5AM0</b>
7.5	10	19.0	17.9	FSC	<b>6SL3511-OPE27-5AM0</b>	<b>6SL3511-1PE27-5AM0</b>

#### Benefits

- Wide power range from 0.75 kW to 7.5 kW (1.0 hp to 10 hp)
- Fast commissioning and maintenance as well as extended diagnostic functions and communications capability with AS-Interface according to specification 3.0:
  - Reduced number of interfaces
  - Plant-wide engineering
  - Easy to handle
- Mechanical design, installation and retrofit of systems are significantly simplified as a result of the compact and space-saving design with an extremely low profile and with the same drilling dimensions for all power ratings; further, the dimensions are identical with those of the SINAMICS G120D inverter.
- Easy commissioning and maintenance as a result of the same, standardized connectors for the bus, power and I/O connections (ISO 23570) for the complete range of power ratings of SINAMICS G110D and SINAMICS G120D.
- The same connectors are used as for the SIRIUS M200D motor starter
- Simple, standard implementation of completely distributed plant and system concepts by using products in a scalable fashion:
  - SIRIUS M200D (motor starter)
  - SINAMICS G110D (inverter for basic conveyor-related applications)
  - SINAMICS G120D (inverter for demanding conveyor-related applications)
- High degree of operator friendliness by using the Intelligent Operator Panel (IOP) to parameterize, diagnose, control (open-loop) and copy drive parameters in the BOP
- Easy to replace thanks to plug-in design and the use of a memory card, providing the highest degree of service friendliness
- Simple connection, engineering, data management as well as control of the inverter in sophisticated plants and systems as a result of the consequential integration in TIA (Totally Integrated Automation)
- Using the optional maintenance switch, the inverter can be simply disconnected from the line supply when service is required, without any additional components or without additional wiring costs when configuring the system
- Using the optional manual local control, commissioning is fast and can be limited to specific areas, the application can be manually pre-tested on site and the system can be cleared or emptied without requiring comprehensive options.
- By being able to connect up to 5 sensors directly at the unit, practically all of the drive-relevant information can be directly managed; local pre-processing of the signals takes the load off the fieldbus and ensures a fast and reproducible response time
- Integrated class A EMC filter (acc. to EN 55011)
- Integrated brake control, brake voltages that are supported 400 V AC/180 V DC and 230 V AC/205 V DC
- Integrated motor protection using a thermal motor model and evaluation of PTC, Thermo-Click or KTY 84 temperature sensors
- Easy replacement of devices and fast copying of parameters to the memory card using the optional memory card holder and the optional memory card
- Engineering and commissioning with standard engineering tools such as SIZER for Siemens Drives (V3.2 and higher), STARTER (V4.1.3 and higher) and Drive ES ensure fast engineering and simple commissioning – STARTER is integrated into STEP 7 with Drive ES Basic, with all the advantages of central data storage and totally integrated communication
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- Increased degree of ruggedness and longer service life as the electronic modules are coated
- Certified worldwide for compliance with CE, UL, c-tick

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for high overload (HO).

<sup>2)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for high overload (HO). These current values apply at 400 V and are specified on the rating plate.

<sup>3)</sup> With the exception of UL operation, 500 V + 10 % is possible.

<sup>4)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Design

The SINAMICS G110D distributed inverters are compact frequency inverters for standard drives. Each SINAMICS G110D includes both the Control Unit as well as the Power Module in one unit.



SINAMICS G110D with integrated maintenance switch and manual local control with keyswitch

SINAMICS G110D features an integrated brake chopper and is suitable for distributed drives without energy recovery capability. If generator energy is produced then this is dissipated in the externally connected braking resistors. The communication is realized via the local inputs (digital and analog) or via the AS-Interface bus integrated as standard.



SINAMICS G110D with integrated maintenance switch

The inverter is available in two versions: With and without maintenance switch. Thanks to the optional maintenance switch (this cannot be retrofitted), when service is required, the inverter can be simply disconnected from the line supply without having to have any additional components or additional wiring costs when configuring.

#### Accessories

##### Braking resistors

Excess energy in the DC link is dissipated in the braking resistors. The braking resistors are designed for use with the SINAMICS G110D. This has an integrated brake chopper (electronic switch).

##### Intelligent Operator Panel IOP Handheld

User-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G110D.

##### Manual local control with keyswitch

Master control can be toggled between automatic mode (PLC) and manual local mode using the manual local control. This can also be used to switch off the inverter. Additional functions include switching over between continuous and jog mode, starting the motor including direction of rotation and deactivating the quick stop in the manual mode.

##### Memory cards

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) and SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card, the drive system is immediately ready for use again. The associated memory card holder is not included in the scope of supply of the inverter and must be separately ordered.

##### Card holder for memory cards

To use the SINAMICS micro memory card (MMC) and SIMATIC memory card (SD card), a card holder is required that is inserted under the blanking cover or under the manual-automatic control operator panel on the inverter.

##### RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.1.3 and higher) has been installed.

##### USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.1.3 and higher) has been installed.

##### Adapter for mounting the SINAMICS G110D instead of a SIRIUS M200D motor starter

Connection board kit to mount a SINAMICS G110D inverter on the connection holes of the SIRIUS M200D motor starter (assuming that there is enough space).

##### Connector kit for braking resistor

Connector kit for using or connecting different braking resistors.

##### UL connector kit

Special UL connector kit for UL-compatible applications.

##### Protection bar

Protection bar for protecting the connector against shearing due to mechanical stress

##### Connecting cable

Connector sets to connect to the line supply and the outgoing motor feeder are available as accessories as well as pre-assembled motor cables for connection to the motor.

Flexible plug-in cables to transfer data between AS-Interface participants as well as to supply the Control Unit and the Power Module with power.

##### Spare Parts Kit

A Spare Parts Kit is available which comprises small parts such as seals, caps and screws.

##### Replacement fan

A replacement fan is available, which comprises a pre-mounted unit with cover, fan and screws.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

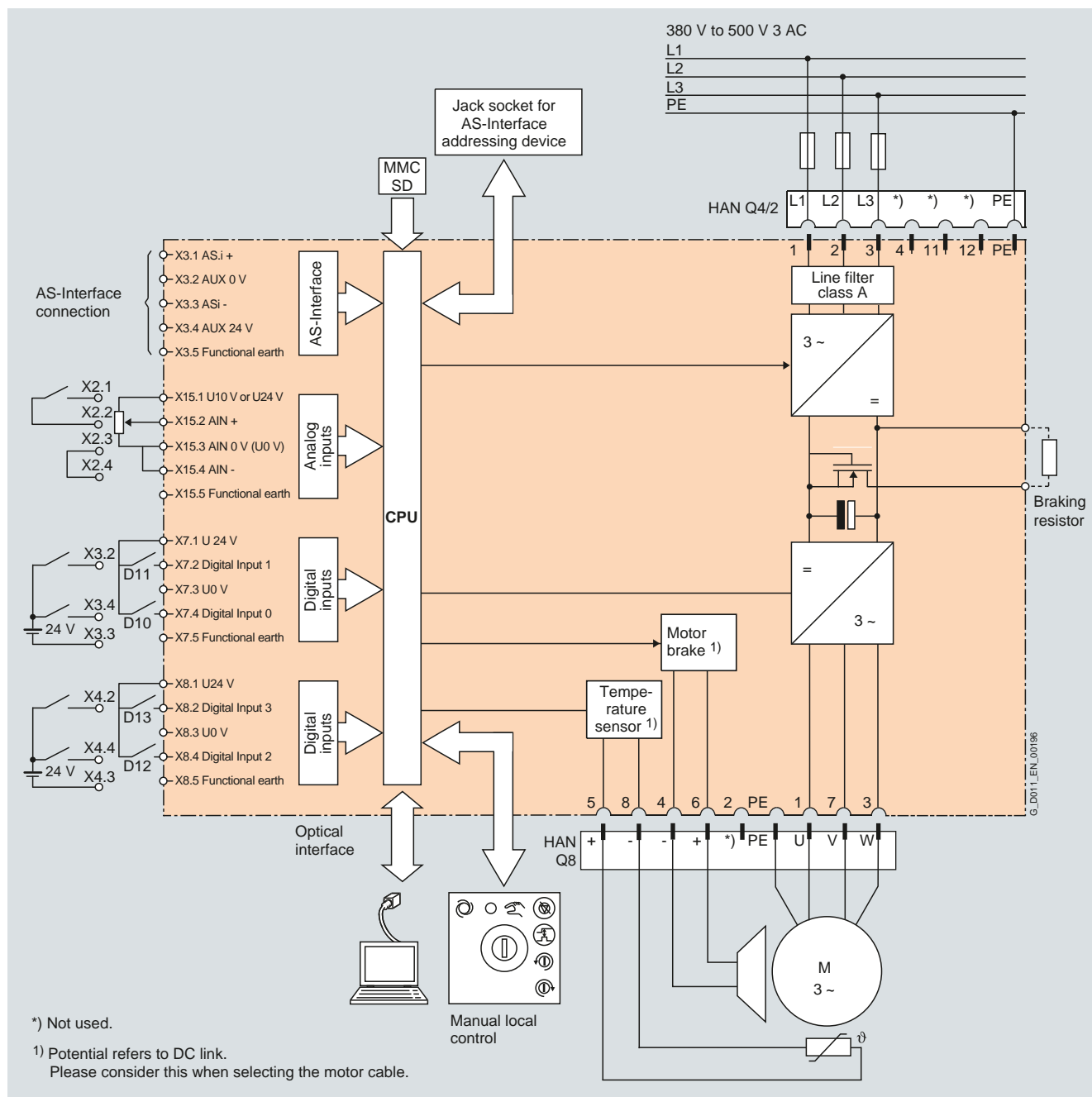
### SINAMICS G110D distributed inverters

#### Integration

The SINAMICS G110D distributed inverters have, as standard, the following interfaces:

- Motor connection via HAN Q8 (connector) including control of the motor brake and temperature sensor
- Line supply connection via HAN Q4/2 (socket)
- Connection for a braking resistor in IP65 degree of protection through a 3-pin connector
- AS-Interface connection via M12 (connector)
- Connection for 4 digital inputs via M12 (socket)
- Connection for an analog input via M12 (socket); this can also be used as digital input
- Connection for an AS-Interface addressing device via jack socket

The interfaces are identical to those of the SINAMICS G120D distributed inverter and those of the SIRIUS M200D motor starter.



Connection diagram for SINAMICS G110D with integrated line filter class A

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G110D distributed inverters:

##### Selection guide DT Configurator

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 DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. The configurator is integrated as a "selection guide" in this catalog on the DVD-ROM with the selection and configuration tools.

##### Online DT Configurator

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:  
[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

##### STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. In addition to SINAMICS drives, STARTER is also suitable for MICROMASTER 4 units and the frequency converters for the distributed I/O SIMATIC ET200S FC and SIMATIC ET 200pro FC. For SINAMICS G110D V4.1.3 and higher.

##### Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7.1.

#### Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all SINAMICS G110D distributed inverters.

General technical specifications	
<b>Mechanical specifications</b>	
<b>Vibratory load according to EN 60068-2-6</b>	
• Transport <sup>1)</sup>	5 ... 9 Hz: Constant deflection 3.1 mm 9 ... 200 Hz: Constant acceleration = 9.81 m/s <sup>2</sup> (1 × g)
• Operation	2 ... 9 Hz: Constant deflection 7 mm 9 ... 200 Hz: Constant acceleration = 19.62 m/s <sup>2</sup> (2 × g)
<b>Shock load according to EN 60068-2-27</b>	
• Transport <sup>1)</sup>	147.15 m/s <sup>2</sup> (15 × g)/11 ms 3 shocks in each axis and direction
• Operation	147.15 m/s <sup>2</sup> (15 × g)/11 ms 3 shocks in each axis and direction
<b>Degree of protection</b>	IP65/UL Type 3
<b>Ambient conditions</b>	
<b>Protection class according to EN 61800-5-1</b>	Class III (PELV)
<b>Touch protection according to EN 61800-5-1</b>	Class I (with protective conductor system)
<b>Humidity, max.</b>	95 % at 40 °C (104 °F)
<b>Ambient temperature</b>	
• Storage <sup>1)</sup> acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Transport <sup>1)</sup> acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60068-2-2	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Environmental class/harmful chemical substances</b>	
• Operation acc. to EN 60721-3-3	Class 3C2
<b>Degree of pollution acc. to EN 61800-5-1</b>	2
<b>Standards</b>	
<b>Compliance with standards</b>	UL 508C (UL list number E121068), CE, c-tick
<b>CE marking, according to</b>	Low-Voltage Directive 2006/95/EC
<b>EMC Directive <sup>2)</sup> acc. to EN 61800-3</b> (corresponds to Class A acc. to EN 55011)	Category C2 <sup>3)</sup>

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

<sup>2)</sup> For further general information [see also chapter SINAMICS G110, Technical specifications, Compliance with standards.](#)

<sup>3)</sup> With shielded motor cable up to 15 m (49 ft).

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Technical specifications

Technical specifications, control electronics	
<b>Electrical specifications</b>	
<b>Operating voltage</b>	External 24 V DC necessary
<b>Current consumption, max. <sup>1)</sup></b> (from the non-switched 24 V supply, yellow AS-Interface cable)	320 mA
<b>Current consumption, max.</b> (from the switched 24 V supply, black AS-Interface cable)	
• Without supplementary fan	180 mA
• With supplementary fan	350 mA
<b>Fixed frequencies</b>	6, parameterizable
<b>Interfaces</b>	
<b>Digital inputs</b>	4
<b>Analog inputs</b> (0 ... 10 V)	1
<b>Bus interface</b>	AS-Interface
<b>PTC/KTY interface</b>	Connection via Power Modules
• Motor temperature sensor	1 input, sensors that can be connected: PTC, KTY or Thermo-Click
<b>Control of a mechanical motor brake</b>	Connection via Power Modules
<b>Memory card slot</b>	Optional
<b>RS232 interface</b>	Connection with RS232 interface cable via the optical inverter interface
<b>USB interface</b>	Connection with USB interface cable via the optical inverter interface
<b>Open-loop/closed-loop control technique and software</b>	
<b>V/f linear/square/parameterizable</b>	✓
<b>V/f with flux current control (FCC)</b>	✓
<b>Software functions</b>	<ul style="list-style-type: none"> <li>• Signal interconnection with BICO technology</li> <li>• Automatic restart after line supply failure or operational fault</li> <li>• Slip compensation</li> <li>• Free function blocks (FFB) for logical operations</li> <li>• Ramp smoothing</li> <li>• 3 selectable drive data sets</li> <li>• 3 selectable command data sets (CDS) (manual/auto)</li> <li>• Flying restart</li> <li>• JOG</li> <li>• Technology controller (PID)</li> <li>• Thermal motor protection</li> <li>• Thermal inverter protection</li> <li>• Setpoint input</li> <li>• Motor identification</li> <li>• Motor holding brake</li> </ul>

<sup>1)</sup> Contains the current consumption of connected sensors.  
Analog input uses 0 V to 10 V as voltage input.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Technical specifications

##### General technical specifications, power electronics

<b>System operating voltage</b>	380 ... 500 V AC 3 AC ±10 %					
<b>Line supply requirements, line short circuit voltage <math>u_K</math></b>	No restriction					
<b>Input frequency</b>	47 ... 63 Hz					
<b>Output frequency</b>	0 ... 650 Hz					
• Control type $V/f$	0 ... 650 Hz					
<b>Pulse frequency</b>	4 kHz (standard), for higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>					
<b>Power factor</b>	0.7 ... 0.85					
<b>Inverter efficiency <math>\eta</math></b>	95 %					
<b>Output voltage, max.</b>	0 ... 87 % of input voltage					
<b>Overload capability</b>	<ul style="list-style-type: none"> <li>High overload (HO)           <ul style="list-style-type: none"> <li>Average maximum rated output current during a cycle time of 300 s</li> <li>1.5 × rated output current (i.e. 150 % overload) over 60 s at a cycle time of 300 s</li> <li>2 × rated output current (i.e. 200 % overload) over 3 s at a cycle time of 300 s</li> </ul> </li> </ul>					
<b>Electromagnetic compatibility</b>	Integrated line filter class A according to EN 55011					
<b>Possible braking methods</b>	DC braking Integrated brake control supplies DC power supply for the brake					
	Line voltage	380 V AC	400 V AC	440 V AC	480 V AC	500 V AC
	Rectified brake voltage	171 V DC	180 V DC	198 V DC	216 V DC	225 V DC
	Recommended brake coil voltage for Siemens motors	170 ... 200 V DC	170 ... 200 V DC 184 ... 218 V DC <sup>2)</sup>	184 ... 218 V DC <sup>2)</sup>	184 ... 218 V DC <sup>2)</sup>	–
	Disconnection on the DC side permits "fast" braking.					
• Output current, max.	<ul style="list-style-type: none"> <li>600 mA (with UL approval)</li> <li>1 A (without UL approval)</li> </ul>					
<b>Permissible mounting position</b>	Horizontal wall mounting and mounting in the horizontal position					
<b>Relative humidity</b>	< 95 % RH, condensation not permissible					
<b>Cooling</b>	<ul style="list-style-type: none"> <li>FSA: Convection</li> <li>FSB and FSC: Air cooling as required using the integrated fan</li> </ul>					
<b>Installation altitude</b>	<ul style="list-style-type: none"> <li>Up to 1000 m (3281 ft) above sea level without derating</li> <li>&gt; 1000 m (3281 ft) <a href="#">see derating characteristics</a></li> </ul>					
<b>Standard SCCR (Short-Circuit Current Rating)<sup>1)</sup></b>	40 kA					
<b>Protection functions</b>	<ul style="list-style-type: none"> <li>Undervoltage</li> <li>Overvoltage</li> <li>Overcontrol/overload</li> <li>Ground fault</li> <li>Short-circuit</li> <li>Stall protection</li> <li>Motor blocking protection</li> <li>Motor overtemperature</li> <li>Inverter overtemperature</li> <li>Parameter locking</li> </ul>					
<b>Compliance with standards</b>	UL 508C (UL list number E121068), CE, c-tick					
<b>CE marking, according to</b>	Low-Voltage Directive 2006/95/EC					

<sup>1)</sup> Applies to industrial control cabinet installations to NEC article 409/UL 508A.

<sup>2)</sup> With voltage boost activated.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

#### Technical specifications

Line voltage 380 ... 500 V 3 AC		SINAMICS G110D					
		6SL3511- .PE17-5AM0	6SL3511- .PE21-5AM0	6SL3511- .PE23-0AM0	6SL3511- .PE24-0AM0	6SL3511- .PE25-5AM0	6SL3511- .PE27-5AM0
<b>Rated output current <math>I_{rated}^{1)}</math></b>	A	2.3	4.3	7.7	10.2	13.2	19
<b>Output current <math>I_{max}</math></b>	A	4.6	8.6	15.4	20.4	26.4	38
<b>Rated power</b>	kW (hp)	0.75 (1.0)	1.5 (1.5) <sup>3)</sup>	3.0 (4.0)	4.0 (5.4)	5.5 (7.4)	7.5 (10)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4	4
<b>Efficiency <math>\eta</math></b>	%	95	95	95	95	95	95
<b>Rated input current <sup>2)</sup></b>	A	2.0	3.8	7.0	9.1	12.2	17.9
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3, PE		HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)
• Conductor cross-section	mm <sup>2</sup>	1.5 ... 6	1.5 ... 6	2.5 ... 6	2.5 ... 6	4 ... 6	4 ... 6
<b>Motor connection</b> U2, V2, W2, PE, motor brake, temperature sensor		HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)
• Conductor cross-section	mm <sup>2</sup>	1 ... 4	1 ... 4	2.5 ... 4	2.5 ... 4	4	4
<b>Motor cable length, max.</b>	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Degree of protection</b>		IP65	IP65	IP65	IP65	IP65	IP65
<b>Dimensions</b>							
• Width	mm (in)	445 (17.52)	445 (17.52)	445 (17.52)	445 (17.52)	445 (17.52)	445 (17.52)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)
• Depth							
- Without maintenance switch	mm (in)	125 (4.92)	125 (4.92)	125 (4.92)	165 (6.50)	240 (9.45)	240 (9.45)
- With maintenance switch	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)	165 (6.50)	240 (9.45)	240 (9.45)
<b>Frame size</b>		FSA	FSA	FSA	FSB	FSC	FSC
<b>Weight, approx.</b>							
• Without maintenance switch	kg (lb)	6.7 (14.8)	6.7 (14.8)	6.9 (15.2)	7.4 (16.3)	9.4 (20.7)	9.5 (20.9)
• With maintenance switch	kg (lb)	7.0 (15.4)	7.0 (15.4)	7.2 (15.9)	7.7 (17.0)	9.7 (21.4)	9.8 (21.6)

<sup>1)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for high overload (HO).

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

<sup>3)</sup> It is not possible to make any assignment to a particular standard.



# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G110D distributed inverters

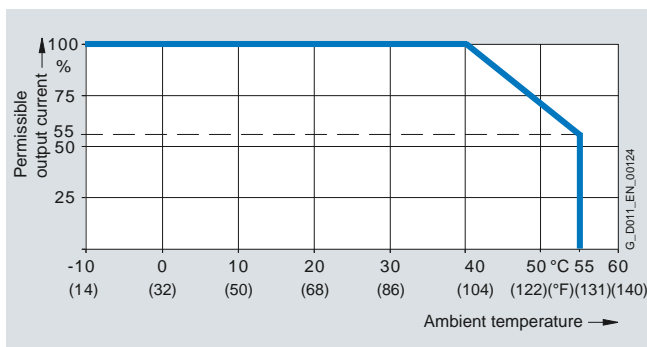
#### Characteristic curves

##### Derating data

###### Pulse frequency

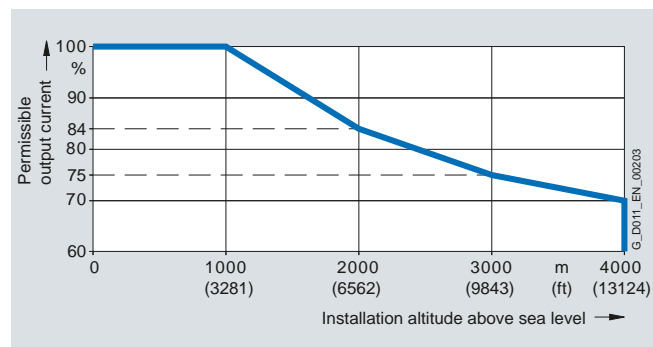
Rated power at 400 V 3 AC		Rated output current in A for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.75	1.0	2.2	1.9	1.5	1.3	1.1	1.0	0.9
1.5	1.5 <sup>1)</sup>	4.1	3.5	2.9	2.5	2.1	1.8	1.6
3.0	4.0	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4.0	5.0	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	13.2	11.2	9.2	7.9	6.6	5.9	5.3
7.5	10	19	16.2	13.3	11.4	9.5	8.6	7.6

###### Ambient temperature

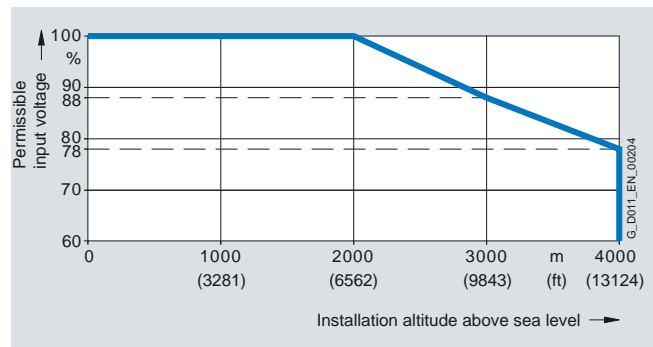


Permissible output current as a function of ambient temperature for frame sizes FSA to FSC

###### Installation altitude



Permissible output current as a function of installation altitude for frame sizes FSA to FSC



Permissible input voltage as a function of installation altitude for frame sizes FSA to FSC



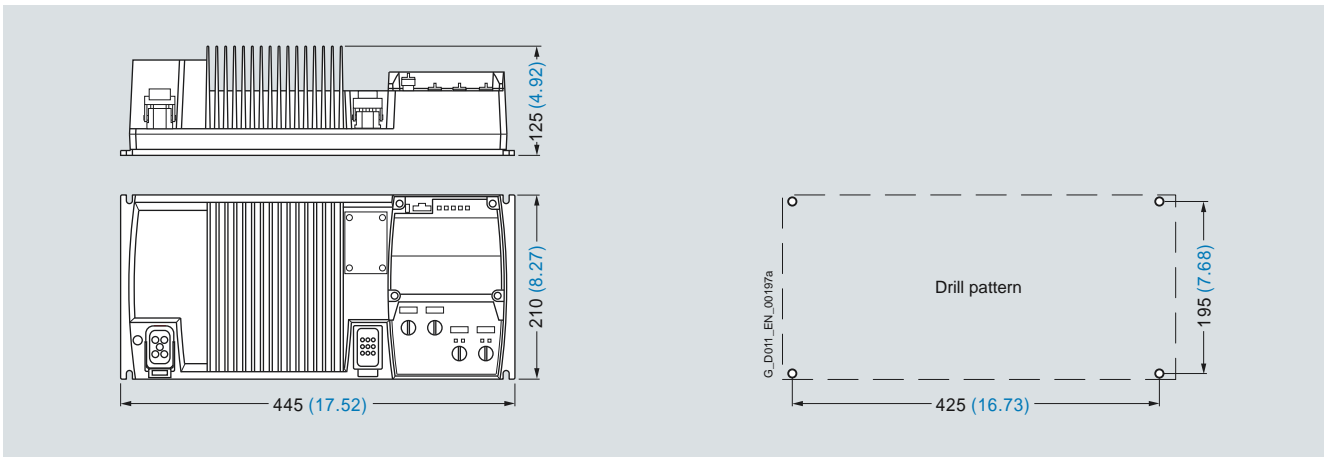
<sup>1)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G110D distributed inverters

0.75 kW to 7.5 kW (1.0 hp to 10 hp)

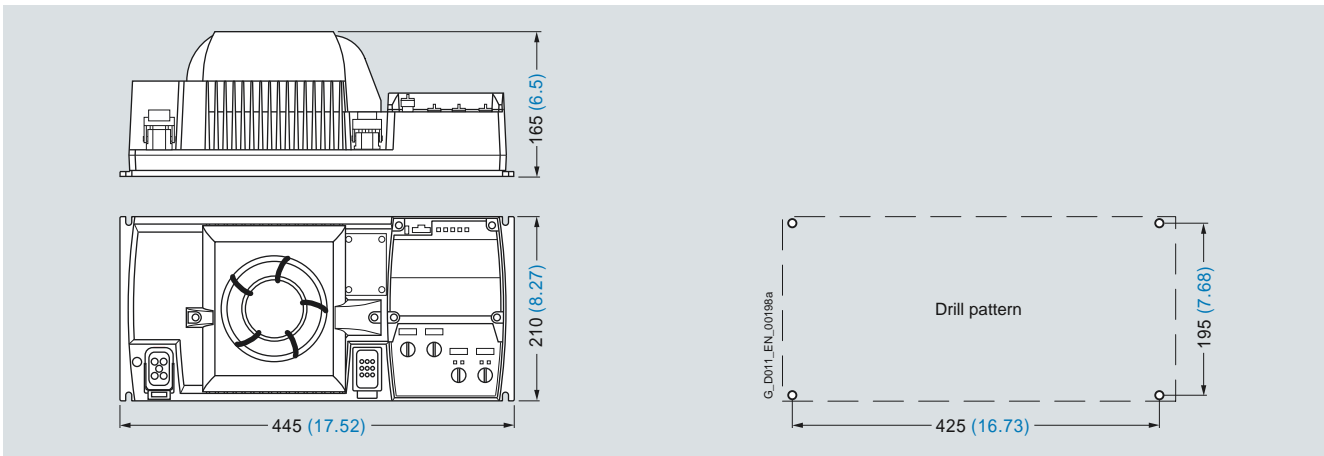
## SINAMICS G110D distributed inverters

### Dimensional drawings

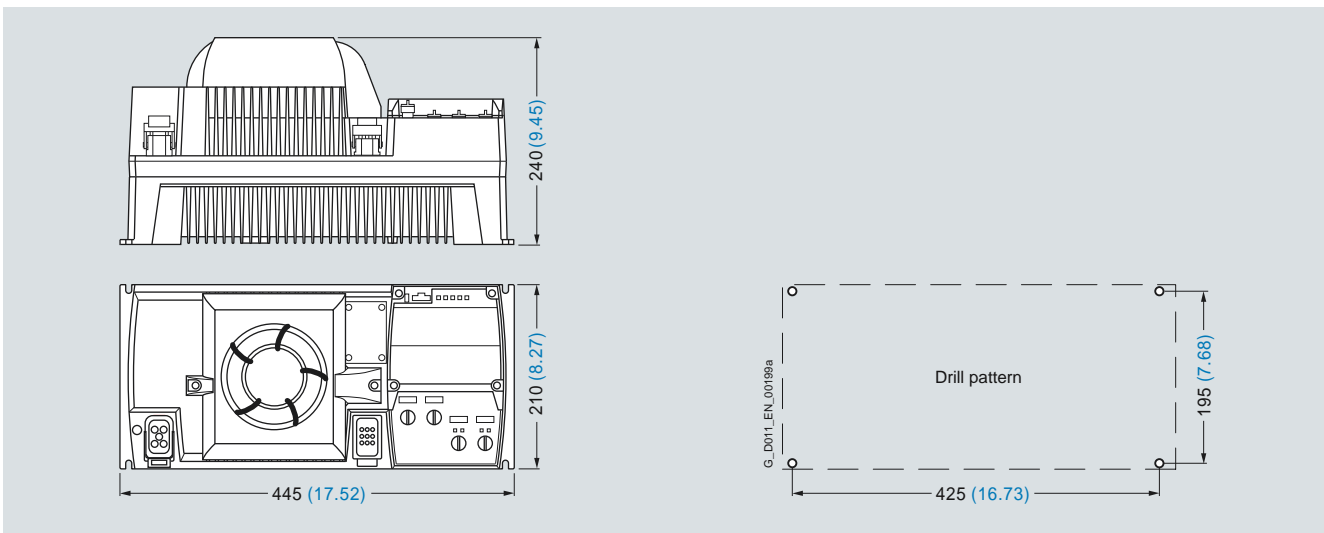


SINAMICS G110D, frame size FSA, with integrated line filter class A

7



SINAMICS G110D, frame size FSB, with integrated line filter class A



SINAMICS G110D, frame size FSC, with integrated line filter class A

Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.

Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches).

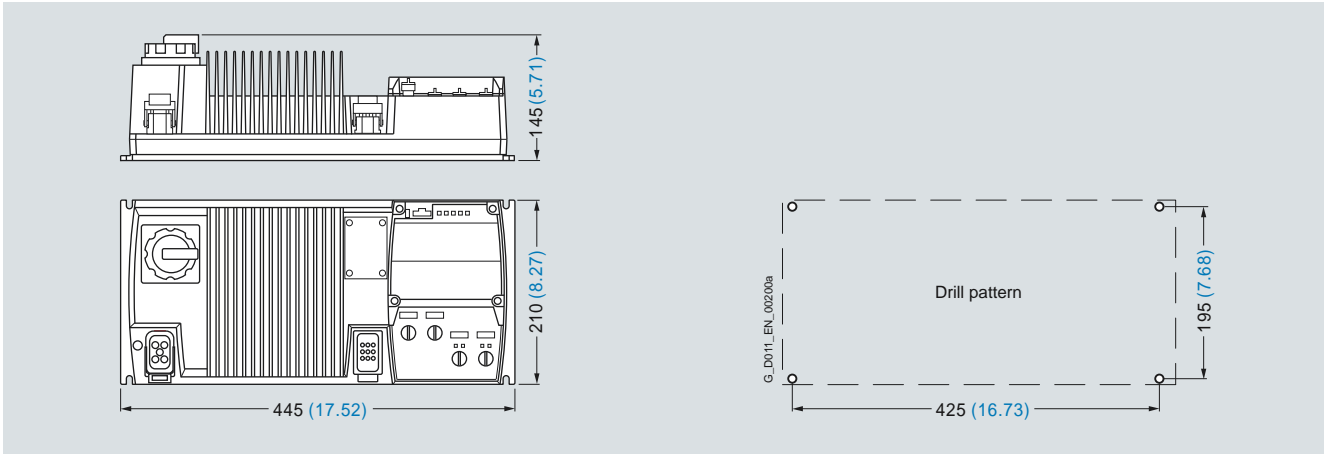
All dimensions in mm (values in brackets are in inches).

# SINAMICS G110D distributed inverters

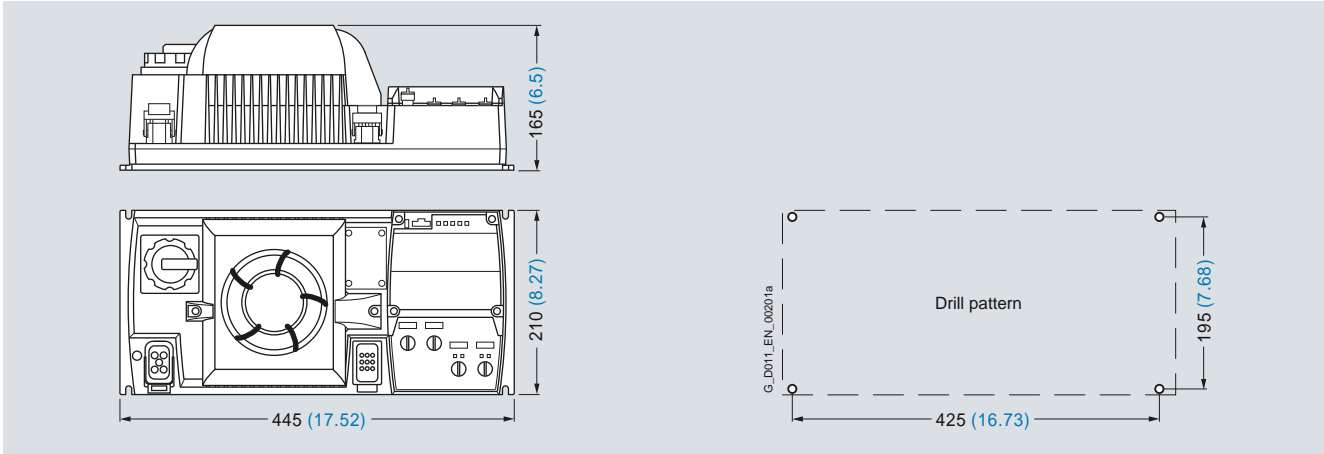
0.75 kW to 7.5 kW (1.0 hp to 10 hp)

## SINAMICS G110D distributed inverters

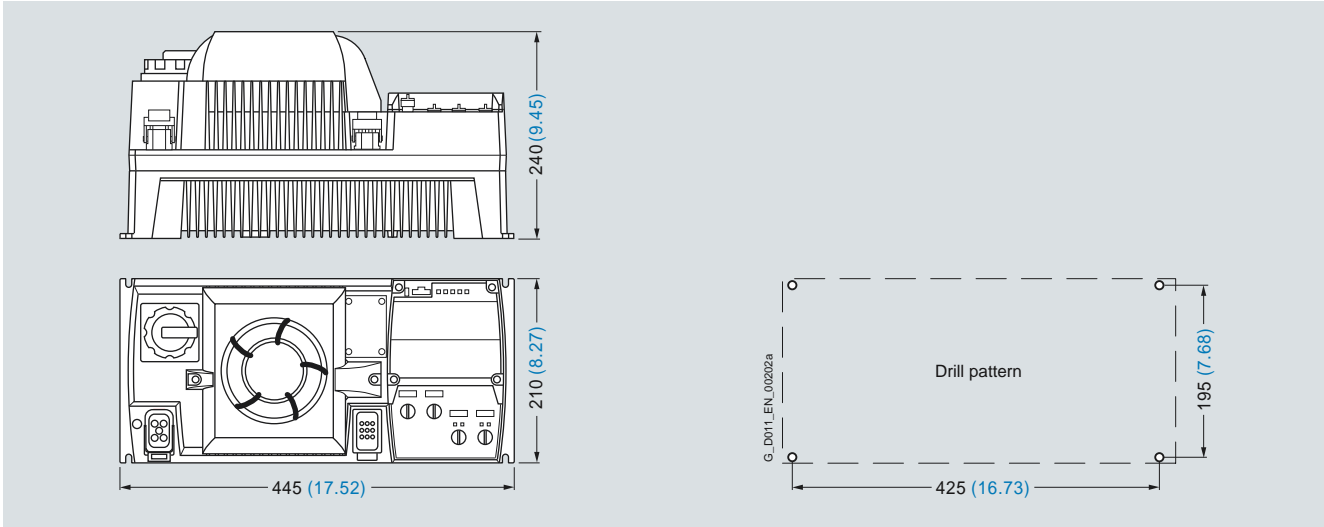
### Dimensional drawings



SINAMICS G110D, frame size FSA, with integrated line filter class A and maintenance switch



SINAMICS G110D, frame size FSB, with integrated line filter class A and maintenance switch



SINAMICS G110D, frame size FSC, with integrated line filter class A and maintenance switch

Mounted with 4 M5 studs, 4 M5 nuts, 4 M5 washers.  
 Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches).  
 All dimensions in mm (values in brackets are in inches).

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Recommended line-side power components

#### Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers (line-side components dimensioned in accordance with IEC standards). The specified circuit breakers are UL-certified. 3NA3 fuses are recommended for European countries. The values in the table take into account the overload capability of the inverter.

Fuses for use in North America must be UL-certified, such as the Class NON fuse series from Busmann or approved circuit breakers from the SIRIUS 3RV and SENTRON 3VL series according to UL 489 (category control number CCN: DiV Q).

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 and IC 10.](#)

#### Individual protection

Rated power		SINAMICS G110D		Protection	Fuse	Circuit breaker
kW	hp	Type 6SL3511-...	Frame size			
<b>380 ... 500 V 3 AC</b>						
0.75	1.0	. PE17-5AM0	FSA	10	<b>3NA3803</b>	<b>3RV1021-1FA10</b>
1.5	1.5 <sup>1)</sup>	. PE21-5AM0	FSA	10	<b>3NA3803</b>	<b>3RV1021-1JA10</b>
3.0	4.0	. PE23-0AM0	FSA	16	<b>3NA3805</b>	<b>3RV1021-4AA10</b>
4.0	5.0	. PE24-0AM0	FSB	20	<b>3NA3807</b>	<b>3RV1021-4BA10</b>
5.5	7.5	. PE25-5AM0	FSC	20	<b>3NA3807</b>	<b>3RV1031-4EA10</b>
7.5	10	. PE27-5AM0	FSC	32	<b>3NA3812</b>	<b>3RV1031-4FA10</b>

<sup>1)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

DC link components  
Braking resistors

### Overview

Excess energy in the DC link is dissipated in the braking resistors. The braking resistors are intended for use with SINAMICS G110D, which have an integrated brake chopper, but cannot regenerate energy to the line supply. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors can be mounted above and to the side of the SINAMICS G110D distributed inverter. The heat dissipated by the braking resistor must not diminish the inverter cooling. This is the reason that a minimum clearance of 150 mm (5.91 in) must be maintained between the inverter and braking resistor.

Every braking resistor has thermal protection (UL-listed). The thermal protection prevents the braking resistor from being thermally overloaded.

All of the braking resistors are provided as standard with a cable; this is pre-assembled and is 500 mm (19.69 in) long.

### Selection and ordering data

Rated power		Suitable for SINAMICS G110D		Braking resistor
kW	hp	Type 6SL3511-...	Frame size	Order No.
<b>380 ... 500 V 3 AC</b>				
0.75	1.0	. PE17-5AM0	FSA	<b>6SL3501-0BE08-6AA0</b>
1.5	1.5 <sup>1)</sup>	. PE21-5AM0	FSA	
3.0	4.0	. PE23-0AM0	FSA	<b>6SL3501-0BE12-1AA0</b>
4.0	5.0	. PE24-0AM0	FSB	
5.5	7.5	. PE25-5AM0	FSC	<b>6SL3501-0BE14-1AA0</b>
7.5	10	. PE27-5AM0	FSC	

### Technical specifications

Line voltage 380 V ... 500 V 3 AC		Braking resistor		
		6SL3501-0BE08-6AA0	6SL3501-0BE12-1AA0	6SL3501-0BE14-1AA0
Resistance	Ω	400	160	80
Rated power $P_{DB}$	kW	0.075	0.2	0.375
Peak power $P_{max}$ (cycle time 12 s)	kW	1.5	4.0	7.5
Degree of protection		IP65	IP65	IP65
Dimensions				
• Width	mm (in)	465 (18.31) <sup>2)</sup>	465 (18.31) <sup>2)</sup>	465 (18.31) <sup>2)</sup>
• Height	mm (in)	199 (7.83)	199 (7.83)	259 (10.20)
• Depth	mm (in)	120 (4.72)	120 (4.72)	120 (4.72)
Weight, approx.	kg (lb)	3.5 (7.7)	4.5 (9.9)	7.0 (15.4)
Suitable for SINAMICS G110D (Frame size)		6SL3511- . PE17-5AM0 (FSA) 6SL3511- . PE21-5AM0 (FSA)	6SL3511- . PE23-0AM0 (FSA) 6SL3511- . PE24-0AM0 (FSB)	6SL3511- . PE25-5AM0 (FSC) 6SL3511- . PE27-5AM0 (FSC)

<sup>1)</sup> It is not possible to make any assignment to a particular standard.

<sup>2)</sup> For the specified width (465 mm/18.31 in) the required bending radius of the braking resistor connecting cable to the SINAMICS G110D has not been taken into account.

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Intelligent Operator Panel IOP Handheld



IOP Handheld for mobile use

The Intelligent Operator Panel IOP Handheld is a very user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of the SINAMICS G110D distributed inverter.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors.

There are quick commissioning wizards for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP Handheld has a dedicated switchover button to switch over from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to two process values can be displayed graphically or numerically on the status screen/status display.

Process values can also be displayed in technological units.

The IOP Handheld supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP Handheld and downloaded into other drive units of the same type as required.

The IOP Handheld includes the following language packages: English, French, German, Italian and Spanish.

In addition to the IOP, the IOP Handheld includes a housing with the rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP Handheld to SINAMICS G110D, the RS232 connecting cable with optical interface is required in addition.

##### Updating the IOP Handheld

The IOP Handheld can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP Handheld via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP Handheld.

The IOP is supplied with power via the USB interface during an update.

##### Selection and ordering data

Description	Order No.
<b>IOP Handheld</b> For use with SINAMICS G120, SINAMICS G120C, SINAMICS G110D, SINAMICS G120D, SIMATIC ET 200S FC or SIMATIC ET 200pro FC Included in the scope of delivery: <ul style="list-style-type: none"> <li>• Intelligent Operator Panel IOP</li> <li>• Handheld housing</li> <li>• Rechargeable batteries (4 × AA)</li> <li>• Charging unit (international)</li> <li>• RS232 connecting cable (3 m/9.84 ft long, can only be used for SINAMICS G120 and SIMATIC ET 200S FC)</li> <li>• USB cable (1 m/3.28 ft long)</li> </ul>	<b>6SL3255-0AA00-4HA0</b>
<b>RS232 connecting cable</b> With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SIMATIC ET 200pro FC inverters to the IOP Handheld (2.5 m/8.2 ft long)	<b>3RK1922-2BP00</b>

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Manual local control with keyswitch



Example: SINAMICS G110D and manual local control with integrated keyswitch

The manual local control is a simple method to locally control and commission the SINAMICS G110D distributed inverter.

To switch over from the automatic to the manual mode or to switch off the inverter, there is a keyswitch from which the key can be withdrawn in each of the three operating modes (Auto/Off/Local).

- The inverter is controlled via the PLC in "Auto" mode
- In the "Off" state, the device is shut down (however, the line supply voltage is still connected)
- The drive is locally and directly controlled in the "Local" setting. The device is simply controlled using directly assigned buttons. The following functions can be selected:
  - Switching over between continuous operation/jog mode
  - On/Counter-clockwise
  - On/Clockwise
  - Deactivate Quick Stop

The manual local control is mounted on the inverter instead of the standard blanking cover. This means that it can be retrofitted at a later date.

##### Selection and ordering data

Description	Order No.
<b>Manual local control with keyswitch</b>	<b>6SL3555-0PL00-2AA0</b>

##### Memory cards



SINAMICS micro memory card (MMC) and SIMATIC memory card (SD card)

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) and SIMATIC memory card (SD card). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The card holder is not included in the scope of supply of the inverter and must be separately ordered.

##### Selection and ordering data

Description	Order No.
<b>SINAMICS micro memory card (MMC)</b>	<b>6SL3254-0AM00-0AA0</b>
<b>SIMATIC memory card (SD card)</b>	<b>6ES7954-8LB01-0AA0</b>

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Card holder for memory card



To use the SINAMICS micro memory card (MMC) and SIMATIC memory card (SD card), a card holder is required. This can be subsequently inserted under the blanking cover or under the optional manual local control on the inverter – where it can also remain. In addition, a Secure Digital card (SD) of up to max. 1 GB can also be used.



SINAMICS G110D with integrated card holder (in the open state)

##### Selection and ordering data

Description	Order No.
<b>Card holder</b> For memory card	<b>6SL3555-0PM00-0AA0</b>

##### RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool<sup>1)</sup>, V4.1.3 and higher) has been installed.

##### Selection and ordering data

Description	Order No.
<b>RS232 interface cable</b> For communication with a PC	<b>3RK1922-2BP00</b>

##### USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool<sup>1)</sup>, V4.1.3 and higher) has been installed.

##### Selection and ordering data

Description	Order No.
<b>USB interface cable</b> For communication with a PC (2.5 m/8.2 ft long)	<b>6SL3555-0PA00-2AA0</b>

##### Adapter for mounting SINAMICS G110D instead of SIRIUS M200D motor starter

For adaptation, there are connection boards that allow SINAMICS G110D to be mounted onto existing connection holes of the SIRIUS M200D motor starter (provided there is sufficient space). This means that a system can be adapted to future changes in requirements.

##### Selection and ordering data

Description	Order No.
<b>Adapter</b> For mounting SINAMICS G110D instead of SIRIUS M200D motor starter	<b>6SL3263-1GA20-0GA0</b>

##### STARTER commissioning tool

The STARTER commissioning tool (STARTER V4.1.3 and higher) supports the commissioning and maintenance of SINAMICS G110D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

##### Selection and ordering data

Description	Order No.
<b>STARTER commissioning tool</b> <sup>1)</sup> On DVD-ROM	<b>6SL3072-0AA00-0AG0</b>

<sup>1)</sup> The STARTER commissioning tool is also available in the Internet at <http://support.automation.siemens.com/WW/view/en/10804985/133100>



# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Connector kit for braking resistor

A connector kit is available for connecting other braking resistors to SINAMICS G110D.

##### Selection and ordering data

Description	Order No.
<b>Connector kit</b> For braking resistor	<b>6SL3563-4RA00-0GA0</b>

##### UL connector kit

A special UL connector kit is required for using SINAMICS G110D in UL-compatible applications. This comprises all parts that are needed to connect power and the motor (contacts, contact housing, metal connector housing and a cable of about 7 m (23 ft) in length).

##### Selection and ordering data

Description	Order No.
<b>UL connector kit</b> For power and motor	<b>6SL3563-4UA00-0GA0</b>

##### Protection bar

Protection bars are available for the various frame sizes for protecting the connectors from shearing off in response to mechanical forces. These are mounted above and to the side of the SINAMICS G110D and protect the connectors and the key-switch of the optional manual local control.

##### Selection and ordering data

Description	Order No.
<b>Protection bar</b>	
• For frame sizes FSA and FSB	<b>6SL3263-1HA20-0GA0</b>
• For frame size FSC	<b>6SL3263-1HC20-0GA0</b>

##### Connecting cable and socket for AS-Interface

##### Selection and ordering data

Description	Order No.
<b>AS-Interface M12 branch</b> To connect the AS-Interface and the $U_{Aux}$ cable to an M12 socket, UL Length:	
• 1.0 m (3.28 ft)	<b>3RK1901-1NR21</b>
• 2.0 m (6.56 ft)	<b>3RK1901-1NR22</b>
<b>M12 socket</b> For screw mounting, 4-pole screw-type connection max. 0.75 mm <sup>2</sup> , A-coded, max. 4 A, UL	
• Angled	<b>3RK1902-4CA00-4AA0</b>

##### Connecting cables and connectors for digital inputs

##### Selection and ordering data

Description	Order No.
<b>M12 plug-in cable</b> With PUR sheath, to connect digital sensors and actuators, pre-assembled at one end, angled, plug connector, 5-pole, 5 × 0.34 mm <sup>2</sup> , UL Length:	
• 1.5 m (4.92 ft)	<b>3RK1902-4HB15-5AA0</b>
• 5 m (16.41 ft)	<b>3RK1902-4HB50-5AA0</b>
• 10 m (32.81 ft)	<b>3RK1902-4HC01-5AA0</b>
<b>M12 connector</b> For screw mounting, 5-pole screw-type connection max. 0.75 mm <sup>2</sup> , A-coded, max. 4 A, UL	
• Straight	<b>3RK1902-4BA00-5AA0</b>
• Angled	<b>3RK1902-4DA00-5AA0</b>

##### Connecting cables pre-assembled at one end and connector sets to connect to the line supply

##### Selection and ordering data

Description	Order No.
<b>Connecting cable pre-assembled at one end</b> Power supply cable, open at one end, for HAN Q4/2, angled, 4 × 4 mm <sup>2</sup>	
• 1.5 m (4.92 ft) long	<b>3RK1911-0DB13</b>
• 5 m (16.41 ft) long	<b>3RK1911-0DB33</b>
<b>Connector set for the power supply</b> HAN Q4/2	
• 2.5 mm <sup>2</sup>	<b>3RK1911-2BE50</b>
• 4 mm <sup>2</sup>	<b>3RK1911-2BE10</b>
• 6 mm <sup>2</sup>	<b>3RK1911-2BE30</b>

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

*Motor cables pre-assembled at one end and connector sets to connect the inverter to the motor*

#### Selection and ordering data

<b>Motor cables pre-assembled at one end</b> For motors with brake and temperature sensor with HAN Q8 connector, shielded	Order No. (HTG: supplied by Harting) (ZKT: supplied by KnorrTec)		
Cross-section	4 × 1.5 mm <sup>2</sup> 2 × (2 × 0.75 mm <sup>2</sup> )	4 × 2.5 mm <sup>2</sup> 2 × (2 × 0.75 mm <sup>2</sup> )	4 × 4 mm <sup>2</sup> 2 × 1 mm <sup>2</sup> + 2 × 1.5 mm <sup>2</sup>
• 1.5 m (4.92 ft) long	<b>HTG: 61 88 201 0288</b> <b>ZKT: 70020501000150</b>	<b>HTG: 61 88 201 0291</b> <b>ZKT: 70009601000150</b>	<b>HTG: 61 88 201 0303</b> <b>ZKT: 70017001000150</b>
• 3 m (9.84 ft) long	<b>HTG: 61 88 201 0289</b> <b>ZKT: 70020501000300</b>	<b>HTG: 61 88 201 0292</b> <b>ZKT: 70009601000300</b>	<b>HTG: 61 88 201 0304</b> <b>ZKT: 70017001000300</b>
• 5 m (16.41 ft) long	<b>HTG: 61 88 201 0290</b> <b>ZKT: 70020501000500</b>	<b>HTG: 61 88 201 0293</b> <b>ZKT: 70009601000500</b>	<b>HTG: 61 88 201 0305</b> <b>ZKT: 70017001000500</b>
• 10 m (82.81 ft) long	<b>HTG: 61 88 201 0299</b> <b>ZKT: 70020501001000</b>	<b>HTG: 61 88 201 0301</b> <b>ZKT: 70009601001000</b>	<b>HTG: 61 88 201 0306</b> <b>ZKT: 70017001001000</b>
<b>Connector set for motor cable</b> HAN Q8, shielded			
	–	<b>6ES7194-1AB01-0XA0</b>	–
	<b>HTG: 61 83 401 0131</b> <b>ZKT: 10032001</b>	<b>HTG: 61 83 401 0132</b> <b>ZKT: 10032011</b>	<b>HTG: 61 83 401 0133</b> <b>ZKT: 10032021</b>

#### Power bus distribution 400 V in IP65 degree of protection

#### Selection and ordering data

Description	Ordering (see Solution Partner)
<b>Power T clamp connector for 2.5 ... 6 mm<sup>2</sup></b> With attached 7-pole connector, socket insert, grommet housing, UL Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Harting
<b>T clamp connector</b> Completely pre-assembled	Ordered from and supplied by KnorrTec
<b>T distributor box, IDC connection power cable</b> Pre-assembled, UL, uncut power cable, 2.5 ... 6 mm <sup>2</sup> , 2 outgoing feeders: Push-in connection: 1.5 ... 6 mm <sup>2</sup> Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Weidmüller
<b>T distributor box</b> Completely pre-assembled	Ordered from and supplied by KnorrTec

#### Additional information

For further information about the connecting cables and plug-in connectors mentioned above, please refer to Catalog IK PI.



Further selected accessories are available from Siemens Solution Partners. Please go to the "Solution Partner Finder" and select technology "Distributed Field Installation System".  
[www.siemens.com/automation/partnerfinder](http://www.siemens.com/automation/partnerfinder)

# SINAMICS G110D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Spare Parts Spare Parts Kit

### Spare Parts Replacement fans

#### Overview

A Spare Parts Kit can be ordered which comprises small parts such as replacement seals, caps and screws.

#### Selection and ordering data

Description	Order No.
<b>Spare Parts Kit for SINAMICS G110D</b> Comprising replacement seals, caps and screws	<b>6SL3500-0TK01-0AA0</b>

#### Overview

The fans are designed for extra long service life. Replacement fans can be ordered for special applications.

#### Selection and ordering data

Rated power		SINAMICS G110D		Replacement fan (pre-mounted unit with cover, fan and screws)
kW	hp	Type 6SL3511-...	Frame size	
<b>380 ... 500 V 3 AC</b>				
4.0	5.0	. PE24-0AM0	FSB	<b>6SL3500-0TF01-0AA0</b>
5.5	7.5	. PE25-5AM0	FSC	
7.5	10	. PE27-5AM0		

# SINAMICS G110D distributed inverters

0.75 kW to 7.5 kW (1.0 hp to 10 hp)

Notes

7

# SINAMICS G120D

## distributed inverters

### 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

# 8




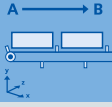
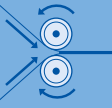

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# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Introduction

### Application

Application	Continuous motion			Non-continuous motion			
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality	Basic	Medium	High	Basic	Medium	High
<b>Pumping, ventilating, compressing</b> 	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	
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)	
<b>Moving</b> 	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	
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (DCM)	
<b>Processing</b> 	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	
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)	
<b>Machining</b> 	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	
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	

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

SINAMICS G120D is ideally suited for demanding conveyor system applications in the industrial environment for which a distributed drive with communications capability is required. This applies in particular to the automotive sector, e.g. for assembly lines.

SINAMICS G120D is also suitable for many additional high-performance applications, e.g. in the airport sector, the food and beverage industry (without surfactants) and in distribution logistics (e.g. electric monorail systems).

### More information

You may also be interested in these inverters/converters:

- Reduced functional scope ⇒ SINAMICS G110D ([chapter 7](#))
- More performance for the control cabinet in IP20 degree of protection ⇒ SINAMICS G120 ([chapter 6](#))  
SINAMICS G120C ([chapter 4](#))
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110 ([chapter 9](#))
- For more axes in a small space ⇒ SIMATIC ET200S FC, SIMATIC ET200pro FC ([Catalog ST 70](#))

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G120D distributed inverters

#### Overview

The SINAMICS G120D distributed inverter series is the solution for demanding drive tasks especially in the field of conveyor systems. SINAMICS G120D inverters continuously control the speed of three-phase asynchronous (induction) motors and fulfill all the requirements of conveyor system applications from simple frequency control through to demanding vector control. With its intelligent modular design with IP65 degree of protection, it can be seamlessly integrated into the plant or system and supports a high plant availability and low stocks of spare parts. The innovative power unit concept capable of energy recovery helps to save energy. The patented implementation concept of integrated Safety functions is unique worldwide, permitting improved plant and system designs with a higher productivity. This drive can be optimally integrated into the Siemens TIA world of automation via PROFIBUS or PROFINET.

With different device versions (frame sizes FSA to FSC) in a power range from 0.75 kW to 7.5 kW (1.0 hp to 10 hp), it is suitable for a wide variety of drive solutions.



Example: SINAMICS G120D, frame size FSA, comprising PM250D Power Module and fail-safe CU240D DP-F Control Unit

#### Reasons for using distributed drive systems

- Modular drive solutions – therefore standardized mechatronic elements that can be individually tested
- A control cabinet is not required, resulting in a smaller space requirement and lower cooling requirements
- Long cables between the inverter and motor can be avoided (which means lower power losses, reduced noise emission and lower costs for shielded cables and additional filters)
- Distributed configurations offer considerable benefits for conveyor systems with their extensive coverage (e.g. in the automotive and logistics sectors)

#### Siemens family of distributed drives

Siemens offers an innovative portfolio of frequency inverters to optimally implement distributed drive solutions. The strengths of the individual members of the drive family permit simple adaptation to the widest range of application demands:

- Identical connection systems
- Identical mounting dimensions for SINAMICS G110D and SINAMICS G120D
- Standard commissioning and configuration tool

Products from the family of distributed drives:

- SINAMICS G110D inverters
- SINAMICS G120D inverters
- SIMATIC ET 200S FC drive converters
- SIMATIC ET 200pro FC drive converters
- SIRIUS M200D motor starters

#### Modularity

SINAMICS G120D is a modular inverter system with IP65 degree of protection comprising various function units. The main units are

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control types that can be selected. The digital inputs and digital outputs on the device support the simple wiring of sensors and actuators directly at the drive. The input signals can either be directly linked within the Control Unit and initiate local responses independently or they can be transferred to the central control via PROFIBUS or PROFINET for further processing within the context of the overall plant.

The Power Module supplies the motor in a power range from 0.75 kW to 7.5 kW (1.0 hp to 10 hp). The Power Module is controlled by a microprocessor in the Control Unit. State-of-the-art IGBT technology with pulse-width-modulation is used for highly reliable and flexible motor operation. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor. The unusually low profile mechanical design is optimized so that the device can be directly used in the plant or system. The Power Module also has the same drilling dimensions for all power ratings (standard footprint). Further, the dimensions are identical to those of SINAMICS G110D. This significantly simplifies the mechanical design, installation and retrofit of a system.

The latest technical documentation (catalogs, dimension drawings, certificates, manuals and operating instructions), are available in the Internet at the following address:

[www.siemens.com/sinamics-g120d/documentation](http://www.siemens.com/sinamics-g120d/documentation)

and offline on the DVD-ROM CA 01 in the DT Configurator. In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G120D distributed inverters

#### Overview

##### Safety Integrated

The SINAMICS G120D distributed inverters include versions for safety-oriented applications. All Power Modules are already designed for Safety Integrated. A Safety Integrated Drive can be created by combining a Power Module with the relevant fail-safe Control Unit.

The SINAMICS G120D fail-safe inverter provides three safety functions, certified in accordance with EN 954-1, Category 3 and IEC 61508 SIL 2:

- Safe Torque Off (STO) to protect against active movement of the drive
- Safe Stop 1 (SS1) for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS) for protection against dangerous movements when a speed limit is exceeded

The functions "Safe Stop 1" and "Safely Limited Speed" can both be implemented without having to use a motor encoder or encoder; the implementation costs are minimal. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The safety functions "Safely Limited Speed" and "Safe Stop 1" are certified for asynchronous (induction) motors without encoders – these safety functions are not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in chapter Highlights, section Safety Integrated.

##### Efficient Infeed Technology

The innovative Efficient Infeed Technology is employed in PM250D Power Modules. This technology allows the energy produced by motors operating in generator mode connected to standard inverters to be fed back into the supply system. At the same time, considerable savings can be achieved in terms of energy consumption and operating costs.

Additional information is included in chapter Highlights, section Efficient Infeed Technology.

##### STARTER commissioning tool

The STARTER commissioning tool (V4.1, SP1 and higher) allows menu-prompted commissioning and maintenance of SINAMICS G120D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

#### Benefits

- Mechanical design, installation and retrofit of systems are significantly simplified as a result of the compact and space-saving design with an extremely low profile and with the same drilling dimensions for all power ratings; further, the dimensions are identical to those of the SINAMICS G110D distributed inverter
- Wide power range from 0.75 kW to 7.5 kW (1.0 hp to 10 hp)
- The safety functions make it easier to integrate drives into safety-oriented machines or plants
- The innovative circuit design (bidirectional input rectifier with "pared-down" DC link) allows the kinetic energy of a load to be fed back into the line supply system. This feedback capability provides enormous potential for energy saving because generated energy no longer has to be converted into heat in a braking resistor. Braking resistors and reactors are not necessary – this is a particular advantage in terms of the space requirement and installation costs for the high IP65 degree of protection.

- Easy commissioning and maintenance as a result of the same, standardized connectors for the bus, power and I/O connections (ISO 23570) for the complete range of power ratings of SINAMICS G110D and SINAMICS G120D
- Increased degree of ruggedness and longer service life as the electronic modules are coated
- Flexibility due to modularity for a future-oriented distributed drive concept with a high IP65 degree of protection
  - Module replacement under voltage (hot swapping)
  - The modules can be easily replaced, which makes the system extremely service friendly.
- Simple, standard implementation of completely distributed plant and system concepts by using products in a scalable fashion:
  - SIRIUS M200D (motor starter)
  - SINAMICS G110D (inverter for basic conveyor-related applications)
  - SINAMICS G120D (inverter for demanding conveyor-related applications)
- The same connectors are used as for the SIRIUS M200D motor starter
- Communications-capable via PROFINET or PROFIBUS with PROFIdrive profile 4.0:
  - Reduced number of interfaces
  - Plant-wide engineering
  - Easy to handle
- Simple connection, engineering, data management as well as control of the inverter in sophisticated plants and systems as a result of the consequential integration in TIA (Totally Integrated Automation)
- High degree of operator friendliness by using the Intelligent Operator Panel (IOP) to parameterize, diagnose, control (open-loop) and copy drive parameters in the BOP
- The ability to connect up to 6 sensors and 2 actuators directly to the Control Unit means that almost all of the drive information can be managed directly; local preprocessing of the signals takes the load off the fieldbus and ensures a fast and reproducible response time.
- Integrated EMC filter class A (acc. to EN 55011)
- Integrated brake control, brake voltages that are supported 400 V AC/180 V DC
- Integrated motor protection using a thermal motor model and evaluation of PTC, Thermo-Click or KTY 84 temperature sensors
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- Easy replacement of devices and fast copying of parameters to the optional SINAMICS micro memory card (MMC)
- Engineering and commissioning with standard engineering tools such as SIZER for Siemens Drives (V2.9 and higher), STARTER (V4.1, SP1 and higher) and Drive ES ensure fast engineering and easy commissioning – STARTER is integrated into STEP 7 with Drive ES Basic, with all the advantages of central data storage and totally integrated communication
- Certified worldwide for compliance with CE, UL, cUL, C-tick and Safety Integrated according to EN 954-1, Category 3 and IEC 61508 SIL 2



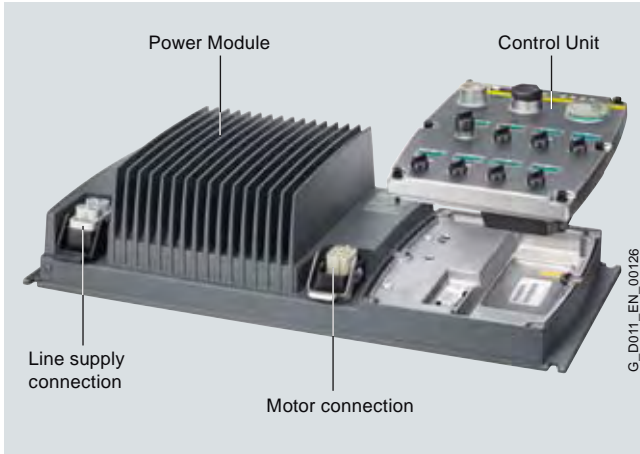
# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G120D distributed inverters

#### Design

The SINAMICS G120D distributed inverters are modular inverters for standard drives. Each SINAMICS G120D comprises two operative units – a Power Module and a Control Unit.



PM250D Power Module with line supply and motor connections and CU240D Control Unit

#### Power Modules

The following Power Modules are available for the SINAMICS G120D distributed inverters:

##### PM250D Power Modules

PM250D Power Modules (0.75 kW to 7.5 kW/1.0 hp to 10 hp) have an innovative circuit design which allows line-commutated energy recovery back into the line supply. This innovative circuit permits generated energy to be fed back into the supply system and therefore saves energy.

#### Control Units

The following Control Units are available for SINAMICS G120D distributed inverters:

##### CU240D Control Units

The Control Unit performs closed-loop control functions for the inverter. In addition to the closed-loop control, it has additional functions that can be adapted to the particular application through parameterization. Several Control Units are available in different versions:

- CU240D DP
- CU240D DP-F
- CU240D PN
- CU240D PN-F
- CU240D PN-F PP

#### Supplementary system components

##### Intelligent Operator Panel IOP Handheld

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission, diagnose and locally control standard drives.

##### SINAMICS micro memory card (MMC)

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The associated slot is located on the rear of the Control Unit.

##### RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.1, SP1 and higher) has been installed.

##### USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool V4.1.3 and higher) has been installed.

##### Connecting cable for the Control Units

Flexible plug-in cables to transfer data between the industrial Ethernet stations or PROFIBUS stations, as well as to supply power to the Control Unit.

##### Connecting cable for the Power Modules

Connector sets to connect to the line supply and the outgoing motor feeder are available as accessories as well as pre-assembled motor cables for connection to the motor.

##### Spare Parts Kit

A Spare Parts Kit is available which comprises small parts such as seals, caps, PROFIBUS address windows and screws.

##### Replacement fan

A replacement fan is available, which comprises a pre-mounted unit with cover, fan and screws.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G120D distributed inverters

#### Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G120D distributed inverters:

##### *Selection guide DT Configurator within the 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 DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. The configurator is integrated as a "selection guide" in this catalog on the DVD-ROM with the selection and configuration tools.

##### *Online DT Configurator*

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:

[www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

##### *SIZER for Siemens Drives engineering tool*

The SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications, for SINAMICS G120D from SIZER for Siemens Drives V2.9 and higher.

##### *STARTER commissioning tool*

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. In addition to SINAMICS drives, STARTER is also suitable for MICROMASTER 4 units and the frequency converters for the distributed I/O SIMATIC ET 200S FC and SIMATIC ET 200pro FC. For SINAMICS G120D from STARTER V4.1, SP1 and higher.

##### *Drive ES engineering system*

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7.1.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### SINAMICS G120D distributed inverters

#### Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following SINAMICS G120D distributed inverter components listed here.

SINAMICS G120D	
Mechanical specifications	
<b>Vibratory load according to EN 60068-2-6</b>	
• Transport <sup>1)</sup>	5 ... 9 Hz: Constant deflection 3.1 mm 9 ... 200 Hz: Constant acceleration = 9.81 m/s <sup>2</sup> (1 × g)
• Operation	10 ... 58 Hz: Constant deflection 0.15 mm 58 ... 200 Hz: Constant acceleration = 19.62 m/s <sup>2</sup> (2 × g)
<b>Shock load according to EN 60068-2-27</b>	
• Transport <sup>1)</sup>	147.15 m/s <sup>2</sup> (15 × g)/11 ms 3 shocks in each axis and direction
• Operation	147.15 m/s <sup>2</sup> (15 × g)/11 ms 3 shocks in each axis and direction
Ambient conditions	
<b>Protection class according to EN 61800-5-1</b>	Class III (PELV)
<b>Touch protection according to EN 61800-5-1</b>	Class I (with protective conductor system)
<b>Permissible ambient and coolant temperature (air) during operation for Power Modules</b>	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Permissible ambient and coolant temperature (air) during operation for Control Units</b>	CU240D DP: -10 ... +55 °C (14 ... 131 °F) CU240D PN: -10 ... +50 °C (14 ... 122 °F) CU240D DP-F: 0 ... 55 °C (32 ... 131 °F) CU240D PN-F: 0 ... 50 °C (32 ... 122 °F) CU240D PN-F PP: 0 ... 50 °C (32 ... 122 °F) (>40 ... 55 °C (104 ... 131 °F) <a href="#">see derating characteristics</a> ) up to 2000 m (6562 ft) above sea level
<b>Humidity, max.</b>	95 % at 40 °C (104 °F)
<b>Ambient temperature</b>	
• Storage <sup>1)</sup> acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Transport <sup>1)</sup> acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60068-2-2	-10 ... +40 °C (14 ... 104 °F) without derating
<b>Environmental class/harmful chemical substances</b>	
• Operation acc. to EN 60721-3-3	Class 3C2
<b>Degree of pollution acc. to EN 61800-5-1</b>	2
Certification for fail-safe versions	
• Category acc. to EN 954-1	3
• SIL Cl acc. to IEC 61508	2
• PL acc. to ISO 13849	Available soon
• PFH <sub>D</sub>	5 × 10 <sup>-8</sup>
• T1	20 years
Standards	
<b>Compliance with standards</b>	UL 508C (UL list number E121068), CE, c-tick <sup>2)</sup>
<b>CE marking, according to</b>	Low-Voltage Directive 2006/95/EC
<b>EMC Directive <sup>3)</sup></b>	
• Frame sizes FSA to FSC with integrated line filter class A	Category C2 <sup>4)</sup> according to EN 61800-3 (corresponds to class A according to EN 55011)
	<b>Note:</b> The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

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

<sup>2)</sup> UL/c-tick certification for the CU240D PN-F PP Control Unit will be available soon.

<sup>3)</sup> For further general information, [see also chapter SINAMICS G110, section Technical specifications, Compliance with standards.](#)

<sup>4)</sup> With shielded motor cable up to 15 m (49 ft).

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### CU240D Control Units

#### Overview



Example of CU240D DP-F Control Unit



Example of CU240D PN-F PP Control Unit



Example of CU240D PN-F Control Unit

The Control Unit performs closed-loop control functions for the inverter. In addition to the closed-loop control, it has additional functions that can be adapted to the particular application through parameterization. Control Units are available in different versions:

- CU240D DP
- CU240D DP-F
- CU240D PN
- CU240D PN-F
- CU240D PN-F PP (Push Pull)

The Push Pull version comprises an alternative connection method for the 24 V supply voltage and the PN communication.

#### Safety Integrated functions

The SINAMICS G120D fail-safe inverter provides three safety functions, certified in accordance with EN 954-1, Category 3 and IEC 61508 SIL 2:

- Safe Torque Off (STO) to protect against active movement of the drive
- Safe Stop 1 (SS1) for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS) for protection against dangerous movements on exceeding a speed limit

The functions "Safe Stop 1" and "Safely Limited Speed" can both be implemented without having to use a motor encoder or encoder; the implementation costs are minimal. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The safety functions "Safely Limited Speed" and "Safe Stop 1" are not certified for pull-through loads such as hoisting gear and unwinders.

Safety functions have been extended with firmware V3.2.

[Additional information is provided in chapter Highlights, section Safety Integrated.](#)

# SINAMICS G120D distributed inverters

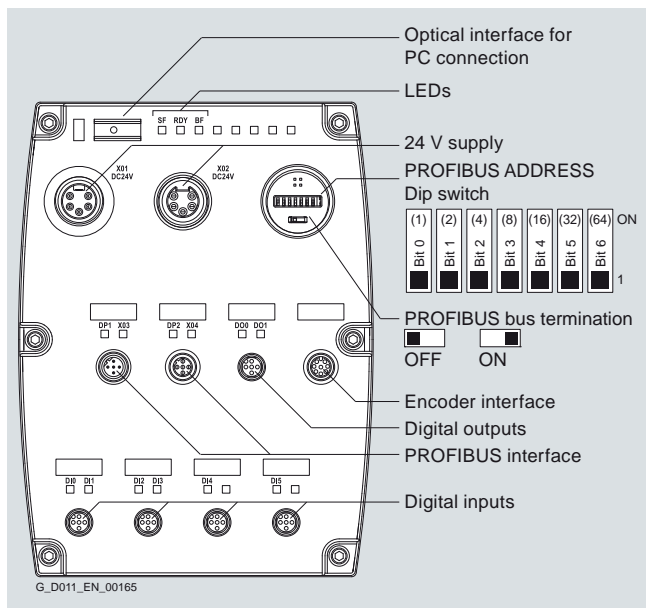
## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### CU240D Control Units

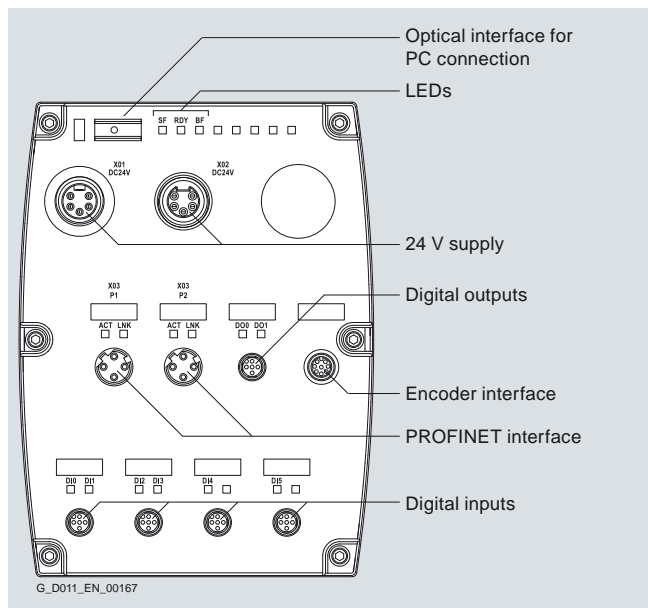
#### Selection and ordering data

Communication	Digital inputs	Digital outputs	Encoder interfaces	Designation	CU240D Control Unit Order No.
<b>Standard</b>					
PROFIBUS DP	6	2	1	CU240D DP	<b>6SL3544-0FA20-1PA0</b>
PROFINET	6	2	1	CU240D PN	<b>6SL3544-0FA20-1FA0</b>
<b>Fail-safe for Safety Integrated</b>					
PROFIBUS DP	6	2	1	CU240D DP-F	<b>6SL3544-0FA21-1PA0</b>
PROFINET	6	2	1	CU240D PN-F	<b>6SL3544-0FA21-1FA0</b>
PROFINET	6	2	1	CU240D PN-F PP	<b>6SL3544-0FA21-1FB0</b>

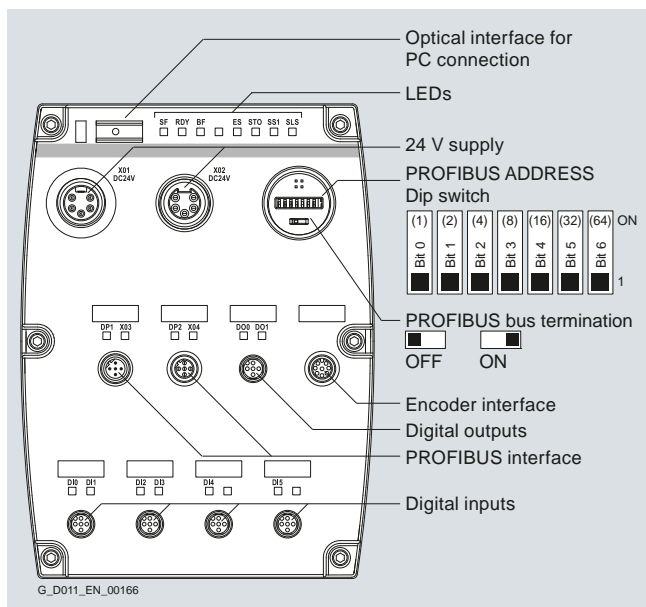
#### Design



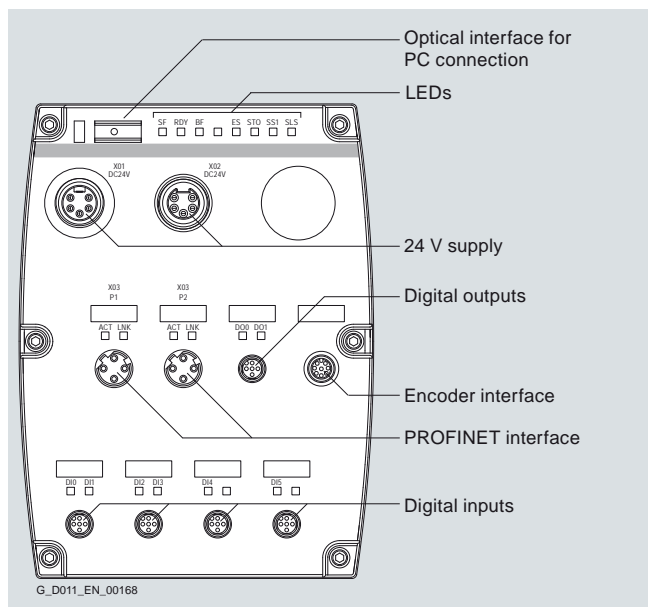
CU240D DP Control Unit



CU240D PN Control Unit



CU240D DP-F Control Unit



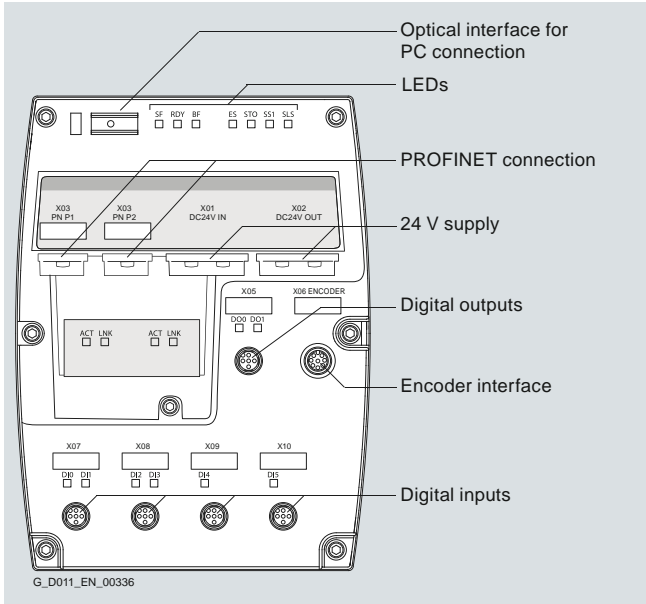
CU240D PN-F Control Unit

# SINAMICS G120D distributed inverters

0.75 kW to 7.5 kW (1.0 hp to 10 hp)

## CU240D Control Units

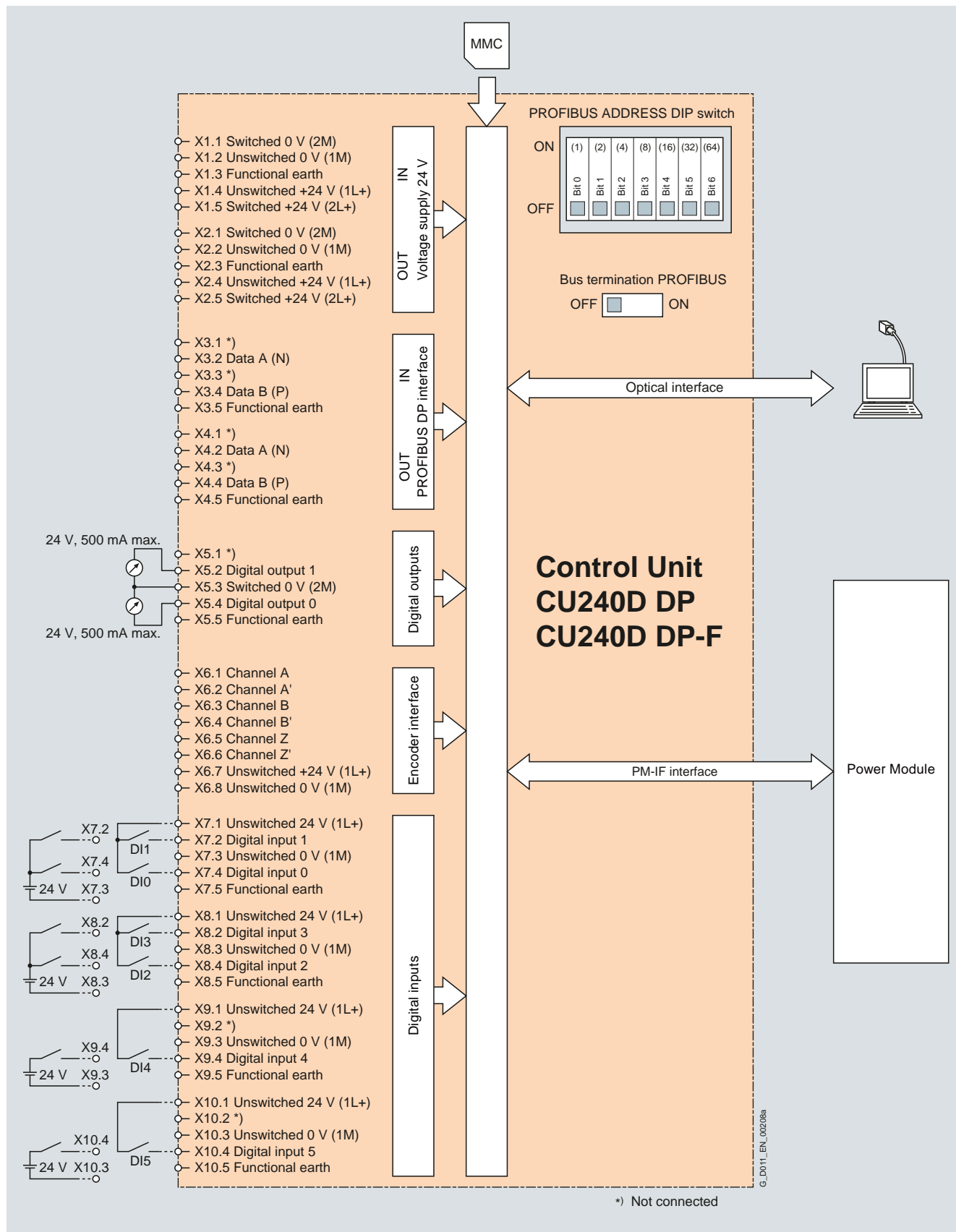
### Design



Control Unit, view from the rear, MMC card slot at the top and PM-IF interface at bottom center

CU240D PN-F PP Control Unit

#### Integration



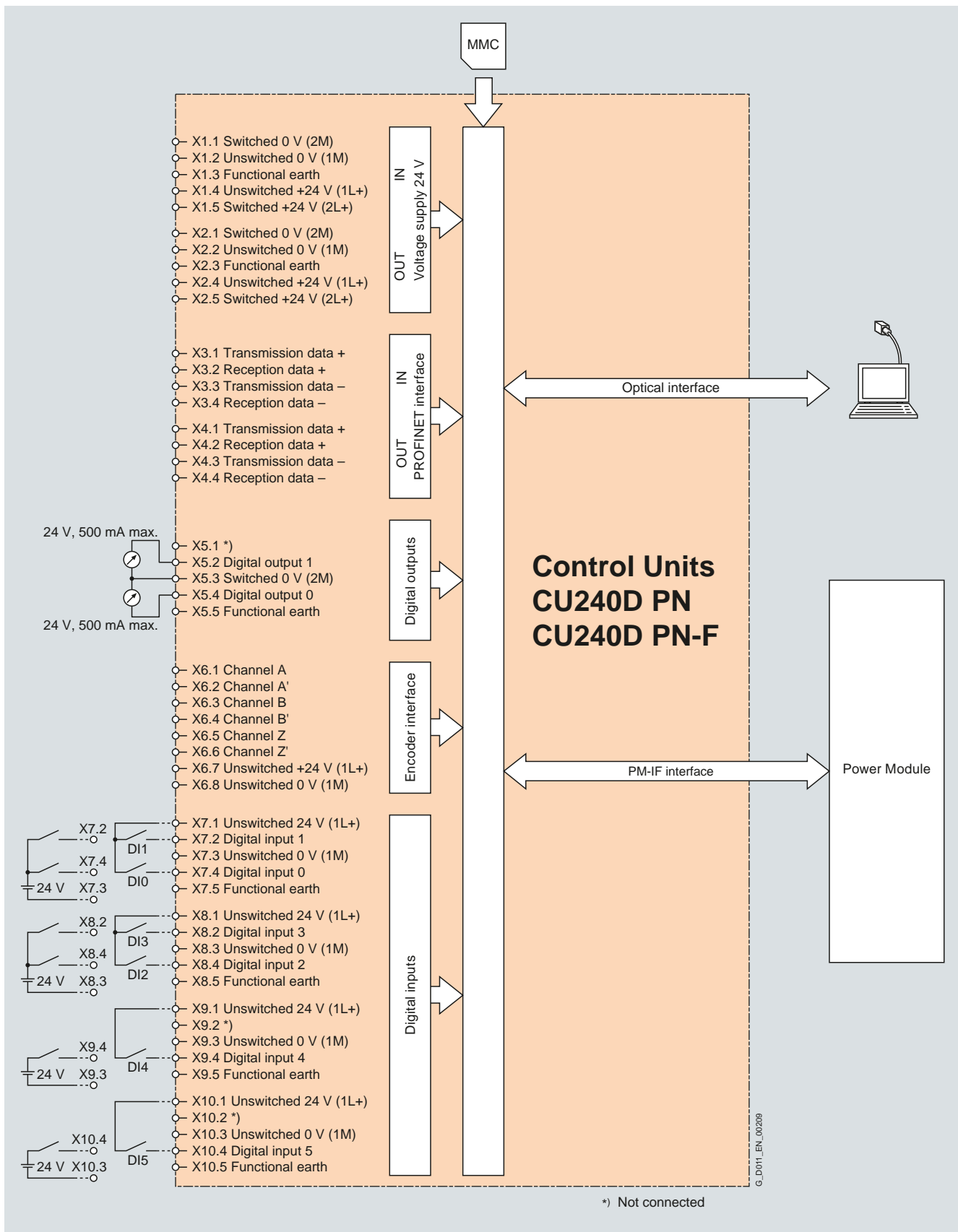
Connection diagram for CU240D DP and CU240D DP-F Control Units

# SINAMICS G120D distributed inverters

0.75 kW to 7.5 kW (1.0 hp to 10 hp)

## CU240D Control Units

### Integration



8

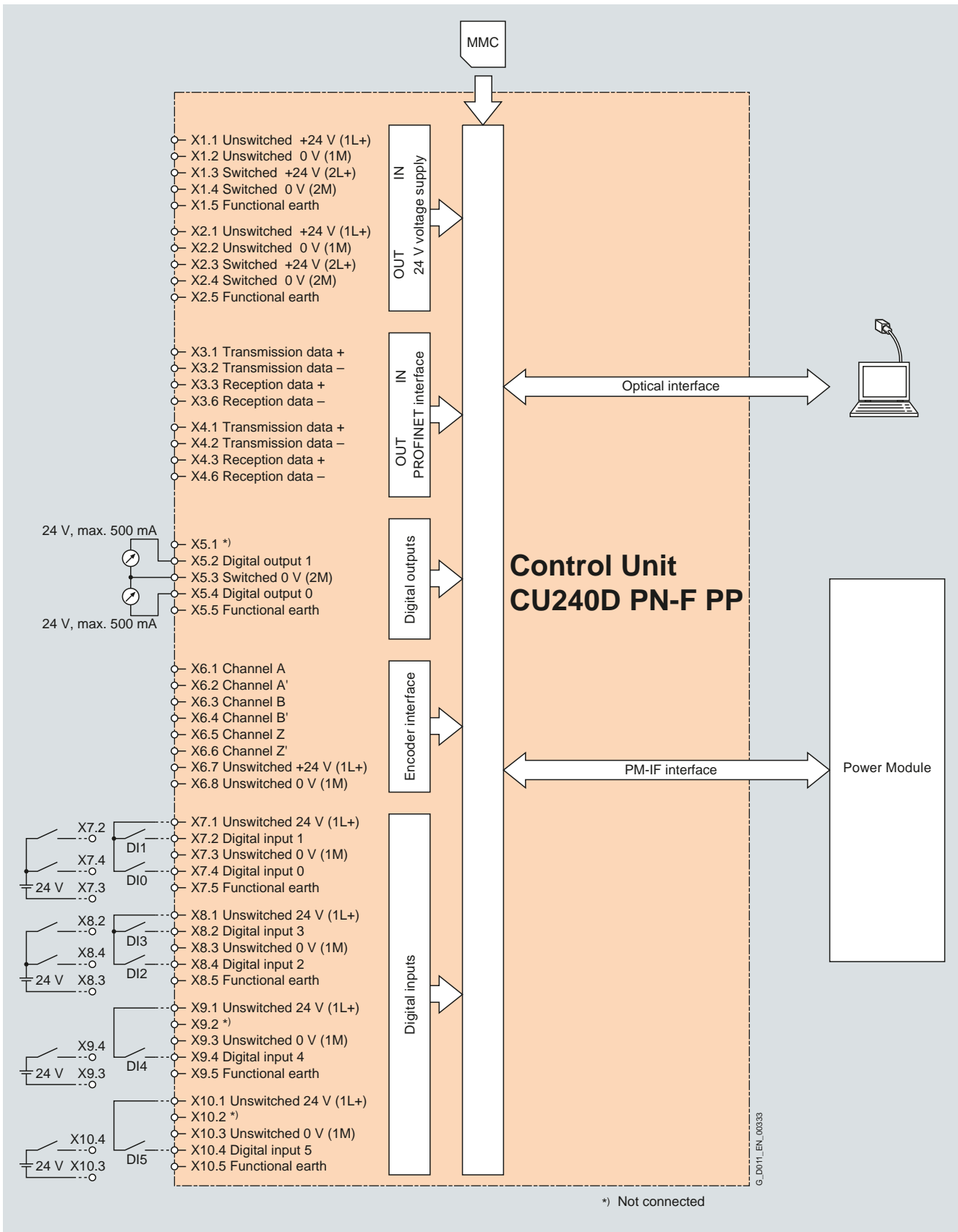
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\*) Not connected

Connection diagram for CU240D PN and CU240D PN-F Control Units



**Integration**



Connection diagram for CU240D PN-F PP Control Unit

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### CU240D Control Units

#### Technical specifications

Control Unit	CU240D DP 6SL3544-0FA20-1PA0	CU240D PN 6SL3544-0FA20-1FA0	CU240D DP-F 6SL3544-0FA21-1PA0	CU240D PN-F 6SL3544-0FA21-1FA0 <b>CU240D PN-F PP</b> 6SL3544-0FA21-1FB0
<b>Electrical specifications</b>				
<b>Operating voltage</b>	External 24 V DC necessary	External 24 V DC necessary	External 24 V DC necessary	External 24 V DC necessary
<b>Current consumption <sup>1)</sup></b> (from the 24 V supply)				
• With Power Module frame sizes FSA and FSB	200 mA	350 mA	200 mA	350 mA
• With Power Module frame size FSC	350 mA	500 mA	350 mA	500 mA
<b>Interfaces</b>				
<b>Digital inputs</b>	6	6	6	6
<b>Digital outputs</b> (0.5 A, fed through switched 24 V DC)	2	2	2	2
<b>Bus interface</b>	PROFIBUS DP	PROFINET	PROFIBUS DP, PROFI-safe	PROFINET, PROFI-safe
<b>Encoder interfaces</b> (HTL incremental interface, bipolar up to 2048 pulses, max. 100 mA)	1	1	1	1
<b>PTC/KTY interface</b> (connection via Power Module)	✓	✓	✓	✓
• Motor temperature sensor	1 input, sensors that can be connected: PTC, KTY or Thermo-Click	1 input, sensors that can be connected: PTC, KTY or Thermo-Click	1 input, sensors that can be connected: PTC, KTY or Thermo-Click	1 input, sensors that can be connected: PTC, KTY or Thermo-Click
<b>Control of a mechanical motor brake</b> (connection via Power Module)	✓	✓	✓	✓
<b>MMC memory card slot</b>	✓	✓	✓	✓
<b>RS232 interface</b> (connected with RS232 interface cable or USB interface cable via the optical interface of the Control Unit)	✓	✓	✓	✓
<b>Safety functions</b>				
<b>Integrated safety functions</b> Acc. to Category 3 of EN 954-1 and SIL 2 of IEC 61508	–		<ul style="list-style-type: none"> <li>• Safe Stop 1 (SS1)</li> <li>• Safely Limited Speed (SLS)</li> <li>• Safe Torque Off (STO)</li> <li>• The safety functions "Safely Limited Speed" and "Safe Stop 1" are not certified for pull-through loads such as hoisting gear and unwinders</li> </ul>	<ul style="list-style-type: none"> <li>• Safe Stop 1 (SS1)</li> <li>• Safely Limited Speed (SLS)</li> <li>• Safe Torque Off (STO)</li> <li>• The safety functions "Safely Limited Speed" and "Safe Stop 1" are not certified for pull-through loads such as hoisting gear and unwinders</li> </ul>

<sup>1)</sup> The current consumption of connected encoders and sensors (total, max. 300 mA) as well as the current drawn from the digital outputs must be added.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### CU240D Control Units

#### Technical specifications

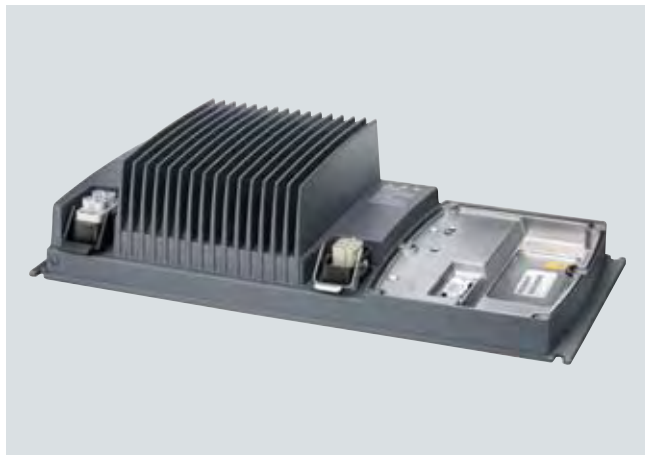
Control Unit	CU240D DP 6SL3544-0FA20-1PA0	CU240D PN 6SL3544-0FA20-1FA0	CU240D DP-F 6SL3544-0FA21-1PA0	CU240D PN-F 6SL3544-0FA21-1FA0 CU240D PN-F PP 6SL3544-0FA21-1FB0
<b>Open-loop/closed-loop control techniques</b>				
V/f linear/square/parameterizable	✓	✓	✓	✓
V/f with flux current control (FCC)	✓	✓	✓	✓
Vector control, sensorless	✓	✓	✓	✓
Vector control, with sensor	✓	✓	✓	✓
Torque control, sensorless	✓	✓	✓	✓
Torque control, with sensor	✓	✓	✓	✓
<b>Software functions</b>				
Fixed frequencies	16, parameterizable	16, parameterizable	16, parameterizable	16, parameterizable
Signal interconnection with BICO technology	✓	✓	✓	✓
Automatic restart after line supply failure or operational fault	✓	✓	✓	✓
Positioning down ramp	✓	✓	✓	✓
Slip compensation	✓	✓	✓	✓
Free function blocks (FFB) for logical and arithmetic operations	✓	✓	✓	✓
Ramp smoothing	✓	✓	✓	✓
3 selectable drive data sets	✓	✓	✓	✓
3 selectable command data sets (CDS) (manual/auto)	✓	✓	✓	✓
Flying restart	✓	✓	✓	✓
JOG	✓	✓	✓	✓
Technology controller (PID)	✓	✓	✓	✓
Thermal motor protection	✓	✓	✓	✓
Thermal inverter protection	✓	✓	✓	✓
Setpoint input	✓	✓	✓	✓
Motor identification	✓	✓	✓	✓
Motor holding brake	✓	✓	✓	✓
<b>Mechanical specifications and ambient conditions</b>				
Degree of protection	IP65/UL Type 3	IP65/UL Type 3	IP65/UL Type 3	IP65/UL Type 3
Operating temperature	-10 ... +55 °C (14 ... 131 °F)	-10 ... +50 °C (14 ... 122 °F)	0 ... 55 °C (32 ... 131 °F)	0 ... 50 °C (32 ... 122 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	< 95 % RH, condensation not permissible	< 95 % RH, condensation not permissible	< 95 % RH, condensation not permissible	< 95 % RH, condensation not permissible
<b>Dimensions</b>				
• Width	150 mm (5.91 in)	150 mm (5.91 in)	150 mm (5.91 in)	150 mm (5.91 in)
• Height	210 mm (8.27 in)	210 mm (8.27 in)	210 mm (8.27 in)	210 mm (8.27 in)
• Depth	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)
<b>Weight, approx.</b>	0.7 kg (1.5 lb)	0.7 kg (1.5 lb)	0.7 kg (1.5 lb)	0.7 kg (1.5 lb)

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### PM250D Power Modules

#### Overview



Example of PM250D Power Module, frame size FSA

The regenerative feedback capability of the PM250D Power Module in generating mode (electronic braking) means that energy is returned to the supply system and not wasted in a braking resistor. This saves space, time-consuming dimensioning of the braking resistor as well as its wiring. Generated heat is also reduced. [Additional information is included in chapter Highlights, section Efficient Infeed Technology.](#)

An innovative circuit design reduces the line harmonics. A line reactor is not required. This saves space and costs for engineering and procurement.

The PM250D Power Module is also designed for safety-oriented applications. In conjunction with a fail-safe Control Unit, the drive can be transformed into a Safety Integrated Drive ([see Control Units](#)).

The PM250D Power Modules with integrated line filter class A are suitable for connection to TN and TT supply systems.

#### Selection and ordering data

Rated power <sup>1)</sup>		Rated output current <sup>2)</sup>	Input current	Frame size	PM250D Power Module with integrated line filter class A Order No.
kW	hp				
<b>380 ... 500 V 3 AC</b>					
0.75	1	2.2	2.1	FSA	<b>6SL3525-0PE17-5AA1</b>
1.5	1.5 <sup>3)</sup>	4.1	3.8	FSA	<b>6SL3525-0PE21-5AA1</b>
3	4	7.7	7.2	FSB	<b>6SL3525-0PE23-0AA1</b>
4	5	10.2	9.5	FSC	<b>6SL3525-0PE24-0AA1</b>
5.5	7.5	13.2	12.2	FSC	<b>6SL3525-0PE25-5AA1</b>
7.5	10	19.0	17.7	FSC	<b>6SL3525-0PE27-5AA1</b>

<sup>1)</sup> Rated power based on the rated output current  $I_{rated}$ . The rated output current  $I_{rated}$  is based on the duty cycle for high overload (HO).

<sup>2)</sup> The rated output current  $I_{rated}$  is based on the duty cycle for high overload (HO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

<sup>3)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

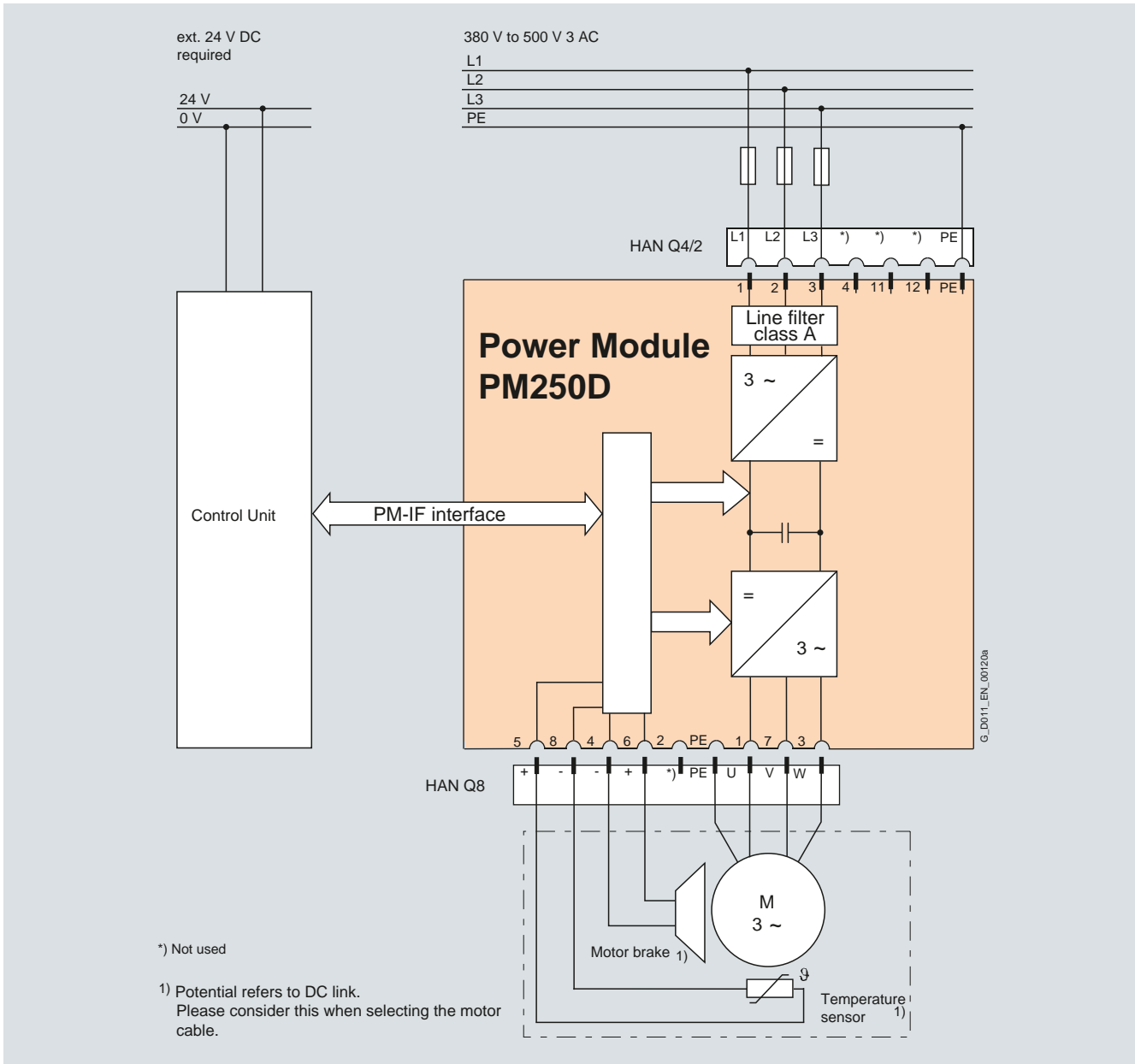
### PM250D Power Modules

#### Integration

PM250D Power Modules communicate with the Control Unit via the PM-IF interface.

PM250D Power Modules have the following interfaces as standard:

- PM-IF interface to connect the PM250D Power Module to the Control Unit.
- Motor connection via a HAN Q8 (connector) including control of the motor brake and temperature sensor
- Line supply connection via HAN Q4/2 (socket)



Connection diagram for PM250D Power Module with integrated line filter class A

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### PM250D Power Modules

#### Technical specifications

##### General technical specifications

	PM250D Power Modules					
<b>System operating voltage</b>	380 ... 500 V 3 AC $\pm 10\%$					
<b>Line supply requirements</b>	$\leq 1\%$					
<b>Line short circuit voltage <math>u_K</math></b>						
<b>Input frequency</b>	47 ... 63 Hz					
<b>Output frequency</b>						
• Control type V/f	0 ... 650 Hz					
• Control type Vector	0 ... 200 Hz					
<b>Pulse frequency</b>	4 kHz (standard), for higher pulse frequencies up to 16 kHz, <a href="#">see derating data</a>					
<b>Power factor</b>	0.95					
<b>Inverter efficiency</b>	95 ... 97 %					
<b>Output voltage, max.</b>	0 ... 87 % of input voltage					
<b>Overload capability</b>						
• High overload (HO)	<ul style="list-style-type: none"> <li>• Average maximum rated output current during a cycle time of 300 s</li> <li>• 1.5 × rated output current (i.e. 150 % overload) over 60 s at a cycle time of 300 s</li> <li>• 2 × rated output current (i.e. 200 % overload) over 3 s at a cycle time of 300 s</li> </ul>					
<b>Electromagnetic compatibility</b>	Integrated line filter class A according to EN 55011					
<b>Possible braking methods</b>	Energy recovery in regenerative mode (max. with rated power possible); Integrated brake control supplies the DC supply voltage for the brake					
	Line input voltage	380 V AC	400 V AC	440 V AC	480 V AC	500 V AC
	Resulting brake voltage	171 V DC	180 V DC	198 V DC	216 V DC	225 V DC
	Disconnection on the DC permits "fast" braking (max. output current 1 A)					
<b>Degree of protection</b>	IP65/UL Type 3					
<b>Operating temperature</b>	-10 ... +55 °C (14 ... 131 °F) (operating temperature ranges of the Control Units should be taken into account)					
<b>Storage temperature</b>	-40 ... +70 °C (-40 ... +158 °F)					
<b>Permissible mounting position</b>	Horizontal wall mounting and mounting in the horizontal position					
<b>Relative humidity</b>	< 95 % RH, condensation not permissible					
<b>Cooling</b>	FSA and FSB: Convection FSC: Air cooling as required using the integrated fan					
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m (3281 ft) <a href="#">see derating characteristics</a>					
<b>Standard SCCR</b> (Short Circuit Current Rating) <sup>1)</sup>	40 kA					
<b>Protection functions</b>	<ul style="list-style-type: none"> <li>• Undervoltage</li> <li>• Overvoltage</li> <li>• Overcontrol/Overload</li> <li>• Ground fault</li> <li>• Short-circuit</li> <li>• Stall protection</li> <li>• Motor blocking protection</li> <li>• Motor overtemperature</li> <li>• Inverter overtemperature</li> <li>• Parameter locking</li> </ul>					
<b>Compliance with standards</b>	UL 508C (UL list number E121068), cUL, CE, c-tick					
<b>CE marking, according to</b>	Low-Voltage Directive 2006/95/EC					

<sup>1)</sup> Applies to industrial control cabinet installations to NEC Article 409/UL 508A.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### PM250D Power Modules

#### Technical specifications

Line voltage 380 ... 500 V 3 AC	PM250D Power Modules		
	6SL3525-0PE17-5AA1	6SL3525-0PE21-5AA1	6SL3525-0PE23-0AA1
Rated output current $I_{\text{rated}}$ <sup>1)</sup> A	2.2	4.1	7.7
Output current $I_{\text{max}}$ A	4.4	8.2	15.4
Rated power kW (hp)	0.75 (1.0)	1.5 (1.5) <sup>3)</sup>	3 (4.0)
Rated pulse frequency kHz	4	4	4
Efficiency $\eta$ %	0.97	0.97	0.97
Power loss kW	0.047	0.061	0.103
Cooling air requirement m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.004 (0.14)	0.005 (0.18)	0.009 (0.32)
Sound pressure level $L_{\text{pA}}$ (1 m) dB	–	–	–
Rated input current <sup>2)</sup> A	2.1	3.8	7.2
Line supply connection U1/L1, V1/L2, W1/L3, PE	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)
• Conductor cross-section mm <sup>2</sup>	1.5 ... 6	1.5 ... 6	2.5 ... 6
Motor connection U2, V2, W2, PE, motor brake, temperature sensor	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)
• Conductor cross-section mm <sup>2</sup>	1 ... 4	1 ... 4	2.5 ... 4
Motor cable length, max. m (ft)	15 (49)	15 (49)	15 (49)
Degree of protection	IP65/UL Type 3	IP65/UL Type 3	IP65/UL Type 3
<b>Dimensions</b>			
• Width mm (in)	445 (17.52)	445 (17.52)	445 (17.52)
• Height mm (in)	210 (8.27)	210 (8.27)	210 (8.27)
• Depth mm (in)	110 (4.33)	110 (4.33)	180 (7.09)
Frame size	FSA	FSA	FSB
Weight, approx. kg (lb)	5.7 (12.6)	5.7 (12.6)	8 (17.6)

<sup>1)</sup> The rated output current  $I_{\text{rated}}$  is based on the duty cycle for high overload (HO).

<sup>2)</sup> The input current depends on the motor load and line impedance. The input currents apply for load at rated power for a line impedance corresponding to  $u_K = 1\%$ .

<sup>3)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### PM250D Power Modules

#### Technical specifications

Line voltage 380 ... 500 V 3 AC	PM250D Power Modules		
	6SL3525-0PE24-0AA1	6SL3525-0PE25-5AA1	6SL3525-0PE27-5AA1
Rated output current $I_{\text{rated}}^{1)}$ A	10.2	13.2	19
Output current $I_{\text{max}}$ A	20.4	26.4	38
Rated power kW (hp)	4 (5)	5.5 (7.5)	7.5 (10)
Rated pulse frequency	kHz 4	4	4
Efficiency $\eta$	% 0.97	0.97	0.97
Power loss	kW 0.141	0.209	0.295
Cooling air requirement	$\text{m}^3/\text{s}$ ( $\text{ft}^3/\text{s}$ ) 0.012 (0.42)	0.018 (0.64)	0.025 (0.88)
Sound pressure level $L_{\text{pA}}$ (1 m)	dB 74.5	74.5	74.5
Rated input current $I^{2)}$ A	9.5	12.2	17.7
Line supply connection U1/L1, V1/L2, W1/L3, PE	HAN Q4/2 (connector)	HAN Q4/2 (connector)	HAN Q4/2 (connector)
• Conductor cross-section	$\text{mm}^2$ 2.5 ... 6	4 ... 6	4 ... 6
Motor connection U2, V2, W2, PE, motor brake, temperature sensor	HAN Q8 (socket)	HAN Q8 (socket)	HAN Q8 (socket)
• Conductor cross-section	$\text{mm}^2$ 2.5 ... 4	4	4
Motor cable length, max.	m (ft) 15 (49)	15 (49)	15 (49)
Degree of protection	IP65/UL Type 3	IP65/UL Type 3	IP65/UL Type 3
<b>Dimensions</b>			
• Width	mm (in) 445 (17.52)	445 (17.52)	445 (17.52)
• Height	mm (in) 210 (8.27)	210 (8.27)	210 (8.27)
• Depth	mm (in) 220 (8.66)	220 (8.66)	220 (8.66)
Frame size	FSC	FSC	FSC
Weight, approx.	kg (lb) 8.5 (18.7)	8.5 (18.7)	8.5 (18.7)

<sup>1)</sup> The rated output current  $I_{\text{rated}}$  is based on the duty cycle for high overload (HO).

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



# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### PM250D Power Modules

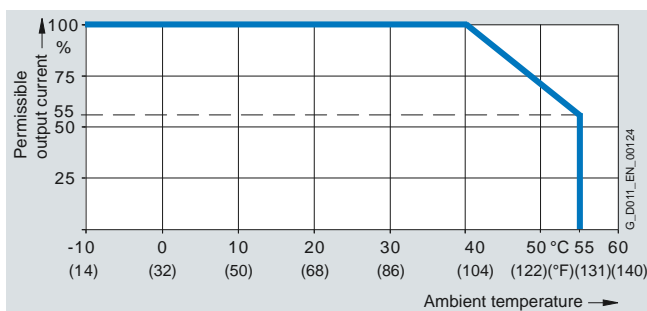
#### Characteristic curves

##### Derating data

###### Pulse frequency

Rated power at 400 V 3 AC		Rated output current in A for a pulse frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.75	1.0	2.2	1.9	1.5	1.3	1.1	1.0	0.9
1.5	1.5 <sup>1)</sup>	4.1	3.5	2.9	2.5	2.1	1.8	1.6
3.0	4.0	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4.0	5.0	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	13.2	11.2	9.2	7.9	6.6	5.9	5.3
7.5	10	19	16.2	13.3	11.4	9.5	8.6	7.6

###### Ambient temperature

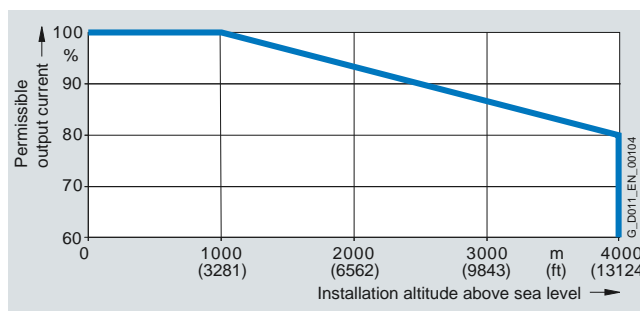


Permissible output current as a function of ambient temperature for PM250D Power Modules, frame sizes FSA to FSC

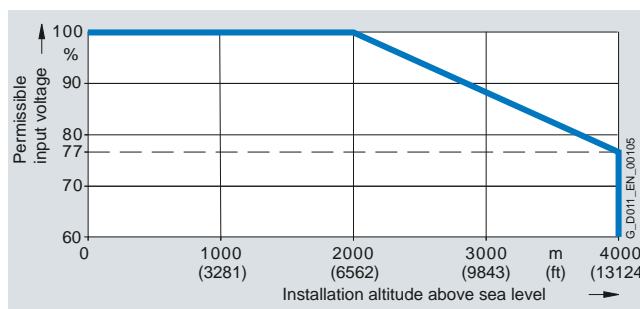
###### Note:

The operating temperature ranges of the Control Units should be taken into account. [The temperature ranges are specified in the technical specifications under Control Units.](#)

###### Installation altitude



Permissible output current as a function of installation altitude for PM250D Power Modules, frame sizes FSA to FSC



Permissible input current as a function of installation altitude for PM250D Power Modules, frame sizes FSA to FSC



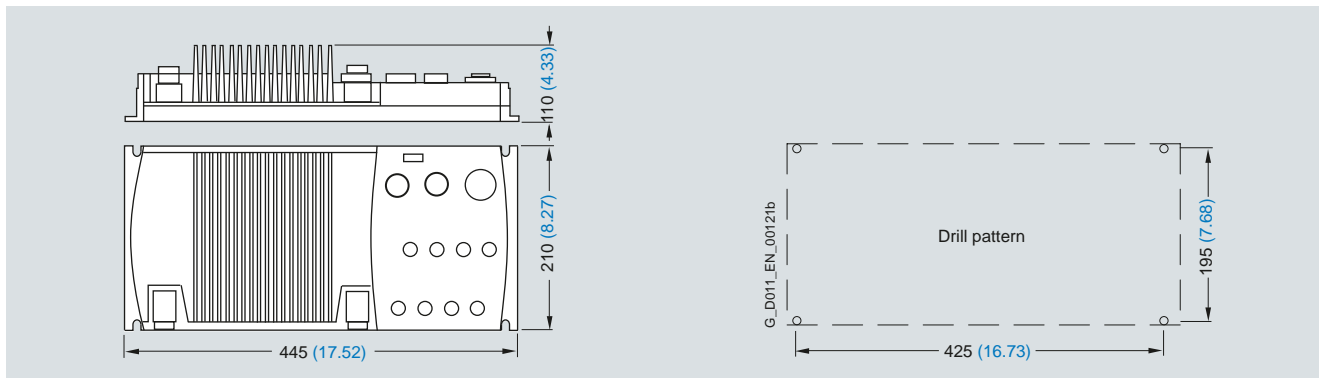
<sup>1)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

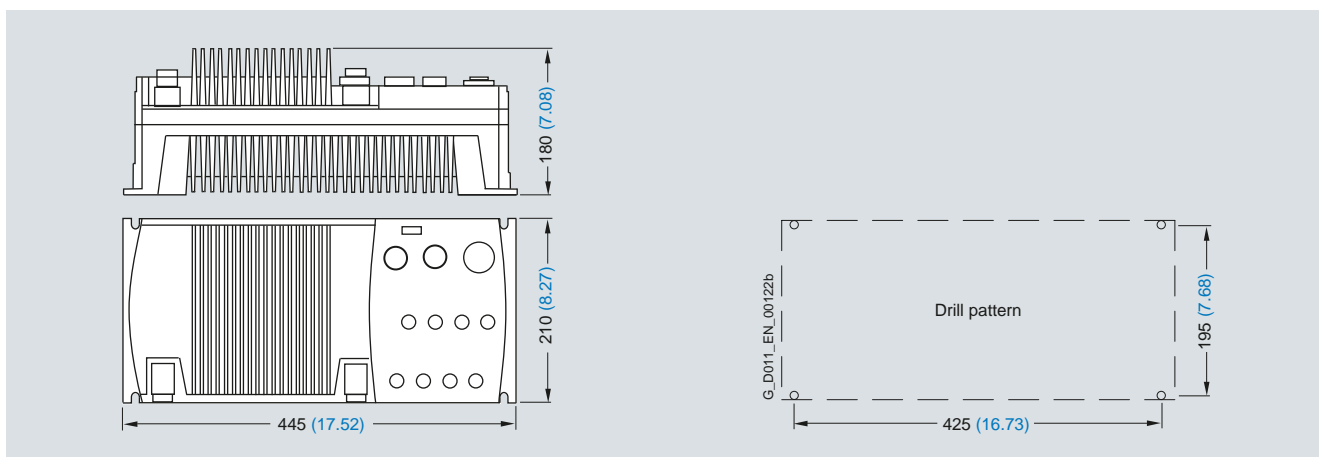
### PM250D Power Modules

#### Dimensional drawings



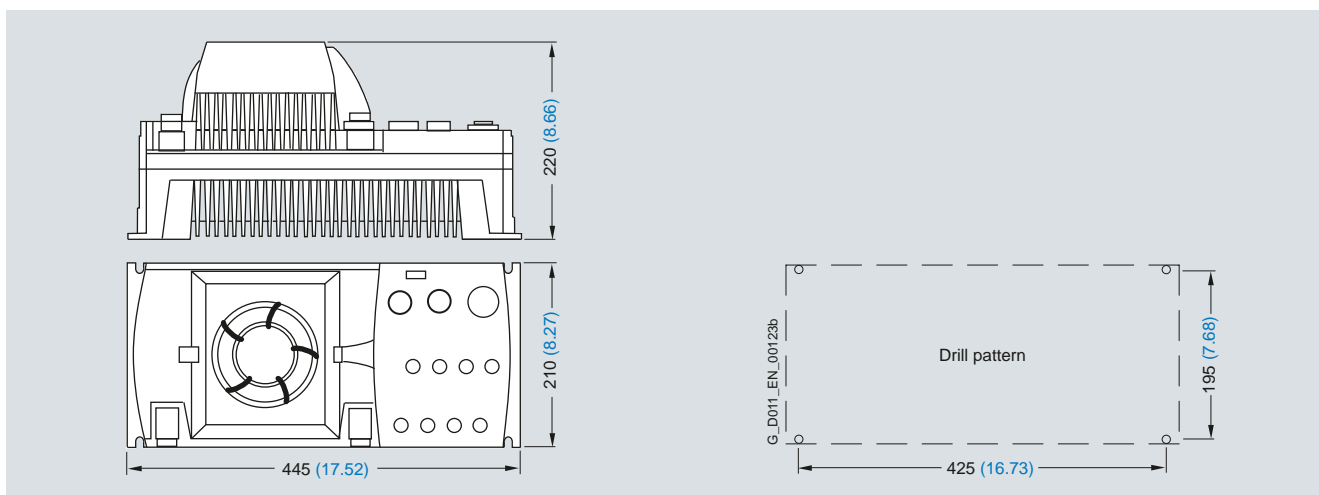
PM250D Power Module, frame size FSA, with integrated line filter class A and plugged-in Control Unit

If the CU240D PN-F PP Control Unit is used, the height increases to 128.3 mm (5.05 inches).



PM250D Power Module, frame size FSB, with integrated line filter class A and plugged-in Control Unit

If the CU240D PN-F PP Control Unit is used, the height increases to 198.3 mm (7.81 inches).



PM250D Power Module, frame size FSC, with integrated line filter class A and plugged-in Control Unit

Mounted with M5 or M6 screwed joints with a maximum washer diameter of 12 mm (0.47 inches).

3 mm (0.12 inch) allen screw for the Control Unit.

Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches).

All dimensions in mm (values in brackets are in inches).

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Recommended line-side power components

#### Selection and ordering data

The following table lists recommendations for additional line-side components, such as fuses and circuit breakers (line-side components dimensioned in accordance with IEC standards). The specified circuit breakers are UL-certified. 3NA3 fuses are recommended for European countries.

Furthermore, only contactors complying with the utilization category AC-3 (according to IEC 60947-4-1) may be used. The values in the table take into account the overload capability of the inverter.

Fuses for use in North America must be UL-certified, such as the Class NON fuse series from Bussmann or approved circuit breakers from the SIRIUS 3RV and SENTRON 3VL series according to UL 489 (category control number CCN: DiV Q).

[Additional information about the listed fuses and circuit breakers can be found in Catalogs LV 1 AO, LV 10.1 and IC 10.](#)

#### Individual protection

Rated power		SINAMICS G120D PM250D Power Modules		Protection	Fuse	Circuit breaker
kW	hp	Type 6SL3525-...	Frame size	A	Order No.	Order No.
<b>380 ... 500 V 3 AC</b>						
0.75	1	0PE17-5AA1	FSA	10	<b>3NA3803</b>	<b>3RV1021-1FA10</b>
1.5	1.5 <sup>1)</sup>	0PE21-5AA1	FSA	10	<b>3NA3803</b>	<b>3RV1021-1JA10</b>
3	4	0PE23-0AA1	FSB	16	<b>3NA3805</b>	<b>3RV1021-4AA10</b>
4	5	0PE24-0AA1	FSC	20	<b>3NA3807</b>	<b>3RV1021-4BA10</b>
5.5	7.5	0PE25-5AA1	FSC	20	<b>3NA3807</b>	<b>3RV1031-4EA10</b>
7.5	10	0PE27-5AA1	FSC	32	<b>3NA3812</b>	<b>3RV1031-4FA10</b>

<sup>1)</sup> It is not possible to make any assignment to a particular standard.

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Intelligent Operator Panel IOP Handheld



IOP Handheld for mobile use

The Intelligent Operator Panel IOP Handheld is a very user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of the SINAMICS G120D distributed inverter.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission standard drives. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and the parameter filtering function are provided.

Application wizards interactively guide you when commissioning important applications such as conveyor technology, pumps, fans and compressors.

There are quick commissioning wizards for general commissioning.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP Handheld has a dedicated switchover button to switch over from automatic to manual mode.

The inverter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to two process values can be displayed graphically or numerically on the status screen/status display.

Process values can also be displayed in technological units.

The IOP Handheld supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from an inverter into the IOP Handheld and downloaded into other drive units of the same type as required.

The IOP Handheld includes the following language packages: English, French, German, Italian and Spanish.

In addition to the IOP, the IOP Handheld includes a housing with the rechargeable batteries, charging unit and RS232 connecting cable. The charging unit is supplied with connector adapters for Europe, the US and UK. When the batteries are fully charged, the operating time is up to 8 hours.

To connect the IOP Handheld to SINAMICS G120D, the RS232 connecting cable with optical interface is required in addition.

##### Updating the IOP Handheld

The IOP Handheld can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP Handheld via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP Handheld.

The IOP is supplied with power via the USB interface during an update.

##### Selection and ordering data

Description	Order No.
<b>IOP Handheld</b> For use with SINAMICS G120, SINAMICS G120C, SINAMICS G110D, SINAMICS G120D, SIMATIC ET 200S FC or SIMATIC ET 200pro FC Included in the scope of delivery: <ul style="list-style-type: none"> <li>• Intelligent Operator Panel IOP</li> <li>• Handheld housing</li> <li>• Rechargeable batteries (4 × AA)</li> <li>• Charging unit (international)</li> <li>• RS232 connecting cable (3 m/9.84 ft long, can only be used for SINAMICS G120 and SIMATIC ET 200S FC)</li> <li>• USB cable (1 m/3.28 ft long)</li> </ul>	<b>6SL3255-0AA00-4HA0</b>
<b>RS232 connecting cable</b> With optical interface to connect the SINAMICS G110D, SINAMICS G120D or SIMATIC ET 200pro FC inverters to the IOP Handheld (2.5 m/8.2 ft long)	<b>3RK1922-2BP00</b>

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### SINAMICS micro memory card (MMC)



The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC). When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again.

##### Selection and ordering data

Description	Order No.
<b>SINAMICS micro memory card (MMC)</b>	<b>6SL3254-0AM00-0AA0</b>

##### RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool<sup>1)</sup>, V4.1, SP1 and higher) has been installed.

##### Selection and ordering data

Description	Order No.
<b>RS232 interface cable</b> For communication with a PC	<b>3RK1922-2BP00</b>

##### USB interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC via a point-to-point connection if the appropriate software (STARTER commissioning tool<sup>1)</sup>, V4.1, SP1 and higher) has been installed.

##### Selection and ordering data

Description	Order No.
<b>USB interface cable</b> For communication with a PC (2.5 m/8.2 ft long)	<b>6SL3555-0PA00-2AA0</b>

##### STARTER commissioning tool

The STARTER commissioning tool (V4.1, SP1 and higher) supports the commissioning and maintenance of SINAMICS G120D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily.

##### Selection and ordering data

Description	Order No.
<b>STARTER commissioning tool<sup>1)</sup></b> On DVD-ROM	<b>6SL3072-0AA00-0AG0</b>

<sup>1)</sup> The STARTER commissioning tool is also available on the Internet at <http://support.automation.siemens.com/WW/view/en/10804985/133100>

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Connecting cables for the Control Unit

###### PROFINET connecting cables

Flexible connecting cables and plug-in connectors that can be assembled in the field for transmission of data (up to 100 Mbit/s) between industrial Ethernet stations with IP65 degree of protection.

###### Selection and ordering data

Description	Order No.
<b>IE connecting cable M12-180/M12-180</b> Pre-assembled IE FC TP trailing cable GP 2 x 2 PROFINET type C) with two 4-pole M12 plugs (4-pole, D-coded), IP65/IP67 degree of protection, UL Length: <ul style="list-style-type: none"> <li>• 0.3 m (0.98 ft)</li> <li>• 0.5 m (1.64 ft)</li> <li>• 1.0 m (3.28 ft)</li> <li>• 1.5 m (4.92 ft)</li> <li>• 2.0 m (6.56 ft)</li> <li>• 3.0 m (9.84 ft)</li> <li>• 5.0 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6XV1870-8AE30</b> <b>6XV1870-8AE50</b> <b>6XV1870-8AH10</b> <b>6XV1870-8AH15</b> <b>6XV1870-8AH20</b> <b>6XV1870-8AH30</b> <b>6XV1870-8AH50</b> <b>6XV1870-8AN10</b> <b>6XV1870-8AN15</b>
<b>IE M12 Plug PRO</b> For assembly in the field, M12 plug-in connector (D-coded), metal enclosure, UL, fast connection method for SCALANCE X208PRO and IM 154-4 PN <ul style="list-style-type: none"> <li>• 1 unit</li> <li>• 8 units</li> <li>• 1 unit (angled)</li> </ul>	<b>6GK1901-0DB20-6AA0</b> <b>6GK1901-0DB20-6AA8</b> <b>3RK1902-2DA00</b>
<b>RJ45 PLUG PRO connector</b> For on-site assembly for CU240D PN-F PP Control Unit, UL 1 package = 1 unit <ul style="list-style-type: none"> <li>• 1 unit</li> </ul>	<b>6GK1901-1BB10-6AA0</b>

###### PROFIBUS connecting cables

Flexible plug-in cables/connectors for transmission of data (up to 12 Mbit/s) from PROFIBUS stations

###### Selection and ordering data

Description	Order No.
<b>PROFIBUS M12 plug-in cable</b> Pre-assembled with two 5-pole M12 plug/socket connectors, UL Length: <ul style="list-style-type: none"> <li>• 0.3 m (0.98 ft)</li> <li>• 0.5 m (1.64 ft)</li> <li>• 1.0 m (3.28 ft)</li> <li>• 1.5 m (4.92 ft)</li> <li>• 2.0 m (6.56 ft)</li> <li>• 3.0 m (9.84 ft)</li> <li>• 5.0 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6XV1830-3DE30</b> <b>6XV1830-3DE50</b> <b>6XV1830-3DH10</b> <b>6XV1830-3DH15</b> <b>6XV1830-3DH20</b> <b>6XV1830-3DH30</b> <b>6XV1830-3DH50</b> <b>6XV1830-3DN10</b> <b>6XV1830-3DN15</b>
<b>PROFIBUS M12 connector</b> 5-pole, B-coded, metal enclosure, 1 package = 5 units <ul style="list-style-type: none"> <li>• Pin insert</li> <li>• Female contact insert</li> </ul>	<b>6GK1905-0EA00</b> <b>6GK1905-0EB00</b>

##### Connecting cables/connectors for supplying the Control Unit with power

###### Selection and ordering data

Description	Order No.
<b>7/8" plug-in cable</b> For power supply, pre-assembled with two 5-pole 7/8" plug/socket connectors, UL, 5 x 1.5 mm <sup>2</sup> Length: <ul style="list-style-type: none"> <li>• 0.3 m (0.98 ft)</li> <li>• 0.5 m (1.64 ft)</li> <li>• 1.0 m (3.28 ft)</li> <li>• 1.5 m (4.92 ft)</li> <li>• 2.0 m (6.56 ft)</li> <li>• 3.0 m (9.84 ft)</li> <li>• 5.0 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> <li>• 15 m (49.22 ft)</li> </ul>	<b>6XV1822-5BE30</b> <b>6XV1822-5BE50</b> <b>6XV1822-5BH10</b> <b>6XV1822-5BH15</b> <b>6XV1822-5BH20</b> <b>6XV1822-5BH30</b> <b>6XV1822-5BH50</b> <b>6XV1822-5BN10</b> <b>6XV1822-5BN15</b>
<b>7/8" connector</b> 5-pole, B-coded, plastic enclosure, 1 package = 5 units <ul style="list-style-type: none"> <li>• Pin insert (IN)</li> <li>• Female contact insert (OUT)</li> </ul>	<b>6GK1905-0FA00</b> <b>6GK1905-0FB00</b>
<b>POWER PLUG PRO connector</b> For the CU240D PN-F PP 5-pole push-pull power connector for on-site assembly 1 package = 1 unit <ul style="list-style-type: none"> <li>• 1 unit</li> </ul>	<b>6GK1907-0AB10-6AA0</b>

##### Connecting cables and connectors for digital inputs

###### Selection and ordering data

Description	Order No.
<b>M12 plug-in cable</b> With PUR sheath, to connect digital sensors and actuators, pre-assembled at one end, angled, plug connector, 5-pole, 5 x 0.34 mm <sup>2</sup> , UL Length: <ul style="list-style-type: none"> <li>• 1.5 m (4.92 ft)</li> <li>• 5.0 m (16.41 ft)</li> <li>• 10 m (32.81 ft)</li> </ul>	<b>3RK1902-4HB15-5AA0</b> <b>3RK1902-4HB50-5AA0</b> <b>3RK1902-4HC01-5AA0</b>
<b>M12 connector</b> For screw mounting, 5-pole screw-type connection max. 0.75 mm <sup>2</sup> , A-coded, max. 4 A, UL <ul style="list-style-type: none"> <li>• Straight</li> <li>• Angled</li> </ul>	<b>3RK1902-4BA00-5AA0</b> <b>3RK1902-4DA00-5AA0</b>

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Connecting cables for Power Modules

##### *Connecting cables pre-assembled at one end and connector sets to connect to the line supply*

##### Selection and ordering data

Description	Order No.
<b>Connecting cable pre-assembled at one end</b> Power supply cable, open at one end, for HAN Q4/2, angled, 4 × 4 mm <sup>2</sup>	
• 1.5 m (4.92 ft) long	<b>3RK1911-0DB13</b>
• 5 m (16.41 ft) long	<b>3RK1911-0DB33</b>
<b>Connector set for the power supply</b> HAN Q4/2	
• 2.5 mm <sup>2</sup>	<b>3RK1911-2BE50</b>
• 4 mm <sup>2</sup>	<b>3RK1911-2BE10</b>
• 6 mm <sup>2</sup>	<b>3RK1911-2BE30</b>

##### *Motor cables pre-assembled at one end and connector sets to connect the Power Module to the motor*

##### Selection and ordering data

Motor cables pre-assembled at one end For motors with brake and temperature sensor with HAN Q8 connector, shielded	Order No.		
	(HTG: supplied by Harting) (ZKT: supplied by KnorrTec)		
Cross-section	4 × 1.5 mm <sup>2</sup> 2 × (2 × 0.75 mm <sup>2</sup> )	4 × 2.5 mm <sup>2</sup> 2 × (2 × 0.75 mm <sup>2</sup> )	4 × 4 mm <sup>2</sup> 2 × 1 mm <sup>2</sup> + 2 × 1.5 mm <sup>2</sup>
• 1.5 m (4.92 ft) long	<b>HTG: 61 88 201 0288</b> <b>ZKT: 70020501000150</b>	<b>HTG: 61 88 201 0291</b> <b>ZKT: 70009601000150</b>	<b>HTG: 61 88 201 0303</b> <b>ZKT: 70017001000150</b>
• 3 m (9.84 ft) long	<b>HTG: 61 88 201 0289</b> <b>ZKT: 70020501000300</b>	<b>HTG: 61 88 201 0292</b> <b>ZKT: 70009601000300</b>	<b>HTG: 61 88 201 0304</b> <b>ZKT: 70017001000300</b>
• 5 m (16.41 ft) long	<b>HTG: 61 88 201 0290</b> <b>ZKT: 70020501000500</b>	<b>HTG: 61 88 201 0293</b> <b>ZKT: 70009601000500</b>	<b>HTG: 61 88 201 0305</b> <b>ZKT: 70017001000500</b>
• 10 m (32.81 ft) long	<b>HTG: 61 88 201 0299</b> <b>ZKT: 70020501001000</b>	<b>HTG: 61 88 201 0301</b> <b>ZKT: 70009601001000</b>	<b>HTG: 61 88 201 0306</b> <b>ZKT: 70017001001000</b>
<b>Connector set for motor cable</b> HAN Q8, shielded			
	– <b>HTG: 61 83 401 0131</b> <b>ZKT: 10032001</b>	<b>6ES7194-1AB01-0XA0</b> <b>HTG: 61 83 401 0132</b> <b>ZKT: 10032011</b>	– <b>HTG: 61 83 401 0133</b> <b>ZKT: 10032021</b>

# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Supplementary system components

#### Accessories

##### Power bus distribution 400 V in IP65 degree of protection

##### Selection and ordering data

Description	Ordering (see Solution Partner)
<b>Power T clamp connector for 2.5 ... 6 mm<sup>2</sup></b> With attached 7-pole connector, socket insert, grommet housing, UL Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Harting
<b>T clamp connector</b> Completely pre-assembled	Ordered from and supplied by KnorrTec
<b>T distributor box, IDC connection power cable</b> Pre-assembled, UL, uncut power cable, 2.5 ... 6 mm <sup>2</sup> , 2 outgoing feeders: Push-in connection: 1.5 ... 6 mm <sup>2</sup> Seals for various cable cross-sections must be ordered separately	Ordered from and supplied by Weidmüller
<b>T distributor box</b> Completely pre-assembled	Ordered from and supplied by KnorrTec

##### Additional information

For further information about the connecting cables and plug-in connectors mentioned above, please refer to Catalog IK PI.



Further selected accessories are available from Siemens Solution Partners. Please go to the "Solution Partner Finder" and select technology "Distributed Field Installation System".  
[www.siemens.com/automation/partnerfinder](http://www.siemens.com/automation/partnerfinder)



# SINAMICS G120D distributed inverters

## 0.75 kW to 7.5 kW (1.0 hp to 10 hp)

### Spare parts Spare Parts Kit

### Spare parts Replacement fans

#### Overview

A Spare Parts Kit can be ordered, comprising small parts such as replacement seals, caps, PROFIBUS address windows and screws.

#### Selection and ordering data

Description	Order No.
<b>Spare Parts Kit for SINAMICS G120D</b> Comprising replacement seals, caps, PROFIBUS address windows and screws	<b>6SL3500-0SK01-0AA0</b>
<b>Replacement caps for CU240D PN-F PP</b>	
• 24 V push-pull PLUG PRO caps 1 package = 5 units	<b>6ES7194-4JA50-0AA0</b>
• RJ45 PLUG PRO caps 1 package = 5 units	<b>6ES7194-4JD50-0AA0</b>

#### Overview

The Power Module fans are designed for extra long service life. Replacement fans can be ordered for special applications.

#### Selection and ordering data

Rated power		SINAMICS G120D Power Module PM250D		Replacement fan (pre-mounted unit with cover, fan and screws)
kW	hp	Type 6SL3525-...	Frame size	Order No.
<b>380 ... 500 V 3 AC</b>				
4.0	5.0	0PE24-0AA1	FSC	<b>6SL3500-0SF01-0AA0</b>
5.5	7.5	0PE25-5AA1		
7.5	10	0PE27-5AA1		

# SINAMICS G120D distributed inverters

0.75 kW to 7.5 kW (1.0 hp to 10 hp)

Notes

# SINAMICS S110

## servo drives

### 0.12 kW to 90 kW (0.16 hp to 125 hp)

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# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Introduction

#### Application

Application	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality			Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality		
<b>Pumping, ventilating, compressing</b> 	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
	<b>G110, G120C</b> (G130, G150, GM150, GL150)	<b>G120P, G120C, G120</b> (G130, G150, GM150, GL150)	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (GM150)
<b>Moving</b> 	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
	<b>G110, G110D, G120C</b> (G130, G150, GM150)	<b>G120D, G120C, G120, S120</b> (G130, G150, S150, GM150, GL150, SM150, DCM, SIMATIC ET200S, SIMATIC ET200pro)	<b>S120</b> (S150, SM150, SL150, GM150, DCM)	<b>S110</b>	<b>S110, S120</b> (DCM)	<b>S120</b> (DCM)
<b>Processing</b> 	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
	<b>G120C</b> (G130, G150, GM150)	<b>G120C, G120</b> (G130, G150, S150, GM150, GL150, DCM)	<b>S120</b> (S150, DCM)	<b>S110</b>	<b>S110, S120</b>	<b>S120</b> (SM150, SL150, DCM)
<b>Machining</b> 	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
	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>	<b>S110</b>	<b>S110, S120</b>	<b>S120</b>

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

Many applications in mechanical engineering and plant construction require machine axes to be positioned quickly and precisely by the simplest possible method. It is often simply a case of moving a machine axis from position X to position Y reliably

and with the required level of performance. The SINAMICS S110 drive converter is ideally suited to this type of application. It is specially designed to position single axes accurately and effectively.

#### More information

You may also be interested in these inverters/converters:

- Higher performance, more functionality ⇒ SINAMICS S120 ([chapter 10](#))
- I/O extension using additional modules ⇒ SINAMICS S120 ([chapter 10](#))
- Operation of linear and torque motors ⇒ SINAMICS S120 ([chapter 10](#))
- Reduced functionality for basic applications with standard asynchronous motors ⇒ SINAMICS G120 ([chapter 6](#))

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### SINAMICS S110 servo drives

#### Overview

#### *SINAMICS S110 – the basic positioning drive for single-axis applications*



SINAMICS S110: PM340 Power Module in blocksize format with CU305 Control Unit and BOP20

SINAMICS S110 can be used in numerous applications. Typical examples are:

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

The SINAMICS S110 servo drive is designed for connection to both synchronous servomotors and asynchronous (induction) motors. It supports all the most popular types of encoder.

A variety of fieldbus interfaces is provided for linking the unit to a higher-level control system. Alternatively, it can be controlled via  $\pm 10$  V and a pulse direction interface.

The so-called basic positioner (EPOs) is an integral component of SINAMICS S110. It provides a simple method of solving positioning tasks.

#### *Flexible in application*

SINAMICS S110 is a flexible, versatile system.

Synchronous servomotors and asynchronous (induction) motors with outputs up to 90 kW can be used to implement rotary or linear axes. DRIVE-CLiQ motors can be connected simply by means of the integrated DRIVE-CLiQ interface. This means that the electronic rating plate of the motor is easy to read out, reducing the engineering time and cost involved in commissioning the drive.

Furthermore, the SINAMICS S110 features an integrated encoder interface for optional use. It is capable of evaluating HTL/TTL and SSI encoders.

In addition to pure point-to-point positioning, SINAMICS S110 naturally also offers on-the-fly changeover from continuous operation to positioning mode in order, for example, to precisely position objects transported randomly on a conveyor belt. Even simple traversing profiles with different motion cycles and wait times can be executed automatically by SINAMICS S110.

The CU305 Control Unit of the SINAMICS S110 is equipped with an integrated communication interface for linking the converter to an automation system. A PROFINET, PROFIBUS or CANopen interface can be ordered. Standardized protocols for linking to a higher-level control are supported – the PROFIdrive profile for positioning mode and the PROFIsafe profile for safety-related communication.

The converter is thus perfectly coordinated with the SIMATIC S7 automation system. The devices are linked by means of PROFIBUS and the SIMATIC S7 uses standard function blocks to communicate with the drive. In addition, the STARTER commissioning tool can be seamlessly integrated into STEP 7, the SIMATIC's programming software.

#### *BICO technology*

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

#### *Free function blocks*

The drive can be adapted easily and precisely to a wide range of customized requirements using the "free function blocks" integrated in the CU305 Control Unit. The available range of blocks includes simple logic blocks such as AND/OR elements, as well as more complex devices such as ramp-function generators, smoothing elements or limit-value monitors. All blocks can be flexibly interconnected using BICO (Binector-Connector) technology, ensuring that signals are processed quickly and close to the drive which helps reduce the load on the higher-level control.

#### *Diagnostics optimally supported by trace function*

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### SINAMICS S110 servo drives

#### Overview

##### Safety Integrated

The integrated safety functions of SINAMICS S110 provide highly effective application-oriented protection for personnel and machinery (terms as defined in IEC 61800-5-2).

The following Safety Integrated Basic Functions are included as standard:

- Safe Torque Off (STO)
- Safe Brake Control (SBC)
- Safe Stop 1 (SS1)

The following Safety Integrated Extended Functions are optionally available:

- Safe Stop 2 (SS2)
- Safe Operating Stop (SOS)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

The Safety Integrated functions are fully integrated into the drive system. They can be activated via fail-safe digital inputs on the CU305 Control Unit or via PROFINET or PROFIBUS with PROFIsafe.

The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions.

[Additional information is provided in chapter Highlights, section Safety Integrated.](#)

##### Accessories

###### Memory cards

The memory card can be used as an option for SINAMICS S110. The relevant slot is located underneath the CU305 Control Unit. The complete functionality of SINAMICS S110 can be saved on the memory card: the parameter settings and the firmware. When service is required, e.g. after the converter has been replaced and the data has been downloaded from the memory card, the drive system is immediately ready for use once more.

A SINAMICS Micro Memory Card (MMC) is essential, if the optional Safety Integrated Extended Functions are used. The necessary license is saved on the MMC.

###### Intelligent Operator Panel (IOP)

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, menu-based operation and application wizards, it is easy to commission, diagnose and locally control standard drives.

The IOP can be connected to the RS232 interface of the CU305 Control Unit using the appropriate connecting cable. Mounting the IOP directly on the CU305 Control Unit is not possible.

##### Varnished modules

The following units are equipped as standard with varnished or partially varnished modules:

- Blocksize format units
- Control Units
- Sensor Modules

The varnish coating protects the sensitive SMD components against corrosive gases, chemically active dust and moisture.

#### Function

SINAMICS S110 – Summary of the most important functions	
<b>Control method</b>	Servo control
• Asynchronous (induction) motor	Torque control with encoder Speed control with and without encoder Position control with encoder
• Synchronous motor	Torque control with encoder Speed control with encoder Position control with encoder
<b>Control function</b>	V/f characteristic
• Asynchronous (induction) motor	Basic linear
• Synchronous motor	–
<b>Basic positioner (EPos)</b>	Absolute and relative positioning Linear and rotary axis Motor encoder or direct measuring system 4 referencing modes 16 traversing blocks Direct setpoint input (MDI) Jog mode Backlash compensation Following error monitoring Cam signals Position tracking for extended position range ....
<b>Safety Integrated</b>	Safe Torque OFF (STO) Safe Brake Control (SBC) Safe Stop 1 (SS1) Safe Stop 2 (SS2) Safe Operating Stop (SOS) Safely Limited Speed (SLS) Safe Speed Monitor (SSM) Safe Direction (SDI)
<b>Protection functions</b>	Undervoltage DC link voltage Overvoltage DC link voltage Overcurrent power unit Overcurrent motor Overload power unit ( $I^2t$ ) Short-circuit Ground fault Overtemperature motor Overtemperature power unit
<b>Functions for simplified commissioning</b>	Electronic rating plate for motors with DRIVE-CLiQ Motor data identification Pole position identification Automatic controller optimization with STARTER
<b>Free function blocks</b>	Logic and arithmetic blocks
<b>Data sets</b>	2 command data sets 2 drive data sets 2 motor data sets 1 encoder data set
<b>Further software functions</b>	BICO interconnection Technology controller (PID) Extended setpoint channel Automatic restart Armature short-circuit brake DC brake Brake control $V_{dc\_min}$ control (kinetic buffering) $V_{dc\_max}$ control Travel to fixed stop Vertical axis Variable signaling functions Central measuring probe evaluation Pulse direction interface Efficiency optimization for asynchronous (induction) motors Runtime (operating hours counter)

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### SINAMICS S110 servo drives

## Function

### Basic positioner (EPos)

SINAMICS S110 provides powerful and precise positioning functions. Due to its flexibility and adaptability, the basic positioner can be used for a wide range of positioning tasks.

The functions are easy to handle both during commissioning and during operation. Furthermore, they are characterized by their comprehensive monitoring functions.

Many applications can be carried out without external position controllers.

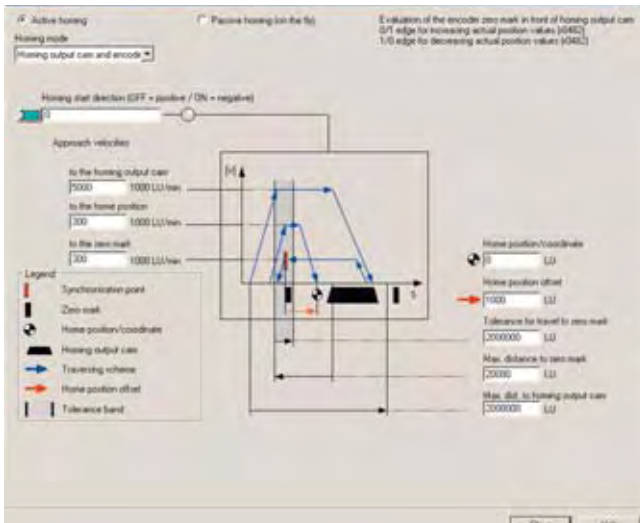
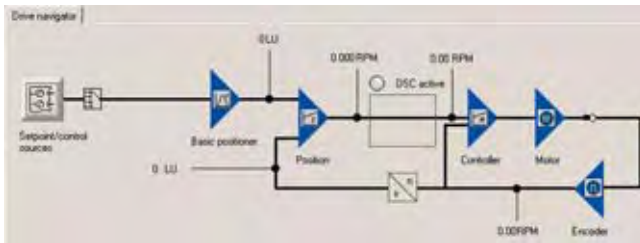
The EPos basic positioner is available as a function module that can be activated in the drive, and is used for the absolute/relative positioning of linear and rotary axes (modulo) with both rotary and linear motor encoders (indirect measuring system).

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

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

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

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



### Functionality of the EPos basic positioner

Closed-loop position control with the following essential components

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

Mechanical system

- Backlash compensation
- Modulo offset

Limits

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

Referencing and alignment

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

Traversing blocks mode (16 traversing blocks)

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

Direct setpoint input (MDI) mode

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

Jog mode

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### SINAMICS S110 servo drives

#### Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS S110 servo drives:

##### **Selection guide DT Configurator within the 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 DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. The configurator is integrated as a "selection guide" in this catalog on the DVD-ROM with the selection and configuration tools.

##### **Online DT Configurator**

In addition, the DT Configurator can be used in the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address: [www.siemens.com/dt-configurator](http://www.siemens.com/dt-configurator)

##### **SIZER for Siemens Drives engineering tool**

The SIZER for Siemens Drives engineering tool makes it easy to engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

[Additional information on the SIZER for Siemens Drives engineering tool is provided in the chapter Engineering tools.](#)

##### **STARTER commissioning tool**

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. In addition to SINAMICS drives, STARTER is also suitable for MICROMASTER 4 units and the frequency converters for the distributed I/O SIMATIC ET 200S FC and SIMATIC ET 200pro FC.

[Additional information on the STARTER commissioning tool is provided in the chapter Engineering tools.](#)

##### **Drive ES engineering system**

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7.1.

[Additional information on the Drive ES engineering system is provided in the chapter Engineering tools.](#)



# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### SINAMICS S110 servo drives

#### Technical specifications

Unless specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS S110 drive system.

<b>Electronics power supply</b>	24 V DC, -15 %/+20 %
<b>Vibratory load</b>	
<ul style="list-style-type: none"> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2           <ul style="list-style-type: none"> <li>- Control Units and Power Modules</li> </ul> </li> <li>• Operation           <ul style="list-style-type: none"> <li>- Test values acc. to EN 60068-2-6</li> </ul> </li> </ul>	Class 2M3  Test Fc  10 ... 58 Hz: Constant deflection 0.075 mm 58 ... 150 Hz: Constant acceleration = 9.81 m/s <sup>2</sup> (1 × g)
<b>Shock stressing</b>	
<ul style="list-style-type: none"> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2           <ul style="list-style-type: none"> <li>- Control Units and Power Modules</li> </ul> </li> <li>• Operation           <ul style="list-style-type: none"> <li>- Test values acc. to EN 60068-2-27               <ul style="list-style-type: none"> <li>- Power Modules frame sizes FSA to FSC</li> <li>- Power Modules frame sizes FSD to FSF</li> </ul> </li> </ul> </li> </ul>	Class 2M3  Test Ea  147 m/s <sup>2</sup> (15 × g)/11 ms 49 m/s <sup>2</sup> (5 × g)/30 ms
<b>Ambient conditions</b>	
<ul style="list-style-type: none"> <li>• Protection class according to EN 61800-5-1</li> <li>• Touch protection</li> <li>• Type of cooling</li> </ul>	Class I (with protective conductor system) and Class III (PELV) DIN VDE 0106 Part 100 and BGV A 3 when used properly Internal ventilator, power units with increased air cooling by built-in fans
<b>Permissible ambient/coolant temperature (air) during operation</b>	
<ul style="list-style-type: none"> <li>• Power Modules</li> <li>• Control Units, supplementary system components, DC link components and Sensor Modules</li> </ul>	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (>104 ... 131 °F), <a href="#">see derating characteristics</a>  0 ... 55 °C (32 ... 131 °F) up to 2000 m (6562 ft) above sea level
<b>Climatic ambient conditions</b>	
<ul style="list-style-type: none"> <li>• Storage <sup>1)</sup> acc. to EN 60721-3-1</li> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2</li> <li>• Operation acc. to EN 60721-3-3</li> </ul>	Class 1K4 Temperature -25 ... +70 °C (-13 ... 158 °F)  Class 2K4 Temperature -40 ... +70 °C (-40 ... 158 °F) Max. air humidity 95 % at 40 °C (104 °F)  Class 3K3 Temperature 0 ... 55 °C (32 ... 131 °F) Condensation, splashwater and ice formation are not permitted (EN 60204, Part 1)
<b>Environmental class/harmful chemical substances</b>	
<ul style="list-style-type: none"> <li>• Storage <sup>1)</sup> acc. to EN 60721-3-1</li> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2</li> <li>• Operation acc. to EN 60721-3-3</li> </ul>	Class 1C2  Class 2C2  Class 3C2
<b>Organic/biological influences</b>	
<ul style="list-style-type: none"> <li>• Storage <sup>1)</sup> acc. to EN 60721-3-1</li> <li>• Transport <sup>1)</sup> acc. to EN 60721-3-2</li> <li>• Operation acc. to EN 60721-3-3</li> </ul>	Class 1B1  Class 2B1  Class 3B1
<b>Degree of pollution</b> According to EN 61800-5-1	2

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### SINAMICS S110 servo drives

#### Technical specifications

##### European standards

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

##### North American standards

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

##### Approvals

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

For satisfactory and reliable operation of the drive, original components of the SINAMICS system and the original Siemens accessories as described in Catalog D 31 and the Configuration Manuals, in the functional descriptions or user manuals should be used.

The user must observe the configuring instructions.

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

If non-original components are used, for example, even in the case of a repair, approvals such as UL, EN and Safety Integrated may become invalid. This may also result in the operating authorization for the machine in which the non-Siemens components are installed becoming invalid.

All of the approvals, certificates, declarations of conformity, 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. In other cases, the vendor of these products is responsible for arranging that new certificates are issued.

##### Note:

The products described in Catalog D 31 may cause high-frequency disturbances in a residential environment and necessitate the implementation of interference-suppression measures.

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### CU305 Control Unit

#### Overview



CU305 PN Control Unit

The CU305 Control Unit for the communication and open-loop/closed-loop control functions of a SINAMICS S110 is combined with the PM340 Power Module to create a powerful single drive.

#### Design

The CU305 Control Unit features the following connections and interfaces as standard:

- Fieldbus interface
  - CU305 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
  - CU305 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
  - CU305 CAN: 1 CANopen interface with DS301 V4.0, DSP402 V2.0, DR303-3 V1.0 profile
- 1 DRIVE-CLiQ socket, used solely to connect a DRIVE-CLiQ motor or a Sensor Module
- 1 onboard encoder evaluation for evaluating the following encoder signals
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 1 PE/protective conductor connection
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 temperature sensor input (KTY84-130 or PTC)
- 3 parameterizable, fail-safe digital inputs (floating), or alternatively 6 parameterizable digital inputs (floating)
- 5 parameterizable digital inputs (floating)
- 1 parameterizable, fail-safe digital output (floating), or alternatively 1 digital output (floating)
- 4 parameterizable bidirectional digital inputs/outputs
- 1 analog input  $\pm 10$  V, resolution 12 bit + sign
- 1 serial RS232 interface
- 1 slot for the memory card on which the firmware, parameters and licenses can be stored
- 1 PM-IF interface for communication with PM340 Power Modules in blocksize format
- 2 test sockets and one reference ground for commissioning support
- 1 interface to the BOP20 Basic Operator Panel

#### Integration

The CU305 Control Unit controls the PM340 Power Module via the PM-IF interface.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU305 for diagnostic purposes. For comprehensive diagnostics and commissioning functions, an Intelligent Operator Panel (IOP) can be connected to the RS232 interface.

DRIVE-CLiQ motors can be connected to the integrated DRIVE-CLiQ socket as well as Sensor Modules (SMC) to permit the operation of motors without a DRIVE-CLiQ interface.

The status of the CU305 is indicated via multi-color LEDs.

The CU305 can be operated optionally with a memory card. The firmware and project data are stored on the plug-in card underneath, so that the CU305 can be replaced without the support of software tools. This memory card can also be used to perform standard commissioning on multiple drives of identical type. The card is available as an empty memory card or containing the latest drive firmware version. The card also contains the safety license for the Extended Safety Functions. To use these Extended Safety Functions, a memory card containing the safety license must be permanently inserted.

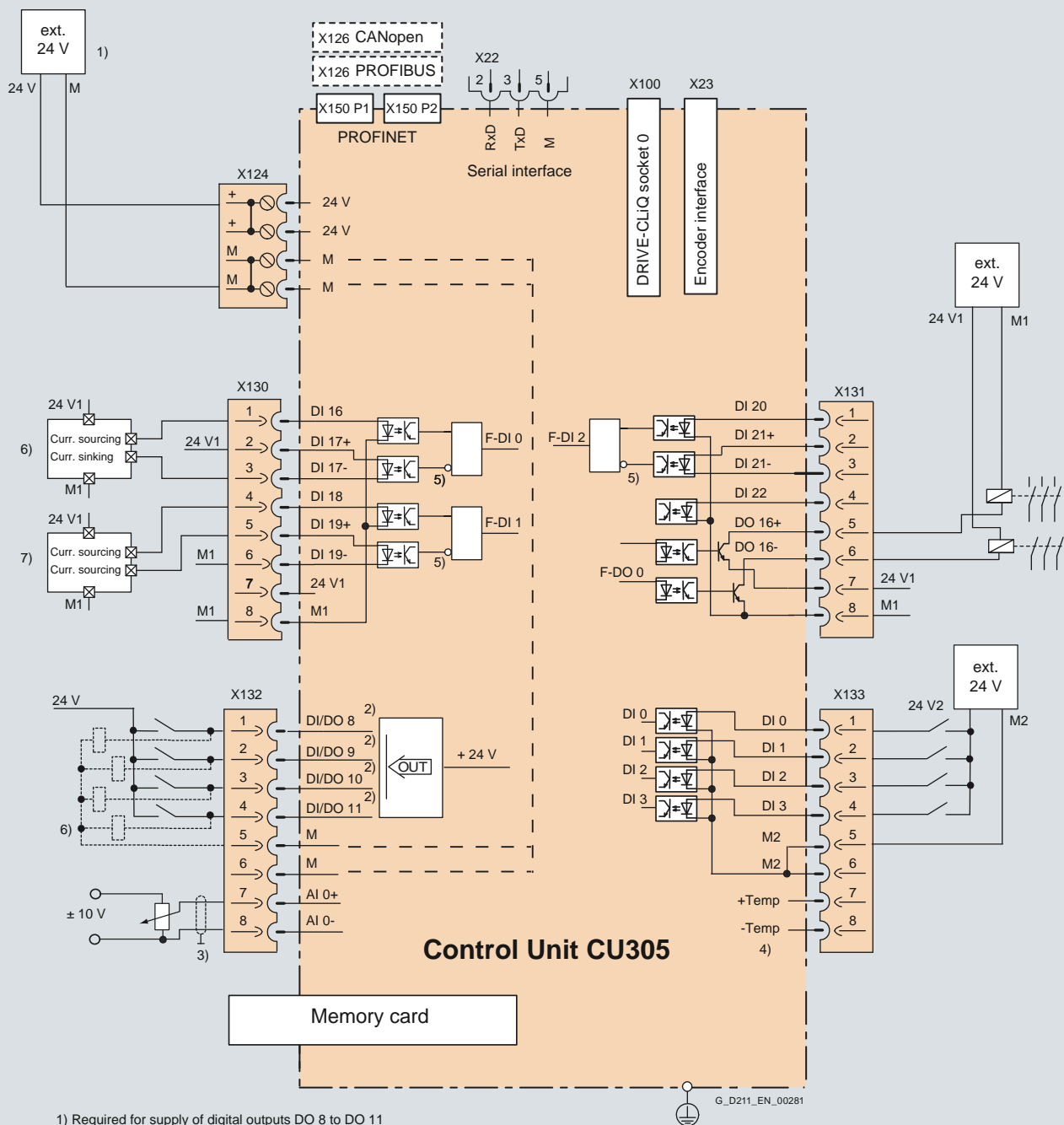
The CU305 and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### CU305 Control Unit

#### Integration



- 1) Required for supply of digital outputs DO 8 to DO 11
- 2) High-speed inputs must be shielded
- 3) Analog input must be shielded
- 4) Motor temperature sensor input must be shielded
- 5) Inversion can be parameterized
- 6) Safety-related control with current sourcing and current sinking outputs
- 7) Safety-related control with two current sourcing outputs

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Connection example of CU305 Control Unit

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### CU305 Control Unit

#### Technical specifications

##### CU305 PN / CU305 DP / CU305 CAN Control Units

PROFINET: 6SL3040-0JA01-0AA0  
 PROFIBUS: 6SL3040-0JA00-0AA0  
 CANopen: 6SL3040-0JA02-0AA0

**Power requirement**  
 At 24 V DC, max. 0.8 A for CU305 incl.  
 350 mA for HTL encoder +  
 without taking account of digital outputs  
 and DRIVE-CLiQ supply 0.5 A for PM340 Power  
 Module

**Conductor cross-section, max.** 2.5 mm<sup>2</sup>

**Fuse protection, max.** 20 A

##### Digital inputs

In accordance with  
 IEC 61131-2 Type 1  
 3 floating fail-safe inputs  
 5 bidirectional floating  
 digital inputs/outputs

• Voltage -3 ... +30 V

• Low level (an open digital input is  
 interpreted as "low") -3 ... +5 V

• High level 15 ... 30 V

• Current consumption at 24 V DC, typ. 6 mA

• Delay time  
 of digital inputs <sup>1)</sup>, approx.

- L → H 15 μs

- H → L 55 μs

• Delay time  
 of high-speed digital inputs <sup>1)</sup>, approx.  
 (high-speed digital inputs can be used  
 for position detection)

- L → H 5 μs

- H → L 5 μs

• Conductor cross-section, max. 1.5 mm<sup>2</sup>

##### Digital outputs

(continuously short-circuit-proof)  
 1 fail-safe digital output  
 4 bidirectional non-floating  
 digital inputs/digital outputs

• Voltage 24 V DC

• Load current per digital output <sup>2)</sup>, max. 100 mA

• Delay time <sup>1)</sup>, approx. 150 μs

• Conductor cross-section, max. 1.5 mm<sup>2</sup>

##### Analog input

-10 ... +10 V  
 resolution 12 bit + sign

• Internal resistance 15 kΩ

##### CU305 PN / CU305 DP / CU305 CAN Control Units

PROFINET: 6SL3040-0JA01-0AA0  
 PROFIBUS: 6SL3040-0JA00-0AA0  
 CANopen: 6SL3040-0JA02-0AA0

##### Encoder evaluation

• Encoder supply

• Incremental encoder  
 TTL/HTL

• SSI encoder without  
 incremental signals

24 V DC/0.35 A or  
 5 V DC/0.35 A

• Encoder frequency, max. 500 kHz

• SSI baud rate

100 ... 250 kBaud  
 depending on cable length

• Resolution absolute position SSI

30 bit

• Cable length, max.

- TTL encoder

100 m (328 ft)  
 (only bipolar signals  
 permitted) <sup>3)</sup>

- HTL encoder

100 m (328 ft) for unipolar  
 signals  
 300 m (984 ft) for bipolar  
 signals <sup>3)</sup>

- SSI encoder

100 m (328 ft)

##### Power loss

<20 W

##### PE connection

M5 screw

##### Dimensions

• Width 73 mm (2.87 in)

• Height 183.2 mm (7.21 in)  
 (for CU305 PN:  
 195 mm/7.68 in)

• Depth 55 mm (2.17 in)  
 (for CU305 PN:  
 71 mm/2.80 in)

##### Weight, approx.

0.95 kg (2.09 lb)

##### Approvals

cULus

#### Selection and ordering data

Description	Order No.
<b>CU305 PN Control Unit</b> Without memory card	<b>6SL3040-0JA01-0AA0</b>
<b>CU305 DP Control Unit</b> Without memory card	<b>6SL3040-0JA00-0AA0</b>
<b>CU305 CAN Control Unit</b> Without memory card	<b>6SL3040-0JA02-0AA0</b>

##### Accessories

##### Memory card for CU305 PN / CU305 DP / CU305 CAN Control Units

• Empty	<b>6SL3054-4AG00-0AA0</b>
• With firmware version V4.1	<b>6SL3054-4EB00-0AA0</b>
• With firmware version V4.3	<b>6SL3054-4ED00-0AA0</b>
• With firmware version V4.4	<b>6SL3054-4EE00-0AA0</b>
• With firmware version V4.4 and safety license (Extended Functions)	<b>6SL3054-4EE00-0AA0-Z F01</b>

**Safety license (Extended Functions)** **6SL3074-0AA10-0AA0**

**STARTER commissioning tool** **6SL3072-0AA00-0AG0**

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

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

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Overview



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

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

- Line supply connection
- PM-IF interface for connection of the PM340 and CU305 Control Unit. The PM340 Power Module also supplies power to the CU305 Control Unit by means of an integrated power supply.
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Motor connection made with screw-type terminals or screw studs
- Control circuit for the Safe Brake Relay for controlling a holding brake
- 2 PE/protective conductor connections

PM340 Power Modules without integrated line filter can be connected to grounded TN/TT and non-grounded IT systems. PM340 Power Modules with integrated line filter are suitable only for connection to TN systems with grounded star point.

The integrated braking unit (braking chopper) is rated with the capability to repeatedly utilize the external braking resistor. The temperature of the external braking resistor must be monitored to provide protection against thermal overloading.

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#### Integration

PM340 Power Modules communicate with the CU305 Control Unit via the PM-IF interface.



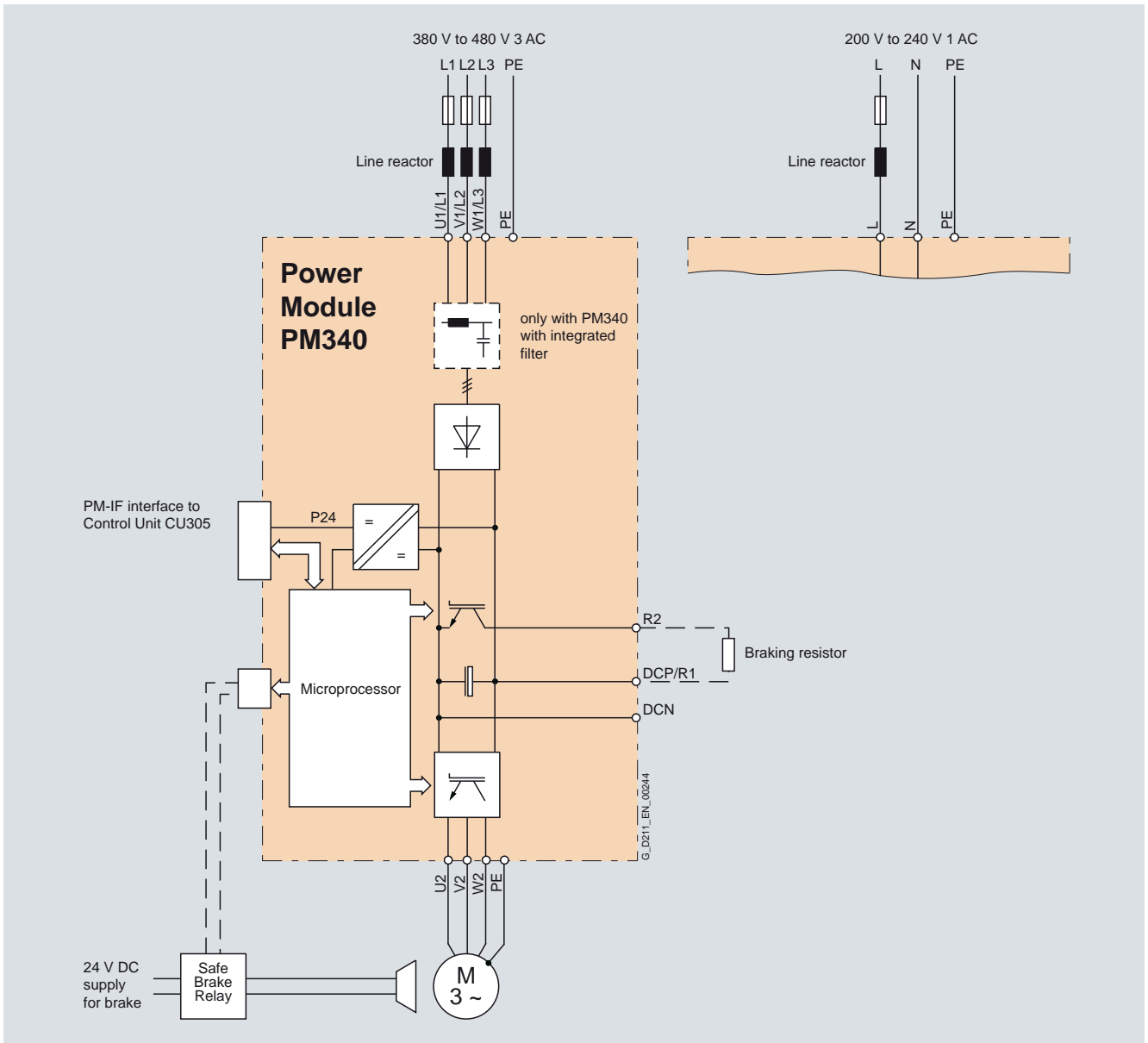
PM340 Power Module with CU305 DP Control Unit and BOP20 Basic Operator Panel

# SINAMICS S110 servo drives

0.12 kW to 90 kW (0.16 hp to 125 hp)

## PM340 Power Modules in blocksize format

### Integration



Connection example: PM340 Power Module

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

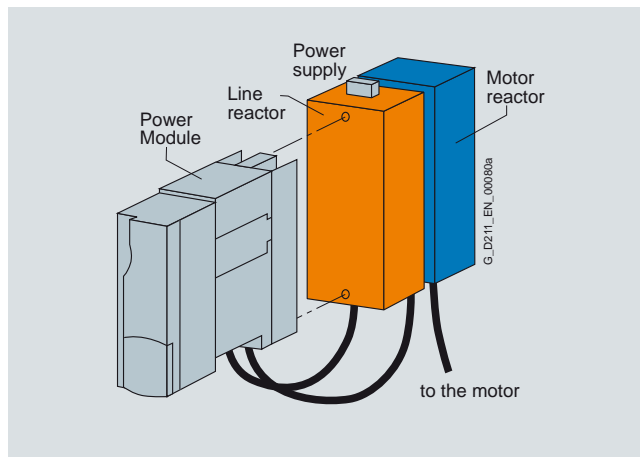
### PM340 Power Modules in blocksize format

#### Integration

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

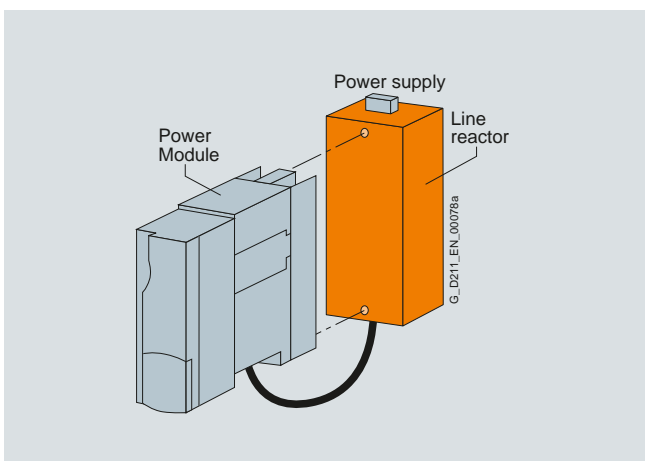
	FSA	FSB	FSC	FSD	FSE	FSF
Line filter	✓	–	–	–	–	–
Line reactor	✓	✓	✓	✓	✓	○
Braking resistor	✓	✓	○	○	○	○
Motor reactor	✓	✓	✓	○	○	○

- ✓ = suitable as base type
- = not suitable as base type
- = not available (use PM340 Power Modules with integrated line filter)



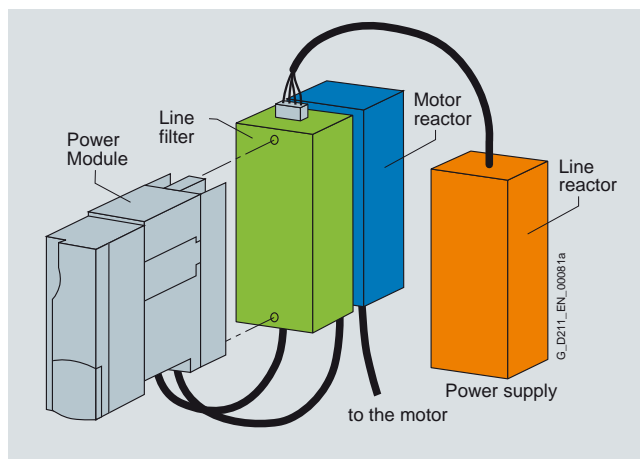
PM340 Power Module in frame size FSA with line reactor and motor reactor

PM340 Power Modules of frame size FSB and higher are available with integrated line filters, alleviating the need for an external line filter.

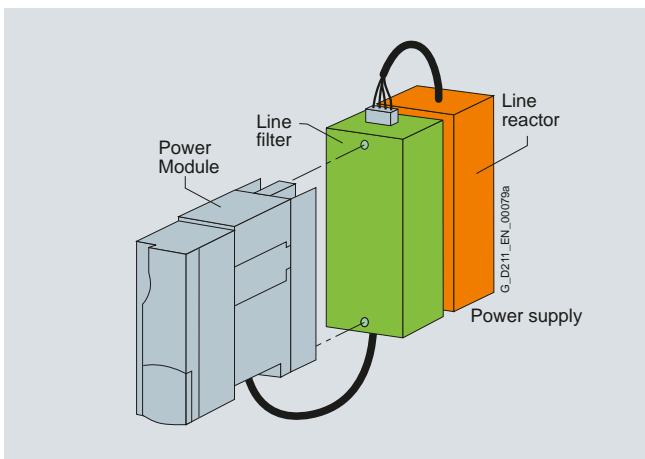


Basic layout of a PM340 Power Module with line reactor as base component

The line reactors are equipped with terminals on the line side and with a pre-assembled cable on the PM340 Power Module side. When installed, the mains terminals are at the top on frame sizes FSA to FSC, and at the bottom on frame sizes FSD and FSE.



For configurations involving more than two base-type system components, e.g. line reactor + motor reactor + braking resistor, individual components must be mounted to the side of the PM340 Power Module. In this instance, the line and motor reactors must be installed behind the PM340 Power Module and the braking resistor to the side.



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

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

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# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Technical specifications

<b>Air-cooled PM340 Power Module in blocksize format</b> 6SL3210-1S...	
<b>Line supply connection voltage</b> (up to 2000 m (6562 ft) above sea level)	200 V ... 240 V 1 AC $\pm 10\%$ (in operation -15 % < 1 min) or 380 ... 480 V 3 AC $\pm 10\%$ (in operation -15 % < 1 min)
<b>Line</b>	
• Power Modules without integrated line filter	Grounded TN/TT systems and non-grounded IT systems
• Power Modules with integrated line filter	TN systems with grounded star point
<b>Line frequency</b>	47 ... 63 Hz
<b>Line power factor</b> at rated power	
• Fundamental power factor ( $\cos \varphi_1$ )	>0.96
• Total ( $\lambda$ )	
- 200 ... 240 V 1 AC	0.45 ... 0.7
- 380 ... 480 V 3 AC	0.65 ... 0.95
<b>Overvoltage category</b> acc. to EN 60664-1	Class III
<b>Precharging frequency</b> of the DC link, max.	1x every 30 s
<b>DC link voltage, approx.</b>	1.35 x line voltage
<b>Output frequency</b>	
• Control type Servo	0 ... 650 Hz <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC -15 %/+20 %
<b>Radio interference suppression</b>	
• Standard	No radio interference suppression
• With line filter	Category C2 according to EN 61800-3
<b>Type of cooling</b>	Forced air cooling by means of built-in fan
<b>Ambient or coolant temperature (air)</b> in operation for line-side components, Power Modules	0 ... 40 °C (32 ... 104 °F) without derating, >40 ... 55 °C (>104 ... 131 °F) <a href="#">see derating characteristics</a>
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, <a href="#">see derating characteristics</a>
<b>Conformity</b>	CE (low-voltage and EMC Directives)
<b>Approvals, according to</b>	cULus
<b>Safety Integrated</b>	Safety Integrity Level 2 (SIL2) acc. to IEC 61508, Performance Level d (PLd) acc. to ISO 13849-1 and Control Category 3 acc. to ISO 13849-1 or EN 954-1 <a href="#">Additional information is provided in chapter Highlights, section Safety Integrated.</a>

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Technical specifications

Line voltage 200 ... 240 V 1 AC	Air-cooled PM340 Power Module in blocksize format			
		6SL3210-1SB11-0...	6SL3210-1SB12-3...	6SL3210-1SB14-0...
<b>Output current</b>				
• Rated current $I_{rated}$	A	0.9	2.3	3.9
• Base-load current $I_H$	A	0.8	2.0	3.4
• For S6 duty (40 %) $I_{S6}$	A	1.4	3.3	5.5
• $I_{max}$	A	2.0	4.6	7.8
<b>Type rating <sup>1)</sup></b> Based on $I_{rated}$	kW (hp)	0.12 (0.16)	0.37 (0.5)	0.75 (0.75)
<b>Rated pulse frequency</b>	kHz	4	4	4
<b>Power loss</b>	kW	0.06	0.075	0.11
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)
<b>Sound pressure level</b> $L_{pA}$ (1 m)	dB	<45	<45	<45
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0
<b>Rated input current <sup>2)</sup></b> with/without line reactor	A	1.4/2.2	4/6	6.5/10
<b>Resistance value</b> of the external braking resistor	Ω	≥180	≥180	≥180
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> L, N		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>Motor connection</b> U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>PE connection</b>		M4 screw	M4 screw	M4 screw
<b>Motor cable length <sup>3)</sup>, max.</b> (without external options)				
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth				
- PM340	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)
- PM340 with CU305 PN	mm (in)	216 (8.50)	216 (8.50)	216 (8.50)
- PM340 with CU305 DP/CAN	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)
<b>Frame size</b>		FSA	FSA	FSA
<b>Weight, approx.</b>	kg (lb)	1.2 (2.65)	1.3 (2.87)	1.3 (2.87)

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

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

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format				
		6SL3210-1SE11-3UA0	6SL3210-1SE11-7UA0	6SL3210-1SE12-2UA0	6SL3210-1SE13-1UA0	6SL3210-1SE14-1UA0
<b>Output current</b>						
• Rated current $I_{rated}$	A	1.3	1.7	2.2	3.1	4.1
• Base-load current $I_H$	A	1.1	1.5	1.9	2.7	3.6
• For S6 duty (40 %) $I_{S6}$	A	1.3	2.0	2.5	3.5	4.5
• $I_{max}$	A	2.6	3.4	4.4	6.2	8.2
<b>Type rating <sup>1)</sup></b>						
• Based on $I_{rated}$	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1.0)	1.1 (1.5)	1.5 (2.0)
• Based on $I_H$	kW (hp)	0.37 (0.5)	0.55 (0.5)	0.75 (0.75)	1.1 (1)	1.5 (2.0)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Power loss</b>	kW	0.10	0.10	0.10	0.11	0.11
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)	0.005 (0.2)
<b>Sound pressure level</b> $L_{pA}$ (1 m)	dB	<45	<45	<45	<45	<45
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0	1.0	1.0
<b>Rated input current <sup>2)</sup></b> with/without line reactor	A	1.3/1.7	1.7/2.2	2.2/2.6	3.1/3.9	4.1/4.8
<b>Resistance value</b> of the external braking resistor	Ω	≥390	≥390	≥390	≥390	≥390
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>Motor connection</b> U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5	1.0 ... 2.5
<b>PE connection</b>		M4 screw	M4 screw	M4 screw	M4 screw	M4 screw
<b>Motor cable length <sup>3)</sup>, max.</b>						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)	173 (6.81)
• Depth						
- PM340	mm (in)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)	145 (5.71)
- PM340 with CU305 PN	mm (in)	216 (8.50)	216 (8.50)	216 (8.50)	216 (8.50)	216 (8.50)
- PM340 with CU305 DP/CAN	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)
<b>Frame size</b>		FSA	FSA	FSA	FSA	FSA
<b>Weight, approx.</b>	kg (lb)	1.2 (2.65)	1.2 (2.65)	1.2 (2.65)	1.2 (2.65)	1.2 (2.65)

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

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

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format					
		6SL3210-1SE16-0...	6SL3210-1SE17-7...	6SL3210-1SE21-0...	6SL3210-1SE21-8...	6SL3210-1SE22-5...	6SL3210-1SE23-2...
<b>Output current</b>							
• Rated current $I_{rated}$	A	5.9	7.7	10.2	18	25	32
• Base-load current $I_H$	A	5.2	6.8	9.1	14	21	27
• For S6 duty (40 %) $I_{S6}$	A	6.4	8.3	10.8	19.6	27.8	37.1
• $I_{max}$	A	11.8	15.4	20.4	26.4	38	52
<b>Type rating <sup>1)</sup></b>							
• Based on $I_{rated}$	kW (hp)	2.2 (3.0)	3 (5)	4 (5)	7.5 (10)	11 (15)	15 (20)
• Based on $I_H$	kW (hp)	2.2 (3.0)	3 (4)	4 (5)	5.5 (10)	7.5 (15)	11 (20)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4	4
<b>Power loss</b>	kW	0.14	0.16	0.18	0.24	0.30	0.40
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.009 (0.3)	0.009 (0.3)	0.009 (0.3)	0.038 (1.3)	0.038 (1.3)	0.038 (1.3)
<b>Sound pressure level</b> $L_{pA}$ (1 m)	dB	<50	<50	<50	<60	<60	<60
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0	1.0	1.0	1.0
<b>Rated input current <sup>2)</sup></b> with/without line reactor	A	5.6/6.7	7.5/8.9	9.8/12.4	17.1/23.1	24.6/32.6	33/39
<b>Resistance value</b> of the external braking resistor	Ω	≥160	≥160	≥160	≥56	≥56	≥56
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 6	1.0 ... 6	1.0 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 6	1.0 ... 6	1.0 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>Motor connection</b> U2, V2, W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	1.0 ... 6	1.0 ... 6	1.0 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 10
<b>PE connection</b>		M5 screw	M5 screw	M5 screw	M5 screw	M5 screw	M5 screw
<b>Motor cable length <sup>3)</sup>, max.</b>							
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)	75 (246)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)	153 (6.02)	153 (6.02)	153 (6.02)	188.4 (7.42)	188.4 (7.42)	188.4 (7.42)
• Height	mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	333.4 (13.13)	333.4 (13.13)	333.4 (13.13)
• Depth							
- PM340	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	185 (7.28)	185 (7.28)	185 (7.28)
- PM340 with CU305 PN	mm (in)	236 (9.29)	236 (9.29)	236 (9.29)	256 (10.08)	256 (10.08)	256 (10.08)
- PM340 with CU305 DP/CAN	mm (in)	220 (8.66)	220 (8.66)	220 (8.66)	240 (9.45)	240 (9.45)	240 (9.45)
<b>Frame size</b>		FSB	FSB	FSB	FSC	FSC	FSC
<b>Weight, approx.</b>	kg (lb)	4.0 (9)	4.0 (9)	4.0 (9)	6.5 (14.3)	6.5 (14.3)	6.5 (14.3)

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

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

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Air-cooled PM340 Power Module in blocksize format				
		6SL3210-1SE23-8...	6SL3210-1SE24-5...	6SL3210-1SE26-0...	6SL3210-1SE27-5...	6SL3210-1SE31-0...
<b>Output current</b>						
• Rated current $I_{rated}$	A	38	45	60	75	90
• Base-load current $I_H$	A	33	40	48	65	80
• For S6 duty (40 %) $I_{S6}$	A	49	58	78	98	117
• $I_{max}$	A	64	76	90	124	150
<b>Type rating <sup>1)</sup></b>						
• Based on $I_{rated}$	kW (hp)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
• Based on $I_H$	kW (hp)	15 (20)	18.5 (30)	22 (30)	30 (50)	37 (60)
<b>Rated pulse frequency</b>	kHz	4	4	4	4	4
<b>Power loss</b>	kW	0.38	0.51	0.69	0.99	1.21
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.022 (0.8)	0.022 (0.8)	0.039 (1.4)	0.022 (0.8)	0.039 (1.4)
<b>Sound pressure level</b> $L_{pA}$ (1 m)	dB	<60	<60	<61	<60	<62
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0	1.0	1.0
<b>Rated input current <sup>2)</sup></b> with/without line reactor	A	40/46	47/53	63/72	78/88	94/105
<b>Resistance value</b> of the external braking resistor	Ω	≥27	≥27	≥27	≥15	≥15
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35	10 ... 35	10 ... 35
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35	10 ... 35	10 ... 35
<b>Motor connection</b> U2, V2, W2		M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud	M6 screw stud
• Conductor cross-section	mm <sup>2</sup>	10 ... 35	10 ... 35	10 ... 35	10 ... 35	10 ... 35
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Motor cable length <sup>3)</sup>, max.</b>						
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>						
• Width	mm (in)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)	275 (10.83)
• Height, PM340 without/with int. filter	mm (in)	418.3/511 (16.47/20.12)	418.3/511 (16.47/20.12)	418.3/511 (16.47/20.12)	498.3/633 (19.62/24.92)	498.3/633 (19.62/24.92)
• Depth						
- PM340	mm (in)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)	203.5 (8.01)
- PM340 with CU305 PN	mm (in)	274.5 (10.81)	274.5 (10.81)	274.5 (10.81)	274.5 (10.81)	274.5 (10.81)
- PM340 with CU305 DP/CAN	mm (in)	258.5 (10.18)	258.5 (10.18)	258.5 (10.18)	258.5 (10.18)	258.5 (10.18)
<b>Frame size</b>		FSD	FSD	FSD	FSE	FSE
<b>Weight, approx.</b> PM340 without/with int. filter	kg (lb)	15.9/19.3 (35/43)	15.9/19.3 (35/43)	15.9/19.3 (35/43)	19.8/27.1 (44/60)	19.8/27.1 (44/60)

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

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

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### PM340 Power Modules in blocksize format

#### Technical specifications

Line voltage 380 ... 480 V 3 AC	Air-cooled PM340 Power Module in blocksize format			
		6SL3210-1SE31-1...	6SL3210-1SE31-5...	6SL3210-1SE31-8...
<b>Output current</b>				
• Rated current $I_{rated}$	A	110	145	178
• Base-load current $I_H$	A	95	115	155
• For S6 duty (40 %) $I_{S6}$	A	143	188	231
• $I_{max}$	A	180	220	290
<b>Type rating <sup>1)</sup></b>				
• Based on $I_{rated}$	kW (hp)	55 (75)	75 (100)	90 (125)
• Based on $I_H$	kW (hp)	45 (60)	55 (75)	75 (100)
<b>Rated pulse frequency</b>	kHz	4	4	4
<b>Power loss</b>	kW	1.42	1.93	2.31
<b>Cooling air requirement</b>	m <sup>3</sup> /s (ft <sup>3</sup> /s)	0.094 (3.3)	0.094 (3.3)	0.117 (4.1)
<b>Sound pressure level</b> $L_{pA}$ (1 m)	dB	<60	<60	<65
<b>24 V DC power supply</b> for the Control Unit	A	1.0	1.0	1.0
<b>Rated input current <sup>2)</sup></b> with/without line reactor	A	115/129	151/168	186/204
<b>Resistance value</b> of the external braking resistor	Ω	≥8.2	≥8.2	≥8.2
<b>Cable length</b> to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)
<b>Line supply connection</b> U1/L1, V1/L2, W1/L3		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm <sup>2</sup>	120	120	120
<b>DC link connection, connection for braking resistor</b> DCP/R1, DCN, R2		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm <sup>2</sup>	120	120	120
<b>Motor connection</b> U2, V2, W2		M8 screw stud	M8 screw stud	M8 screw stud
• Conductor cross-section, max.	mm <sup>2</sup>	120	120	120
<b>PE connection</b>		M8 screw	M8 screw	M8 screw
<b>Motor cable length <sup>3)</sup>, max.</b>				
• Shielded	m (ft)	70 (230)	70 (230)	70 (230)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)
<b>Degree of protection</b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	350 (13.78)	350 (13.78)	350 (13.78)
• Height, PM340 without/with int. filter	mm (in)	634/934 (24.96/36.77)	634/934 (24.96/36.77)	634/934 (24.96/36.77)
• Depth				
- PM340	mm (in)	315.5 (12.42)	315.5 (12.42)	315.5 (12.42)
- PM340 with CU305 PN	mm (in)	386.5 (15.22)	386.5 (15.22)	386.5 (15.22)
- PM340 with CU305 DP/CAN	mm (in)	370.5 (14.59)	370.5 (14.59)	370.5 (14.59)
<b>Frame size</b>		FSF	FSF	FSF
<b>Weight, approx.</b> PM340 without/with int. filter	kg (lb)	50.7/66.7 (112/147)	50.7/66.7 (112/147)	50.7/66.7 (112/147)

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

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

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

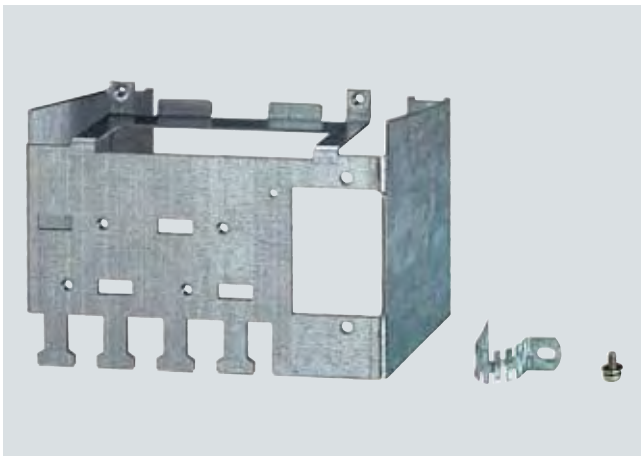
### PM340 Power Modules in blocksize format

#### Selection and ordering data

Rated output current	Type rating	Frame size	Air-cooled PM340 Power Module in blocksize format <b>without</b> line filter	Air-cooled PM340 Power Module in blocksize format <b>with</b> integrated line filter
			Order No.	Order No.
A	kW (hp)			
<b>Line voltage 200 ... 240 V 1 AC</b>				
0.9	0.12 (0.16)	FSA	<b>6SL3210-1SB11-0UA0</b>	<b>6SL3210-1SB11-0AA0</b>
2.3	0.37 (0.5)		<b>6SL3210-1SB12-3UA0</b>	<b>6SL3210-1SB12-3AA0</b>
3.9	0.75 (0.75)		<b>6SL3210-1SB14-0UA0</b>	<b>6SL3210-1SB14-0AA0</b>
<b>Line voltage 380 ... 480 V 3 AC</b>				
1.3	0.37 (0.5)	FSA	<b>6SL3210-1SE11-3UA0</b>	—
1.7	0.55 (0.75)		<b>6SL3210-1SE11-7UA0</b>	—
2.2	0.75 (1.0)		<b>6SL3210-1SE12-2UA0</b>	—
3.1	1.1 (1.5)		<b>6SL3210-1SE13-1UA0</b>	—
4.1	1.5 (2.0)		<b>6SL3210-1SE14-1UA0</b>	—
5.9	2.2 (3.0)	FSB	<b>6SL3210-1SE16-0UA0</b>	<b>6SL3210-1SE16-0AA0</b>
7.7	3 (5)		<b>6SL3210-1SE17-7UA0</b>	<b>6SL3210-1SE17-7AA0</b>
10.2	4 (5)		<b>6SL3210-1SE21-0UA0</b>	<b>6SL3210-1SE21-0AA0</b>
18	7.5 (10)	FSC	<b>6SL3210-1SE21-8UA0</b>	<b>6SL3210-1SE21-8AA0</b>
25	11 (15)		<b>6SL3210-1SE22-5UA0</b>	<b>6SL3210-1SE22-5AA0</b>
32	15 (20)		<b>6SL3210-1SE23-2UA0</b>	<b>6SL3210-1SE23-2AA0</b>
38	18.5 (25)	FSD	<b>6SL3210-1SE23-8UA0</b>	<b>6SL3210-1SE23-8AA0</b>
45	22 (30)		<b>6SL3210-1SE24-5UA0</b>	<b>6SL3210-1SE24-5AA0</b>
60	30 (40)		<b>6SL3210-1SE26-0UA0</b>	<b>6SL3210-1SE26-0AA0</b>
75	37 (50)	FSE	<b>6SL3210-1SE27-5UA0</b>	<b>6SL3210-1SE27-5AA0</b>
90	45 (60)		<b>6SL3210-1SE31-0UA0</b>	<b>6SL3210-1SE31-0AA0</b>
110	55 (75)	FSF	<b>6SL3210-1SE31-1UA0</b>	<b>6SL3210-1SE31-1AA0</b>
145	75 (100)		<b>6SL3210-1SE31-5UA0</b>	<b>6SL3210-1SE31-5AA0</b>
178	90 (125)		<b>6SL3210-1SE31-8UA0</b>	<b>6SL3210-1SE31-8AA0</b>

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#### Accessories



Example of shield connection kit for PM340 Power Module, frame size FSB

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

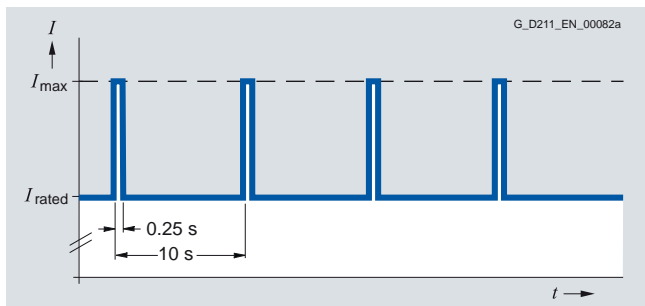
# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

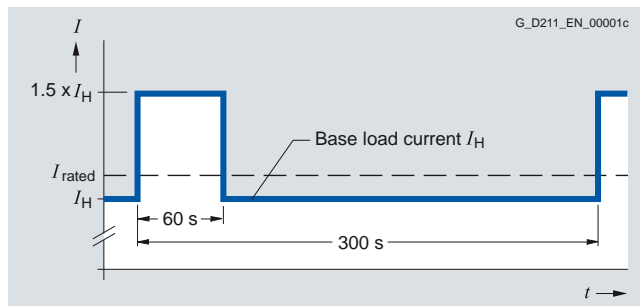
### PM340 Power Modules in blocksize format

#### Characteristic curves

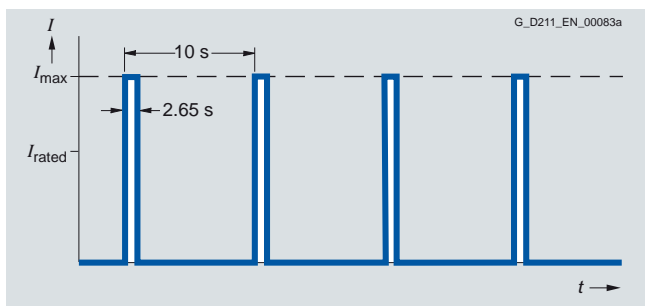
##### Overload capability



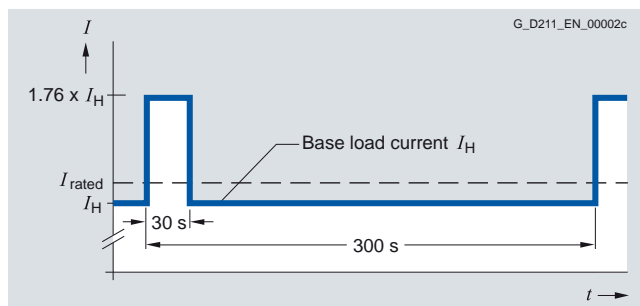
Duty cycle with initial load



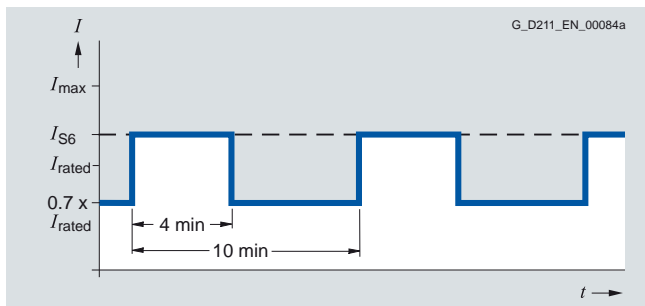
Duty cycle with 60 s overload with a duty cycle duration of 300 s



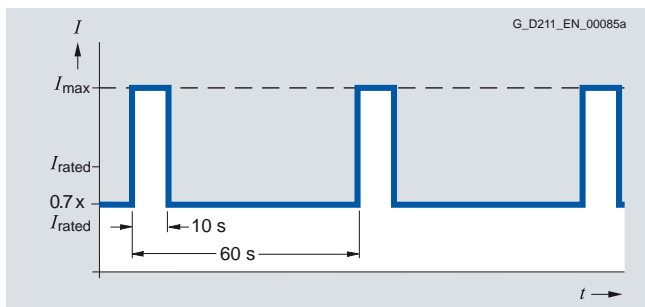
Duty cycle without initial load



Duty cycle with 30 s overload with a duty cycle duration of 300 s



S6 duty cycle with initial load with a duty cycle duration of 600 s



S6 duty cycle with initial load with a duty cycle duration of 60 s

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# SINAMICS S110 servo drives

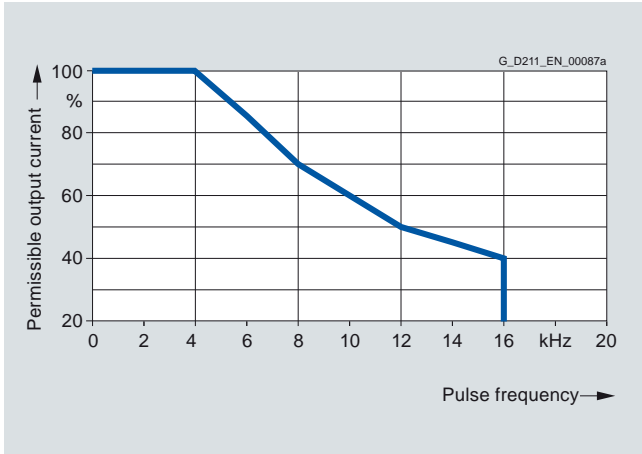
0.12 kW to 90 kW (0.16 hp to 125 hp)

PM340 Power Modules in blocksize format

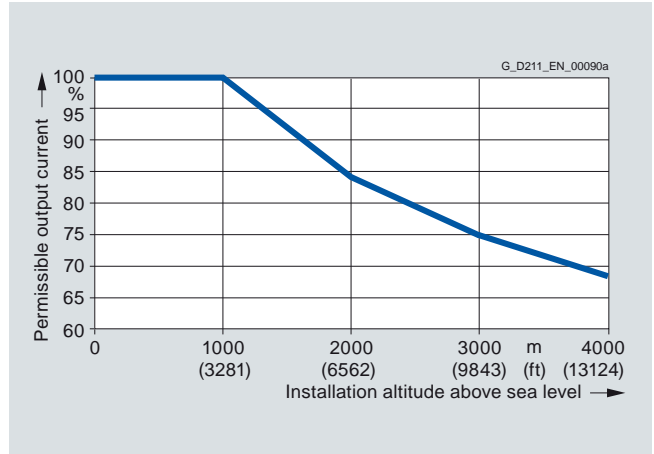
## Characteristic curves

### Derating characteristics

- Frame sizes FSA to FSE

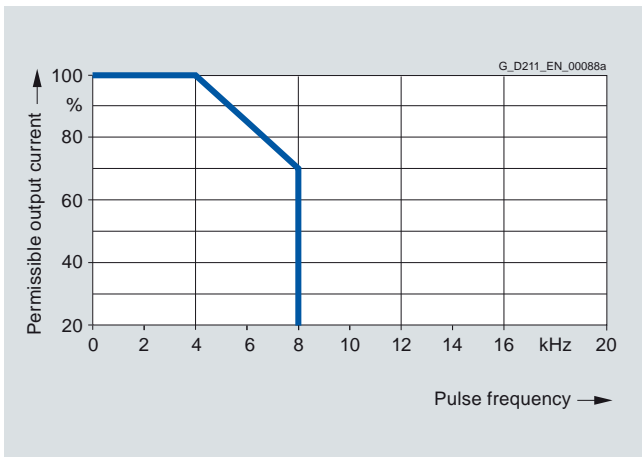


Output current as a function of pulse frequency

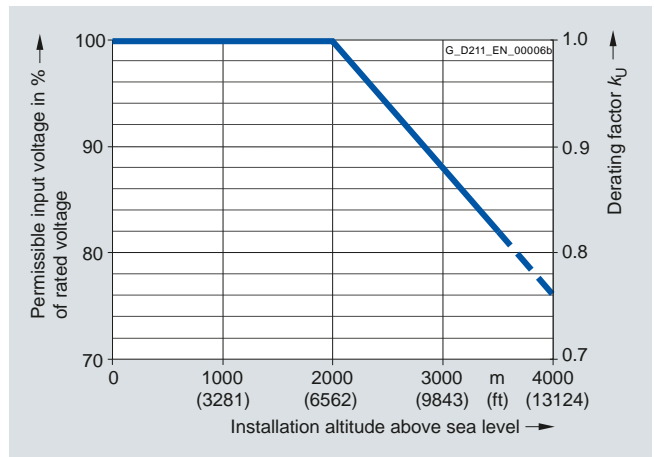


Output current as a function of installation altitude

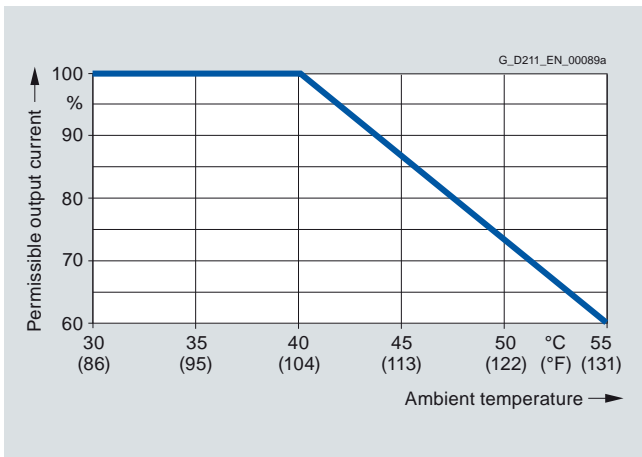
- Frame sizes FSF



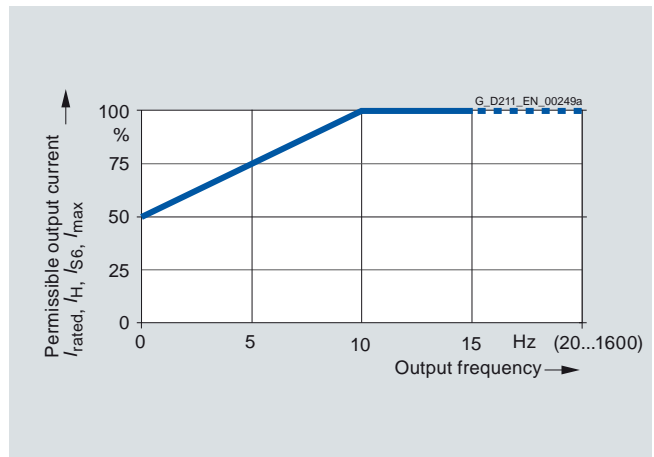
Output current as a function of pulse frequency



Voltage derating as a function of installation altitude



Output current as a function of ambient temperature



Output current as a function of output frequency

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

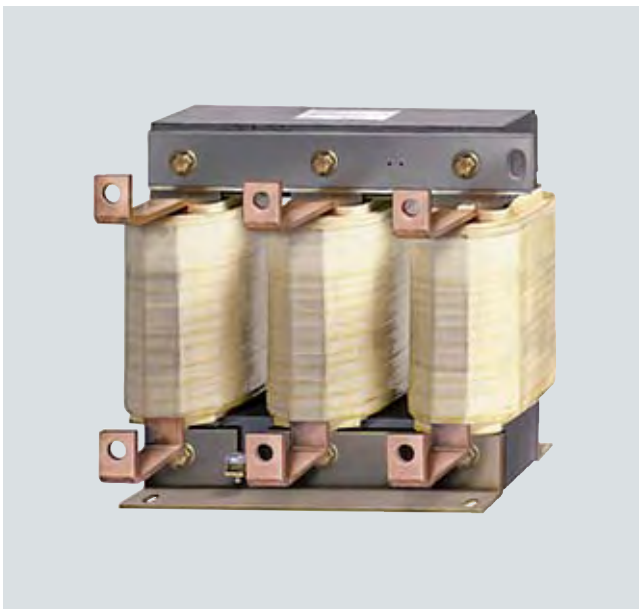
### Line-side components

#### Line reactors

#### Overview



Line reactors for PM340 Power Modules, frame sizes FSA to FSE



Line reactor for PM340 Power Modules, frame size FSF

Line reactors limit the low-frequency harmonic effects and reduce the load on the other loads in the same supply system. In addition, the line reactors limit the current spikes at the converter input, e.g. for commutation notches. It is recommended to use the line reactors in combination with unfiltered PM340 Power Modules and line voltages with a high harmonic content (industrial networks).

#### Integration

The line reactors for PM340 Power Modules of frame sizes FSA to FSE are designed as base components. The line reactor is attached to the mounting surface and the Power Module is mounted directly on the line reactor. The cables to the Power Module are already connected at the line reactor.

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



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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

Line-side components  
Line reactors

### Technical specifications

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

Line voltage 380 ... 480 V 3 AC		Line reactor					
		6SE6400-3CC00-2AD3	6SE6400-3CC00-4AD3	6SE6400-3CC00-6AD3	6SL3203-0CD21-0AA0	6SL3203-0CD21-4AA0	6SL3203-0CD22-2AA0
<b>Rated current</b>	A	1.9	3.5	4.8	9	11.6	25
<b>Power loss</b> at 50/60 Hz	W	6/7	12,5/15	7,5/9	9/11	27/32	98/118
<b>Line supply connection</b> U1, V1, W1		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6	6	6	6
<b>Load connection</b>		Cable	Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	3 × AWG16 (1.5 mm <sup>2</sup> )	4 × AGW10 (2.5 mm <sup>2</sup> )
• Length, approx.	m (ft)	0.38 (1.25)	0.38 (1.25)	0.38 (1.25)	0.46 (1.51)	0.46 (1.51)	0.49 (1.61)
<b>PE connection</b>		M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud
<b>Degree of protection <sup>1)</sup></b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Dimensions</b>							
• Width	mm (in)	75.5 (2.97)	75.5 (2.97)	75.5 (2.97)	153 (6.02)	153 (6.02)	190 (7.48)
• Height	mm (in)	201 (7.91)	201 (7.91)	201 (7.91)	270 (10.63)	270 (10.63)	336 (13.23)
• Depth	mm (in)	50 (1.97)	50 (1.97)	50 (1.97)	70 (2.76)	70 (2.76)	50 (1.97)
<b>Weight, approx.</b>	kg (lb)	1.2 (3)	1.3 (3)	1.3 (3)	3.4 (7.50)	3.4 (7.50)	6.3 (14)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated output current)	6SL3210-1SE11-3... (1.3 A) 6SL3210-1SE11-7... (1.7 A)	6SL3210-1SE12-2... (2.2 A) 6SL3210-1SE13-1... (3.1 A)	6SL3210-1SE14-1... (4.1 A)	6SL3210-1SE16-0... (5.9 A) 6SL3210-1SE17-7... (7.7 A)	6SL3210-1SE21-0... (10 A)	6SL3210-1SE21-8... (18 A) 6SL3210-1SE22-5... (25 A)

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Line-side components

#### Line reactors

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Line reactor					
		6SL3203-0CD23-5AA0	6SL3203-0CJ24-5AA0	6SL3203-0CD25-3AA0	6SL3203-0CJ28-6AA0	6SE6400-3CC11-2FD0	6SE6400-3CC11-7FD0
<b>Rated current</b>	A	33	47	63	94	151	186
<b>Power loss</b> at 50/60 Hz	W	37/44	90/115	90/115	170/215	280/360	280/360
<b>Line supply connection</b> U1, V1, W1		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section	mm <sup>2</sup>	16	16	16	50	–	–
<b>Load connection</b>		Cable	Cable	Cable	Cable	Flat connector for M10 screw	Flat connector for M10 screw
• Conductor cross-section		4 × AWG10 (2.5 mm <sup>2</sup> )	4 × 16 mm <sup>2</sup>	4 × 16 mm <sup>2</sup>	4 × 35 mm <sup>2</sup>	–	–
• Length, approx.	m (ft)	0.49 (1.61)	0.7 (2.30)	0.7 (2.30)	0.7 (2.30)		
<b>PE connection</b>		M5 screw stud	M8 screw	M8 screw	M8 screw	M8 screw stud	M8 screw stud
<b>Degree of protection <sup>1)</sup></b>		IP20	IP20	IP20	IP20	IP00	IP00
<b>Dimensions</b>							
• Width	mm (in)	190 (7.48)	275 (10.83)	275 (10.83)	275 (10.83)	240 (9.45)	240 (9.45)
• Height	mm (in)	336 (13.23)	455 (17.91)	455 (17.91)	577 (22.72)	228 (8.98)	228 (8.98)
• Depth	mm (in)	50 (1.97)	83.5 (3.29)	83.5 (3.29)	93.5 (3.68)	141 (5.55)	141 (5.55)
<b>Weight, approx.</b>	kg (lb)	6.4 (14)	13 (29)	13 (29)	19 (42)	25 (55)	25 (55)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated output current)	6SL3210-1SE23-2... (32 A)	6SL3210-1SE23-8... (38 A) 6SL3210-1SE24-5... (45 A)	6SL3210-1SE26-0... (60 A)	6SL3210-1SE27-5... (75 A) 6SL3210-1SE31-0... (90 A)	6SL3210-1SE31-1... (110 A) 6SL3210-1SE31-5... (145 A)	6SL3210-1SE31-8... (178 A)

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

Line-side components  
Line reactors

### Selection and ordering data

Rated output current A	Type rating kW (hp)	Suitable for Power Module in blocksize format		Line reactor
		Type	Frame size	Order No.
<b>Line voltage 200 ... 240 V 1 AC</b>				
0.9	0.12 (0.16)	6SL3210-1SB11-0...	FSA	<b>6SE6400-3CC00-4AB3</b>
2.3	0.37 (0.5)	6SL3210-1SB12-3...		
3.9	0.75 (0.75)	6SL3210-1SB14-0...	FSA	<b>6SE6400-3CC01-0AB3</b>
<b>Line voltage 380 ... 480 V 3 AC</b>				
1.3	0.37 (0.5)	6SL3210-1SE11-3UA0	FSA	<b>6SE6400-3CC00-2AD3</b>
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1.0)	6SL3210-1SE12-2UA0	FSA	<b>6SE6400-3CC00-4AD3</b>
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2.0)	6SL3210-1SE14-1UA0	FSA	<b>6SE6400-3CC00-6AD3</b>
5.9	2.2 (3.0)	6SL3210-1SE16-0...	FSB	<b>6SL3203-0CD21-0AA0</b>
7.7	3 (5)	6SL3210-1SE17-7...		
10	4 (5)	6SL3210-1SE21-0...	FSB	<b>6SL3203-0CD21-4AA0</b>
18	7.5 (10)	6SL3210-1SE21-8...	FSC	<b>6SL3203-0CD22-2AA0</b>
25	11 (15)	6SL3210-1SE22-5...		
32	15 (20)	6SL3210-1SE23-2...	FSC	<b>6SL3203-0CD23-5AA0</b>
38	18.5 (25)	6SL3210-1SE23-8...	FSD	<b>6SL3203-0CJ24-5AA0</b>
45	22 (30)	6SL3210-1SE24-5...		
60	30 (40)	6SL3210-1SE26-0...	FSD	<b>6SL3203-0CD25-3AA0</b>
75	37 (50)	6SL3210-1SE27-5...	FSE	<b>6SL3203-0CJ28-6AA0</b>
90	45 (60)	6SL3210-1SE31-0...		
110	55 (75)	6SL3210-1SE31-1...	FSF	<b>6SE6400-3CC11-2FD0</b>
145	75 (100)	6SL3210-1SE31-5...		
178	90 (125)	6SL3210-1SE31-8...	FSF	<b>6SE6400-3CC11-7FD0</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Line-side components

#### Line filter

#### Overview



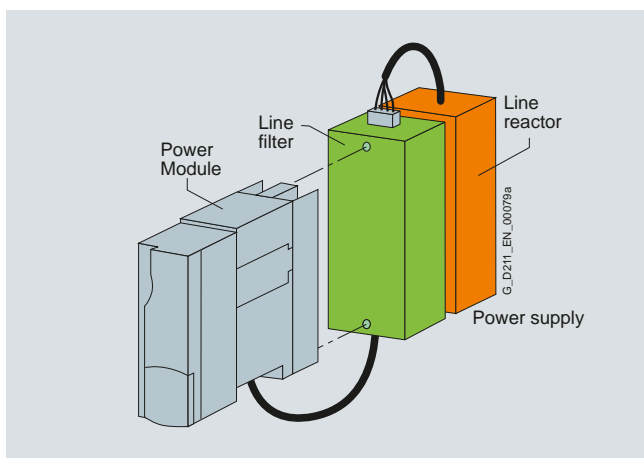
In plants with strict EMC requirements, the line filter for frame size FSA restricts the conducted interference emanating from the PM340 Power Module to the limit values of Category C2 as defined in EN 61800-3. The line filter is suited only for direct connection to TN (grounded) systems.

#### Note:

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

#### Integration

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



#### Technical specifications

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

#### Selection and ordering data

Suitable for Power Modules in blocksize format Frame size FSA	<b>Line filter</b>
Type	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>	
6SL3210-1SE11-... 6SL3210-1SE12-... 6SL3210-1SE13-... 6SL3210-1SE14-...	<b>6SE6400-2FA00-6AD0</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

Line-side components  
Recommended line-side power components

### Selection and ordering data

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

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

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

Rated output current	Type rating	Suitable for Power Module in blocksize format	Line contactor	Circuit breaker	UL/CSA fuse, Class J		
			Type	IEC 60947 and UL489/CSA C22.2 No. 5-02	Available from: Ferraz Shawmut <a href="http://www.ferrazshawmut.com">www.ferrazshawmut.com</a>	Rated current	Size d × l mm
A	kW (hp)	Type 6SL3210-...	Type	Order No.			
<b>Line voltage 200 ... 240 V 1 AC</b>							
0.9	0.12 (0.16)	1SB11-0...	<b>5TT57...</b>	<b>5SJ4206-7HG41</b>	6 A	21 × 57	AJT6
2.3	0.37 (0.5)	1SB12-3...	<b>5TT57...</b>	<b>5SJ4210-7HG41</b>	10 A	21 × 57	AJT10
3.9	0.75 (0.75)	1SB14-0...	<b>5TT57...</b>	<b>5SJ4216-7HG41</b>	15 A	21 × 57	AJT15

Rated output current	Type rating	Suitable for Power Module in blocksize format	Line contactor	Circuit breaker	Main switch
			Type	IEC 60947	Order No.
A	kW (hp)	Type 6SL3210-...	Type	Order No.	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>					
1.3	0.37 (0.5)	1SE11-3UA0	<b>3RT1015-...</b>	<b>3RV1021-1DA10</b>	<b>3LD2003-1TP51</b>
1.7	0.55 (0.75)	1SE11-7UA0	<b>3RT1015-...</b>	<b>3RV1021-1DA10</b>	<b>3LD2003-1TP51</b>
2.2	0.75 (1.0)	1SE12-2UA0	<b>3RT1015-...</b>	<b>3RV1021-1FA10</b>	<b>3LD2003-1TP51</b>
3.1	1.1 (1.5)	1SE13-1UA0	<b>3RT1015-...</b>	<b>3RV1021-1GA10</b>	<b>3LD2003-1TP51</b>
4.1	1.5 (2.0)	1SE14-1UA0	<b>3RT1015-...</b>	<b>3RV1021-1HA10</b>	<b>3LD2003-1TP51</b>
5.9	2.2 (3.0)	1SE16-0...	<b>3RT1015-...</b>	<b>3RV1021-1KA10</b>	<b>3LD2003-1TP51</b>
7.7	3 (5)	1SE17-7...	<b>3RT1015-...</b>	<b>3RV1021-4AA10</b>	<b>3LD2003-1TP51</b>
10	4 (5)	1SE21-0...	<b>3RT1016-...</b>	<b>3RV1021-4BA10</b>	<b>3LD2103-1TP51</b>
18	7.5 (10)	1SE21-8...	<b>3RT1025-...</b>	<b>3RV1031-4EA10</b>	<b>3LD2203-0TK51</b>
25	11 (15)	1SE22-5...	<b>3RT1026-...</b>	<b>3RV1031-4FA10</b>	<b>3LD2504-0TK51</b>
32	15 (20)	1SE23-2...	<b>3RT1034-...</b>	<b>3RV1031-4HA10</b>	<b>3LD2504-0TK51</b>
38	18.5 (25)	1SE23-8...	<b>3RT1035-...</b>	<b>3RV1042-4JA10</b>	<b>3LD2504-0TK51</b>
45	22 (30)	1SE24-5...	<b>3RT1036-...</b>	<b>3RV1042-4KA10</b>	<b>3LD2504-0TK51</b>
60	30 (40)	1SE26-0...	<b>3RT1044-...</b>	<b>3RV1042-4MA10</b>	<b>3LD2704-0TK51</b>
75	37 (50)	1SE27-5...	<b>3RT1045-...</b>	<b>3VL1712-1DD33-....</b>	<b>3LD2704-0TK51</b>
90	45 (60)	1SE31-0...	<b>3RT1046-...</b>	<b>3VL1716-1DD33-....</b>	<b>3LD2804-0TK51</b>
110	55 (75)	1SE31-1...	<b>3RT1054-...</b>	<b>3VL3720-1DC36-....</b>	<b>3KA5330-1GE01</b>
145	75 (100)	1SE31-5...	<b>3RT1056-...</b>	<b>3VL3720-1DC36-....</b>	<b>3KA5530-1GE01</b>
178	90 (125)	1SE31-8...	<b>3RT1064-...</b>	<b>3VL4725-1DC36-....</b>	<b>3KA5530-1GE01</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Line-side components Recommended line-side power components

#### Selection and ordering data

Rated output current A	Type rating kW (hp)	Suitable for Power Module in blocksize format Type 6SL3210-...	Fuse switch disconnect	Switch disconnect with fuse holders	Fuse <sup>1)</sup>	UL/CSA fuse, Class J <sup>2)</sup>		
			Order No.	Order No.	Order No.	Rated current	Size d × l mm	Reference No.
<b>Line voltage 380 ... 480 V 3 AC</b>								
1.3	0.37 (0.5)	1SE11-3UA0	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3804</b>	4 A	21 × 57	AJT4
1.7	0.55 (0.75)	1SE11-7UA0	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3804</b>	4 A	21 × 57	AJT4
2.2	0.75 (1.0)	1SE12-2UA0	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3801</b>	6 A	21 × 57	AJT6
3.1	1.1 (1.5)	1SE13-1UA0	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3803</b>	8 A	21 × 57	AJT8
4.1	1.5 (2.0)	1SE14-1UA0	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3803</b>	10 A	21 × 57	AJT10
5.9	2.2 (3.0)	1SE16-0...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3803</b>	10 A	21 × 57	AJT10
7.7	3 (5)	1SE17-7...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3805</b>	12 A	21 × 57	AJT12
10	4 (5)	1SE21-0...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3805</b>	15 A	21 × 57	AJT15
18	7.5 (10)	1SE21-8...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3810</b>	25 A	21 × 57	AJT25
25	11 (15)	1SE22-5...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3814</b>	35 A	27 × 60	AJT35
32	15 (20)	1SE23-2...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3817</b>	45 A	27 × 60	AJT45
38	18.5 (25)	1SE23-8...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3820</b>	50 A	27 × 60	AJT50
45	22 (30)	1SE24-5...	<b>3NP1123-1CA20</b>	<b>3KL5030-1GB01</b>	<b>3NA3822</b>	60 A	27 × 60	AJT60
60	30 (40)	1SE26-0...	<b>3NP1123-1CA20</b>	<b>3KL5230-1GB01</b>	<b>3NA3824</b>	90 A	29 × 117	AJT90
75	37 (50)	1SE27-5...	<b>3NP1123-1CA20</b>	<b>3KL5230-1GB01</b>	<b>3NA3830</b>	100 A	29 × 117	AJT100
90	45 (60)	1SE31-0...	<b>3NP1133-1CA20</b>	<b>3KL5230-1GB01</b>	<b>3NA3832</b>	125 A	41 × 146	AJT125
110	55 (75)	1SE31-1...	<b>3NP1133-1CA20</b>	<b>3KL5330-1GB01</b>	<b>3NA3836</b>	150 A	41 × 146	AJT150
145	75 (100)	1SE31-5...	<b>3NP1143-1DA10</b>	<b>3KL5530-1GB01</b>	<b>3NA3140</b>	200 A	41 × 146	AJT200
178	90 (125)	1SE31-8...	<b>3NP1143-1DA10</b>	<b>3KL5530-1GB01</b>	<b>3NA3144</b>	250 A	54 × 181	AJT250

<sup>1)</sup> Can also be protected by semiconductor protection or device protection fuses of type 3NE, and the switch disconnecter appropriate for the fuse.

<sup>2)</sup> Not suitable for 3NP and 3KL switch disconnectors.



# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### DC link components

#### Braking resistors

### Overview



Braking resistor for blocksize format, frame sizes FSA and FSC

The PM340 Power Modules cannot regenerate energy into the line supply. For regenerative operation, e.g. the braking of a rotating mass, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistor is connected at terminals DCP/R1 and R2.

The braking resistors can be installed at the side next to the PM340 Power Modules. The braking resistors for the FSA and FSB frame sizes are designed as base components. If the PM340 Power Modules of the FSA or FSB frame sizes are operated without line reactor, the braking resistors can also be installed under the Power Modules.

The braking resistors for the Power Modules of the FSC to FSF frame sizes should be placed outside the control cabinet or the switchgear room in order to direct the resulting heat loss away from the Power Modules, thereby allowing a corresponding reduction in the level of air conditioning required.

The braking resistors are designed with a temperature switch. The temperature switch must be evaluated to prevent consequential damage if the braking resistor overheats. This can be done, for example, via an input of the Control Unit while configuring a correspondent error.

### Selection and ordering data

Description	Suitable for Power Module in blocksize format	Braking resistor
		Order No.
<b>DC link voltage 240 ... 360 V DC (line voltage 200 ... 240 V 1 AC)</b>		
180 Ω	Frame size FSA	<b>6SE6400-4BC05-0AA0</b>
<b>DC link voltage 510 ... 720 V DC (line voltage 380 ... 480 V 3 AC)</b>		
390 Ω	Frame size FSA	<b>6SE6400-4BD11-0AA0</b>
160 Ω	Frame size FSB	<b>6SL3201-0BE12-0AA0</b>
56 Ω	Frame size FSC	<b>6SE6400-4BD16-5CA0</b>
27 Ω	Frame size FSD	<b>6SE6400-4BD21-2DA0</b>
15 Ω	Frame size FSE	<b>6SE6400-4BD22-2EA1</b>
8.2 Ω	Frame size FSF	<b>6SE6400-4BD24-0FA0</b>

### Technical specifications

DC link voltage 240 ... 360 V DC	Braking resistor
	6SE6400-4BC05-0AA0
<b>Resistance</b>	180 Ω
<b>Rated power <math>P_{DB}</math></b>	0.05 kW
<b>Peak power <math>P_{max}</math></b>	1 kW
<b>Degree of protection <sup>1)</sup></b>	IP20
<b>Power connections</b>	3 × 1.5 mm <sup>2</sup> (shielded)
• Length	0.5 m (1.64 ft)
<b>Thermostatic switch (NC contact)</b>	
• Switching capacity	250 V AC/max. 2.5 A
• Conductor cross-section	0.5 ... 2.5 mm <sup>2</sup>
<b>Dimensions</b>	
• Width	72 mm (2.83 in)
• Height	230 mm (9.06 in)
• Depth	43.5 mm (1.71 in)
<b>Weight, approx.</b>	1.0 kg (2.21 lb)
<b>Approvals, according to</b>	cURus
<b>Suitable for Power Module in blocksize format</b>	Frame size FSA

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

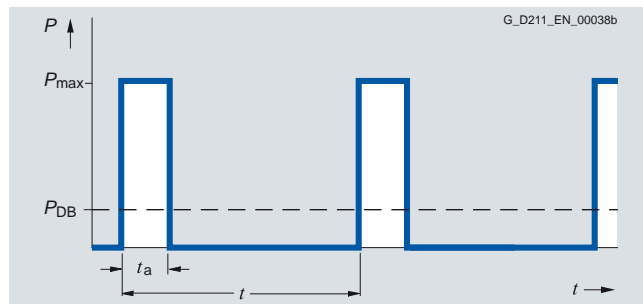
### DC link components

#### Braking resistors

#### Technical specifications

DC link voltage 510 V ... 720 V DC		Braking resistor					
		6SE6400-4BD11-0AA0	6SL3201-0BE12-0AA0	6SE6400-4BD16-5CA0	6SE6400-4BD21-2DA0	6SE6400-4BD22-2EA1	6SE6400-4BD24-0FA0
<b>Resistance</b>	Ω	390	160	56	27	15	8.2
<b>Rated power <math>P_{DB}</math></b>	kW	0.1	0.2	0.65	1.2	2.2	4.0
<b>Peak power <math>P_{max}</math></b>	kW	1.7	4.1	12	24	44	80
<b>Degree of protection <sup>1)</sup></b>		IP20	IP20	IP20	IP20	IP20	IP20
<b>Power connections</b>		3 × 1.5 mm <sup>2</sup> (shielded)	3 × 1.5 mm <sup>2</sup> (shielded)	3 × 1.5 mm <sup>2</sup> (shielded)	M6 screw stud	M6 screw stud	M6 screw stud
• Length	m (ft)	0.5 (1.64)	0.5 (1.64)	0.9 (2.95)	–	–	–
<b>Thermostatic switch (NC contact)</b>							
• Switching capacity		250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A	250 V AC/ max. 2.5 A
• Conductor cross-section	mm <sup>2</sup>	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5	0.5 ... 2.5
<b>Dimensions</b>							
• Width	mm (in)	72 (2.83)	153 (6.02)	185 (7.28)	270 (10.63)	301 (11.85)	400 (15.75)
• Height	mm (in)	230 (9.06)	329 (12.95)	285 (11.22)	515 (20.28)	483 (19.02)	650 (25.59)
• Depth	mm (in)	43.5 (1.71)	43.5 (1.71)	150 (5.91)	175 (6.89)	326 (12.83)	315 (12.4)
<b>Weight, approx.</b>	kg (lb)	1.0 (2.21)	1.6 (3.53)	3.8 (8.38)	7.4 (16.3)	10.6 (23.4)	16.7 (36.8)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Frame size	FSA	FSB	FSC	FSD	FSE	FSF

#### Characteristic curves



Load diagram for braking resistors in blocksize format

$$t_a = 12 \text{ s}$$

$$t = 240 \text{ s}$$

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

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

Load-side power components  
Motor reactors

### Overview



Motor reactors for blocksize format

Motor reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents that place an additional load on the power unit when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

The motor reactors are designed for a pulse frequency of 4 kHz. Higher pulse frequencies are not permissible.

The motor reactor must be installed as close as possible to the Power Module.

### Technical specifications

Line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)		
		6SE6400-3TC00-4AD2	6SL3202-0AE21-0CA0	6SL3202-0AJ23-2CA0
<b>Rated current</b>	A	4.5	10	32
<b>Rated inductance</b>	mH	2	1.24	0.33
<b>Power loss</b>	kW	0.005	0.02	0.06
<b>Connection to the Power Module</b>		Cable 4 × AWG16 (1.5 mm <sup>2</sup> )	Cable 4 × AWG14 (1.5 mm <sup>2</sup> )	Cable 4 × 6 mm <sup>2</sup>
• Length, approx.	m (ft)	0.3 (0.98)	0.4 (1.31)	0.35 (1.15)
<b>Motor connection</b>		Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup>	6	6	6
<b>PE connection</b>		M5 screw stud	M5 screw stud	M5 screw stud
<b>Cable length</b> between motor reactor and motor, max.				
• Shielded	m (ft)	100 (328)	100 (328)	100 (328)
• Unshielded	m (ft)	150 (492)	150 (492)	150 (492)
<b>Degree of protection <sup>1)</sup></b>		IP20	IP20	IP20
<b>Dimensions</b>				
• Width	mm (in)	75.5 (2.97)	153 (6.02)	189 (7.44)
• Height	mm (in)	201 (7.91)	285 (11.22)	351 (13.82)
• Depth	mm (in)	110 (4.33)	70 (2.76)	80 (3.15)
<b>Weight, approx.</b>	kg (lb)	2 (4.5)	4.5 (10)	9 (20)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated current)	6SL3210-1SE11-3UA0 (1.3 A) 6SL3210-1SE11-7UA0 (1.7 A) 6SL3210-1SE12-2UA0 (2.2 A) 6SL3210-1SE13-1UA0 (3.1 A) 6SL3210-1SE14-1UA0 (4.1 A)	6SL3210-1SE16-0 . A0 (5.9 A) 6SL3210-1SE17-7 . A0 (7.7 A) 6SL3210-1SE21-0 . A0 (10 A)	6SL3210-1SE21-8 . A0 (18 A) 6SL3210-1SE22-5 . A0 (25 A) 6SL3210-1SE23-2 . A0 (32 A)
• Frame size		FSA	FSB	FSC

<sup>1)</sup> With correctly connected connection cable to the Power Module.

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Load-side power components

#### Motor reactors

#### Technical specifications

Line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)				
		6SE6400-3TC05-4DD0	6SE6400-3TC03-8DD0	6SE6400-3TC05-4DD0	6SE6400-3TC08-0ED0	6SE6400-3TC07-5ED0
<b>Rated current</b>	A	68	45	68	104	90
<b>Rated inductance</b>	mH	0.232	0.82	0.232	0.111	0.3
<b>Power loss</b>	kW	0.2	0.2	0.2	0.17	0.27
<b>Connection to the Power Module</b>		Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw
<b>Motor connection</b>		Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw	Flat connector for M6 screw
<b>PE connection</b>		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
<b>Cable length</b> between motor reactor and motor, max.						
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
<b>Degree of protection</b>		IP00	IP00	IP00	IP00	IP00
<b>Dimensions</b>						
• Width	mm (in)	225 (8.86)	225 (8.86)	225 (8.86)	225 (8.86)	270 (10.63)
• Height	mm (in)	210 (8.27)	210 (8.27)	210 (8.27)	210 (8.27)	248 (9.76)
• Depth	mm (in)	140 (5.51)	140 (5.51)	140 (5.51)	140 (5.51)	189 (7.44)
<b>Weight, approx.</b>	kg (lb)	11.5 (25.4)	19 (42)	11.5 (25.4)	12 (26.5)	27 (59.5)
<b>Approvals, according to</b>		cURus	cURus	cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated current)	6SL3210-1SE23-8 . A0 (38 A)	6SL3210-1SE24-5 . A0 (45 A)	6SL3210-1SE26-0 . A0 (60 A)	6SL3210-1SE27-5 . A0 (75 A)	6SL3210-1SE31-0 . A0 (90 A)
• Frame size		FSD	FSD	FSD	FSE	FSE

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Line voltage 380 ... 480 V 3 AC		Motor reactor (for a 4 kHz pulse frequency)		
		6SE6400-3TC14-5FD0	6SE6400-3TC15-4FD0	6SE6400-3TC14-5FD0
<b>Rated current</b>	A	178	178	178
<b>Rated inductance</b>	mH	0.2	0.033	0.2
<b>Power loss</b>	kW	0.47	0.25	0.47
<b>Connection to the Power Module</b>		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
<b>Motor connection</b>		Flat connector for M8 screw	Flat connector for M8 screw	Flat connector for M8 screw
<b>PE connection</b>		M8 screw	M8 screw	M8 screw
<b>Cable length</b> between motor reactor and motor, max.				
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)
<b>Degree of protection</b>		IP00	IP00	IP00
<b>Dimensions</b>				
• Width	mm (in)	357 (14.06)	270 (10.63)	357 (14.06)
• Height	mm (in)	321 (12.64)	248 (9.76)	321 (12.64)
• Depth	mm (in)	221 (8.70)	189 (7.44)	221 (8.70)
<b>Weight, approx.</b>	kg (lb)	57 (126)	24 (53)	57 (126)
<b>Approvals, according to</b>		cURus	cURus	cURus
<b>Suitable for Power Module in blocksize format</b>	Type (rated current)	6SL3210-1SE31-1 . A0 (110 A)	6SL3210-1SE31-5 . A0 (145 A)	6SL3210-1SE31-8 . A0 (178 A)
• Frame size		FSF	FSF	FSF

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

Load-side power components  
Motor reactors

### Selection and ordering data

Rated output current of the Power Module A	Type rating of the Power Module kW (hp)	Suitable for Power Module in blocksize format		Motor reactor
		Type	Frame size	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>				
1.3	0.37 (0.5)	6SL3210-1SE11-3UA0	FSA	<b>6SE6400-3TC00-4AD2</b>
1.7	0.55 (0.75)	6SL3210-1SE11-7UA0		
2.2	0.75 (1.0)	6SL3210-1SE12-2UA0		
3.1	1.1 (1.5)	6SL3210-1SE13-1UA0		
4.1	1.5 (2.0)	6SL3210-1SE14-1UA0		
5.9	2.2 (3.0)	6SL3210-1SE16-0...	FSB	<b>6SL3202-0AE21-0CA0</b>
7.7	3 (5)	6SL3210-1SE17-7...		
10	4 (5)	6SL3210-1SE21-0...		
18	7.5 (10)	6SL3210-1SE21-8...	FSC	<b>6SL3202-0AJ23-2CA0</b>
25	11 (15)	6SL3210-1SE22-5...		
32	15 (20)	6SL3210-1SE23-2...		
38	18.5 (25)	6SL3210-1SE23-8...	FCD	<b>6SE6400-3TC05-4DD0</b>
45	22 (30)	6SL3210-1SE24-5...		<b>6SE6400-3TC03-8DD0</b>
60	30 (40)	6SL3210-1SE26-0...		<b>6SE6400-3TC05-4DD0</b>
75	37 (50)	6SL3210-1SE27-5...	FSE	<b>6SE6400-3TC08-0ED0</b>
90	45 (60)	6SL3210-1SE31-0...		<b>6SE6400-3TC07-5ED0</b>
110	55 (75)	6SL3210-1SE31-1...	FSF	<b>6SE6400-3TC14-5FD0</b>
145	75 (100)	6SL3210-1SE31-5...		<b>6SE6400-3TC15-4FD0</b>
178	90 (125)	6SL3210-1SE31-8...		<b>6SE6400-3TC14-5FD0</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Supplementary system components

#### BOP20 Basic Operator Panel

#### Overview



BOP20 Basic Operator Panel

The BOP20 Basic Operator Panel can be snapped onto any CU305 Control Unit and may be used to acknowledge faults, set parameters and read diagnostic information (e.g. alarm and fault messages).

#### Design

The BOP20 has a backlit two-line display area and 6 keys.

The integrated plug connector on the back of the BOP20 provides its power and establishes communication with the Control Unit.

#### Integration



CU305 Control Unit with attached BOP20 Basic Operator Panel

#### Selection and ordering data

Description	Order No.
<b>BOP20 Basic Operator Panel</b>	<b>6SL3055-0AA00-4BA0</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Supplementary system components

#### Intelligent Operator Panel IOP

## Overview



The Intelligent Operator Panel IOP is a very user-friendly and powerful operator panel for SINAMICS S110.

The IOP supports both entry-level personnel and drive experts. Thanks to the large plain text display, the menu-based operation and the application wizards, it is easy to commission the drive. A drive can be essentially commissioned without having to use a printed parameter list – as the parameters are displayed in plain text, and explanatory help texts and a parameter filtering function are provided.

The drives are easily controlled manually using directly assigned buttons and the navigation wheel. The IOP has a dedicated switchover button to switch from automatic to manual mode.

The converter can be diagnosed in a user-friendly fashion using the plain text display of faults and alarms. Help texts can be obtained by pressing the INFO button.

Up to 2 process values can be displayed graphically or numerically at the same time. Process values can also be displayed in technological units.

The IOP supports standard commissioning of identical drives. For this purpose, a parameter list can be copied from a converter into the IOP and downloaded into other drive units of the same type as required.

The IOP includes the following language packages: English, French, German, Italian and Spanish.

#### Note:

The IOP cannot be directly snapped onto the CU305 Control Unit. An adapter cable is required for operation.

#### Note:

The IOP cannot be used for commissioning SINAMICS S120.

### Updating the IOP

The IOP can be updated and expanded using the integrated USB interface.

Data to support future drive systems can be transferred from the PC to the IOP via drag & drop. Further, the USB interface allows user languages and wizards that will become available in the future to be subsequently downloaded and the firmware to be updated for the IOP.

The IOP is supplied with power via the USB interface during an update.

## Benefits

- Simple commissioning of standard applications using wizards, it is not necessary to know the parameter structure
- Diagnostics using plain text display; can be used locally on-site without documentation
- Direct manual operation of the drive; you can toggle between the automatic and manual modes
- Status display with freely selectable units; display of real physical values
- Intuitive navigation using a wheel – just like in everyday applications
- Graphic display with bar charts, e.g. for status values such as pressure or flowrate
- Commissioning without documentation using the integrated help function
- Standard commissioning using the clone function (parameter set data is saved for fast replacement)
- User-defined parameter list with a reduced number of self-selected parameters (to generate your own commissioning screens)
- 5 integrated languages
- Simple update of languages, wizards and firmware via USB

## Selection and ordering data

Description	Bestell-Nr.
<b>Intelligent Operator Panel IOP</b>	<b>6SL3255-0AA00-4JA0</b>
<b>IOP Handheld</b>	<b>6SL3255-0AA00-4HA0</b>
For use with SINAMICS S110, SINAMICS G120, SINAMICS G110D, SINAMICS G120D, SIMATIC ET 200S FC or SIMATIC ET 200pro FC Included in the scope of delivery: <ul style="list-style-type: none"> <li>• IOP</li> <li>• Handheld housing</li> <li>• Rechargeable batteries (4 × AA)</li> <li>• Charging unit (international)</li> <li>• RS232 connecting cable (3 m/9.84 ft long), can only be used for SINAMICS G120 and SIMATIC ET 200S FC)</li> <li>• USB cable (1 m/3.28 ft long)</li> </ul>	
<b>Door mounting kit</b>	<b>6SL3256-0AP00-4JA0</b>
IP54 degree of protection for mounting an operator panel in control cabinet doors with sheet steel thicknesses of 1 ... 3 mm (0.04 ... 0.12 in) IP54 degree of protection for IOP IP55 degree of protection for BOP-2 Included in the scope of delivery: <ul style="list-style-type: none"> <li>• Seal</li> <li>• Mounting material</li> <li>• Connecting cable (5 m/16.4 ft long)</li> </ul>	

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Supplementary system components

#### Safe Brake Relay

#### Overview



In the case of the Safe Brake Relay, the brake is controlled in accordance with EN 954-1 safety category 3 and IEC 61508 SIL2.

#### Design

The Safe Brake Relay can be installed below the Power Module on the shield connection plate.

The Safe Brake Relay has the following connections and interfaces:

- 1 two-channel transistor output stage to control the motor brake solenoid
- 1 connection for the cable harness (CTRL) to the Power Module in blocksize format
- 1 connection for the 24 V DC power supply

The connection between the 24 V DC supply and the Safe Brake Relay must be kept as short as possible.

The scope of delivery of a Safe Brake Relay includes the following:

- 2 cable harnesses for connecting to the CTRL socket of the PM340 Power Module
  - 0.32 m (1.05 ft) length for frame sizes FSA and FSC
  - 0.55 m (1.8 ft) length for frame sizes FSD and FSF

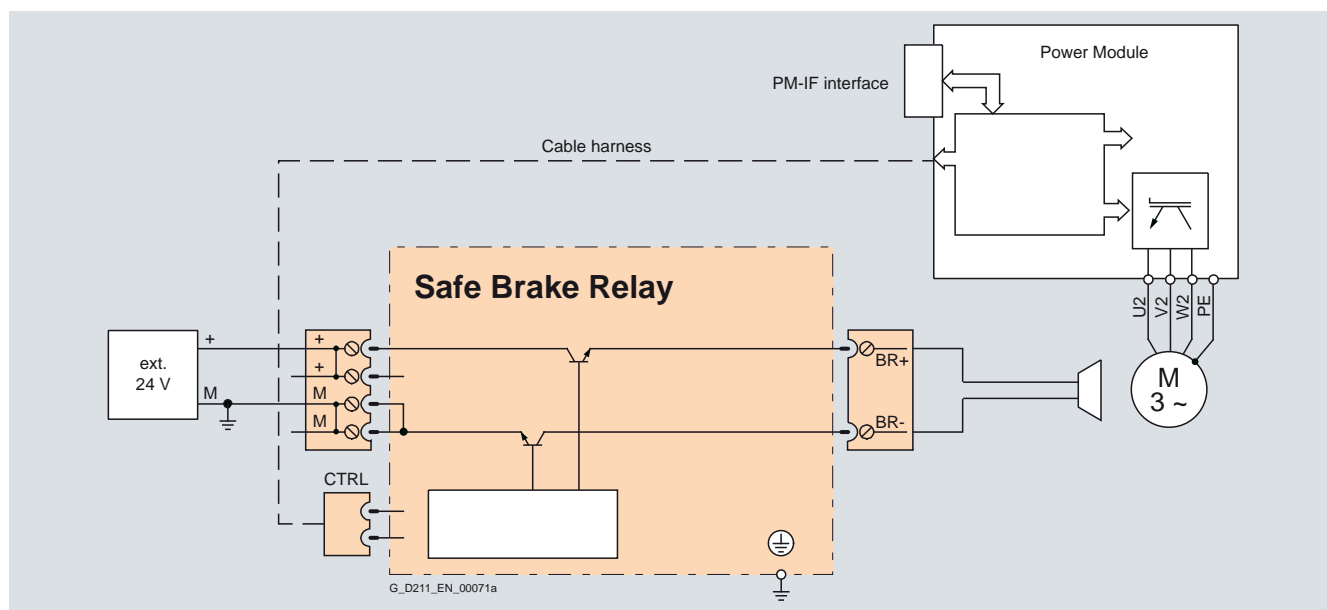
#### Technical specifications

<b>Safe Brake Relay</b> 6SL3252-0BB01-0AA0	
<b>Switching capability of the NO contact</b>	—
<b>Power supply</b>	20.4 ... 28.8 V DC Recommended rated supply voltage 26 V DC (to compensate for voltage drop in feeder cable to 24 V DC motor brake solenoid)
<b>Power requirement, max.</b>	
• Motor brake	2 A
• At 24 V DC	0.05 A + the current requirement of motor brake
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Dimensions</b>	
• Width	69 mm (2.72 in)
• Height	63 mm (2.48 in)
• Depth	33 mm (1.30 in)
<b>Weight, approx.</b>	0.17 kg (0.37 lb)

#### Selection and ordering data

Description	Order No.
<b>Safe Brake Relay</b> Including cable harness for connection to Power Module	<b>6SL3252-0BB01-0AA0</b>

#### Integration



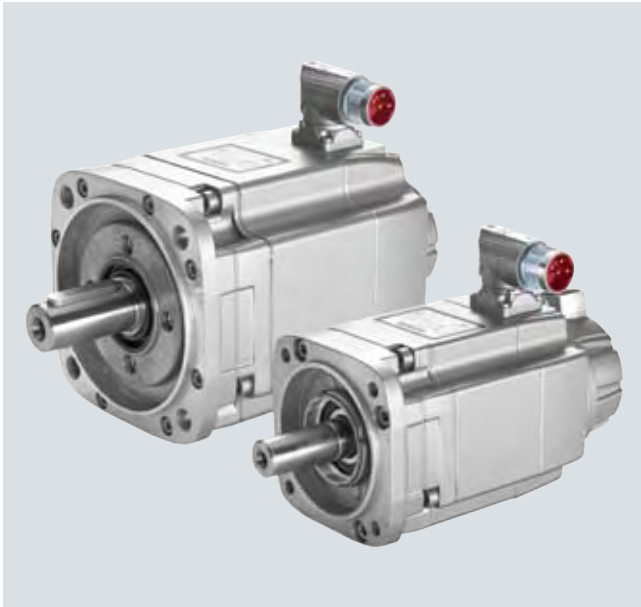
Connection example of Safe Brake Relay

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.



### Overview

#### Motors with DRIVE-CLiQ interface



DRIVE-CLiQ is the preferred method for connecting the encoder systems to SINAMICS S110.

Motors with DRIVE-CLiQ interface are available for this purpose, e.g.

- 1PH8/1FT7/1FK7 synchronous motors
- 1PH8 asynchronous (induction) motors

Motors with a DRIVE-CLiQ interface can be directly connected to the CU305 Control Unit via the available MOTION-CONNECT DRIVE-CLiQ cables. The connection of the MOTION-CONNECT DRIVE-CLiQ cable at the motor has degree of protection IP67.

The DRIVE-CLiQ interface supplies the motor encoder via the integrated 24 V DC supply and transfers the motor encoder and temperature signals and the electronic rating plate data, e.g. a unique identification number and rated data (voltage, current, torque) to the Control Unit. This means that for the various encoder types, e.g. resolvers or absolute encoders, different encoder cables with varying permissible lengths are now no longer a concern. Instead, just one cable type, MOTION-CONNECT DRIVE-CLiQ, can be used for all encoders.

Motors with a DRIVE-CLiQ interface simplify SINAMICS S110 commissioning and diagnostics, as the motor and encoder type are identified automatically and programmed error-free in the drive.

#### Motors without DRIVE-CLiQ interface

The cables for motor encoder and temperature signals of motors without DRIVE-CLiQ interface, as well as those of external encoders, must be connected via Sensor Modules. Sensor Modules Cabinet-Mounted are available in degree of protection IP20 for control cabinet installation, as well as Sensor Modules External-Mounted in degree of protection IP67.

Only one encoder system can be connected to each Sensor Module.

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Encoder system connection SMC10 Sensor Module Cabinet-Mounted

#### Overview



The SMC10 Sensor Module Cabinet-Mounted is utilized to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC10.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multi-pole resolver

#### Design

The SMC10 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection, including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/protective conductor connection

The status of the SMC10 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC10 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 standard mounting rail according to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC10 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Integration

SMC10 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical specifications

<b>SMC10 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5AA3</b>	
<b>Power requirement, max.</b> At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• 2-pole resolver</li> <li>• Multi-pole resolver</li> </ul>
• Excitation voltage, rms	4.1 V
• Excitation frequency	5 ... 10 kHz depending on the current controller clock cycle of the Motor Module or Power Module
• Transformation ratio	0.5
• Encoder frequency, max.	2 kHz (120000 rpm) depending on the number of resolver pole pairs and current controller clock cycle of the Motor Module or Power Module
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• Cable length to encoder, max.	130 m (427 ft)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.4 kg (0.88 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SMC10 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5AA3</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Encoder system connection SMC20 Sensor Module Cabinet-Mounted

#### Overview



The SMC20 Sensor Module Cabinet-Mounted is utilized to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC20.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos  $1 V_{pp}$
- Absolute encoder EnDat
- SSI encoder with incremental signals sin/cos  $1 V_{pp}$  (firmware version 2.4 and later)

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### Design

The SMC20 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection, including motor temperature detection (KTY84-130 or PTC) via SUB-D connector
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/protective conductor connection

The status of the SMC20 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC20 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 standard mounting rail according to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC20 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Integration

SMC20 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical specifications

<b>SMC20 Sensor Module Cabinet-Mounted</b> 6SL3055-0AA00-5BA3	
<b>Power requirement, max.</b> At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss, max.</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• Incremental encoder sin/cos <math>1 V_{pp}</math></li> <li>• Absolute encoder EnDat</li> <li>• SSI encoder with incremental signals sin/cos <math>1 V_{pp}</math> (firmware version 2.4 and later)</li> </ul>
• Encoder supply	5 V DC/0.35 A
• Encoder frequency incremental signals, max.	500 kHz
• Signal subdivision (interpolation), max.	16384 times (14 bit)
• SSI baud rate	100 kBaud
• Cable length to encoder, max.	100 m (328 ft)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.45 kg (1 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SMC20 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5BA3</b>

# SINAMICS S110 servo drives

## 0.12 kW to 90 kW (0.16 hp to 125 hp)

### Encoder system connection

#### SMC30 Sensor Module Cabinet-Mounted

#### Overview



The SMC30 Sensor Module Cabinet-Mounted is utilized to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

#### Design

The SMC30 Sensor Module Cabinet-Mounted features the following interfaces as standard:

- 1 DRIVE-CLiQ interface
- 1 encoder connection, including motor temperature detection (KTY84-130 or PTC) via SUB-D connector or terminals
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE/protective conductor connection

The status of the SMC30 Sensor Module Cabinet-Mounted is indicated using a multi-color LED.

The SMC30 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 standard mounting rail according to EN 60715 (IEC 60715).

The maximum encoder cable length between SMC30 modules and encoders is 100 m (328 ft). For HTL encoders, this length can be increased to 300 m (984 ft) if the A+/A- and B+/B- signals are evaluated and the power supply cable has a minimum cross section of 0.5 mm<sup>2</sup>.

The signal cable shield can be connected to the SMC30 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g., Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1.

#### Integration

SMC30 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

#### Technical specifications

<b>SMC30 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5CA2</b>	
<b>Power requirement, max.</b> At 24 V DC, not taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm <sup>2</sup>
• Fuse protection, max.	20 A
<b>Power loss</b>	10 W
<b>Encoders which can be evaluated</b>	<ul style="list-style-type: none"> <li>• Incremental encoder TTL/HTL</li> <li>• SSI encoder with TTL/HTL incremental signals</li> <li>• SSI encoder without incremental signals</li> </ul>
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBaud
• Limiting frequency	300 kHz
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) <sup>1)</sup>
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals <sup>1)</sup>
- SSI encoder	100 m (328 ft)
<b>PE connection</b>	M4 screw
<b>Dimensions</b>	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
<b>Weight, approx.</b>	0.45 kg (1 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

Description	Order No.
<b>SMC30 Sensor Module Cabinet-Mounted</b> Without DRIVE-CLiQ cable	<b>6SL3055-0AA00-5CA2</b>

<sup>1)</sup> Signal cables twisted in pairs and shielded.

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

# 10



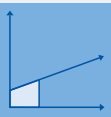
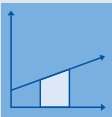
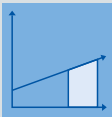
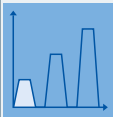
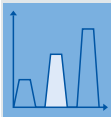
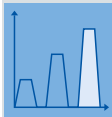

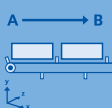
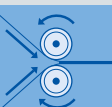

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# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

### Introduction

### Application

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

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

As part of the SINAMICS drive family, the SINAMICS S120 drive is a modular system for high-performance applications in machine and plant engineering. SINAMICS S120 offers high-performance single-axis and multi-axis (common DC bus) drives for a very broad range of industrial applications. Thanks to its

scalability and flexibility, SINAMICS S120 is the ideal system for satisfying the ever increasing demand for more axes and better performance. SINAMICS S120 supports flexible machine designs and speedy implementation of customized drive solutions.

### More information

You may also be interested in these inverters/converters:

- SINAMICS multi-axis system with energy compensation and regenerative feedback ⇒ SINAMICS S120 ([Catalog PM 21](#))
- Power range up to 1400 kW ⇒ SINAMICS S120 ([Catalog PM 21](#))
- Reduced functionality for applications with synchronous motors ⇒ SINAMICS S110 ([chapter 9](#))

# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

### SINAMICS S120 drive system

#### Overview

Thanks to its modular design, the SINAMICS S120 drive system can be perfectly adapted to a wide range of different drive tasks utilizing induction, servo, linear, and torque motors. The SINAMICS S120 modular components are computed on the Control Unit. Power units (Power Modules, Line Modules and Motor Modules) ensure an optimum conversion of energy between the supply system and motor. SINAMICS S120 is available in blocksize, booksize, booksize compact and chassis formats and offers optimum solutions both for simple single-axis drives as well as for demanding multi-axis drives.

SINAMICS S120 can be used in a number of applications. Typical examples are:

- Turning, milling and grinding machines
- Packaging machines
- Machines for producing food and beverages
- Printing and paper machines
- Textile machines
- Plastics processing machines
- Presses and punches
- Machines used in the wood, glass, and ceramics industries
- Assembly and testing equipment
- Handling equipment
- Rolling mill drives
- Vehicle and gearbox test stands
- Hoisting gear, cranes
- Plants and processing lines
- Test bays
- Renewable energy

#### SINAMICS S120 single-axis drives (AC/AC)

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



SINAMICS S120: PM340 Power Module in blocksize format with CU310-2 PN Control Unit

SINAMICS S120 Power Modules are single drives which are not capable of regenerating energy to the supply. Generated energy produced during braking can be converted to heat via braking resistors. Power Modules for SINAMICS S120 are available in the following formats and power ranges:

Format	Rated current (type rating)
Blocksize	0.9 ... 178 A (0.12 ... 90 kW/0.16 ... 125 hp)
Chassis	210 ... 490 A (110 ... 250 kW/150 ... 400 hp)

Essentially, SINAMICS S120 single-axis drives offer the following additional functions compared to SINAMICS S110:

- Higher power up to 250 kW (400 hp)
- Operation of linear and torque motors
- Motor and machine encoders can be evaluated simultaneously
- Flexible technology functionality with Drive Control Chart (DCC)
- Higher dynamic response for current, speed and position control loop
- Vector control for highly precise torque control of asynchronous (induction) motors
- More digital I/Os via external terminal modules

You can find more information on SINAMICS S120 in Catalog PM 21.

#### Selection and ordering data

The following units are identical as for SINAMICS S110 servo drives ([chapter 9](#)):

- PM340 Power Modules in blocksize format
- Line-side components (e.g. line reactors, line filters)
- DC link components (braking resistors)
- Load-side components (motor reactors)
- Supplementary system components (e.g. BOP20)
- Encoder system connection (Sensor Modules)

# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

### SINAMICS S120 drive system

#### Overview

##### SINAMICS S120 multi-axis drives

A multi-axis drive consists of a Line Module, several Motor Modules and a Control Unit. The Line Module generates a DC voltage from the line voltage and supplies the Motor Modules with energy via the DC link. In the Motor Modules, the DC link voltage is converted by an inverter into an AC voltage for feeding the motor. On the shared Control Unit, both the line infeed/regenerative feedback and the closed-loop control of the motors are computed. The connection between the Control Unit and the power units is made very simply using the digital system interface DRIVE-CLiQ.



SINAMICS S120: CU320-2 Control Unit, Line Module and 3 Motor Modules in booksize format

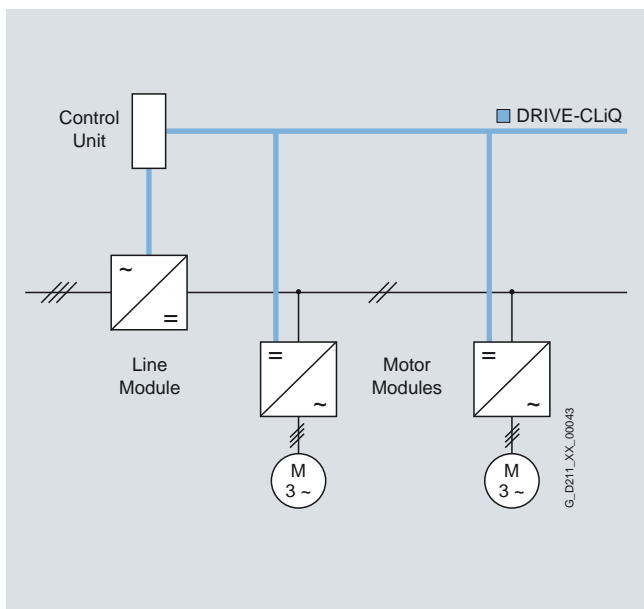
SINAMICS S120 multi-axis drives are available with various cooling methods (internal air cooling, external air cooling, cold plate cooling and liquid cooling) and in the following formats and output ranges:

Format	Rated power or rated current (type rating)
<b>Line Modules</b>	
Booksize compact	16 kW
Booksize	5 ... 120 kW
Chassis	132 ... 1400 kW
<b>Motor Modules</b>	
Booksize compact	1.7 ... 18 A (0.9 ... 9.7 kW)
Booksize	3 ... 200 A (1.6 ... 107 kW)
Chassis	210 ... 1405 A (110 ... 1200 kW)

The SINAMICS S120 multi-axis drives are often used together with a higher-level controller for motion control (SIMOTION, SINUMERIK). For this reason, the following catalogs contain a detailed description of SINAMICS S120 multi-axis drives together with the perfectly matched servo, torque and linear motors including the associated cables and connections and the higher-level controllers for motion control:

- Catalog PM 21  
SIMOTION, SINAMICS S120 and Motors for Production Machines
- Catalog NC 61  
SINUMERIK & SINAMICS, Equipment for Machine Tools

10



Block diagram with CU320-2 Control Unit, Line Module and 2 Motor Modules



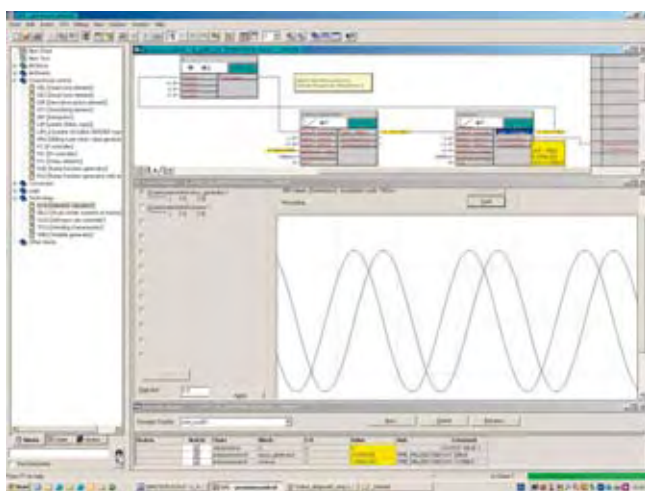
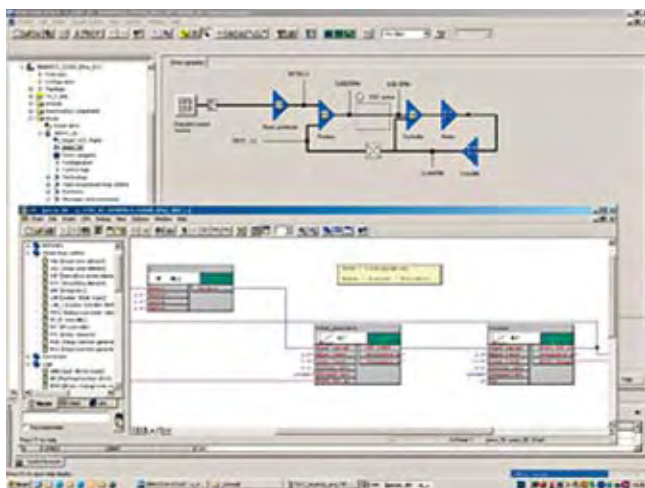
# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

### Drive Control Chart (DCC)

#### Overview

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



For users, DCC opens up a new dimension regarding the adaptability of the systems mentioned to the specific functions of their machines. DCC has no restrictions with regard to the number of usable functions; this is only limited by the performance capability of the CU310-2 Control Unit.

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

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

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

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

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

Minimum hardware and software requirements

[See chapter Engineering tools, STARTER commissioning tool.](#)

#### Selection and ordering data

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

DCC is installed in coordination with the STARTER commissioning tool.

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

Description	Order No.
<b>DCC-SINAMICS V2.1</b> For STARTER V4.2 (single Engineering License, with DCC data carrier) DCC Editor + DCB Library for use on SINAMICS S120 V4.3 SP1 / V4.4 English, French, German, Italian, Spanish	<b>6AU1810-1HA21-0XA0</b>

# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

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

#### Overview



CU310-2 PN and CU310-2 DP Control Units

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

#### Design

The CU310-2 Control Unit features the following connections and interfaces as standard:

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

<sup>1)</sup> In order to use the digital outputs, a 24 V supply voltage must be connected to terminal X124.

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

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

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

#### Integration

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

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

The CU310-2 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool. The CU310-2 Control Unit requires a CompactFlash card with firmware version V4.4 or higher.

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

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

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

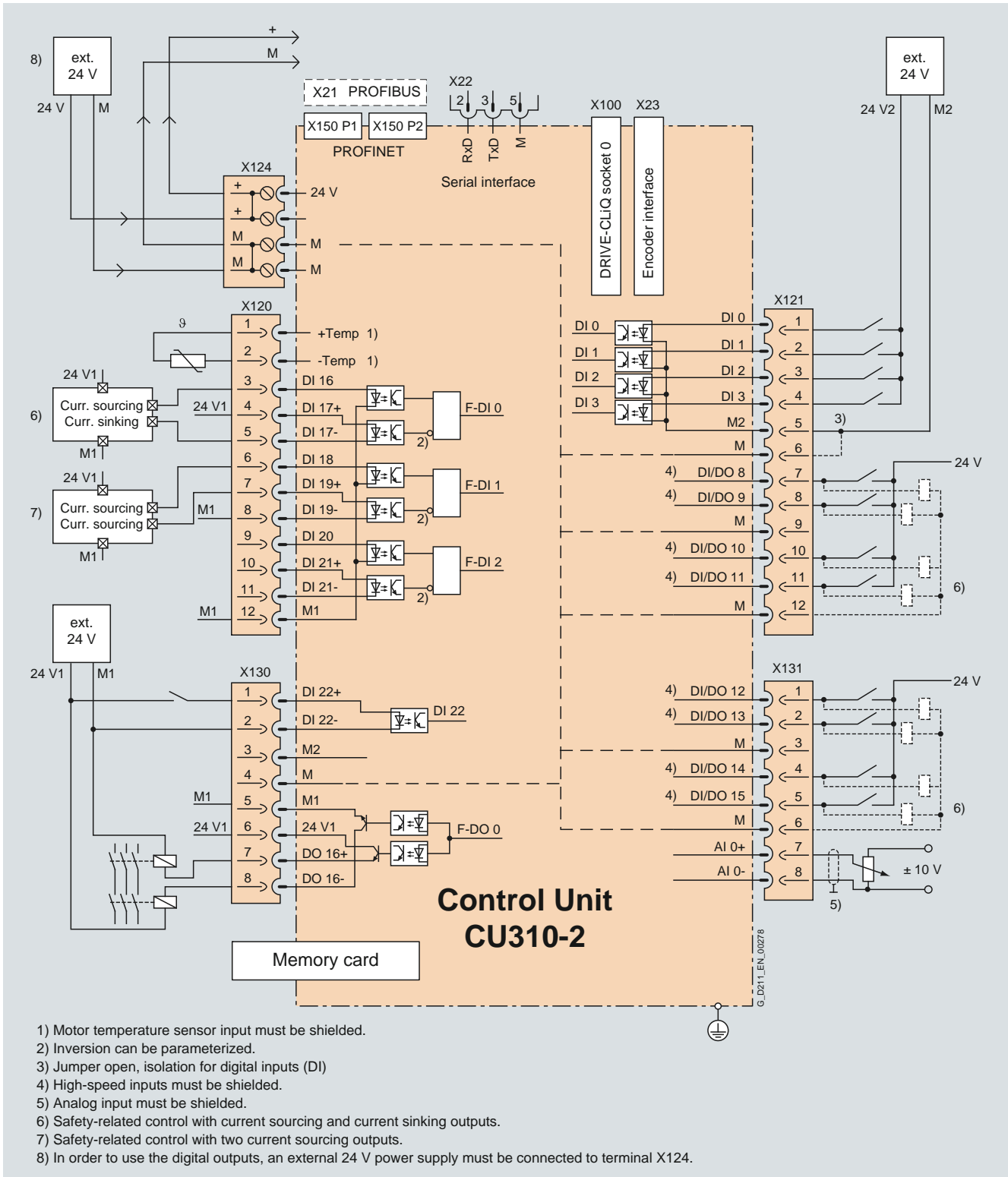
An external 24 V power supply can be connected to the CU310-2 Control Unit to power the Control Unit when the power connection for the Power Module is not energized.

# SINAMICS S120 drive system

0.12 kW to 250 kW (0.16 hp to 400 hp)

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

### Integration



Connection example of the CU310-2 Control Unit  
 Safety capability of the digital inputs will be available soon.

# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

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

#### Technical specifications

<b>CU310-2 Control Unit</b> PROFINET: 6SL3040-1LA01-0AA0 PROFIBUS: 6SL3040-1LA00-0AA0	
<b>Power requirement, max.</b> At 24 V DC, without taking account of digital outputs and DRIVE-CLiQ supply	0.35 A for CU310-2 + 0.5 A for PM340 Power Module
<b>Conductor cross-section, max.</b>	2.5 mm <sup>2</sup>
<b>Fuse protection, max.</b>	20 A
<b>Digital inputs</b>	In accordance with IEC 61131-2 Type 1 5 isolated digital inputs 4 bidirectional non-isolated digital inputs/digital outputs 3 parameterizable, fail-safe (available soon) digital inputs (isolated), or alternatively 6 parameterizable digital inputs (isolated) 5 bidirectional isolated digital inputs/outputs
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	10 mA
• Delay time of digital inputs <sup>1)</sup> , approx.	
- L → H	50 μs
- H → L	100 μs
• Delay time of high-speed digital inputs <sup>1)</sup> , approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 μs
- H → L	50 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>
<b>Digital outputs</b> (continuously short-circuit-proof)	8 bidirectional non-isolated digital inputs/digital outputs
• Voltage	24 V DC
• Load current per digital output <sup>2)</sup> , max.	500 mA
• Delay time <sup>1)</sup> , typ./max.	
- L → H	150 μs/400 μs
- H → L	75 μs/100 μs
• Conductor cross-section, max.	0.5 mm <sup>2</sup>

<b>CU310-2 Control Unit</b> PROFINET: 6SL3040-1LA01-0AA0 PROFIBUS: 6SL3040-1LA00-0AA0	
<b>Encoder evaluation</b>	<ul style="list-style-type: none"> <li>• Incremental encoder TTL/HTL</li> <li>• SSI encoder without incremental signals</li> </ul>
• Input impedance	
- TTL	570 Ω
- HTL, max.	16 mA
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	300 kHz
• SSI baud rate	100 ... 250 kBAud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) <sup>3)</sup>
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals <sup>3)</sup>
- SSI encoder	100 m (328 ft)
<b>Power loss</b>	< 20 W
<b>PE connection</b>	M5 screw
<b>Dimensions</b>	
• Width	73 mm (2.87 in)
• Height	191 mm (7.52 in)
• Depth	75 mm (2.95 in)
<b>Weight, approx.</b>	0.95 kg (2.09 lb)
<b>Approvals, according to</b>	cULus

#### Selection and ordering data

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

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

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

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

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

# SINAMICS S120 drive system

## 0.12 kW to 250 kW (0.16 hp to 400 hp)

### CompactFlash card for CU310-2

#### Overview



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

#### Design

A CU310-2 Control Unit can perform the communication, open-loop and closed-loop control functions for one Power Module. The Compact Flash card is required for the CU310-2 but the SINAMICS S120 performance expansion is not required in this case.

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

The firmware option can also be enabled on-site, for example, if the Safety Integrated Extended Functions are to be enabled retrospectively. You will need the serial number of the CompactFlash card and the order number of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

#### Selection and ordering data

Description	Order No.
<b>CompactFlash card for CU310-2 PN and CU310-2 DP Control Units</b> With firmware version V4.4 including Certificate of License	<b>6SL3054-0EE00-1BA0</b>
<b>CompactFlash card for CU310-2 PN and CU310-2 DP Control Units</b> With firmware version V4.4 including Certificate of License and with Safety license	<b>6SL3054-0EE00-1BA0-Z F01</b>
<b>Firmware license</b> Safety Integrated Extended Functions option including Certificate of License for one axis for adding the license to a CompactFlash card.	<b>6SL3074-0AA10-0AA0</b>

#### More information

##### Firmware version

The firmware version is encoded as follows in the order number printed on the CompactFlash card:

Order No.:	6SL3054-0□□00-1BA0
Firmware version	↑ E
	4
Version	↑ E F G
	.4 .5 .6

##### Example:

A CompactFlash card with firmware version 4.4 and a Safety license for a CU310-2 PN Control Unit are required:

Order No.  
6SL3054-0EE00-1BA0-Z  
F01

# SINAMICS S120 drive system

0.12 kW to 250 kW (0.16 hp to 400 hp)

Notes

10



## Motors



<b>11/2</b>	<b>Overview</b>
<b>11/4</b>	<b>Servomotors for SINAMICS S110</b>
11/4	<u>1FK7 synchronous motors</u>
<b>11/10</b>	<b>Main motors for SINAMICS S110</b>
11/10	<u>1PH8 asynchronous (induction) motors</u>
11/12	Forced ventilation, IP55 degree of protection
11/14	Water cooling, IP65 degree of protection
11/16	Selection guides
<b>11/19</b>	<b>Dimensional drawings</b>
11/19	1FK7 synchronous motors
11/22	1PH8 asynchronous (induction) motors Forced ventilation
11/28	1PH8 asynchronous (induction) motors Water cooling
	<b>CAD CREATOR</b>
	For dimension drawing and 2D/3D CAD generator, see chapter 14, and <a href="http://www.siemens.com/cadcreator">www.siemens.com/cadcreator</a>

# Motors

## Overview




Motor type	Features	Degree of protection	Cooling method
<b>1FK7 synchronous motor</b> 	Permanent-magnet synchronous servomotor	IP64	Natural cooling
<b>1PH8 asynchronous (induction) motor</b> 	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](http://www.siemens.com/drives/infocenter)



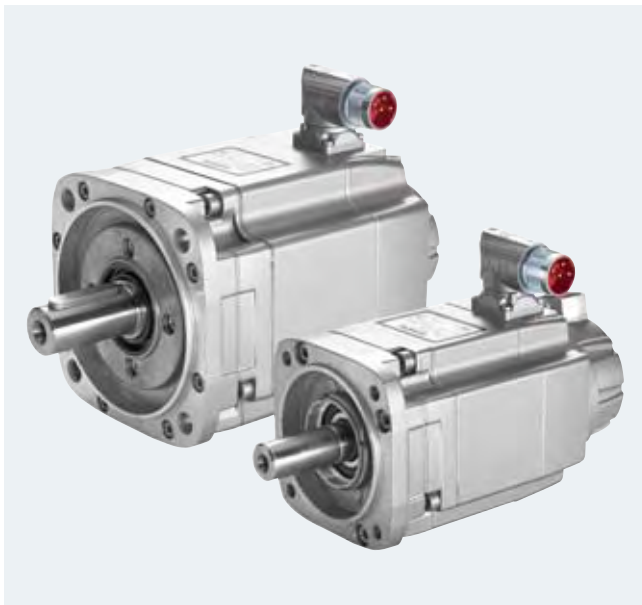
Shaft height	Rated power $P_{rated}$ for S1 duty kW (hp)	Rated torque $M_{rated}$	Page
SH 20/SH 28/ SH 36/ SH 48 SH 63/SH 80/ SH 100	 <b>0.05 8.2</b> <b>(0.07) (11.0)</b>	0.08 ... 37 Nm (0.06 ... 27.3 lb <sub>f</sub> -ft)	<b>11/6</b>
SH 80/SH 100/ SH 132/SH 160	 <b>2.8 45</b> <b>(3.75) (60.3)</b>	18 ... 310 Nm (13.3 ... 229 lb <sub>f</sub> -ft)	<b>11/12</b>
SH 80/SH 100/ SH 132/SH 160	 <b>3.5 68</b> <b>(4.69) (91.2)</b>	22 ... 331 Nm (16.2 ... 244 lb <sub>f</sub> -ft)	<b>11/14</b>

# Motors

## Servomotors for SINAMICS S110

### 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

### Technical specifications

1FK7 Compact motors	
<b>Motor type</b>	Permanent-magnet synchronous motor
<b>Magnet material</b>	Rare-earth magnet material
<b>Cooling</b>	Natural cooling
<b>Temperature monitoring</b>	KTY84 temperature sensor in the stator winding
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	Temperature class 155 (F) for a winding temperature rise of $\Delta T = 100$ K at an ambient temperature of 40 °C (104 °F)
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b>	IM B5 (IM V1, IM V3)
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	<ul style="list-style-type: none"> <li>• 1FK701 IP54</li> <li>• 1FK702 ... 1FK710 IP64</li> </ul>
<b>Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance N
<b>Vibration magnitude in accordance with EN 60034-14 (IEC 60034-14)</b>	Grade A is maintained up to rated speed
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b> Tolerance + 3 dB	<ul style="list-style-type: none"> <li>• 1FK701 ... 1FK704 55 dB</li> <li>• 1FK706 65 dB</li> <li>• 1FK708/1FK710 70 dB</li> </ul>
<b>Connection</b>	Connectors for signals and power, can be rotated
<b>Paint finish</b>	Anthracite (RAL 7016)
<b>2nd rating plate</b>	Enclosed separately
<b>Holding brake</b>	Without play 24 V DC
<b>Approvals, according to</b>	cURus

### Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

### Built-in encoder systems with DRIVE-CLiQ interface

Incremental 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

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

# Motors

## Servomotors for SINAMICS S110

### 1FK7 synchronous motors

#### Selection and ordering data

Rated speed	Shaft height	Rated power	Static torque	Rated torque	Rated current	<b>1FK7 Compact synchronous motor Natural cooling</b>	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.	$p$	$J$	$m$	
rpm		kW (hp)	Nm (lb <sub>r</sub> -ft)	Nm (lb <sub>r</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lbf-in-s}^2$ )	kg (lb)	
<b>1FK7 Compact motors for DC link voltage 720 V DC</b>										
<b>6000</b>	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.85	<b>1FK7011-5AK71-1 ■ ■ 3</b>	4	0.064 (0.06)	0.9 (2.0)	
		0.10 (0.13)	0.35 (0.26)	0.16 (0.12)	0.85	<b>1FK7015-5AK71-1 ■ ■ 3</b>	4	0.083 (0.08)	1.1 (2.4)	
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	<b>1FK7022-5AK71-1 ■ ■ 3</b>	3	0.28 (0.25)	1.8 (4.0)	
<b>1FK7 Compact motors for DC link voltage 270 ... 325 V DC</b>										
<b>6000</b>	20	0.05 (0.07)	0.18 (0.13)	0.08 (0.06)	0.5	<b>1FK7011-5AK21-1 ■ ■ 3</b>	4	0.064 (0.06)	0.9 (2.0)	
		0.10 (0.13)	0.35 (0.26)	0.16 (0.12)	0.5	<b>1FK7015-5AK21-1 ■ ■ 3</b>	4	0.083 (0.08)	1.1 (2.4)	
	28	0.38 (0.51)	0.85 (0.63)	0.6 (0.44)	1.4	<b>1FK7022-5AK21-1 ■ ■ 3</b>	3	0.28 (0.25)	1.8 (4.0)	
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>		IC2048S/R encoder					A H J S T			
		AM512S/R encoder (only for 1FK702)								
		AM16S/R encoder								
		Multi-pole resolver 2-pole resolver								
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>		IC22DQ encoder (only for 1FK702)					D L V U P			
		AM20DQ encoder (only for 1FK702)								
		AM15DQ encoder (only for 1FK702)								
		R15DQ resolver (only for 1FK702)								
		R14DQ resolver (only for 1FK702)								
<b>Shaft extension:</b>		<b>Shaft and flange accuracy:</b>			<b>Holding brake:</b>		G H			
Plain shaft		Tolerance N			Without					
Plain shaft		Tolerance N			With					

# Motors

## Servomotors for SINAMICS S110

### 1FK7 synchronous motors

Motor type (repeated)	Efficiency <sup>1)</sup>	Static current	Calculated power $P_{\text{calc}}$ <sup>4)</sup>	SINAMICS S110 blocksize format		Pre-assembled power cable with complete shield		
	$\eta$			$I_0$ at $M_0$ $\Delta T=100$ K	$P_{\text{calc}}$ at $M_0$ $\Delta T=100$ K	Rated output current <sup>2)</sup>	PM340 Power Module Air cooling	Motor and brake connection via SPEED-CONNECT power connector
	%	A	kW (hp)	$I_{\text{rated}}$	Order No.	Power connector	Cable cross- section <sup>3)</sup>	Order No.
<b>Line voltage 380 ... 480 V 3 AC</b>								
1FK7011-5AK71...	62	1.5	0.1 (0.13)	1.7	<b>6SL3210-1SE11-7UA0</b>	0.5	4 × 1.5	<b>6FX002-5DN30-....</b>
1FK7015-5AK71...	68	1.5	0.2 (0.27)	1.7	<b>6SL3210-1SE11-7UA0</b>	0.5	4 × 1.5	<b>6FX002-5DN30-....</b>
1FK7022-5AK71...	86	1.8	0.5 (0.67)	2.2	<b>6SL3210-1SE12-2UA0</b>	1	4 × 1.5	<b>6FX002-5G10-....</b>
<b>Line voltage 200 ... 240 V 1 AC</b>								
1FK7011-5AK21...	62	0.85	0.1 (0.13)	0.9	<b>6SL3210-1SB11-0A0</b>	0.5	4 × 1.5	<b>6FX002-5DN30-....</b>
1FK7015-5AK21...	68	0.85	0.2 (0.27)	0.9	<b>6SL3210-1SB11-0A0</b>	0.5	4 × 1.5	<b>6FX002-5DN30-....</b>
1FK7022-5AK21...	85	1.8	0.5 (0.67)	2.3	<b>6SL3210-1SB12-3A0</b>	1	4 × 1.5	<b>6FX002-5G10-....</b>

<b>Line filter:</b>		
Without	<b>U</b>	<b>Power cable:</b>
Integrated	<b>A</b>	
		MOTION-CONNECT 500 <b>5</b>
		Without brake cores <b>C</b>
		With brake cores <b>D</b>
		Length code <b>....</b>

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

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

<sup>1)</sup> Optimum efficiency in continuous duty.

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

<sup>4)</sup>  $P_{\text{calc}} [\text{kW}] = \frac{M_0 [\text{Nm}] \times n_{\text{rated}}}{9550}$      $P_{\text{calc}} [\text{hp}] = \frac{M_0 [\text{lb}_f\text{-ft}] \times n_{\text{rated}}}{5250}$

# Motors

## Servomotors for SINAMICS S110

### 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)	
$n_{\text{rated}}$	SH	$P_{\text{rated}}$ at $\Delta T=100\text{ K}$	$M_0$ at $\Delta T=100\text{ K}$	$M_{\text{rated}}$ at $\Delta T=100\text{ K}$	$I_{\text{rated}}$ at $\Delta T=100\text{ K}$	Order No.	$p$	$J$	$m$	
rpm		kW (hp)	Nm (lb <sub>f</sub> -ft)	Nm (lb <sub>f</sub> -ft)	A			$10^{-4}\text{ kgm}^2$ ( $10^{-3}\text{ lbf-in-s}^2$ )	kg (lb)	
<b>1FK7 Compact motors for DC link voltage 720 V DC</b>										
<b>2000</b>	48	0.6 (0.80)	3 (2.21)	2.8 (2.07)	1.55	<b>1FK7042-2AC71-1 ■ ■ 0</b>	4	2.9 (2.57)	4.6 (10.1)	
		63	1.1 (1.5)	6 (4.43)	5.3 (3.91)	2.95	<b>1FK7060-2AC71-1 ■ ■ 0</b>	4	7.7 (6.82)	7.1 (15.7)
			1.5 (2.0)	8.5 (6.27)	7 (5.16)	2.65	<b>1FK7062-2AC71-1 ■ ■ 0</b>	4	11.2 (9.91)	9.1 (20.1)
			1.9 (2.55)	11 (8.11)	8.9 (6.56)	4.4	<b>1FK7063-2AC71-1 ■ ■ 0</b>	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	12 (8.85)	10 (7.38)	4.4	<b>1FK7081-2AC71-1 ■ ■ 0</b>	4	20 (17.7)	12.9 (28.4)	
		2.6 (3.49)	16 (11.8)	12.5 (9.22)	6.3	<b>1FK7083-2AC71-1 ■ ■ 0</b>	4	26 (23.0)	15.6 (34.4)	
		3.1 (4.16)	20 (14.7)	15 (11.1)	6.7	<b>1FK7084-2AC71-1 ■ ■ 0</b>	4	32.5 (28.8)	18.3 (40.4)	
	100	3 (4.02)	18 (13.3)	14.5 (10.7)	7.1	<b>1FK7100-2AC71-1 ■ ■ 0</b>	4	54 (47.8)	17.6 (38.8)	
		4.3 (5.77)	27 (19.9)	20.5 (15.1)	9.7	<b>1FK7101-2AC71-1 ■ ■ 0</b>	4	79 (69.9)	23 (50.7)	
		5.2 (6.97)	36 (26.6)	25 (18.4)	11	<b>1FK7103-2AC71-1 ■ ■ 0</b>	4	104 (92.1)	28.5 (62.8)	
		7.7 (10.33)	48 (35.4)	37 (27.3)	16	<b>1FK7105-2AC71-1 ■ ■ 0</b>	4	154 (136)	39 (86.0)	
<b>3000</b>	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	2	<b>1FK7042-2AF71-1 ■ ■ 0</b>	4	2.9 (2.57)	4.6 (10.1)	
		63	1.5 (2.01)	6 (4.43)	4.7 (3.47)	3.7	<b>1FK7060-2AF71-1 ■ ■ 0</b>	4	7.7 (6.82)	7.1 (15.7)
			1.9 (2.55)	8.5 (6.27)	6 (4.43)	4	<b>1FK7062-2AF71-1 ■ ■ 0</b>	4	11.2 (9.91)	9.1 (20.1)
			2.3 (3.08)	11 (8.11)	7.3 (5.38)	5.6	<b>1FK7063-2AF71-1 ■ ■ 0</b>	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	8 (5.90)	6.8 (5.02)	4.4	<b>1FK7080-2AF71-1 ■ ■ 0</b>	4	14.2 (12.6)	10.3 (22.7)	
		2.7 (3.62)	12 (8.85)	8.7 (6.42)	6.8	<b>1FK7081-2AF71-1 ■ ■ 0</b>	4	20 (17.7)	12.9 (28.4)	
		3.3 (4.43)	16 (11.8)	10.5 (7.74)	7.2	<b>1FK7083-2AF71-1 ■ ■ 0</b>	4	26 (23.0)	15.6 (34.4)	
		3.1 (4.16)	20 (14.7)	10 (7.38)	6.5	<b>1FK7084-2AF71-1 ■ ■ 0</b>	4	32.5 (28.8)	18.3 (40.4)	
	100	3.8 (5.10)	18 (13.3)	12 (8.85)	8	<b>1FK7100-2AF71-1 ■ ■ 0</b>	4	54 (47.8)	17.6 (38.8)	
		4.9 (6.57)	27 (19.9)	15.5 (11.4)	11.6	<b>1FK7101-2AF71-1 ■ ■ 0</b>	4	79 (69.9)	23 (50.7)	
		4.4 (5.90)	36 (26.6)	14 (10.3)	11.5	<b>1FK7103-2AF71-1 ■ ■ 0</b>	4	104 (92.1)	28.5 (62.8)	
8.2 (11.0)		48 (35.4)	26 (19.2)	18	<b>1FK7105-2AF71-1 ■ ■ 0</b>	4	154 (136)	39 (86.0)		
<b>4500</b>	63	1.7 (2.28)	6 (4.43)	3.7 (2.73)	4.3	<b>1FK7060-2AH71-1 ■ ■ 0</b>	4	7.7 (6.82)	7.1 (15.7)	
		1.4 (1.88)	8.5 (6.27)	3 (2.21)	3.3	<b>1FK7062-2AH71-1 ■ ■ 0</b>	4	11.2 (9.91)	9.1 (20.1)	
		1.4 (1.88)	11 (8.11)	3 (2.21)	3.8	<b>1FK7063-2AH71-1 ■ ■ 0</b>	4	14.7 (13.0)	11.1 (24.5)	
	80	2.1 (2.82)	8 (5.90)	4.5 (3.32)	4.8	<b>1FK7080-2AH71-1 ■ ■ 0</b>	4	14.2 (12.6)	10.3 (22.7)	
		1.8 (2.41)	12 (8.85)	3.8 (2.80)	4.9	<b>1FK7081-2AH71-1 ■ ■ 0</b>	4	20 (17.7)	12.9 (28.4)	
		1.4 (1.88)	16 (11.8)	3 (2.21)	3.6	<b>1FK7083-2AH71-1 ■ ■ 0</b>	4	26 (23.0)	15.6 (34.4)	
<b>6000</b>	36	0.5 (0.67)	1.15 (0.85)	0.8 (0.59)	1.3	<b>1FK7032-2AK71-1 ■ ■ 0</b>	3	0.65 (0.58)	2.7 (5.95)	
		0.6 (0.80)	1.6 (1.18)	1 (0.74)	1.3	<b>1FK7034-2AK71-1 ■ ■ 0</b>	3	0.9 (0.80)	3.5 (7.72)	
	48	0.7 (0.94)	1.6 (1.18)	1.1 (0.81)	1.85	<b>1FK7040-2AK71-1 ■ ■ 0</b>	4	1.6 (1.42)	3.2 (7.06)	
		0.9 (1.21)	3 (2.21)	1.5 (1.11)	2.5	<b>1FK7042-2AK71-1 ■ ■ 0</b>	4	2.9 (2.57)	4.6 (10.1)	
<b>1FK7 Compact motors for DC link voltage 270 ... 325 V DC</b>										
<b>3000</b>	36	0.3 (0.40)	1.15 (0.85)	1 (0.74)	1.6	<b>1FK7032-2AF21-1 ■ ■ 0</b>	3	0.65 (0.58)	2.7 (5.95)	
		0.5 (0.67)	1.6 (1.18)	1.45 (1.07)	1.8	<b>1FK7034-2AF21-1 ■ ■ 0</b>	3	0.9 (0.80)	3.5 (7.72)	
	48	0.8 (1.07)	3 (2.21)	2.6 (1.92)	3.5	<b>1FK7042-2AF21-1 ■ ■ 0</b>	4	2.9 (2.57)	4.6 (10.1)	
<b>Encoder systems for motors without DRIVE-CLiQ interface:</b>			IC2048S/R encoder AM2048S/R encoder Multi-pole resolver 2-pole resolver			<b>A E S T</b>				
<b>Encoder systems for motors with DRIVE-CLiQ interface:</b>			AS20DQI encoder AM20DQI encoder R15DQ resolver R14DQ resolver			<b>Q R U P</b>				
<b>Shaft extension:</b> Plain shaft Plain shaft			<b>Shaft and flange accuracy:</b> Tolerance N Tolerance N		<b>Holding brake:</b> Without With		<b>G H</b>			

# Motors

## Servomotors for SINAMICS S110

### 1FK7 synchronous motors

Motor type (repeated)	Efficiency <sup>1)</sup> $\eta$ %	Static current $I_0$ at $M_0$ $\Delta T=100$ K A	Calculated power $P_{calc}$ <sup>4)</sup> $P_{calc}$ at $M_0$ $\Delta T=100$ K kW (hp)	SINAMICS S110 blocksize format		Pre-assembled power cable with complete shield Motor and brake connection via SPEED-CONNECT power connector		
				Rated output current <sup>2)</sup> $I_{rated}$ A	PM340 Power Module Air cooling Order No.	Power connector Size	Cable cross- section <sup>3)</sup> mm <sup>2</sup>	Order No.
1FK7042-2AC71...	88	1.6	0.6 (0.80)	1.7	6SL3210-1SE11-7UA0	1	4 × 1.5	6FX002-5G10-....
1FK7060-2AC71...	90	3.15	1.3 (1.74)	4.1	6SL3210-1SE14-1UA0	1	4 × 1.5	6FX002-5G10-....
1FK7062-2AC71...	91	3	1.8 (2.41)	3.1	6SL3210-1SE13-1UA0	1	4 × 1.5	6FX002-5G10-....
1FK7063-2AC71...	91	5.3	2.3 (3.08)	5.9	6SL3210-1SE16-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7081-2AC71...	93	5	2.5 (3.35)	5.9	6SL3210-1SE16-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7083-2AC71...	93	7.5	3.4 (4.56)	7.7	6SL3210-1SE17-7A0	1	4 × 1.5	6FX002-5G10-....
1FK7084-2AC71...	93	8.5	4.2 (5.63)	10.2	6SL3210-1SE21-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7100-2AC71...	92	8.4	3.8 (5.10)	10.2	6SL3210-1SE21-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7101-2AC71...	93	12.3	5.7 (7.64)	18	6SL3210-1SE21-8A0	1.5	4 × 1.5	6FX002-5G22-....
1FK7103-2AC71...	93	14.4	7.5 (10.1)	18	6SL3210-1SE21-8A0	1.5	4 × 1.5	6FX002-5G22-....
1FK7105-2AC71...	93	20	10.1 (13.5)	25	6SL3210-1SE22-5A0	1.5	4 × 2.5	6FX002-5G32-....
1FK7042-2AF71...	89	2.2	0.9 (1.21)	2.2	6SL3210-1SE12-2UA0	1	4 × 1.5	6FX002-5G10-....
1FK7060-2AF71...	90	4.45	1.9 (2.55)	5.9	6SL3210-1SE16-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7062-2AF71...	91	5.3	2.7 (3.62)	5.9	6SL3210-1SE16-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7063-2AF71...	91	8	3.5 (4.69)	10.2	6SL3210-1SE21-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7080-2AF71...	92	4.9	2.5 (3.35)	5.9	6SL3210-1SE16-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7081-2AF71...	93	8.7	3.8 (5.10)	10.2	6SL3210-1SE21-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7083-2AF71...	93	10.1	5 (6.71)	10.2	6SL3210-1SE21-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7084-2AF71...	93	12.1	6.3 (8.45)	18	6SL3210-1SE21-8A0	1	4 × 1.5	6FX002-5G10-....
1FK7100-2AF71...	92	11.1	5.7 (7.64)	18	6SL3210-1SE21-8A0	1	4 × 1.5	6FX002-5G10-....
1FK7101-2AF71...	93	18.8	8.5 (11.4)	25	6SL3210-1SE22-5A0	1.5	4 × 2.5	6FX002-5G32-....
1FK7103-2AF71...	93	26	11.3 (15.1)	32	6SL3210-1SE23-2A0	1.5	4 × 4	6FX002-5G42-....
1FK7105-2AF71...	94	31	15.1 (20.2)	32	6SL3210-1SE23-2A0	1.5	4 × 6	6FX002-5G52-....
1FK7060-2AH71...	90	6.3	2.8 (3.75)	7.7	6SL3210-1SE17-7A0	1	4 × 1.5	6FX002-5G10-....
1FK7062-2AH71...	91	8	4 (5.36)	10.2	6SL3210-1SE21-0A0	1	4 × 1.5	6FX002-5G10-....
1FK7063-2AH71...	90	12	5.2 (6.97)	18	6SL3210-1SE21-8A0	1	4 × 1.5	6FX002-5G10-....
1FK7080-2AH71...	92	7.4	3.8 (5.10)	7.7	6SL3210-1SE17-7A0	1	4 × 1.5	6FX002-5G10-....
1FK7081-2AH71...	93	13.1	5.7 (7.64)	18	6SL3210-1SE21-8A0	1	4 × 1.5	6FX002-5G10-....
1FK7083-2AH71...	93	15	7.5 (10.1)	18	6SL3210-1SE21-8A0	1	4 × 1.5	6FX002-5G10-....
1FK7032-2AK71...	88	1.7	0.7 (0.94)	1.7	6SL3210-1SE11-7UA0	1	4 × 1.5	6FX002-5G10-....
1FK7034-2AK71...	88	1.9	1 (1.34)	2.2	6SL3210-1SE12-2UA0	1	4 × 1.5	6FX002-5G10-....
1FK7040-2AK71...	88	2.35	1 (1.34)	3.1	6SL3210-1SE13-1UA0	1	4 × 1.5	6FX002-5G10-....
1FK7042-2AK71...	89	4.4	1.9 (2.55)	5.9	6SL3210-1SE16-0A0	1	4 × 1.5	6FX002-5G10-....
					Line voltage 200 ... 240 V 1 AC			
1FK7032-2AF21...	85	1.7	0.4 (0.54)	2.3	6SL3210-1SB12-3A0	1	4 × 1.5	6FX002-5G10-....
1FK7034-2AF21...	85	1.9	0.5 (0.67)	2.3	6SL3210-1SB12-3A0	1	4 × 1.5	6FX002-5G10-....
1FK7042-2AF21...	89	3.95	0.9 (1.21)	3.9	6SL3210-1SB14-0A0	1	4 × 1.5	6FX002-5G10-....

**Line filter:**

 Without  
Integrated

 U  
A

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

**Power cable:**

 MOTION-CONNECT 800PLUS  
MOTION-CONNECT 500

 8  
5

 Without brake cores  
With brake cores

 C  
D

Length code

....

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

<sup>1)</sup> Optimum efficiency in continuous duty.

<sup>2)</sup> With default setting of the pulse frequency.

<sup>3)</sup> The current carrying capacity of the power cables complies with EN 60204-1 for installation type C, for continuous duty at an ambient air temperature of 40 °C (104 °F). Cable cross-section for brake connection 2 × 1.5 mm<sup>2</sup>.

<sup>4)</sup>  $P_{calc} [kW] = \frac{M_0 [Nm] \times n_{rated}}{9550}$       $P_{calc} [hp] = \frac{M_0 [lb-ft] \times n_{rated}}{5250}$

# Motors

## Main motors for SINAMICS S110

### 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

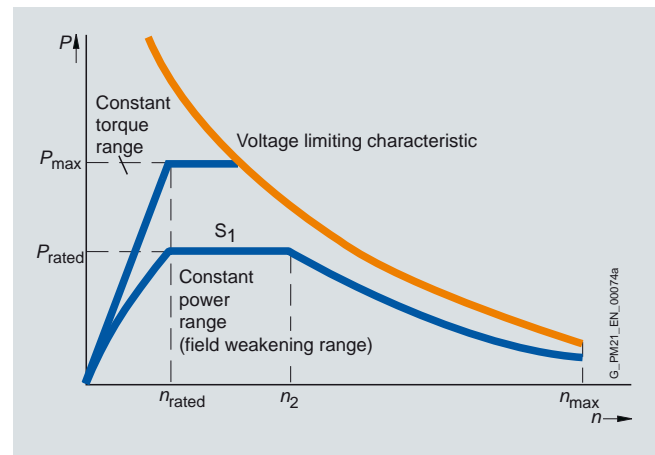
#### Application

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.



# Motors

## Main motors for SINAMICS S110

### 1PH8 asynchronous (induction) motors

#### Technical specifications

1PH8 motor, forced ventilation		1PH8 motor, water cooling	
<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	For an ambient temperature of up to 40 °C (104 °F) Temperature class 180 (H)	<b>Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)</b>	For a cooling water inlet temperature of up to 30 °C (86 °F) Temperature class 180 (H) <sup>3)</sup>
<b>Cooling in accordance with EN 60034-6 (IEC 60034-6)</b>	Forced ventilation Fan mounted axially at NDE	<b>Cooling in accordance with EN 60034-6 (IEC 60034-6)</b>	Water cooling Max. cooling water pressure at inlet: 6 bar Connecting thread at NDE
<b>Temperature monitoring</b>	KTY84 temperature sensor in the stator winding	<b>Temperature monitoring</b>	KTY84 temperature sensor in the stator winding
<b>Motor fan ratings</b> • 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	<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b> • 1PH808 • 1PH810 ... 1PH816	IM B3, IM B5 IM B3, IM B5, IM B35
<b>Type of construction in accordance with EN 60034-7 (IEC 60034-7)</b> • 1PH808 • 1PH810 ... 1PH816	IM B3, IM B5 IM B3, IM B5, IM B35	<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP65
<b>Degree of protection in accordance with EN 60034-5 (IEC 60034-5)</b>	IP55	<b>Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft or fitted key half-key balancing for fitted key
<b>Shaft extension on the drive end in accordance with DIN 748-3 (IEC 60072-1)</b>	Plain shaft or fitted key half-key balancing for fitted key	<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance R (reduced)
<b>Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)<sup>1)</sup></b>	Tolerance R (reduced)	<b>Vibration magnitude in accordance with Siemens/ EN 60034-14 (IEC 60034-14)<sup>1)</sup></b>	Grade R/A
<b>Vibration magnitude in accordance with Siemens/ EN 60034-14 (IEC 60034-14)<sup>1)</sup></b>	Grade R/A	<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b> Tolerance +3 dB external fan 50 Hz • 1PH808 ... 1PH813 • 1PH816	68 dB <sup>2)</sup> 69 dB <sup>2)</sup>
<b>Sound pressure level <math>L_{pA}</math> (1 m) in accordance with EN ISO 1680, max.</b> Tolerance +3 dB, external fan 50 Hz • 1PH808 ... 1PH813 • 1PH816	70 dB <sup>2)</sup> 73 dB <sup>2)</sup>	<b>Connection</b>	Connector for signals (mating connector is not included in the scope of delivery) Terminal box NDE top
<b>Connection</b>	Connector for signals (mating connector is not included in the scope of delivery) Terminal box NDE top	<b>Paint finish</b>	Anthracite RAL 7016
<b>Paint finish</b>	Anthracite RAL 7016	<b>Built-in encoder systems <u>without DRIVE-CLiQ</u> interface</b>	
<b>Incremental encoder</b>			
HTL2048S/R encoder		Incremental encoder HTL 2048 S/R	
HTL1024S/R encoder		Incremental encoder HTL 1024 S/R	

S/R = signals/revolution

<sup>1)</sup> Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.  
<sup>2)</sup> For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.  
<sup>3)</sup> The following motors are designed to conform to temperature class 155 (F): 1PH8107-1.F2/1PH8138-2.F2/1PH8138-2.G2/1PH8166

# Motors

## Main motors for SINAMICS S110

**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. <sup>1)</sup>	Speed, max. <sup>2)</sup>	1PH8 asynchronous (induction) motor Forced ventilation NDE → DE Order No.	
$n_{\text{rated}}$ rpm	SH	$P_{\text{rated}}$ kW (hp)	$M_{\text{rated}}$ Nm (lb <sub>f</sub> -ft)	$I_{\text{rated}}$ A	$U_{\text{rated}}$ V	$f_{\text{rated}}$ Hz	$n_2$ rpm	$n_{\text{max}}$ rpm		
<b>Line voltage 400 V 3 AC</b>										
<b>400</b>	160	9.5 (12.74)	227 (167)	30	260	14.3	2150	6500	<b>1PH8163-1 B 1 - ■■■■ 1</b>	
		13 (17.43)	310 (229)	36	300	14.1	1750	6500	<b>1PH8165-1 B 1 - ■■■■ 1</b>	
<b>1000</b>	100	3.7 (4.96)	35 (25.8)	10	333	35.8	2550	9000	<b>1PH8103-1 D 1 - ■■■■ 1</b>	
		6.3 (8.45)	60 (44.3)	17.5	307	35.5	4300	9000	<b>1PH8107-1 D 1 - ■■■■ 1</b>	
	132	12 (16.1)	115 (84.8)	30	319	35.0	3000	8000	<b>1PH8133-1 D 1 - ■■■■ 1</b>	
		17 (22.8)	162 (119)	43	307	34.8	4300	8000	<b>1PH8137-1 D 1 - ■■■■ 1</b>	
	160	22 (29.5)	210 (155)	55	300	34.2	2800	6500	<b>1PH8163-1 D 1 - ■■■■ 1</b>	
		28 (37.55)	267 (197)	71	292	34.2	4600	6500	<b>1PH8165-1 D 1 - ■■■■ 1</b>	
<b>1500</b>	80	2.8 (3.75)	18 (13.3)	7.5	346	53.3	4700	10000	<b>1PH8083-1 F 1 - ■■■■ 1</b>	
		3.7 (4.96)	24 (17.7)	10	336	53.2	5200	10000	<b>1PH8087-1 F 1 - ■■■■ 1</b>	
	100	3.7 (4.96)	24 (17.7)	12.5	265	52.4	5000	9000	<b>1PH8101-1 F 1 - ■■■■ 1</b>	
		5.5 (7.38)	35 (25.8)	13.5	368	52.4	4200	9000	<b>1PH8103-1 F 1 - ■■■■ 1</b>	
		7.0 (9.39)	45 (33.2)	17.5	348	51.9	5250	9000	<b>1PH8105-1 F 1 - ■■■■ 1</b>	
		9.0 (12.1)	57 (42)	23.5	330	52.2	4500	9000	<b>1PH8107-1 F 1 - ■■■■ 1</b>	
	132	11 (14.75)	70 (51.6)	24	360	51.4	4800	8000	<b>1PH8131-1 F 1 - ■■■■ 1</b>	
		15 (20.12)	96 (70.8)	34	342	51.3	5500	8000	<b>1PH8133-1 F 1 - ■■■■ 1</b>	
		18.5 (24.81)	118 (87)	43	330	51.3	6150	8000	<b>1PH8135-1 F 1 - ■■■■ 1</b>	
		22 (29.5)	140 (103)	56	308	51.3	4300	8000	<b>1PH8137-1 F 1 - ■■■■ 1</b>	
		160	30 (40.23)	191 (141)	71	319	50.8	3500	6500	<b>1PH8163-1 F 1 - ■■■■ 1</b>
			37 (49.62)	236 (174)	78	350	50.8	2800	6500	<b>1PH8165-1 F 1 - ■■■■ 1</b>
	<b>Line voltage 480 V 3 AC</b>									
	<b>600</b>	160	14.5 (19.4)	231 (170)	30	370	21.0	2150	6500	<b>1PH8163-1 B 1 - ■■■■ 1</b>
19 (25.5)			302 (223)	35	420	20.8	1800	6500	<b>1PH8165-1 B 1 - ■■■■ 1</b>	
<b>1350</b>	100	4.7 (6.30)	33 (24.3)	9.7	423	47.3	3500	9000	<b>1PH8103-1 D 1 - ■■■■ 1</b>	
		8.0 (10.7)	57 (42.0)	17	400	47.1	5045	9000	<b>1PH8107-1 D 1 - ■■■■ 1</b>	
	132	15 (20.1)	106 (78.2)	28	417	46.5	3500	8000	<b>1PH8133-1 D 1 - ■■■■ 1</b>	
		22 (29.5)	156 (115)	42	404	46.4	4000	8000	<b>1PH8137-1 D 1 - ■■■■ 1</b>	
	160	28 (37.6)	198 (146)	52	400	45.8	4000	6500	<b>1PH8163-1 D 1 - ■■■■ 1</b>	
		34 (45.6)	241 (178)	66	387	45.8	5600	6500	<b>1PH8165-1 D 1 - ■■■■ 1</b>	
<b>2000</b>	80	3.7 (4.96)	18 (13.3)	7.6	447	70.0	5550	10000	<b>1PH8083-1 F 1 - ■■■■ 1</b>	
		4.9 (6.57)	23 (17.0)	10	435	69.9	6100	10000	<b>1PH8087-1 F 1 - ■■■■ 1</b>	
	100	4.7 (6.30)	22 (16.2)	12.5	343	69.0	7500	9000	<b>1PH8101-1 F 1 - ■■■■ 1</b>	
		7 (9.39)	33 (24.3)	12.7	460	69.1	4100	9000	<b>1PH8103-1 F 1 - ■■■■ 1</b>	
		9 (12.1)	43 (31.7)	17	453	68.5	6180	9000	<b>1PH8105-1 F 1 - ■■■■ 1</b>	
		11 (14.8)	53 (39.1)	21.5	428	68.6	5500	9000	<b>1PH8107-1 F 1 - ■■■■ 1</b>	
	132	15 (20.1)	72 (53.1)	24	460	68.2	5300	8000	<b>1PH8131-1 F 1 - ■■■■ 1</b>	
		20 (26.8)	96 (70.8)	34	445	68.0	6200	8000	<b>1PH8133-1 F 1 - ■■■■ 1</b>	
		24 (32.2)	115 (84.8)	43	434	67.9	7100	8000	<b>1PH8135-1 F 1 - ■■■■ 1</b>	
		28 (37.6)	134 (98.8)	55	401	67.9	4000	8000	<b>1PH8137-1 F 1 - ■■■■ 1</b>	
		160	37 (49.6)	177 (131)	68	416	67.4	3550	6500	<b>1PH8163-1 F 1 - ■■■■ 1</b>
			45 (60.4)	215 (159)	75	440	67.5	3300	6500	<b>1PH8165-1 F 1 - ■■■■ 1</b>

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

Motor type (repeated)	Power factor	Magne- tizing current	Efficiency	Moment of inertia	Weight, approx.	Terminal box	SINAMICS S110 blocksize format	
							Rated output current <sup>3)</sup>	PM340 Power Module Air cooling
	$\cos \varphi$	$I_{\mu}$ A	$\eta$	$J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	kg (lb)	Type	$I_{\text{rated}}$ A	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  
IntegratedU  
AYou 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  $P = P_{\text{rated}}$ .2)  $n_{\text{max}}$ : 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.

# Motors

## Main motors for SINAMICS S110

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

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

Motor type (repeated)	Power factor  $\cos \varphi$	Magne- tizing current  $I_{\mu}$ A	Efficiency  $\eta$	Moment of inertia  $J$ kgm <sup>2</sup> (lb <sub>r</sub> -in-s <sup>2</sup> )	Weight, approx.  kg (lb)	Terminal box  Type	SINAMICS S110 blocksize format	
							Rated output current <sup>3)</sup>  $I_{\text{rated}}$ A	PM340 Power Module Air cooling  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  
IntegratedU  
AYou 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  $P = P_{\text{rated}}$ .2)  $n_{\text{max}}$ : 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.

# Motors

## Main motors for SINAMICS S110

### 1PH8 asynchronous (induction) motors Selection guides

#### 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		
<b>Shaft height 80</b>	1	P	H	8	0	8	.	-	1	■	.	■	■	-	■	■	■	1
<b>Shaft height 100</b>	1	P	H	8	1	0	.	-	1	■	.	■	■	-	■	■	■	1
<b>Shaft height 132</b>	1	P	H	8	1	3	.	-	1	■	.	■	■	-	■	■	■	1
<b>Shaft height 160</b>	1	P	H	8	1	6	.	-	1	■	.	■	■	-	■	■	■	1
<b>Overall length<sup>1)</sup></b>	-																	
<b>Asynchronous variant</b>									1									
<b>Encoder systems for motors <u>without</u> DRIVE-CLiQ interface</b>																		
Without encoder										A								
Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) <sup>2)</sup>										H								
Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) <sup>3)</sup>										J								
<b>Rated speeds at 400 V to 480 V 3 AC (winding design)</b>																		
400 rpm/600 rpm										B								
1000 rpm/1350 rpm										D								
1500 rpm/2000 rpm										F								
<b>Cooling</b>		<b>Degree of protection</b>																
Forced ventilation NDE → DE		IP55																
Water cooling		IP65																
<b>Type of construction</b>																		
IM B3 (IM V5, IM V6)												0						
IM B5 (IM V1, IM V3)												2						
IM B35 (IM V15, IM V35) <sup>4)</sup>												3						
<b>Shaft extension DE</b>		<b>Balancing</b>																
Plain shaft		-																
Fitted key		Half-key																
		0																
		2																
<b>Bearing</b>		<b>Vibration magnitude acc. to Siemens/EN 60034-14<sup>5)</sup></b>					<b>Shaft and flange accuracy<sup>5)</sup></b>											
Standard		R/A					R											
Standard		S/A					R											
							B											
							C											
<b>Cable connection (view of DE)</b>																		
<u>Terminal box</u>					<u>Cable entry</u>					<u>Signal connection</u>								
Top					Right					DE								
Top					Left					DE								
Top					NDE					Left								
										A								
										B								
										C								
<b>Version status</b>																1		

#### Ordering example

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

<sup>1)</sup> Not selectable. Determined by the choice of rated power.

<sup>2)</sup> Limited to  $n_{max} = 9000$  rpm.

<sup>3)</sup> Limited to  $n_{max} = 4600$  rpm.

<sup>4)</sup> Only possible with 1PH810 to 1PH816.

<sup>5)</sup> For definition, see 1PH8 Configuration Manual.

# Motors

## Main motors for SINAMICS S110

### 1PH8 asynchronous (induction) motors Selection guides

#### Technical specifications

##### Terminal box

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

##### Ventilation data/Sound pressure levels

Motor type	Direction of air flow	Fan motor max. current consumption at			Volume of air, min. m <sup>3</sup> /s (ft <sup>3</sup> /s)	Sound pressure level L <sub>pA</sub> (1 m) <sup>4)</sup> Motor + external fan operation at 50 Hz Tolerance + 3 dB dB
		A	A	A		
<b>Forced ventilation</b>		<b>230 V 50 Hz (± 10 %)</b>	<b>230 V 60 Hz (± 10 %)</b>	<b>265 V 60 Hz (± 10 %)</b>		
1PH808	NDE → DE	0.33	0.25	0.32	0.02 (0.71)	70
<b>Forced ventilation</b>		<b>400 V 50 Hz (± 10 %)</b>	<b>400 V 60 Hz (± 10 %)</b>	<b>480 V 60 Hz (± 10 %)</b>		
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 bar	Water connection at NDE thread Inch	Sound pressure level L <sub>pA</sub> (1 m) <sup>4)</sup> Motor Tolerance + 3 dB dB
	l/min (US gal./min)			
<b>Water cooling</b>				
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

<sup>1)</sup> Thread M16 × 1.5 arranged with 90° to signal connection; thread only for 9th data position "A" (without encoder).

<sup>2)</sup> Dependent on the design of the metric cable gland.

<sup>3)</sup> Current-carrying capacity based on EN 60204-1/IEC 60364-5-52 with installation type C.

<sup>4)</sup> For rated pulse frequency of 4 kHz and speed range up to 5000 rpm.

# Motors

## Main motors for SINAMICS S110

### 1PH8 asynchronous (induction) motors Selection guides

#### 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  $\mu\text{m}$ .

##### Cooling water specifications

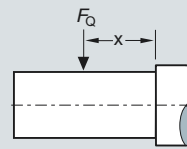
pH value	6.0 ... 9.0
Total hardness	< 170 ppm
Conductivity	< 500 $\mu\text{S/cm}$
Operating pressure, max.	< 6 bar
Pressure drop at V(N)	< 1 bar
Cooling water inlet temperature, max.	< 30 °C (86 °F)
Cooling water temperature, min.	$T_{\text{cooling water}} > T_{\text{ambient}} - 5 \text{ K}$
Anti-freeze protection / corrosion protection	20 ... 30 %
NALCO 00GE056 inhibitor	0.2 ... 0.25 %

##### Components

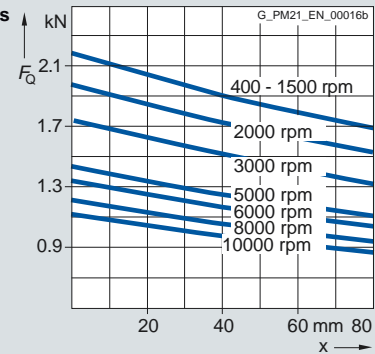
Dissolved substances	< 340 ppm
Max. grain size	< 100 $\mu\text{m}$
Chloride ions	< 40 ppm
Sulfate ions	< 50 ppm
Nitrate ions	< 50 ppm

#### Characteristic curves

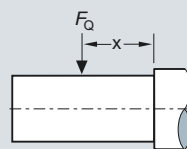
Permissible radial forces  
1PH8 motors  
Shaft height 80  
Standard



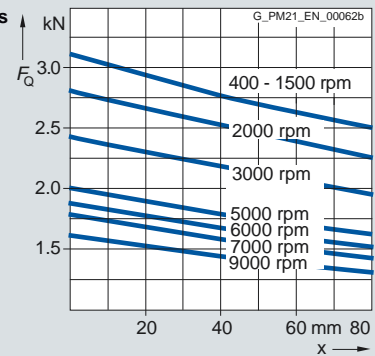
$L_{10h} = 20000 \text{ h}$



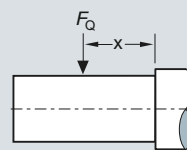
Permissible radial forces  
1PH8 motors  
Shaft height 100  
Standard



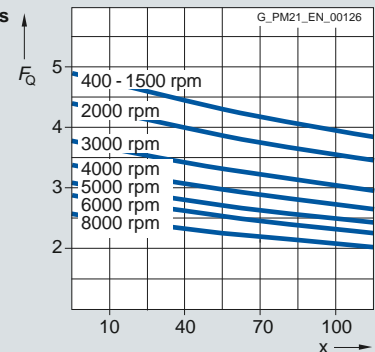
$L_{10h} = 20000 \text{ h}$



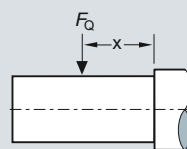
Permissible radial forces  
1PH8 motors  
Shaft height 132  
Standard



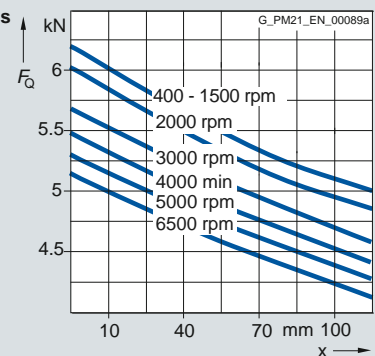
$L_{10h} = 20000 \text{ h}$



Permissible radial forces  
1PH8 motors  
Shaft height 160  
Standard



$L_{10h} = 20000 \text{ h}$



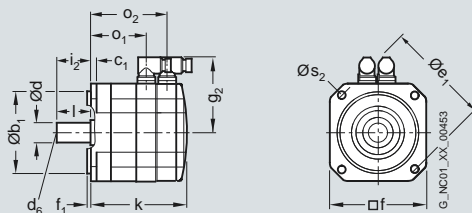


#### Dimensional drawings

For motor		Dimensions in mm (inches)									Shaft extension DE		
Shaft height	Type	DIN IEC	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	g <sub>2</sub> –	i <sub>2</sub> –	s <sub>2</sub> S	d D	d <sub>6</sub> –	l E
<b>1FK7 Compact – Natural cooling</b>													
20	1FK701		30 (1.18)	7 (0.28)	46 (1.81)	40 (1.57)	2.5 (0.10)	66 (2.60)	18 (0.71)	4.5 (0.18)	<b>8</b> <b>(0.31)</b>	–	18 (0.71)
28	1FK702		40 (1.57)	10 (0.39)	63 (2.48)	55 (2.17)	2.5 (0.10)	75 (2.95)	20 (0.79)	5.4 (0.21)	<b>9</b> <b>(0.35)</b>	M3	20 (0.79)

Shaft height	Type	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		
		k LB	o <sub>1</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	o <sub>2</sub> –
20	1FK7011	140 (5.51)	89 (3.50)	118 (4.65)	140 (5.51)	89 (3.50)	118 (4.65)	155 (6.10)	89 (3.50)	118 (4.65)	155 (6.10)	89 (3.50)	118 (4.65)
	1FK7015	165 (6.50)	114 (4.49)	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



# Motors

## Dimensional drawings

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

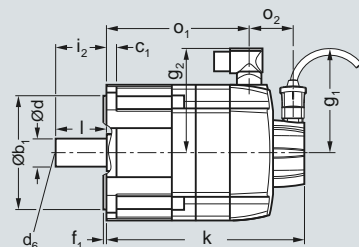
#### Dimensional drawings

For motor		Dimensions in mm (inches)										Shaft extension DE		
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	i <sub>2</sub> -	s <sub>2</sub> S	d D	d <sub>6</sub> -	l E	
<b>1FK7 Compact motors – Natural cooling</b>														
36	1FK703	90	60	8	75	72	3	30	6.5	<b>14</b>	M5	30		
		(3.54)	(2.36)	(0.31)	(2.95)	(2.83)	(0.12)	(1.18)	(0.26)	<b>(0.55)</b>		(1.18)		
48	1FK704	120	80	10	100	96	3	40	6.5	<b>19</b>	M6	40		
		(4.72)	(3.15)	(0.39)	(3.94)	(3.78)	(0.12)	(1.57)	(0.26)	<b>(0.75)</b>		(1.57)		
63	1FK706	155	110	10	130	126	3.5	50	9	<b>24</b>	M8	50		
		(6.10)	(4.33)	(0.39)	(5.12)	(4.96)	(0.14)	(1.97)	(0.35)	<b>(0.94)</b>		(1.97)		
80	1FK708	194	130	11.5	165	155	3.5	58	11	<b>32</b>	M12	58		
		(7.64)	(5.12)	(0.45)	(6.50)	(6.10)	(0.14)	(2.28)	(0.43)	<b>(1.26)</b>		(2.28)		
100	1FK710	245	180	13	215	192	4	80	14	<b>38</b>	M12	80		
		(9.65)	(7.09)	(0.51)	(8.46)	(7.56)	(0.16)	(3.15)	(0.55)	<b>(1.50)</b>		(3.15)		

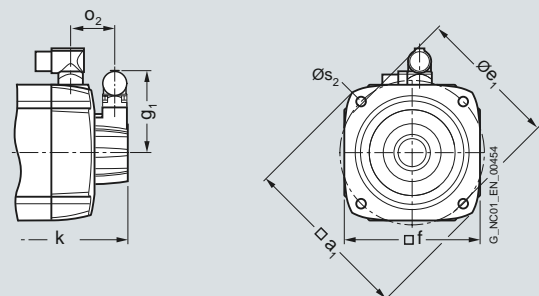
Shaft height	Type	DQI encoder <u>with</u> DRIVE-CLiQ interface								Encoder system (without resolver) <u>without</u> DRIVE-CLiQ interface							
		without brake				with brake				without brake				with brake			
		g <sub>1</sub> -	g <sub>2</sub> -	o <sub>2</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -	g <sub>1</sub> -	g <sub>2</sub> -	o <sub>2</sub> -	k LB	o <sub>1</sub> -	k LB	o <sub>1</sub> -		
<b>1FK7 Compact motors – Natural cooling</b>																	
36	1FK7032-2A	104.5	78	50	173	111	200	138	78	78	47	173	111	200	138		
		(4.11)	(3.07)	(1.97)	(6.81)	(4.37)	(7.87)	(5.43)	(3.07)	(3.07)	(1.85)	(6.81)	(4.37)	(7.87)	(5.43)		
	1FK7034-2A				198	136	225	163				198	136	225	163		
					(7.80)	(5.35)	(8.86)	(6.42)				(7.80)	(5.35)	(8.86)	(6.42)		
48	1FK7040-2A	104.5	90	50	147	85	179	117	94	90	52	152	85	184	117		
		(4.11)	(3.54)	(1.97)	(5.79)	(3.35)	(7.05)	(4.61)	(3.70)	(3.54)	(2.05)	(5.98)	(3.35)	(7.24)	(4.61)		
	1FK7042-2A				174	112	206	144				179	112	211	144		
					(6.85)	(4.41)	(8.11)	(5.67)				(7.05)	(4.41)	(8.31)	(5.67)		
63	1FK7060-2A	104.5	104	50	168	106	203	141	102	104	52	173	106	208	141		
		(4.11)	(4.09)	(1.97)	(6.61)	(4.17)	(7.99)	(5.55)	(4.02)	(4.09)	(2.05)	(6.81)	(4.17)	(8.19)	(5.55)		
	1FK7062-2A				190	128	226	163				195	128	231	163		
					(7.48)	(5.04)	(8.90)	(6.42)				(7.68)	(5.04)	(9.09)	(6.42)		
	1FK7063-2A				213	151	248	186				218	151	253	186		
					(8.39)	(5.94)	(9.76)	(7.32)				(8.58)	(5.94)	(9.96)	(7.32)		
80	1FK7080-2A	104.5	119	48	171	111	223	163	94	119	50	176	111	228	163		
		(4.11)	(4.69)	(1.89)	(6.73)	(4.37)	(8.78)	(6.42)	(3.70)	(4.69)	(1.97)	(6.93)	(4.37)	(8.98)	(6.42)		
	1FK7081-2A				190	130	242	182				195	130	247	182		
					(7.48)	(5.12)	(9.53)	(7.17)				(7.68)	(5.12)	(9.72)	(7.17)		
	1FK7083-2A				209	149	261	201				214	149	266	201		
					(8.23)	(5.87)	(10.28)	(7.91)				(8.43)	(5.87)	(10.47)	(7.91)		
	1FK7084-2A				229	168	281	221				234	168	286	221		
					(9.02)	(6.61)	(11.06)	(8.70)				(9.21)	(6.61)	(11.26)	(8.70)		
100	1FK7100-2A	104.5	137	53	183	118	220	170	94	137	55	188	118	225	170		
		(4.11)	(5.39)	(2.09)	(7.20)	(4.65)	(8.66)	(6.69)	(3.70)	(5.39)	(2.17)	(7.40)	(4.65)	(8.86)	(6.69)		
	1FK7101-2A		158		209	144	261	196		158		214	144	266	196		
			(6.22)		(8.23)	(5.67)	(10.28)	(7.72)		(6.22)		(8.43)	(5.67)	(10.47)	(7.72)		
	1FK7103-2A				235	170	287	222				240	170	292	222		
					(9.25)	(6.69)	(11.30)	(8.74)				(9.45)	(6.69)	(11.50)	(8.74)		
	1FK7105-2A				287	222	339	274				292	222	344	274		
					(11.30)	(8.74)	(13.35)	(10.79)				(11.50)	(8.74)	(13.54)	(10.79)		

1FK703  
1FK704  
1FK706  
1FK708  
1FK710

Version with DRIVE-CLiQ interface



Version without DRIVE-CLiQ interface

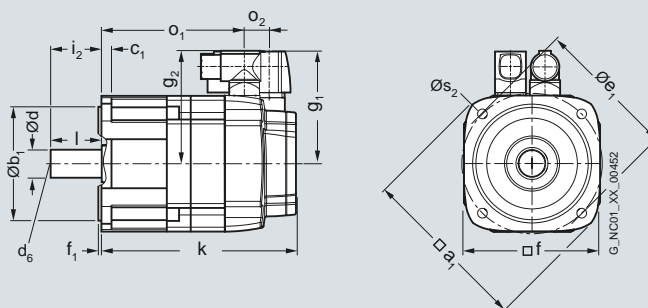


#### Dimensional drawings

For motor		Dimensions in mm (inches)										Shaft extension DE	
Shaft height	Type	DIN IEC	a <sub>1</sub> P	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	i <sub>2</sub> –	s <sub>2</sub> S	d D	d <sub>6</sub> –	l E
<b>1FK7 Compact motors – Natural cooling</b>													
36	1FK703	90 (3.54)	60 (2.36)	8 (0.31)	75 (2.95)	72 (2.83)	3 (0.12)	30 (1.18)	6.5 (0.26)	<b>14</b> <b>(0.55)</b>	M5	30 (1.18)	
48	1FK704	120 (4.72)	80 (3.15)	10 (0.39)	100 (3.94)	96 (3.78)	3 (0.12)	40 (1.57)	6.5 (0.26)	<b>19</b> <b>(0.75)</b>	M6	40 (1.57)	
63	1FK706	155 (6.10)	110 (4.33)	10 (0.39)	130 (5.12)	126 (4.96)	3.5 (0.14)	50 (1.97)	9 (0.35)	<b>24</b> <b>(0.94)</b>	M8	50 (1.97)	
80	1FK708	194 (7.64)	130 (5.12)	11.5 (0.45)	165 (6.50)	155 (6.10)	3.5 (0.14)	58 (2.28)	11 (0.43)	<b>32</b> <b>(1.26)</b>	M12	58 (2.28)	
100	1FK710	245 (9.65)	180 (7.09)	13 (0.51)	215 (8.46)	192 (7.56)	4 (0.16)	80 (3.15)	14 (0.55)	<b>38</b> <b>(1.50)</b>	M12	80 (3.15)	

		Encoder system with resolver <u>with/without</u> DRIVE-CLiQ interface							
		without brake				with brake			
Shaft height	Type	g <sub>1</sub> –	g <sub>2</sub> –	o <sub>2</sub> –	k LB	o <sub>1</sub> –	k LB	o <sub>1</sub> –	
<b>1FK7 Compact motors – Natural cooling</b>									
36	1FK7032-2A	80 (3.15)	80 (3.15)	15 (0.59)	153 (6.02)	117 (4.61)	180 (7.09)	144 (5.67)	
	1FK7034-2A				178 (7.01)	142 (5.59)	205 (8.07)	169 (6.65)	
48	1FK7040-2A	90 (3.54)	90 (3.54)	23 (0.91)	132 (5.20)	85 (3.35)	164 (6.46)	117 (4.61)	
	1FK7042-2A				160 (6.30)	112 (4.41)	192 (7.56)	144 (5.67)	
63	1FK7060-2A	103 (4.06)	104 (4.09)	23 (0.91)	153 (6.02)	106 (4.17)	189 (7.44)	141 (5.55)	
	1FK7062-2A				176 (6.93)	128 (5.04)	211 (8.31)	163 (6.42)	
	1FK7063-2A				198 (7.80)	151 (5.94)	234 (9.21)	186 (7.32)	
80	1FK7080-2A	118 (4.65)	119 (4.69)	21 (0.83)	157 (6.18)	111 (4.37)	209 (8.23)	163 (6.42)	
	1FK7081-2A				176 (6.93)	130 (5.12)	228 (8.98)	182 (7.32)	
	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



# Motors

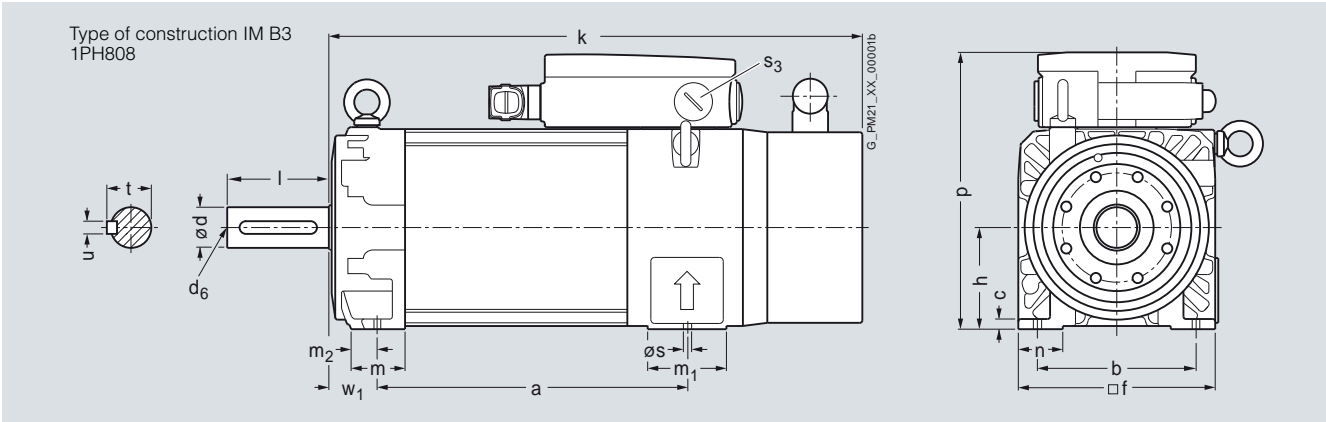
## Dimensional drawings

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

#### Dimensional drawings

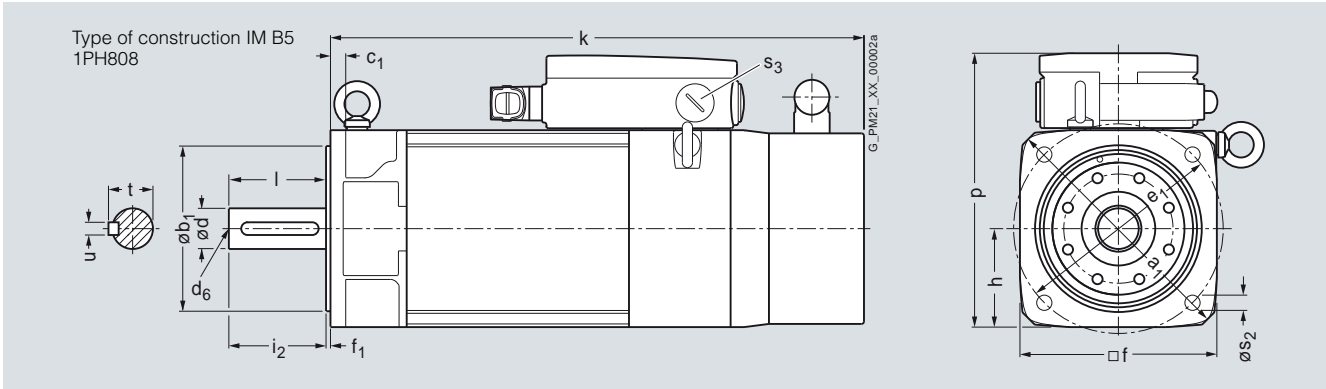
For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n	p	s	s <sub>3</sub>	w <sub>1</sub>
			IEC B	A	HA	AB	H	LB	BA	-	-	AA	HD	K	-	C
<b>1PH8 motor, type of construction IM B3, forced ventilation</b>																
80	1PH8083	194	125	8	155	80	375	42	62	20	35	216	10	M25 × 1.5	38	
		(7.64)	(4.92)	(0.31)	(6.10)	(3.15)	(14.76)	(1.65)	(2.44)	(0.79)	(1.38)	(8.50)	(0.39)		(1.50)	
	1PH8087	244					425									
		(9.61)					(16.73)									



For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC P	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	h	k	p	s <sub>2</sub>	s <sub>3</sub>
			IEC P	N	LA	M	AB	T	H	LB	HD	-	-
<b>1PH8 motor, type of construction IM B5, forced ventilation</b>													
80	1PH8083	200	130	12	165	155	3.5	77.5	375	213.5	12	M25 × 1.5	
		(7.87)	(5.12)	(0.47)	(6.50)	(6.10)	(0.14)	(3.05)	(14.76)	(8.41)	(0.47)		
	1PH8087							425					
								(16.73)					



Shaft extension DE

Shaft height	Type	DIN IEC D	d	d <sub>6</sub>	i <sub>2</sub>	l	t	u
			IEC D	-	E	E	GA	F
<b>1PH8 motor, types of construction IM B3/IM B5, forced ventilation</b>								
80	1PH8083	32	M12	80	80	35	10	
		(1.26)		(3.15)	(3.15)	(1.38)	(0.39)	
	1PH8087							

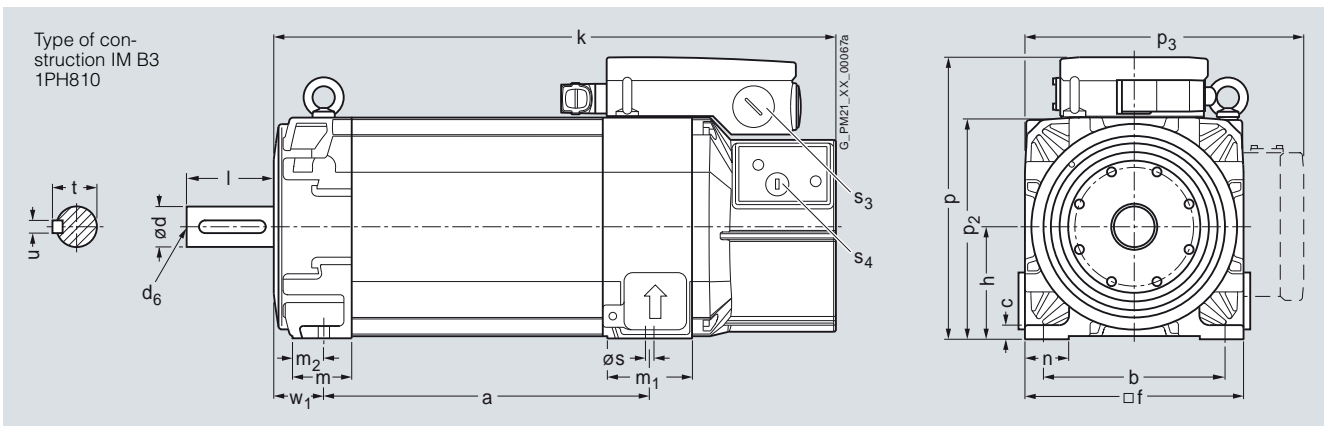
11

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

#### Dimensional drawings

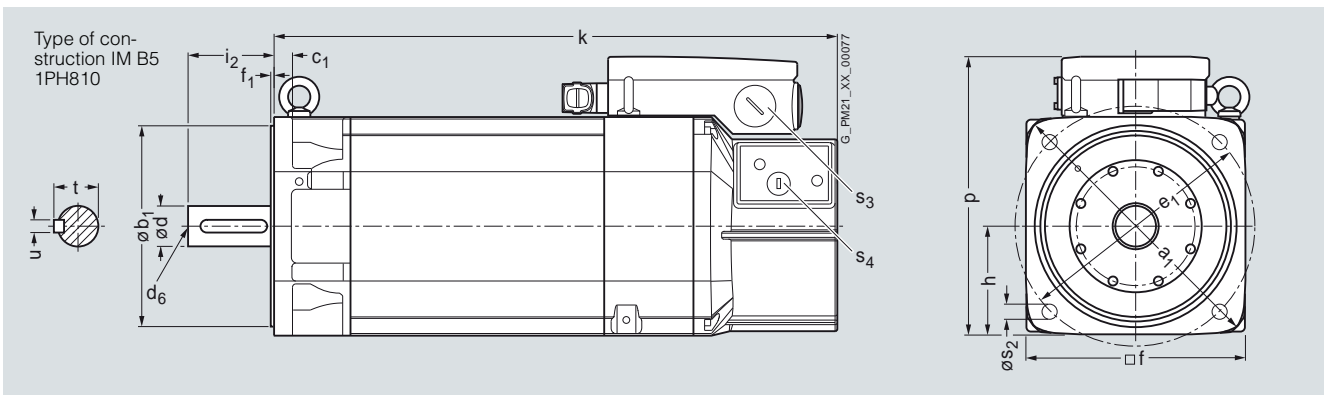
For motor      Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n	p	p <sub>2</sub>	p <sub>3</sub>	s	s <sub>3</sub>	s <sub>4</sub>	W <sub>1</sub> C	
			A	HA	AB	H	LB	BA	-	-	AA	HD	-	-	K	-	-	-		
<b>1PH8 motor, type of construction IM B3, forced ventilation</b>																				
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)												



For motor      Dimensions in mm (inches)

Shaft height	Type	DIN IEC P	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	h	k	p	s <sub>2</sub>	s <sub>3</sub>	s <sub>4</sub>
			N	N	LA	M	AB	T	H	LB	HD	-	-	-
<b>1PH8 motor, type of construction IM B5, forced ventilation</b>														
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)				



# Motors

## Dimensional drawings

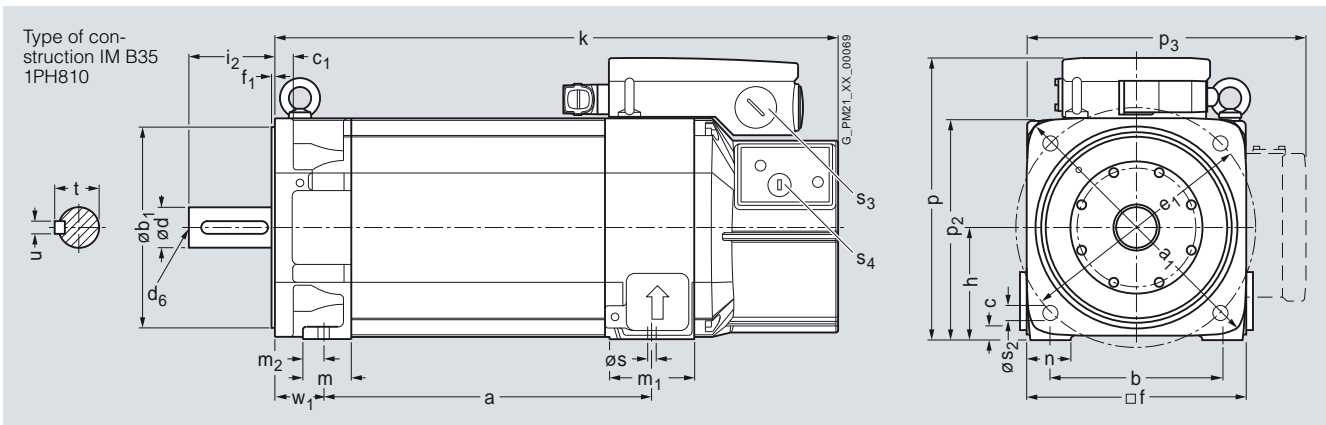
### 1PH8 asynchronous (induction) motors Forced ventilation – Shaft height 100

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c HA	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	k LB	m BA	m <sub>1</sub> –	m <sub>2</sub> –	n AA
<b>1PH8 motor, type of construction IM B35, forced ventilation</b>																	
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 <sub>2</sub> –	p <sub>3</sub> –	s K	s <sub>2</sub> –	s <sub>3</sub> –	s <sub>4</sub> –	w <sub>1</sub> C
<b>1PH8 motor, type of construction IM B35, forced ventilation</b>										
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									



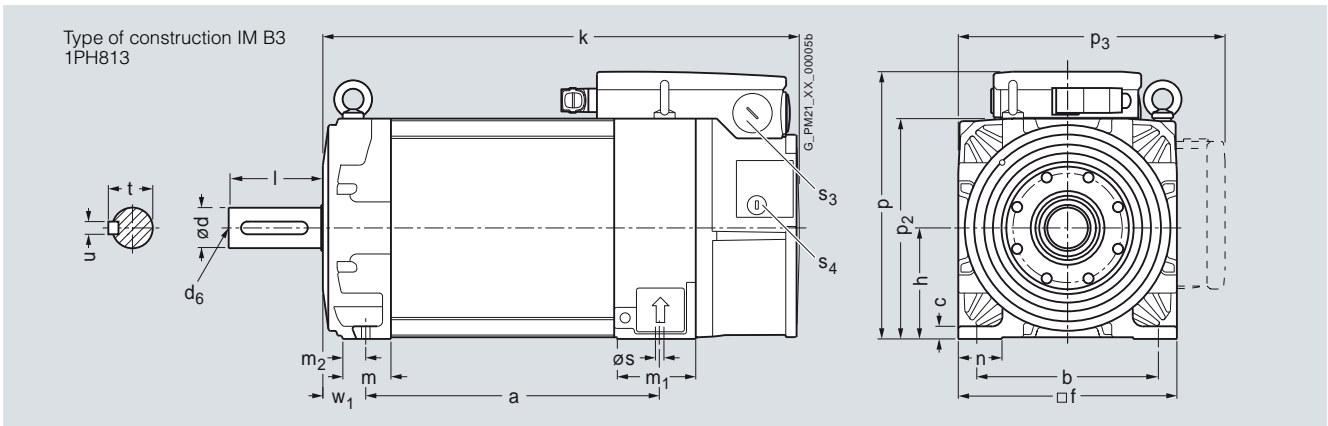
Shaft height	Type	DIN IEC	Shaft extension DE					
			d D	d <sub>6</sub> –	i <sub>2</sub> E	l E	t GA	u F
<b>1PH8 motor, types of construction IM B3/IM B5/IM B35, forced ventilation</b>								
100	1PH8101		<b>38</b> (1.50)	M12	80 (3.15)	80 (3.15)	41 (1.61)	10 (0.39)
	1PH8103							
	1PH8105							
	1PH8107							

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

#### Dimensional drawings

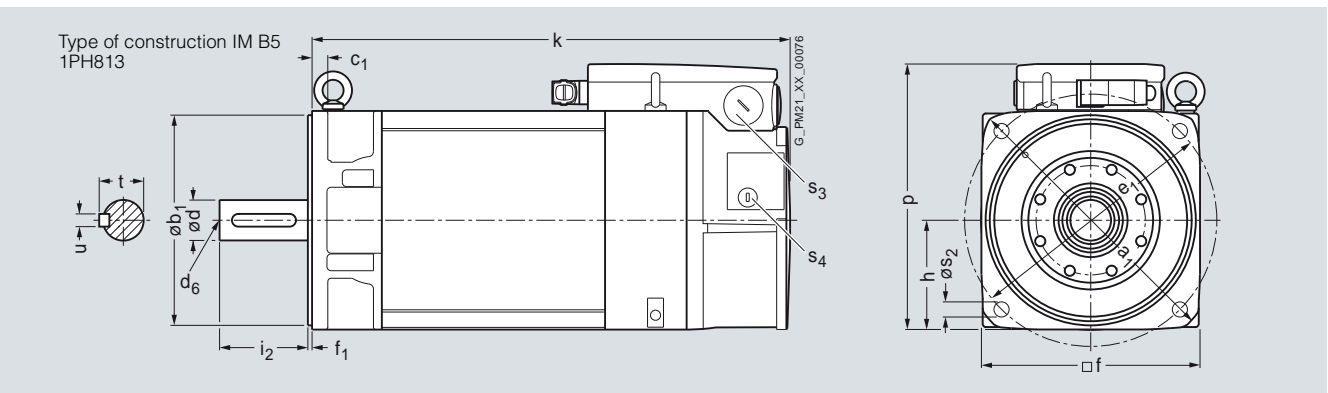
For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n	p	p <sub>2</sub>	p <sub>3</sub>	s	s <sub>3</sub>	s <sub>4</sub>	w <sub>1</sub>
			IEC B	A	HA	AB	H	LB	BA	-	-	AA	HD	-	-	K	-	-	C
<b>1PH8 motor, type of construction IM B3, forced ventilation</b>																			
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)											



For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC P	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	h	k	p	s <sub>2</sub>	s <sub>3</sub>	s <sub>4</sub>
			IEC P	N	LA	M	AB	T	H	LB	HD	-	-	-
<b>1PH8 motor, type of construction IM B5, forced ventilation</b>														
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)				



# Motors

## Dimensional drawings

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

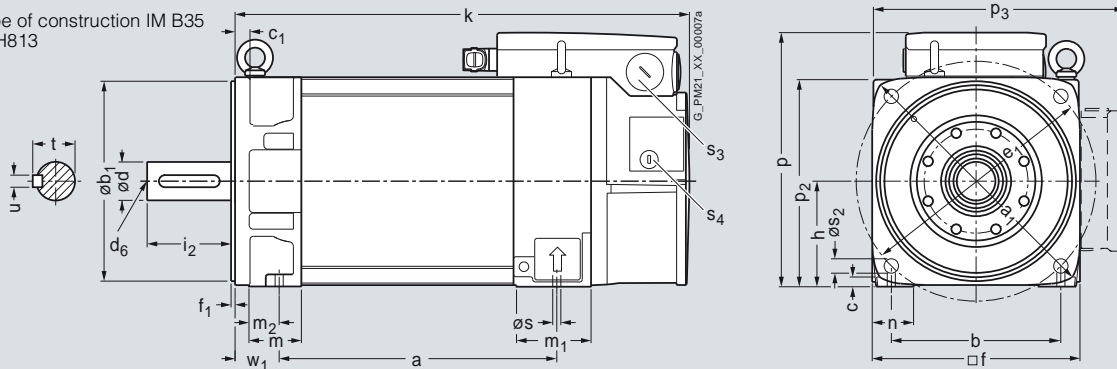
#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c HA	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	k LB	m BA	m <sub>1</sub> –	m <sub>2</sub> –	n AA
<b>1PH8 motor, type of construction IM B35, forced ventilation</b>																	
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 <sub>2</sub> –	p <sub>3</sub> –	s K	s <sub>2</sub> –	s <sub>3</sub> –	s <sub>4</sub> –	W <sub>1</sub> C
<b>1PH8 motor, type of construction IM B35, forced ventilation</b>										
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									

Type of construction IM B35  
1PH813



Shaft extension DE

Shaft height	Type	d D	d <sub>6</sub> –	i <sub>2</sub> E	l E	t GA	u F
<b>1PH8 motor, types of construction IM B3/IM B5/IM B35, forced ventilation</b>							
132	1PH8131	<b>48</b> (1.89)	M16	110 (4.33)	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133						
	1PH8135						
	1PH8137						

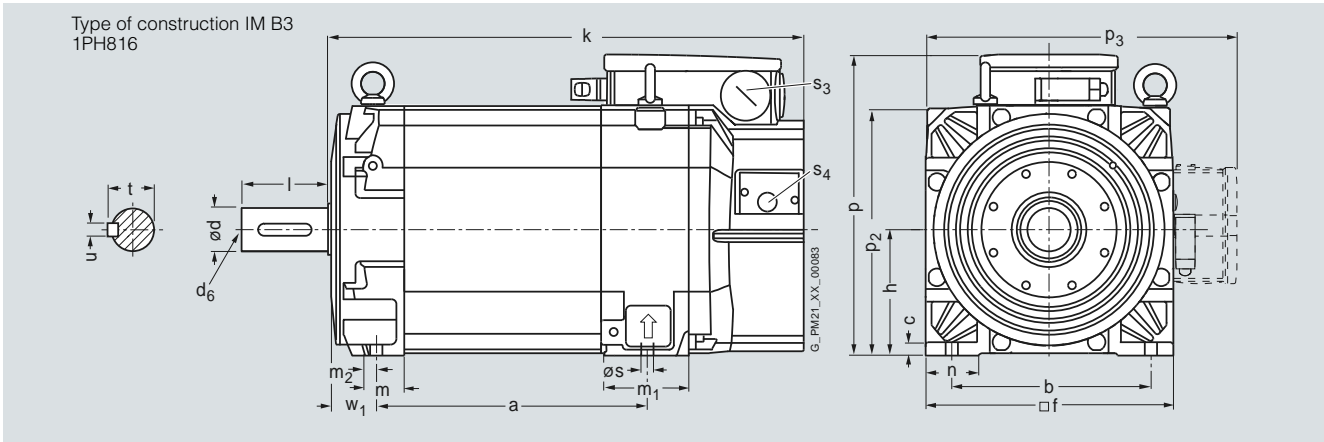


### 1PH8 asynchronous (induction) motors Forced ventilation – Shaft height 160

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	c <sub>1</sub>	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n	p	p <sub>2</sub>	p <sub>3</sub>	s	s <sub>3</sub>	s <sub>4</sub>	w <sub>1</sub>
			A	A	HA	LA	AB	H	LB	BA	-	-	AA	HD	-	-	K	-	-	C
<b>1PH8 motor, type of construction IM B3, forced ventilation</b>																				
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)											



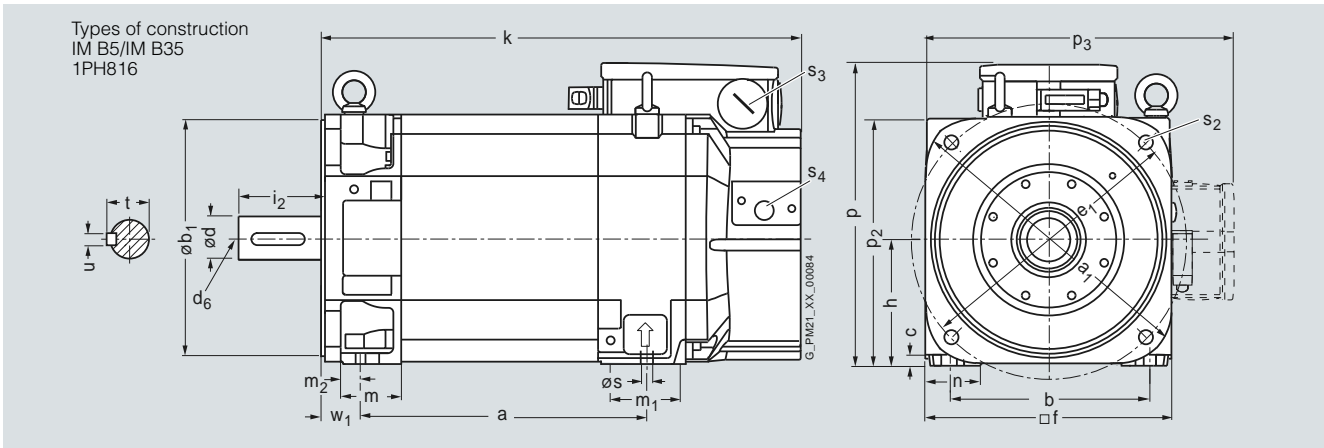
For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	a <sub>1</sub>	b	b <sub>1</sub>	c	e <sub>1</sub>	f	f <sub>1</sub>	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n
			A	P	A	N	HA	M	AB	T	H	LB	BA	-	-	AA
<b>1PH8 motor, types of construction IM B5/IM B35, forced ventilation</b>																
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 extension DE

Shaft height	Type	DIN IEC B	p	p <sub>2</sub>	p <sub>3</sub>	s	s <sub>2</sub>	s <sub>3</sub>	s <sub>4</sub>	w <sub>1</sub>	d	d <sub>6</sub>	i <sub>2</sub>	E	t	u
			HD	-	-	K	-	-	-	C	D	-	E	GA	F	

<b>1PH8 motor, types of construction IM B5/IM B35, forced ventilation</b>											<b>1PH8 motor, types of constr. IM B3/IM B5/IM B35, forced ventil.</b>					
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)	55 (2.17)	M20	110 (4.33)	110 (4.33)	59 (2.32)	16 (0.63)
	1PH8165															



# Motors

## Dimensional drawings

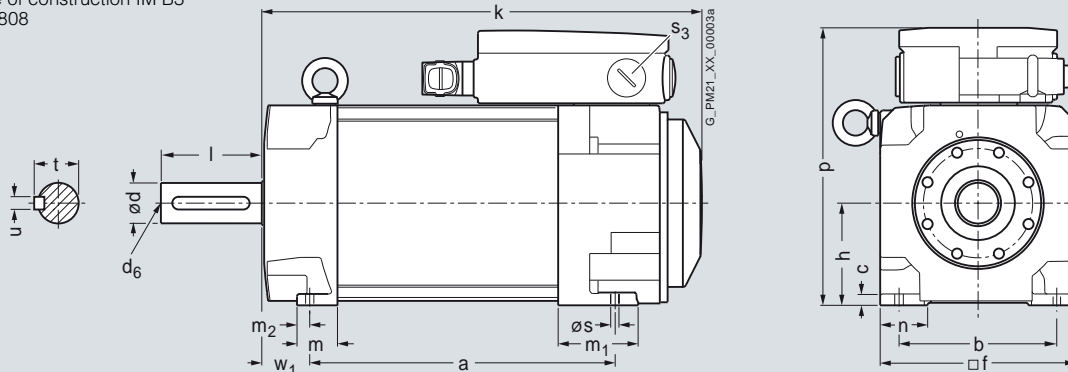
### 1PH8 asynchronous (induction) motors Water cooling – Shaft height 80

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n	p	s	s <sub>3</sub>	w <sub>1</sub>
			IEC B	A	HA	AB	H	LB	BA	-	-	AA	HD	K	-	C
<b>1PH8 motor, type of construction IM B3, water cooling</b>																
80	1PH8083	194	125	8	155	80	301.5	37	63.5	15	35	216	10	M25 × 1.5	38	
		(7.64)	(4.92)	(0.31)	(6.10)	(3.15)	(11.87)	(1.46)	(2.50)	(0.59)	(1.38)	(8.50)	(0.39)		(1.50)	
	1PH8087	244					351.5									
		(9.61)					(13.84)									

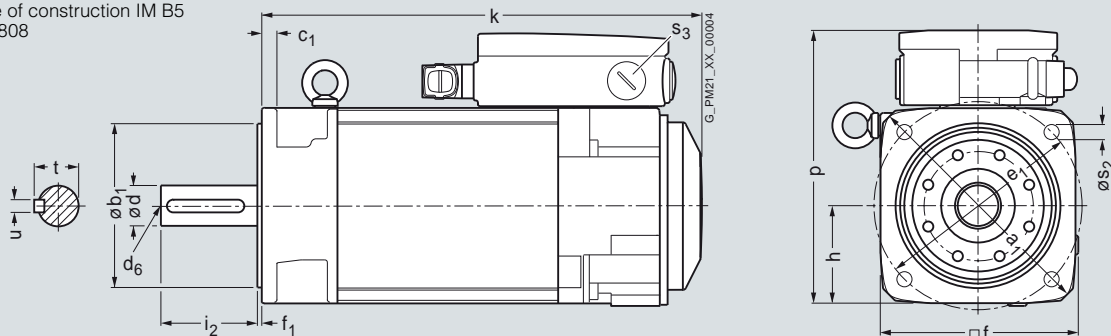
Type of construction IM B3  
1PH808



For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC P	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	h	k	p	s <sub>2</sub>	s <sub>3</sub>
			IEC P	N	LA	M	AB	T	H	LB	HD	-	-
<b>1PH8 motor, type of construction IM B5, water cooling</b>													
80	1PH8083	200	130	12	165	155	3.5	77.5	301.5	213.5	12	M25 × 1.5	
		(7.87)	(5.12)	(0.47)	(6.50)	(6.10)	(0.14)	(3.05)	(11.87)	(8.41)	(0.47)		
	1PH8087								351.5				
									(13.84)				

Type of construction IM B5  
1PH808



Shaft extension DE

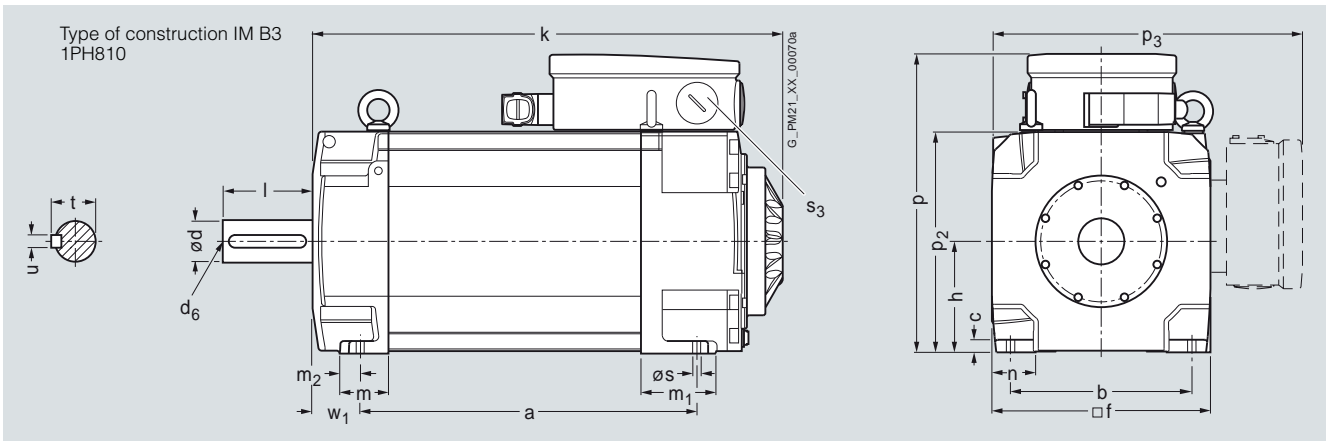
Shaft height	Type	DIN IEC	d	d <sub>6</sub>	i <sub>2</sub>	l	t	u
			D	-	E	E	GA	F
<b>1PH8 motor, types of construction IM B3/IM B5, water cooling</b>								
80	1PH8083	32	M12	80	80	35	10	
		(1.26)		(3.15)	(3.15)	(1.38)	(0.39)	
	1PH8087							

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

### Dimensional drawings

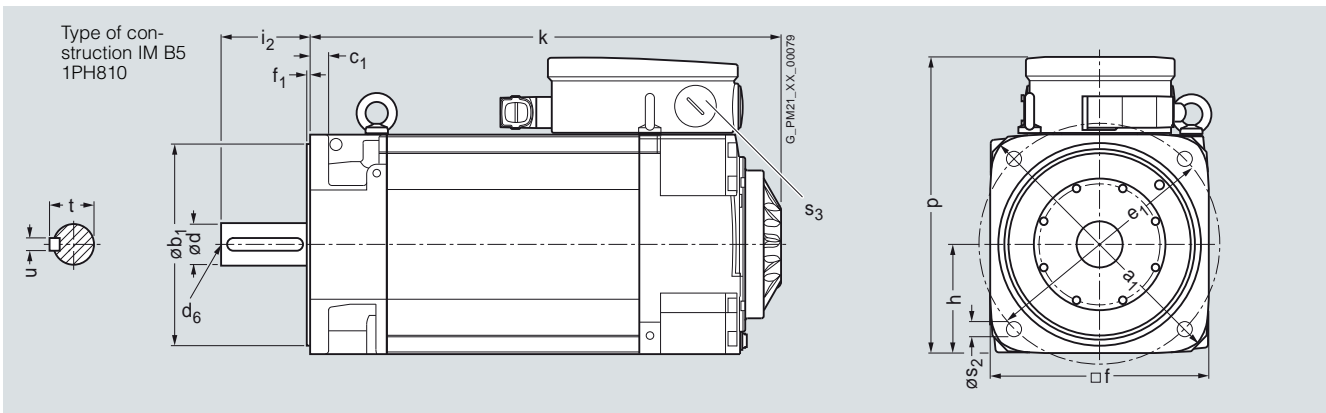
For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n AA	p HD	p <sub>2</sub>	p <sub>3</sub>	s K	s <sub>3</sub>	W <sub>1</sub> C
<b>1PH8 motor, type of construction IM B3, water cooling</b>																		
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							325 (12.80)										
	1PH8105							384.5 (15.14)										
	1PH8107							420 (16.54)										



For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC P	a <sub>1</sub>	b <sub>1</sub> N	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	k LB	p HD	s <sub>2</sub>	s <sub>3</sub>
<b>1PH8 motor, type of construction IM B5, water cooling</b>													
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)			



# Motors

## Dimensional drawings

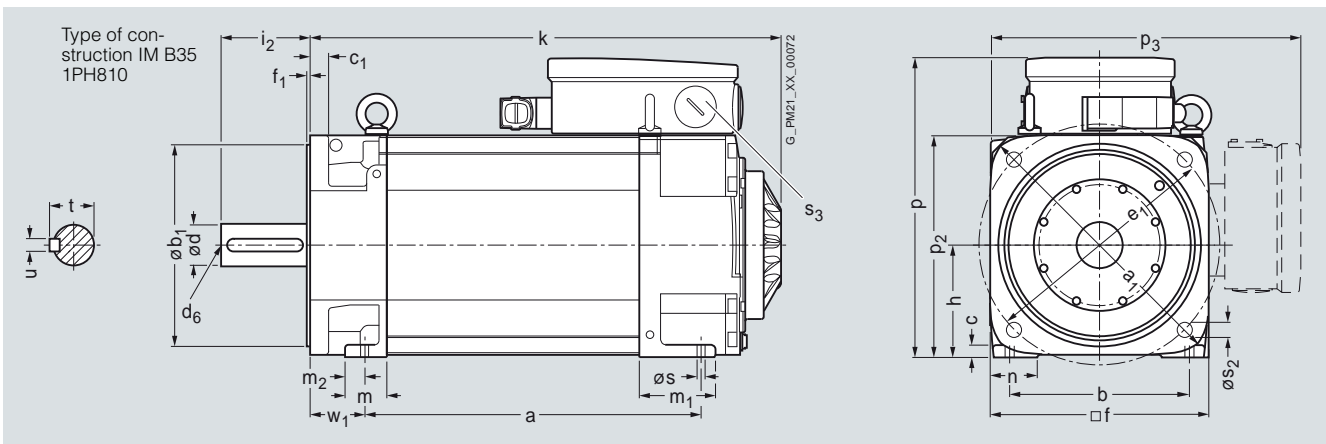
### 1PH8 asynchronous (induction) motors Water cooling – Shaft height 100

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c HA	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	k LB	m BA	m <sub>1</sub> –	m <sub>2</sub> –	n AA
<b>1PH8 motor, type of construction IM B35, water cooling</b>																	
100	1PH8101	167	250	160	180	11	16	215	196	4	100	289.5	37	68	12	43	
		(6.57)	(9.84)	(6.30)	(7.09)	(0.43)	(0.63)	(8.46)	(7.72)	(0.16)	(3.94)	(11.40)	(1.46)	(2.68)	(0.47)	(1.69)	
	1PH8103	202.5										325					
		(7.97)										(12.80)					
	1PH8105	262										384.5					
		(10.31)										(15.14)					
	1PH8107	297.5										420					
		(11.71)										(16.54)					

Shaft height	Type	DIN IEC	p HD	p <sub>2</sub> –	p <sub>3</sub> –	s K	s <sub>2</sub> –	s <sub>3</sub> –	w <sub>1</sub> C
<b>1PH8 motor, type of construction IM B35, water cooling</b>									
100	1PH8101	266.5	198	276.5	12	14	M32 × 1.5	43	
		(10.49)	(7.80)	(10.89)	(0.47)	(0.55)		(1.69)	
	1PH8103								
	1PH8105								
	1PH8107								



#### Shaft extension DE

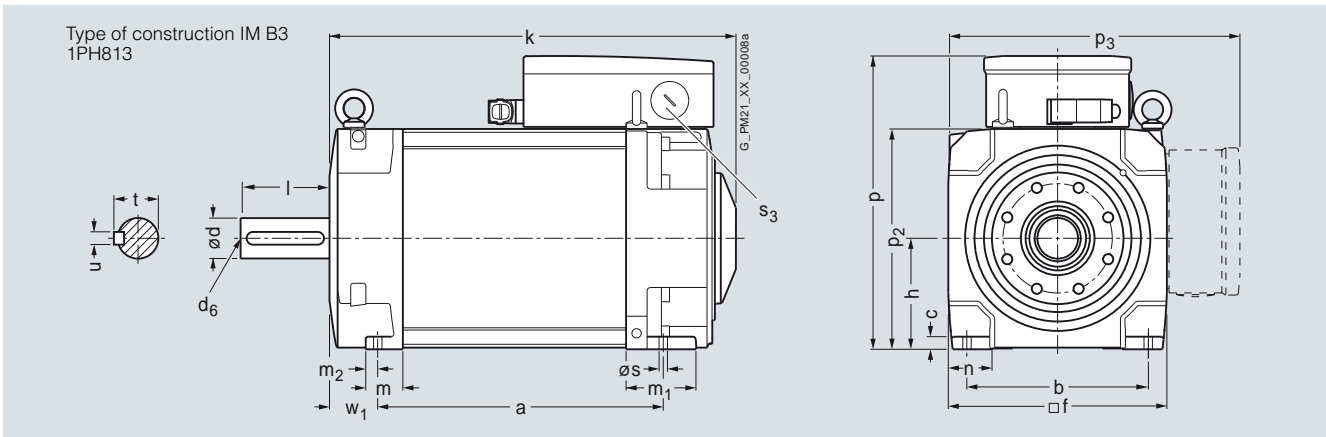
Shaft height	Type	DIN IEC	d D	d <sub>6</sub> –	i <sub>2</sub> E	l E	t GA	u F
<b>1PH8 motor, types of construction IM B3/IM B5/IM B35, water cooling</b>								
100	1PH8101	38	M12	80	80	41	10	
		(1.50)		(3.15)	(3.15)	(1.61)	(0.39)	
	1PH8103							
	1PH8105							
	1PH8107							

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

#### Dimensional drawings

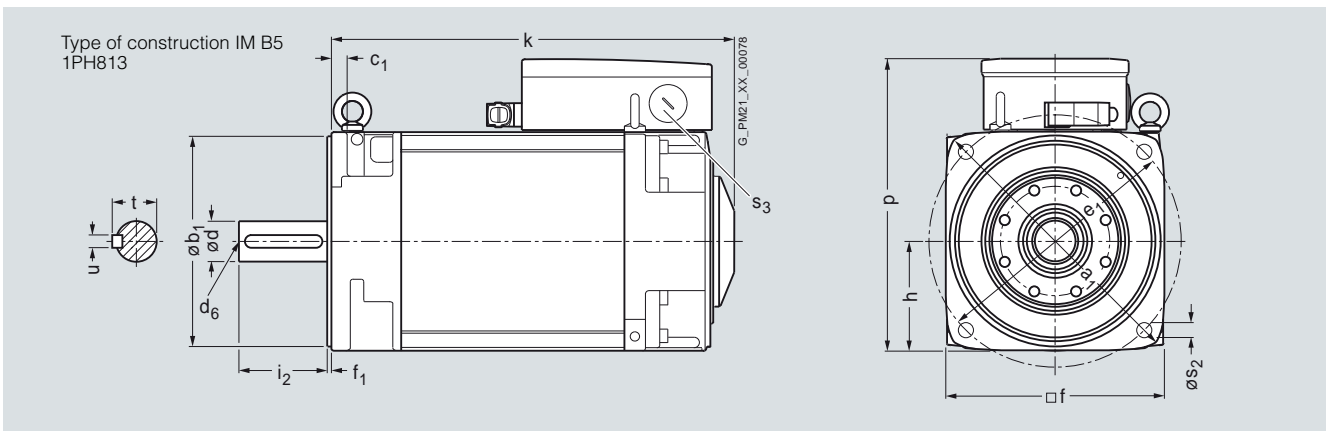
For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	b	c	f	h	k	m	m <sub>1</sub>	m <sub>2</sub>	n	p	p <sub>2</sub>	p <sub>3</sub>	s	s <sub>3</sub>	W <sub>1</sub>		
			mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
<b>1PH8 motor, type of construction IM B3, water cooling</b>																				
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)												



For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC P	a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>	e <sub>1</sub>	f	f <sub>1</sub>	h	k	p	s <sub>2</sub>	s <sub>3</sub>
			mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
<b>1PH8 motor, type of construction IM B5, water cooling</b>													
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)			



# Motors

## Dimensional drawings

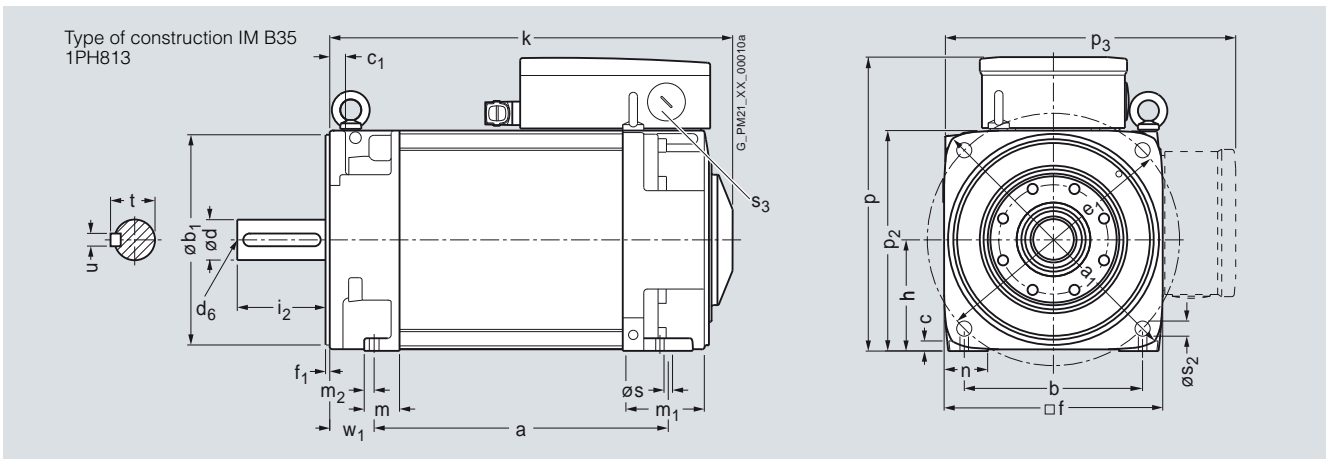
### 1PH8 asynchronous (induction) motors Water cooling – Shaft height 132

#### Dimensional drawings

For motor Dimensions in mm (inches)

Shaft height	Type	DIN IEC B	a	a <sub>1</sub> P	b A	b <sub>1</sub> N	c HA	c <sub>1</sub> LA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	k LB	m BA	m <sub>1</sub> –	m <sub>2</sub> –	n AA	
<b>1PH8 motor, type of construction IM B35, water cooling</b>																		
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 HD	p	p <sub>2</sub> –	p <sub>3</sub> –	s K	s <sub>2</sub> –	s <sub>3</sub> –	w <sub>1</sub> C
<b>1PH8 motor, type of construction IM B35, water cooling</b>									
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								

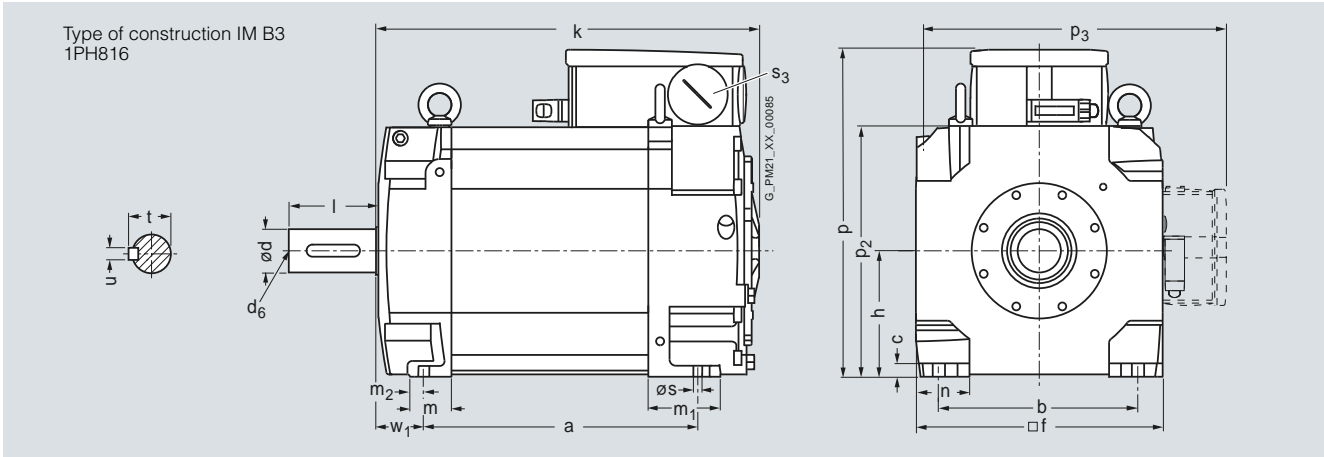


		Shaft extension DE					
Shaft height	Type	d D	d <sub>6</sub> –	i <sub>2</sub> E	l E	t GA	u F
<b>1PH8 motor, types of construction IM B3/IM B5/IM B35, water cooling</b>							
132	1PH8131	<b>48</b> (1.89)	M16	110 (4.33)	110 (4.33)	51.5 (2.03)	14 (0.55)
	1PH8133						
	1PH8135						
	1PH8137						

### 1PH8 asynchronous motors Water cooling – Shaft height 160

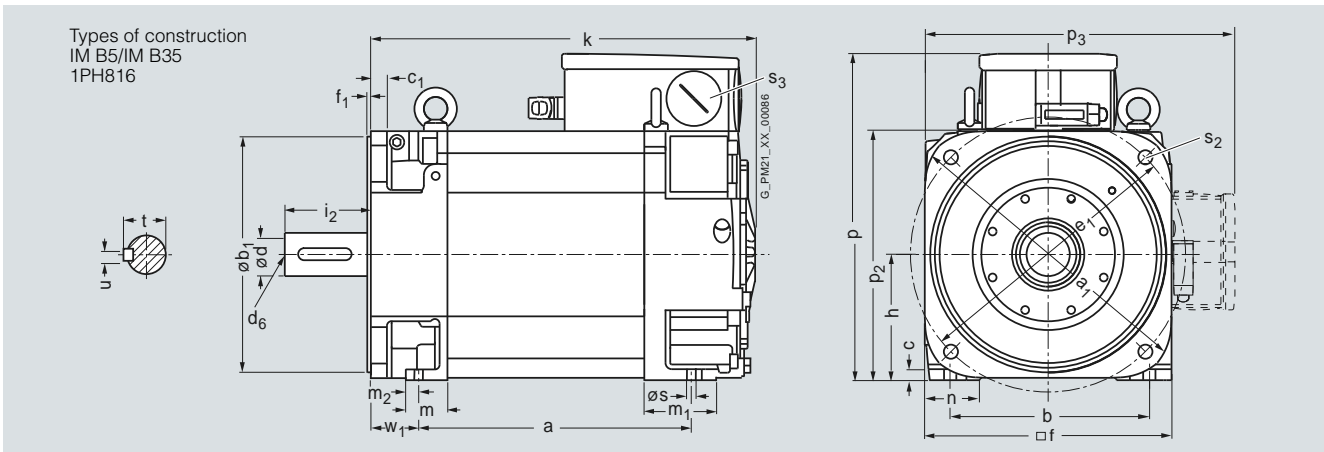
#### Dimensional drawings

For motor		Dimensions in mm (inches)																		
Shaft height	Type	DIN IEC	a B	b A	c HA	c <sub>1</sub> LA	f AB	h H	k LB	m BA	m <sub>1</sub> -	m <sub>2</sub> -	n AA	p HD	p <sub>2</sub> -	p <sub>3</sub> -	s K	s <sub>3</sub> -	w <sub>1</sub> C	
<b>1PH8 motor, type of construction IM B3, water cooling</b>																				
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																			



For motor		Dimensions in mm (inches)														
Shaft height	Type	DIN IEC	a B	a <sub>1</sub> P	b A	b <sub>1</sub> N	c HA	e <sub>1</sub> M	f AB	f <sub>1</sub> T	h H	k LB	m BA	m <sub>1</sub> -	m <sub>2</sub> -	n AA
<b>1PH8, types of construction IM B5/IM B35, water cooling</b>																
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 <sub>2</sub> -	p <sub>3</sub> -	s K	s <sub>2</sub> -	s <sub>3</sub> -	w <sub>1</sub> C	Shaft extension DE						
										d D	d <sub>6</sub> -	i <sub>2</sub> E	l E	t GA	u F	
<b>1PH8, types of construction IM B5/IM B35, water cooling</b>										<b>1PH8, types of construction IM B3/IM B5/IM B35, water cooling</b>						
	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															



# Motors

Notes

11



# 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<sub>pp</sub> 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


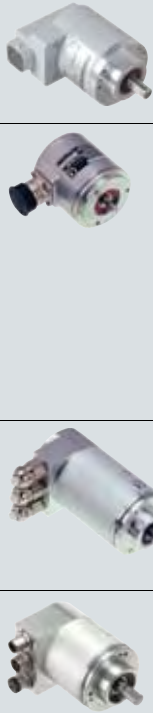
12/9 PROFIBUS DP absolute encoder

12/9 PROFINET IO absolute encoder

12/12 [Accessories](#)

# Measuring systems

## Overview

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

S/R = signals/revolution

<sup>1)</sup> Built-on rotary encoders can be used for Safety Integrated.

<sup>2)</sup> If you require information about the usability of built-on rotary encoders for Safety Integrated, please contact your local Siemens office.

# Measuring systems

## Built-on optoelectronic rotary encoders

### Introduction

#### 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:  $\geq 20$  mm (0.79 in)
- Continuous bending:  $\geq 75$  mm (2.95 in)

# Measuring systems

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Function



Incremental encoders (sin/cos 1 V<sub>pp</sub>/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 photoelectric elements. With an appropriate arrangement of the line pattern on the dividing disk connected to the shaft and the fixed aperture, the photoelectric 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<sub>pp</sub> 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 <sub>pp</sub> incremental encoder 6FX2001-3....	RS422 (TTL) incremental encoder 6FX2001-2....	HTL incremental encoder 6FX2001-4...0	RS422 (TTL) double-track incremental encoder 6FX2001-2UK00
<b>Operating voltage DC U<sub>p</sub> on encoder</b>	V	5 ± 10 %	5 ± 10 % or 10 ... 30	10 ... 30	5 ± 5 %
<b>Limit frequency, typ.</b>	kHz	≥ 180 (-3 dB) ≥ 450 (-6 dB)	–	–	–
<b>Scanning frequency, max.</b>	kHz	–	300	300	Track 1: 160 Track 2: 1000
<b>No-load current consumption, max.</b>	mA	150	150	150	Track 1: 150 Track 2: 150
<b>Signal level</b>		Sinusoidal 1 V <sub>pp</sub>	RS422 (TTL)	U <sub>H</sub> ≥ 21 V at I <sub>H</sub> = 20 mA at 24 V U <sub>L</sub> ≤ 2.8 V at I <sub>L</sub> = 20 mA at 24 V	RS422 (TTL)
<b>Outputs protected against short-circuit to 0 V</b>		Yes	Yes	Yes	Yes
<b>Switching time (10 ... 90 %) Rise/fall time t<sub>r</sub>/t<sub>f</sub> (with 1 m (3.28 ft) cable and recommended input circuit)</b>	ns	–	≤ 50	≤ 200	≤ 100
<b>Phase angle, signal A to B</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
<b>Cable length to downstream electronics, max.<sup>1)</sup></b>	m (ft)	150 (492)	100 (328)	300 (984)	–
• Up to 500 kHz	m (ft)	–	–	–	100 (328)
• Up to 1 MHz	m (ft)	–	–	–	50 (164)

<sup>1)</sup> With recommended cable and input circuitry of the downstream electronics, observe max. permissible cable length of module to be evaluated.

## Technical specifications (continued)

		sin/cos 1 V <sub>pp</sub> incremental encoder 6FX2001-3....	RS422 (TTL) incremental encoder 6FX2001-2....	HTL incremental encoder 6FX2001-4...0	RS422 (TTL) double-track incremental encoder 6FX2001-2UK00
<b>LED failure monitoring</b>		–	High-resistance driver	High-resistance driver	–
<b>Resolution, max.</b>	S/R	2500	5000	2500	Track 1: 1024 Track 2: 9000
<b>Accuracy</b>	arcsec	± 18 mech. × 3600/ number of signals/revolution z	± 18 mech. × 3600/ number of signals/revolution z	± 18 mech. × 3600/ number of signals/revolution z	Track 1: ± 63 Track 2: ± 12
<b>Speed, max.</b>					
• Electrical	rpm	(27 × 10 <sup>6</sup> rpm)/number of signals/revolution (at -6 dB)	(18 × 10 <sup>6</sup> rpm)/number of signals/revolution	(18 × 10 <sup>6</sup> rpm)/number of signals/revolution	Track 1: 9000 Track 2: 6500
• Mechanical	rpm	12000	12000	12000	12000
<b>Friction torque</b> (at 20 °C (68 °F))	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Starting torque</b> (at 20 °C (68 °F))	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Shaft loading capacity</b>					
• n > 6000 rpm					
- Axial	N (lb <sub>f</sub> )	10 (2.25)	10 (2.25)	10 (2.25)	–
- Radial at shaft extension	N (lb <sub>f</sub> )	20 (4.50)	20 (4.50)	20 (4.50)	–
• n ≤ 6000 rpm					
- Axial	N (lb <sub>f</sub> )	40 (8.99)	40 (8.99)	40 (8.99)	10 (2.25)
- Radial at shaft extension	N (lb <sub>f</sub> )	60 (13.5)	60 (13.5)	60 (13.5)	20 (4.50)
<b>Angular acceleration, max.</b>	rad/s <sup>2</sup>	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>
<b>Moment of inertia of rotor</b>	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	20 × 10 <sup>-6</sup> (177 × 10 <sup>-6</sup> )
<b>Vibration (55 ... 2000 Hz) to EN 60068-2-6</b>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 300 (984)	≤ 300 (984)	≤ 300 (984)	≤ 100 (328)
<b>Shock to EN 60068-2-27</b>					
• 2 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 2000 (6562)	≤ 2000 (6562)	≤ 2000 (6562)	–
• 6 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)
<b>Degree of protection to EN 60529 (IEC 60529)</b>					
• Without shaft input		IP67	IP67	IP67	IP67
• With shaft input		IP64	IP64	IP64	IP64
<b>Ambient temperature</b>					
<u>Operation</u>					
• Flange outlet or fixed cable					
- At U <sub>p</sub> = 5 V ± 10 %	°C (°F)	-40 ... +100 (-40 ... +212)	-40 ... +100 (-40 ... +212)	-40 ... +100 (-40 ... +212)	-10 ... +70 (+14 ... +158)
- At U <sub>p</sub> = 10 ... 30 V	°C (°F)	–	-40 ... +70 (-40 ... +158)	–	–
• Flexible cable					
- At U <sub>p</sub> = 5 V ± 10 %	°C (°F)	-10 ... +100 (+14 ... +212)	-10 ... +100 (+14 ... +212)	-10 ... +100 (+14 ... +212)	-10 ... +70 (+14 ... +158)
- At U <sub>p</sub> = 10 ... 30 V	°C (°F)	–	-10 ... +70 (+14 ... +158)	–	–
<b>Weight, approx.</b>	kg (lb)	0.3 (0.66)	0.3 (0.66)	0.3 (0.66)	0.7 (1.54)
<b>EMC</b>		Tested in accordance with the guidelines for electromagnetic compatibility 89/336/EWG and the regulations of the EMC Directives (applicable basic standards)			
<b>Approvals, according to</b>		CE, cULus	CE, cULus	CE, cULus	CE, cULus

S/R= signals/revolution

# Measuring systems

## Built-on optoelectronic rotary encoders

### Incremental encoders

#### Selection and ordering data

Description	Order No.
<b>sin/cos 1 V<sub>pp</sub> incremental encoder</b>	
5 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-3G</b> ■ ■ ■
• Radial flange outlet	<b>6FX2001-3E</b> ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-3C</b> ■ ■ ■
<u>Resolution</u>	
1000 S/R	<b>B 0 0</b>
1024 S/R	<b>B 0 2</b>
2500 S/R	<b>C 5 0</b>
<b>RS422 (TTL) incremental encoder</b>	
5 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2G</b> ■ ■ ■
• Radial flange outlet	<b>6FX2001-2E</b> ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2C</b> ■ ■ ■
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2R</b> ■ ■ ■
• Radial flange outlet	<b>6FX2001-2P</b> ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2M</b> ■ ■ ■
10 ... 30 V DC supply voltage	
<u>Synchro flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2H</b> ■ ■ ■
• Radial flange outlet	<b>6FX2001-2F</b> ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2D</b> ■ ■ ■
<u>Clamp flange and connection via</u>	
• Axial flange outlet	<b>6FX2001-2S</b> ■ ■ ■
• Radial flange outlet	<b>6FX2001-2Q</b> ■ ■ ■
• Cable 1 m (3.28 ft) with connector <sup>1)</sup>	<b>6FX2001-2N</b> ■ ■ ■
<u>Resolution</u>	
500 S/R	<b>A 5 0</b>
1000 S/R	<b>B 0 0</b>
1024 S/R	<b>B 0 2</b>
1250 S/R	<b>B 2 5</b>
1500 S/R	<b>B 5 0</b>
2000 S/R	<b>C 0 0</b>
2048 S/R	<b>C 0 4</b>
2500 S/R	<b>C 5 0</b>
3600 S/R	<b>D 6 0</b>
5000 S/R	<b>F 0 0</b>

S/R = signals/revolution

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

<sup>1)</sup> Universal integrated cable outlet for axial and radial outlet direction.

### 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..
<b>Operating voltage DC <math>U_p</math> on encoder</b>	V	24 - 15 % + 20 %	10 ... 30	5 ± 5 %
<b>Power consumption, approx.</b>				
• Single-turn	mA	245	160	160
• Multi-turn	mA	325	200	200
<b>Interface</b>		DRIVE-CLiQ	SSI	EnDat
<b>Clock input</b>		–	Differential cable receiver according to EIA standard RS485	Differential cable receiver according to EIA standard RS485
<b>Data output</b>		DRIVE-CLiQ	Differential cable driver according to EIA standard RS485	Differential cable driver according to EIA standard RS485
<b>Short-circuit strength</b>		Yes	Yes	Yes
<b>Data transfer rate</b>	Mbit kHz	100 –	– 100 ... 1000	– 100 ... 2000
<b>Speed, max.</b>				
• 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
<b>Cable length to downstream electronics, max.<sup>1)</sup></b>	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)	–
<b>Connection</b>		DRIVE-CLiQ connector, radial	Flange outlet, axial/radial	Flange outlet, axial/radial

<sup>1)</sup> Observe the maximum permissible cable length of the connected module.

# Measuring systems

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Technical specifications (continued)

		<b>Absolute encoder with DRIVE-CLiQ</b> 6FX2001-5.D..-0AA1	<b>SSI absolute encoder</b> 6FX2001-5.S..	<b>EnDat absolute encoder</b> 6FX2001-5.E..
<b>Resolution</b>				
• 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)
<b>Frame</b>				
• Single-turn	bit	–	13, without parity	According to EnDat specification
• Multi-turn	bit	–	25, without parity	According to EnDat specification
<b>Incremental track</b>	S/R	2048, 1 V <sub>pp</sub> (encoder-internal only)	–	512, 1 V <sub>pp</sub>
<b>Code type</b>				
• Sampling		Gray	Gray	Gray
• Transfer		DRIVE-CLiQ	Gray, fir tree format	Binary
<b>Parameterization capability</b>				
• Preset		–	Set to zero	–
• Counting direction		Yes	Yes	–
<b>Accuracy</b>	arcsec	± 36	± 79 (with 8192 steps)	± 60 (incremental track)
<b>Friction torque</b> (at 20 °C (68 °F))	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Starting torque</b> (at 20 °C (68 °F))	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Shaft loading capacity</b>				
• n > 6000 rpm				
- Axial	N (lb <sub>f</sub> )	10 (2.25)	10 (2.25)	10 (2.25)
- Radial at shaft extension	N (lb <sub>f</sub> )	20 (4.50)	20 (4.50)	20 (4.50)
• n ≤ 6000 rpm				
- Axial	N (lb <sub>f</sub> )	40 (8.99)	40 (8.99)	40 (8.99)
- Radial at shaft extension	N (lb <sub>f</sub> )	60 (13.5)	60 (13.5)	60 (13.5)
<b>Angular acceleration, max.</b>	rad/s <sup>2</sup>	10 <sup>5</sup>	10 <sup>5</sup>	10 <sup>5</sup>
<b>Moment of inertia of rotor</b>				
• Solid shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	1.90 × 10 <sup>-6</sup> (16.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )	1.45 × 10 <sup>-6</sup> (12.8 × 10 <sup>-6</sup> )
• Hollow shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	2.80 × 10 <sup>-6</sup> (24.8 × 10 <sup>-6</sup> )	–	–
<b>Vibration (55 ... 2000 Hz) to EN 60068-2-6</b>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 100 (328)	≤ 300 (984)	≤ 300 (984)
<b>Shock to EN 60068-2-27</b>				
• 2 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 2000 (6562)	≤ 2000 (6562)	≤ 2000 (6562)
• 6 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 1000 (3281)	≤ 1000 (3281)	≤ 1000 (3281)
<b>Degree of protection to EN 60529 (IEC 60529)</b>				
• Without shaft input		IP67	IP67	IP67
• With shaft input		IP64	IP64	IP64
<b>Ambient temperature</b>				
• Operation	°C (°F)	-20 ... +100 (-4 ... +212)	-40 ... +85 (-40 ... +185)	-40 ... +100 (-40 ... +212)
<b>Weight, approx.</b>				
• Single-turn	kg (lb)	0.4 (0.88)	0.35 (0.77)	0.35 (0.77)
• Multi-turn	kg (lb)	0.5 (1.10)	0.35 (0.77)	0.35 (0.77)
<b>EMC</b>		Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
<b>Approvals, according to</b>		CE, cULus	CE, cULus	CE, cULus

S/R= signals/revolution



### Technical specifications (continued)

		PROFIBUS DP absolute encoder 6FX2001-5.P..	PROFINET IO absolute encoder 6FX2001-5.N..
<b>Operating voltage DC <math>U_p</math> on encoder</b>	V	10 ... 30	10 ... 30
<b>Power consumption, approx.</b>			
• Single-turn	mA	300 ... 100 (2.5 W)	400 ... 130 (< 4 W)
• Multi-turn	mA	300 ... 100 (2.5 W)	400 ... 130 (< 4 W)
<b>Interface</b>		PROFIBUS DP-V2	PROFINET IO with RT/IRT
<b>Clock input</b>		Differential cable receiver according to EIA standard RS485	2 IRT ports
<b>Data output</b>		Differential cable driver according to EIA standard RS485	2 IRT ports
<b>Short-circuit strength</b>		Yes	Yes
<b>Data transfer rate</b>	Mbit/s	12	100
<b>LED for diagnostics</b>		Green/red	Green/red/yellow
<b>Speed, max.</b>			
• Electrical			
- At $\pm 1$ bit accuracy	rpm	5800	5800
• Mechanical			
- Single-turn	rpm	12000	12000
- Multi-turn	rpm	6000	6000
<b>Cable length to downstream electronics, max.<sup>1)</sup></b>	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)	–
<b>Number of nodes</b>		99	–
<b>Connection</b>		Terminal block with address selector switch and bus terminating resistor in removable cover with radial cable glands (3 units)	2 $\times$ 4-pin M12 connector for PROFINET ports 1 $\times$ 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	–
<b>Resolution</b>			
• Single-turn	bit	13 (8192 steps)	13 (8192 steps)
• Multi-turn	bit	27 (8192 steps $\times$ 16384 revolutions)	27 (8192 steps $\times$ 16384 revolutions)
<b>Frame</b>		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
<b>Code type</b>			
• Sampling		Gray	Gray
• Transfer		Binary, PROFIBUS	Binary, PROFINET
<b>Network load, approx.</b>			
• At 12 Mbit/s per encoder	$\mu$ s	20	–
<b>Cycle time</b>	ms	0.667	1 ... 100

<sup>1)</sup> Observe the maximum permissible cable length of the connected module.

# Measuring systems

## Built-on optoelectronic rotary encoders

### Absolute encoders

#### Technical specifications (continued)

		<b>PROFIBUS DP absolute encoder</b> 6FX2001-5.P..	<b>PROFINET IO absolute encoder</b> 6FX2001-5.N..
<b>Parameterization capability</b>			
• Resolution per revolution		1 ... 8192	1 ... 8192
• Total resolution		1 ... 16384	1 ... 16384
• Preset		Yes	Yes
• Counting direction		Yes	Yes
• Speed signal		Yes	Yes
• Limit switches		Yes, 2 units	No
• Isochronous mode		Yes	Yes
• Slave-to-slave communication		Yes	No
<b>Online parameterization</b>		Yes	Yes
<b>PNO certificate</b>		Yes	Yes
<b>Supported profiles</b>		PNO encoder profile V4.1	PNO encoder profile V4.1
<b>Accuracy with 8192 steps</b>	arcsec	± 79 (± ½ LSB)	± 79 (± ½ LSB)
<b>Friction torque</b> (at 20 °C (68 °F))	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Starting torque</b> (at 20 °C (68 °F))	Nm (lb <sub>f</sub> -in)	≤ 0.01 (0.09)	≤ 0.01 (0.09)
<b>Shaft loading capacity</b>			
• $n > 6000$ rpm			
- Axial	N (lb <sub>f</sub> )	10 (2.25)	10 (2.25)
- Radial at shaft extension	N (lb <sub>f</sub> )	20 (4.50)	20 (4.50)
• $n \leq 6000$ rpm			
- Axial	N (lb <sub>f</sub> )	40 (8.99)	40 (8.99)
- Radial at shaft extension	N (lb <sub>f</sub> )	110 (24.7)	110 (24.7)
<b>Angular acceleration, max.</b>	rad/s <sup>2</sup>	10 <sup>5</sup>	10 <sup>5</sup>
<b>Moment of inertia of rotor</b>			
• Solid shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	1.90 × 10 <sup>-6</sup> (16.8 × 10 <sup>-6</sup> )	1.90 × 10 <sup>-6</sup> (16.8 × 10 <sup>-6</sup> )
• Hollow shaft	kgm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	2.80 × 10 <sup>-6</sup> (24.8 × 10 <sup>-6</sup> )	2.80 × 10 <sup>-6</sup> (24.8 × 10 <sup>-6</sup> )
<b>Vibration (55 ... 2000 Hz) to EN 60068-2-6</b>	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 100 (328)	≤ 100 (328)
<b>Shock to EN 60068-2-27</b>			
• 2 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 2000 (6562)	≤ 2000 (6562)
• 6 ms	m/s <sup>2</sup> (ft/s <sup>2</sup> )	≤ 1000 (3281)	≤ 1000 (3281)
<b>Degree of protection to EN 60529 (IEC 60529)</b>			
• Without shaft input		IP67	IP67
• With shaft input		IP64	IP64
<b>Ambient temperature</b>			
• Operation	°C (°F)	-40 ... +85 (-40 ... +185)	-40 ... +85 (-40 ... +185)
<b>Weight, approx.</b>			
• Single-turn	kg (lb)	0.4 (0.88)	0.4 (0.88)
• Multi-turn	kg (lb)	0.5 (1.10)	0.5 (1.10)
<b>EMC</b>		Tested in accordance with EN 50081 and EN 50082	Tested in accordance with EN 50081 and EN 50082
<b>Approvals, according to</b>		CE, cULus	CE, cULus

### Selection and ordering data

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

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

### More information

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

# Measuring systems

## Built-on optoelectronic rotary encoders

### 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	Plug-in coupling
		6FX2001-7KF10 6FX2001-7KF06	6FX2001-7KS06 6FX2001-7KS10
<b>Transmission torque, max.</b>	Nm (lb <sub>f</sub> -in)	0.8 (7.08)	0.7 (6.20)
<b>Shaft diameter</b>			
• 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)	–
<b>Center offset of shafts, max.</b>	mm (in)	0.4 (0.02)	0.5 (0.02)
<b>Axial offset</b>	mm (in)	± 0.4 (0.02)	± 0.5 (0.02)
<b>Angular displacement of shafts, max.</b>	Degrees	3	1
<b>Torsional rigidity</b>	Nm/rad (lb <sub>f</sub> -ft/rad)	150 (111)	31 (22.9)
<b>Lateral spring stiffness</b>	N/mm (lb <sub>f</sub> )	6 (1.35)	10 (2.25)
<b>Moment of inertia</b>	gcm <sup>2</sup> (lb <sub>f</sub> -in-s <sup>2</sup> )	19 (168 × 10 <sup>-7</sup> )	20 (177 × 10 <sup>-7</sup> )
<b>Speed, max.</b>	rpm	12000	12000
<b>Ambient temperature</b>			
• Operation	°C (°F)	-40 ... +150 (-40 ... +302)	-40 ... +80 (-40 ... +176)
<b>Weight, approx.</b>	g (oz)	16 (0.56)	20 (0.71)

#### Selection and ordering data

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







# Connection system MOTION-CONNECT



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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		✓	✓	
<b>Power cables with SPEED-CONNECT connector</b>				
	1FK7	✓	✓	13/7
<b>Extensions for power cables with SPEED-CONNECT connector</b>				
	1FK7	✓	✓	13/8
<b>Power cables for motors with terminal box</b>				
	1PH8	✓	✓	13/9
<b>MOTION-CONNECT DRIVE-CLiQ signal cables</b>				
	1FK7	✓	✓	13/14
	1PH8	✓	✓	13/14
<b>Signal cables with SPEED-CONNECT/full-thread connector</b>				
	1FK7	✓	✓	13/15
	1PH8	✓	✓	13/15
<b>Extensions for signal cables with SPEED-CONNECT/full-thread connector</b>				
	1FK7	✓	✓	13/15

✓ = Possible  
- = Not possible

**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.

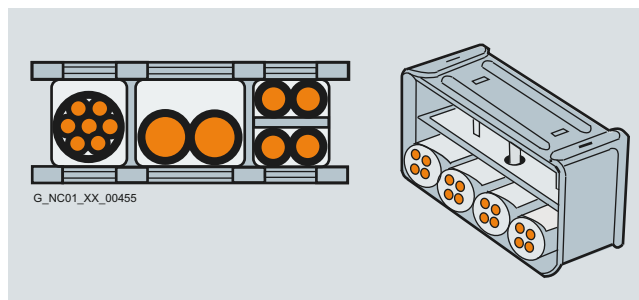
The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

**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:

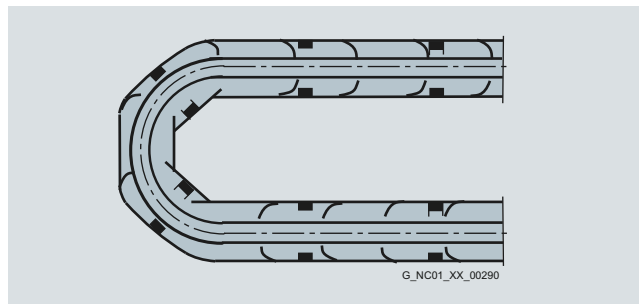
Connector on motor with external thread	Connector with lock nut on the cable	Compatibility
SPEED-CONNECT	SPEED-CONNECT	✓
SPEED-CONNECT	Full-thread	✓
Full-thread	Full-thread	✓
Full-thread	SPEED-CONNECT	-

**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.

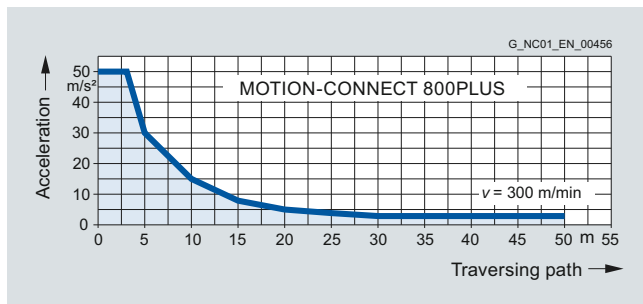
# Connection system MOTION-CONNECT

## Introduction

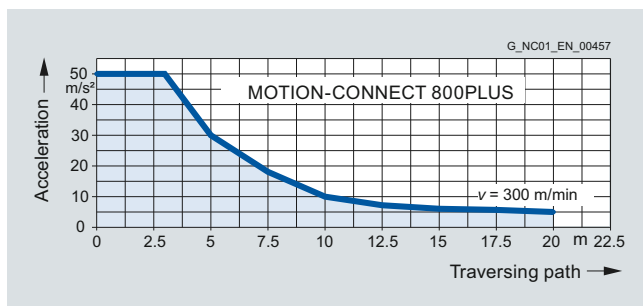
### General information

#### Characteristic curves

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

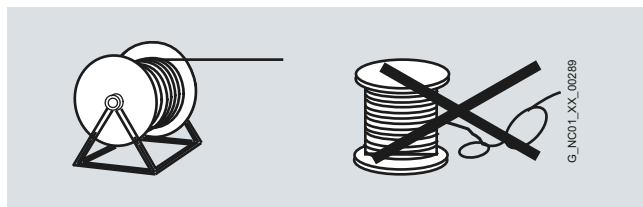


Acceleration for signal and power cables MOTION-CONNECT 800PLUS up to 16 mm<sup>2</sup>



Acceleration for power cables MOTION-CONNECT 800PLUS with 25 mm<sup>2</sup>, 35 mm<sup>2</sup> and 50 mm<sup>2</sup>

#### 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	B2	C	E
	Single-core cables in protection tubes or installation ducts	Multi-core cables in protection tubes or installation ducts	Multi-core cables, vertically or horizontally on walls / open, without protection tubes and installation ducts / with contact	Multi-core cables, horizontally or vertically on perforated cable racks / open, without protection tubes and installation ducts / with contact
mm <sup>2</sup>				
<b>Electronics</b> (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
<b>Power</b> (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



# Connection system MOTION-CONNECT

## Power cables for SINAMICS S110 and S120

### Overview



Power cable for connecting a 1PH8 motor with terminal box 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.012-5....-....

#### Note:

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



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

#### 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 <sup>2</sup>	50 m, 100 m, 200 m, 500 m (164 ft, 328 ft, 656 ft, 1641 ft)
2.5 mm <sup>2</sup>	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 <sup>2</sup>	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
6 mm <sup>2</sup>	without/with	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
10 mm <sup>2</sup>	without	≤ 500 m (1641 ft)	≤ 500 m (1641 ft)
	with	≤ 500 m (1641 ft)	≤ 100 m (328 ft)
16 mm <sup>2</sup>	without/with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
	without	≤ 200 m (656 ft)	–
25 mm <sup>2</sup>	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
	without	≤ 200 m (656 ft)	–
35 mm <sup>2</sup>	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
50 mm <sup>2</sup>	without	≤ 200 m (656 ft)	–
	with	≤ 200 m (656 ft)	≤ 200 m (656 ft)
70 mm <sup>2</sup>	without	≤ 100 m (328 ft)	–

# Connection system MOTION-CONNECT

## Power cables for SINAMICS S110 and S120

### Technical specifications

Power cables	MOTION-CONNECT 500 6FX500-.....-.....	MOTION-CONNECT 800PLUS 6FX800-.....-.....
<b>Approvals, according to</b>		
• VDE <sup>1)</sup>	Yes	Yes
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No. <sup>2)</sup>	Yes	Yes
• RoHS conformity	Yes	Yes
<b>Rated voltage <math>U_0/U</math> in accordance with EN 50395</b>		
• Power conductors	600 V/1000 V	600 V/1000 V
• Signal conductors	24 V (EN) 1000 V (UL/CSA)	24 V (EN) 1000 V (UL/CSA)
<b>Test voltage, rms</b>		
• Power conductors	4 kV	4 kV
• Signal conductors	2 kV	2 kV
<b>Operating temperature on the surface</b>		
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile stress, max.</b>		
• Fixed installation	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>		
• Fixed installation	5 × $D_{\max}$	4 × $D_{\max}$
• Flexible installation	<a href="#">See power cables</a>	<a href="#">See power cables</a>
<b>Torsional stress</b>	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	100000	10 million
<b>Traversing velocity</b>	30 m/min (98.43 ft/min)	Up to 300 m/min (984 ft/min)
<b>Acceleration</b>	2 m/s <sup>2</sup> (6.56 ft/s <sup>2</sup> )	Up to 50 m/s <sup>2</sup> (164 ft/s <sup>2</sup> ), <a href="#">see characteristic curves</a>
<b>Insulation material, incl. jacket</b>	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
<b>Outer jacket</b>	PVC DESINA color orange RAL 2003	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color orange RAL 2003
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled power cables and their extensions when closed and plugged: IP67.

<sup>1)</sup> The respective registration number is printed on the cable jacket (only applies to power cables).

<sup>2)</sup> The file number is printed on the cable jacket.

# Connection system MOTION-CONNECT

## Power cables for SINAMICS S110 and S120

Power cables for 1FK7 motors  
with SPEED-CONNECT connector

### 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 mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable <u>without</u> brake cores	Cable sold by the meter <sup>1)</sup> <u>without</u> brake cores	$D_{max}$	Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
			Order No.	Order No.		6FX5	6FX8	6FX5	6FX8	6FX5
					mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5	1	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)	
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			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 mm <sup>2</sup>	Connector size, motor end	Pre-assembled cable <u>with</u> brake cores	Cable sold by the meter <sup>1)</sup> <u>with</u> brake cores	$D_{max}$	Weight (without connector)		Smallest perm. bending radius <sup>2)</sup>		
			Order No.	Order No.		6FX5	6FX8	6FX5	6FX8	6FX5
					mm (in)	mm (in)	kg/m (lb/ft)	kg/m (lb/ft)	mm (in)	mm (in)
Exposed core ends	4 × 1.5+2 × 1.5	0.5	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)
		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)
	4 × 1.5+2 × 1.5	1.5	6FX 002-5DG22-....							
		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)
	4 × 2.5+2 × 1.5	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)	
<b>MOTION-CONNECT 500</b>			5	5						
<b>MOTION-CONNECT 800PLUS</b>			8	8						
Length code			....	....						

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

# Connection system MOTION-CONNECT

## Power cables for SINAMICS S110 and S120

### 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 Power Modules	Extension
Without brake cores mm <sup>2</sup>	With brake cores mm <sup>2</sup>			
–	4 × 1.5 + 2 × 1.5	0.5	6FX5 002-5DN30-....	Order No. <b>6FX5 002-5MN05-....</b>
4 × 1.5	4 × 1.5 + 2 × 1.5	1	6FX . 002-5 . G10-....	<b>6FX 002-5 N05-....</b>
		1.5	6FX . 002-5 . G22-....	<b>6FX 002-5 Q28-....</b>
4 × 2.5	4 × 2.5 + 2 × 1.5	1	6FX . 002-5 . G12-....	<b>6FX 002-5 Q15-....</b>
		1.5	6FX . 002-5 . G32-....	<b>6FX 002-5 Q38-....</b>
4 × 4	4 × 4 + 2 × 1.5	1.5	6FX . 002-5 . G42-....	<b>6FX 002-5 Q48-....</b>
4 × 6	4 × 6 + 2 × 1.5	1.5	6FX . 002-5 . G52-....	<b>6FX 002-5 Q58-....</b>
4 × 10	4 × 10 + 2 × 1.5	1.5	6FX . 002-5 . G61-....	<b>6FX 002-5 A68-....</b>
			6FX . 002-5 . G62-....	<b>6FX 002-5 Q68-....</b>
		3 <sup>1)</sup>	6FX . 002-5 . G13-....	<b>6FX 002-5 X18-....</b>
4 × 16	4 × 16 + 2 × 1.5	3 <sup>1)</sup>	6FX . 002-5 . G23-....	<b>6FX 002-5 X28-....</b>
–	4 × 25 + 2 × 1.5	3 <sup>1)</sup>	6FX . 002-5DG33-....	<b>6FX 002-5DX38-....</b>
–	4 × 35 + 2 × 1.5	3 <sup>1)</sup>	6FX . 002-5DG43-....	<b>6FX 002-5DX48-....</b>
–	4 × 50 + 2 × 1.5	3 <sup>1)</sup>	6FX . 002-5DG53-....	<b>6FX 002-5DX58-....</b>
<b>MOTION-CONNECT 500</b>		5		<b>5</b>
<b>MOTION-CONNECT 800PLUS</b>		8		<b>8</b>
<b>Without brake cores</b>				<b>C</b>
<b>With brake cores</b>				<b>D</b>
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.

<sup>1)</sup> Connector at motor end with full-thread only.

# Connection system MOTION-CONNECT

## Power cables for SINAMICS S110 and S120

Power cables for 1PH8 motors  
with terminal box

### Selection and ordering data

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

Motor	Thread	No. of cores × cross-section	Connection method Power Module end	Pre-assembled cable	Cable sold by the meter <sup>1)</sup>	$D_{max}$	Weight (without thread)	Smallest perm. bending radius <sup>2)</sup>	
Type		mm <sup>2</sup>		Order No.	Order No.	mm (in)	kg/m (lb/ft)	mm (in)	
1PH808	M25	4 × 2.5	Exposed core ends <sup>3)</sup>	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 <sup>3)</sup>	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 <sup>3)</sup>	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)	
				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)
					6FX8002-5CR53-....				
	M40	4 × 35			6FX5002-5CR72-....	6FX5008-1BB35-.... 6FX8008-1BA35-....	31.5 (1.24)	1.93 (1.3)	570 (22.44)
					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 <sup>3)</sup>	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				....		....			

<sup>1)</sup> Note type of delivery.

<sup>2)</sup> Valid for installation in a cable carrier.

<sup>3)</sup> Length of core ends: 300 mm (11.81 in). 4 M8 cable lugs and 4 M6 cable lugs are also included in the scope of delivery of the cables.

# Connection system MOTION-CONNECT

## Signal cables for SINAMICS S110 and S120

### 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.042-2C...-....

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.012-2C...-....

#### Note:

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

# Connection system MOTION-CONNECT

## Signal cables for SINAMICS S110 and S120

### Technical specifications

DRIVE-CLiQ signal cables	DRIVE-CLiQ	DRIVE-CLiQ MOTION-CONNECT 500	DRIVE-CLiQ MOTION-CONNECT 800PLUS
	6FX2...-1DC...-....	6FX5...-DC...-....	6FX8...-DC...-....
<b>Approvals, according to</b>			
• cURus or UR/CSA	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90	UL STYLE 2502/CSA-N.210.2-M90
• UR-CSA File No. <sup>1)</sup>	Yes	Yes	Yes
• RoHS conformity	Yes	Yes	Yes
<b>Rated voltage according to EN 50395</b>	30 V	30 V	30 V
<b>Test voltage, rms</b>	500 V	500 V	500 V
<b>Operating temperature on the surface</b>			
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-20 ... +80 °C (-4 ... +176 °F)	-20 ... +80 °C (-4 ... +176 °F)
• Flexible installation	–	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile stress, max.</b>			
• Fixed installation	45 N/mm <sup>2</sup> (6526 lb <sub>f</sub> /in <sup>2</sup> )	80 N/mm <sup>2</sup> (11603 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	–	30 N/mm <sup>2</sup> (4351 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>			
• Fixed installation	50 mm (1.97 in)	35 mm (1.38 in)	35 mm (1.38 in)
• Flexible installation	–	125 mm (4.92 in)	75 mm (2.95 in)
<b>Torsional stress</b>	–	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	–	100000	10 million
<b>Traversing velocity</b>	–	30 m/min (98.4 ft/min)	300 m/min (984 ft/min)
<b>Acceleration</b>	–	2 m/s <sup>2</sup> (6.56 ft/s <sup>2</sup> )	Up to 50 m/s <sup>2</sup> (164 ft/s <sup>2</sup> ), <a href="#">see characteristic curves</a>
<b>Insulation material, incl. jacket</b>	CFC/silicone-free	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
<b>Outer jacket</b>	PVC	PVC	PUR, HD22.10 S2 (VDE 0282, Part 10)
	Gray RAL 7032	DESINA color green RAL 6018	DESINA color green RAL 6018
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and plugged: IP67.

<sup>1)</sup> The file number is printed on the cable jacket.

# Connection system MOTION-CONNECT

## Signal cables for SINAMICS S110 and S120

### Technical specifications (continued)

Signal cables	MOTION-CONNECT 500 6FX500.-.....-.....	MOTION-CONNECT 800PLUS 6FX800.-.....-.....
<b>Approvals, according to</b>		
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No. <sup>1)</sup>	Yes	Yes
• RoHS conformity	Yes	Yes
<b>Rated voltage according to EN 50395</b>	30 V	30 V
<b>Test voltage, rms</b>	500 V	500 V
<b>Operating temperature on the surface</b>		
• Fixed installation	-20 ... +80 °C (-4 ... +176 °F)	-50 ... +80 °C (-58 ... +176 °F)
• Flexible installation	0 ... 60 °C (32 ... 140 °F)	-20 ... +60 °C (-4 ... +140 °F)
<b>Tensile stress, max.</b>		
• Fixed installation	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )	50 N/mm <sup>2</sup> (7252 lb <sub>f</sub> /in <sup>2</sup> )
• Flexible installation	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )	20 N/mm <sup>2</sup> (2901 lb <sub>f</sub> /in <sup>2</sup> )
<b>Smallest bending radius</b>		
• Fixed installation	60 mm (2.36 in)	4 × D <sub>max</sub>
• Flexible installation	100 mm (3.94 in)	<a href="#">See signal cables</a>
<b>Torsional stress</b>	Absolute 30°/m	Absolute 30°/m
<b>Bending</b>	2 million	10 million
<b>Traversing velocity</b>	180 m/min (591 ft/min)	Up to 300 m/min (984 ft/min)
<b>Acceleration</b>	5 m/s <sup>2</sup> (16.41 ft/s <sup>2</sup> )	Up to 50 m/s <sup>2</sup> (164 ft/s <sup>2</sup> ), <a href="#">see characteristic curves</a>
<b>Insulation material, incl. jacket</b>	CFC/silicone-free	CFC/halogen/silicone-free IEC 60754-1/DIN VDE 0472-815
<b>Oil resistance</b>	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
<b>Outer jacket</b>	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
<b>Flame-retardant</b>	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and plugged: IP67.

<sup>1)</sup> The file number is printed on the cable jacket.






# Connection system MOTION-CONNECT

## Signal cables for SINAMICS S110 and S120

**DRIVE-CLiQ signal cables  
without 24 V DC cores**

### Selection and ordering data

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

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




# Connection system MOTION-CONNECT

## Signal cables for SINAMICS S110 and S120

### 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 Order No.
		m (ft)	mm (in)		
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	<b>6FX5002-2DC00-....</b>
		75 (246)	7.1 (0.28)	IP20/IP20	<b>6FX8002-2DC00-....</b>
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	<b>6FX5002-2DC10-....</b>
		75 (246)	7.1 (0.28)	IP20/IP67	<b>6FX8002-2DC10-....</b>
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	<b>6FX5002-2DC20-....</b>
		75 (246)	7.1 (0.28)	IP67/IP67	<b>6FX8002-2DC20-....</b>
MOTION-CONNECT 500					5
MOTION-CONNECT 800PLUS					8
Length code					....

# Connection system MOTION-CONNECT

## Signal cables for SINAMICS S110 and S120

Signal cables for motors  
with SPEED-CONNECT/full-thread connector

### 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.		Degree of protection Connector	Basic cable		Extension	
			m (ft)	mm (in)		Order No.	Order No.		
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R	1FK701	SMC20	50 (164)	9.2 (0.36)	IP20/IP67	6FX 002-2CN20-....	6FX 8002-2CN24-....		
Incremental encoder sin/cos 1 V <sub>pp</sub> 2048 S/R, with C and D tracks	1FK7 <sup>1)</sup>	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-....	6FX 8002-2EN24-....		
Absolute encoder with EnDat	1FK7 <sup>1)</sup>	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-....	6FX 8002-2CN24-....		
• 2-pole	1FK701	SMC10	130 (427)	9.2 (0.36)	IP20/IP67	6FX 002-2CN20-....	6FX 8002-2CN24-....		
<b>MOTION-CONNECT 500</b>						5		5	
<b>MOTION-CONNECT 800PLUS</b>						8		8	
Length code						....		....	

#### Pre-assembled MOTION-CONNECT signal cables for motors with full-thread connector

Encoder system	Motor type	Connection via	Length, 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 <sup>1)</sup>	SMC10	50 (164)	9.2 (0.36)	IP20/IP67	6FX 002-2CF02-....	6FX 002-2CF04-....		
• 2-pole	1FK7 <sup>1)</sup>	SMC10	130 (427)	9.2 (0.36)	IP20/IP67	6FX 002-2CF02-....	6FX 002-2CF04-....		
HTL incremental encoder	1PH8	SMC30	300 (984) <sup>2)</sup>	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	6FX 5002-2CA12-....	–		
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	6SX 7002-0AN30-....	–		
HTL incremental enc. 1XP8001-1	1LA								
• Signals A, B		SMC30	100 (328)	6.3 (0.25)	IP20/IP67	6SX 7002-0AL00-....	–		
• Signals A*, A, B*, B, R*, R		SMC30	300 (984) <sup>2)</sup>	8.0 (0.31)	IP20/IP67	6SX 7002-0AN00-....	–		
• Signals A*, A, B*, B, R*, R with right-angled connector		SMC30	300 (984) <sup>2)</sup>	8.0 (0.31)	IP20/IP67	6SX 7002-0AN10-....	–		
Incremental encoder sin/cos 1 V <sub>pp</sub> 6FX2001-3		SMC20	50 (164)	9.3 (0.37)	IP20/IP67	6FX 002-2CG00-....	6FX 002-2CB54-....		
<b>MOTION-CONNECT 500</b>						5		5	
<b>MOTION-CONNECT 800PLUS</b>						8		8	
Length code						....		....	

The combinations of signal cable extensions shown are only provided by way of example.

The maximum specified cable length (basic cable and extensions) must not be exceeded. The total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

<sup>1)</sup> Not for 1FK701 motors.

<sup>2)</sup> With evaluation of difference signals A\*, A, B\*, B, otherwise ≤ 100 m (328 ft).

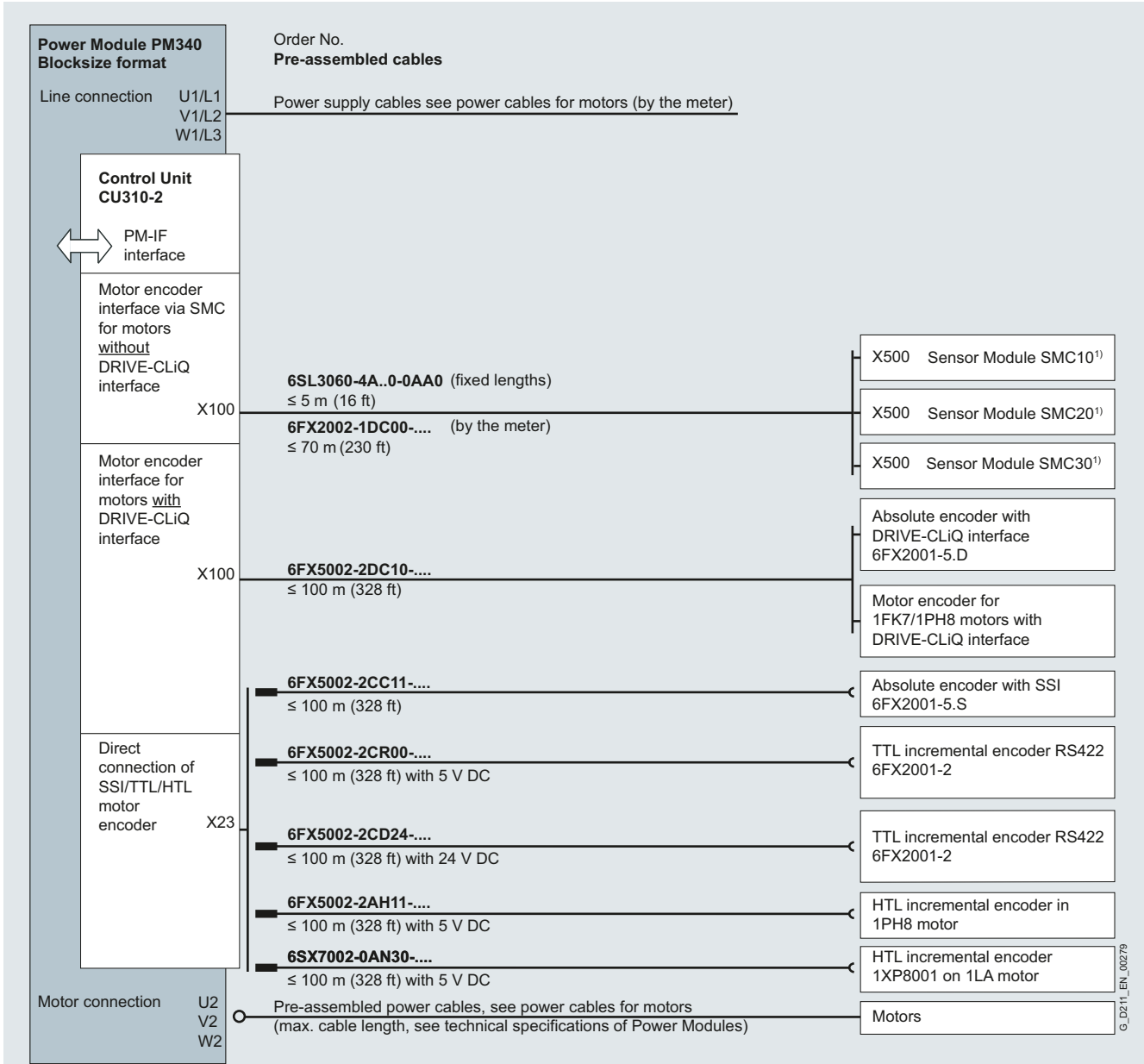
# Connection system MOTION-CONNECT

## Connection overviews



### 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**

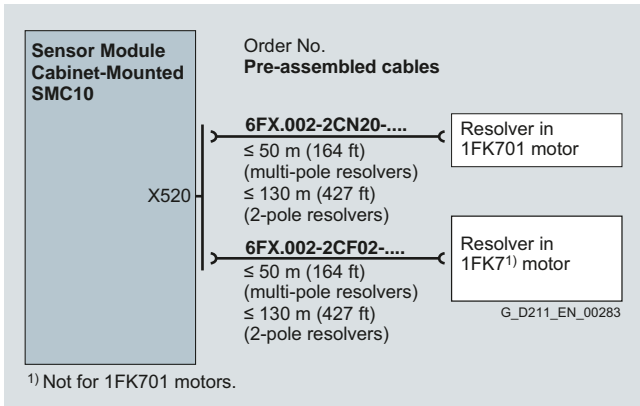


G\_D211\_EN\_00279

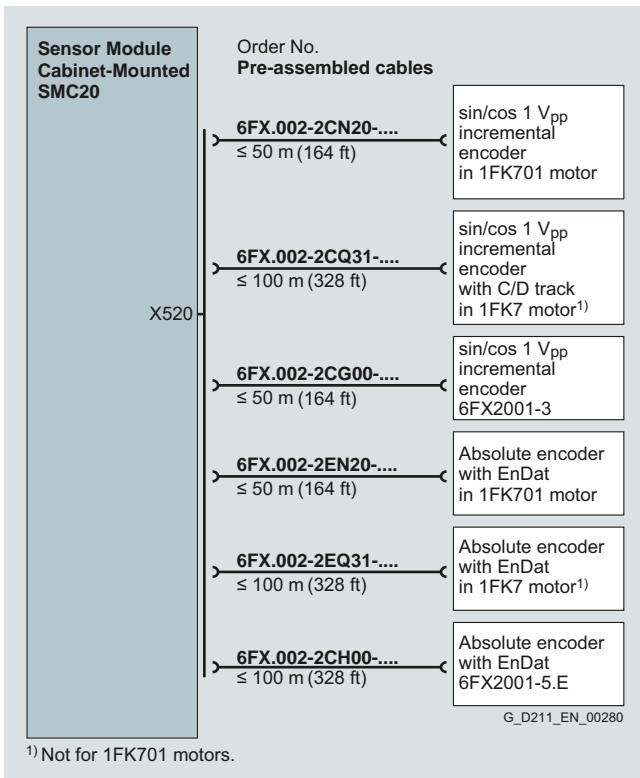
<sup>1)</sup> See connection overviews for SMC10/SMC20/SMC30.

### Integration (continued)

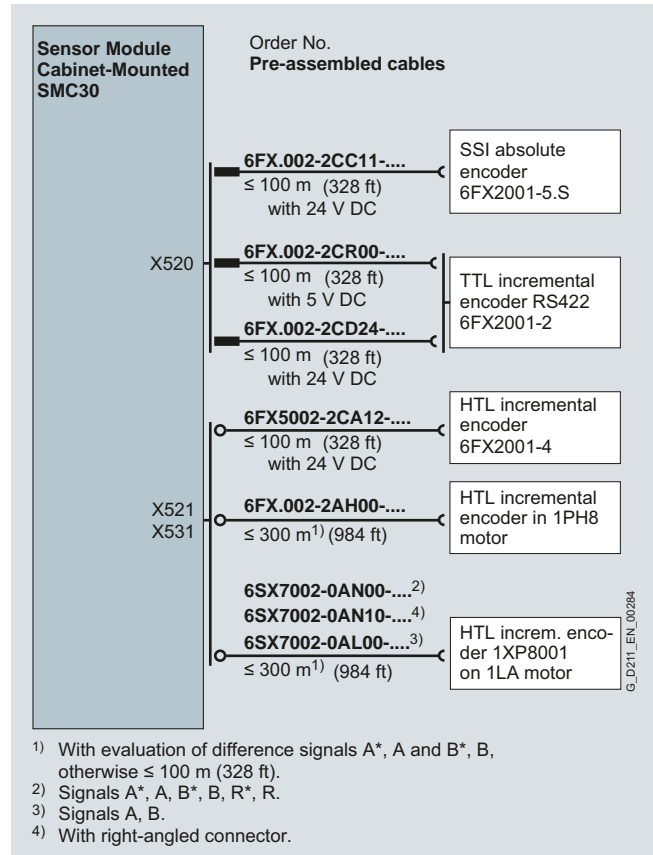
#### Connection overview for SINAMICS S110 and S120 SMC10 Sensor Module Cabinet-Mounted



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



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



# Connection system MOTION-CONNECT

## 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

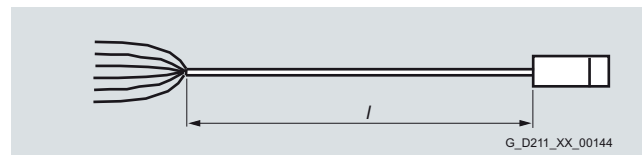
#### Length code for power and signal cables, sold by the meter<sup>1)</sup>

6FX.008.....- ■ ■ ■ A 0

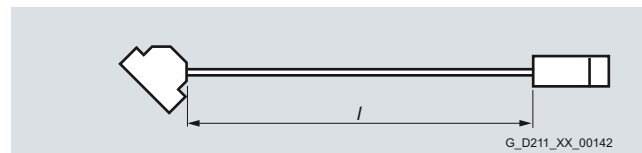
50 m (164 ft)	1	F		
100 m (328 ft)	2	A		
200 m (656 ft)	3	A		
500 m (1641 ft)	6	A		

### More information

#### Definition of lengths for pre-assembled cables



Cable with exposed core ends and pre-assembled connector



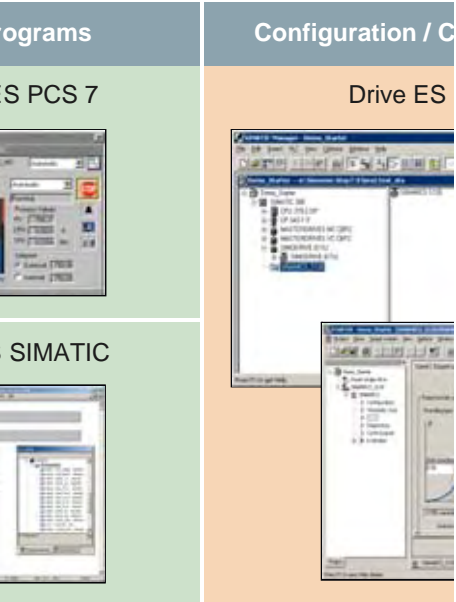
Cable with pre-assembled connectors at both ends

Tolerances:

- Cable lengths up to 10 m (32.8 ft):  $\pm 2\%$
- Cable lengths of 10 m (32.8 ft) and longer:  $\pm 1\%$

<sup>1)</sup> Note type of delivery.

## Engineering tools

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**Security note**

In the case of software for remote maintenance or connection to higher-level networks, suitable protection measures must be taken (including IT security, e.g. network segmentation) to guarantee safe operation of the system. You can find more information on Industrial Security on the Internet at: [www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity)

# Engineering tools

## 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 pre-selection 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.

### Data sheet for three-phase Squirrel-Cage-Motors

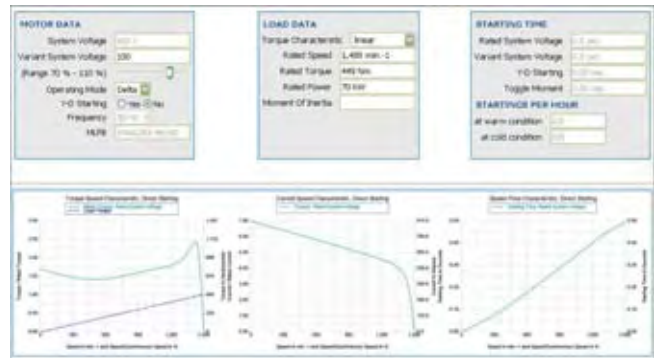
Datenblatt für Drehstrom-Käfigläufermotoren

**Ordering data / Bestellangaben:**

**1LE1001-1AD52-2AA4**

Electrical data / Elektrische Daten:		general data / Allgemeine Daten:	
rated motor voltage	230/240/230V 50Hz, 480V/500V 60Hz	name size	50L
rated motor power	1.10 kW	type of construction	IM B3
rated motor speed	1425 1/min	weight in kg, without optional accessories	38.0 kg
rated motor torque	14.0 Nm	weight in kg, with optional accessories	25.0 kg
rated motor current	3.0 A	name material	Aluminum
starting / rated motor current	5.8	degree of protection	IP 55
efficiency class	IE3	method of cooling	TEFC
efficiency	87.0 %	cooling class	TEFC
power factor	0.87	isolation class	F
motor protection	without (standard)	isolation	100V to 1300V
terminal box position	terminal box - at top	isolation	2000V max. 1000V
noise (L <sub>WA</sub> )	66.0 dB(A)	duty type	S1 + continuous operation
moment of inertia	0.01000 kg m²	isolation	S2 + 2 weeks
bearing A3	6208 2RS1	direction of rotation	clockwise
bearing B3	6208 2RS1	terminal box / Klemmenkasten:	
type of lubrication	oil	material of terminal box	Aluminum
lubrication interval at 40°C	20000 h	type	IP20
quantity of grease for substitution at 40°C	- 0	terminal screw thread	M6
external wiring	Yes	type of cable cross-sectional area	4.0 mm²
explosion protection / Explosionsschutz:		type of cable diameter from ... to	11.0 mm - 21.0 mm
type of protection	without (standard)	type of cable entry	2 x 1
site conditions / Umgebungsbedingungen:		type of cable gland	2 page
ambient temperature	-50 °C - +40 °C	special configurations / Sonderausführung:	
altitude above sea level	1000 m		
standards and specifications	IEC 60034, IEC 60034-2, IEC 60034-30		

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.



## DT Configurator selection guide

**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](http://www.siemens.com/dt-configurator)

**Selection and ordering data**

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

**More information**

The electronic CA 01 catalog can be ordered from the relevant Siemens sales office or via the Internet:  
[www.siemens.com/automation/CA01](http://www.siemens.com/automation/CA01)

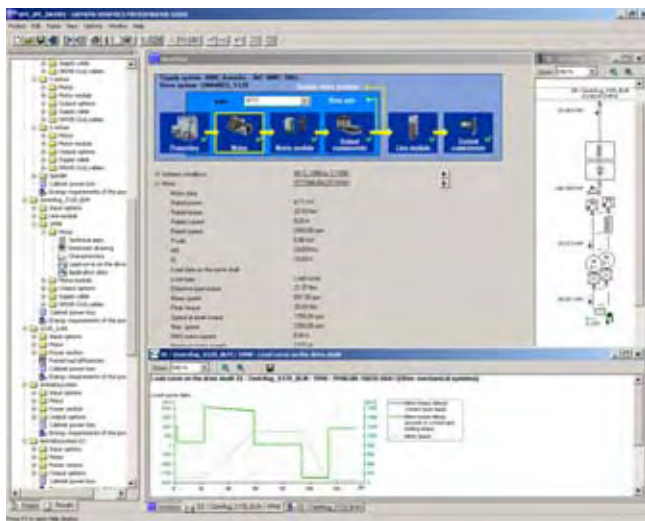
Links to tips, tricks and downloads for functional or content updates can also be found at this address.

For technical advice, you can also contact our hotline for catalog CA 01:

E-mail: [adsupport@siemens.com](mailto:adsupport@siemens.com)

## 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 x 768 pixels (1280 x 1024 pixels recommended)
- Operating system:
  - Windows XP Home Edition SP2
  - Windows XP Professional 32 bit SP2
  - Windows XP Professional 64 bit SP2
  - Windows Vista Business
  - Windows 7 Ultimate 32 bit
  - Windows 7 Professional 32 bit
- Microsoft Internet Explorer V5.5 SP2

## Selection and ordering data

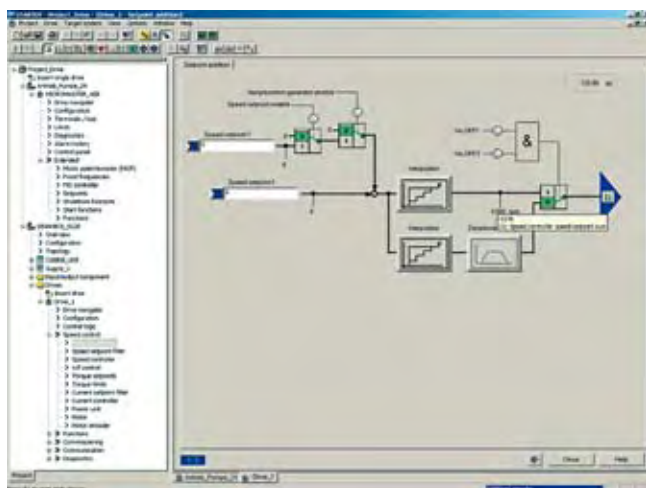
Description	Order No.
<b>SIZER for Siemens Drives engineering tool</b> DVD-ROM English, French, German, Italian	<b>6SL3070-0AA00-0AG0</b>

## More information

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

## 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.
<b>STARTER commissioning tool</b> for SINAMICS and MICROMASTER DVD-ROM English, French, German, Italian, Spanish	<b>6SL3072-0AA00-0AG0</b>

# Engineering tools

## 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.
<b>SINAMICS G110</b>		
• RS232	<b>PC inverter connection kit</b> Scope of delivery: 9-pin SUB-D connector RS232 standard cable, 3 m (9.84 ft) STARTER commissioning tool on DVD-ROM	<b>6SL3255-0AA00-2AA1</b>
<b>SINAMICS G120</b>		
• PROFIBUS	<b>SIMATIC DP plug-in cable</b> 12 MBaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	<b>6ES7901-4BD00-0XA0</b>
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–
• USB	<b>PC inverter connection kit 2</b> 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	<b>6SL3255-0AA00-2CA0</b>
	Standard Mini B5 USB cable for Control Units CU230.-2, CU240.-2 and SINAMICS G120C	–
<b>SINAMICS G110D</b>		
• Optical	<b>USB interface cable</b> For communication with a PC, 2.5 m (8.2 ft)	<b>6SL3555-0PA00-2AA0</b>
<b>SINAMICS G120D</b>		
• Optical	<b>USB interface cable</b> For communication with a PC, 2.5 m (8.2 ft)	<b>6SL3555-0PA00-2AA0</b>
• PROFIBUS	Connection to the PROFIBUS system in the plant	–
• PROFINET/ Ethernet	Connection to the PROFINET system in the plant	–

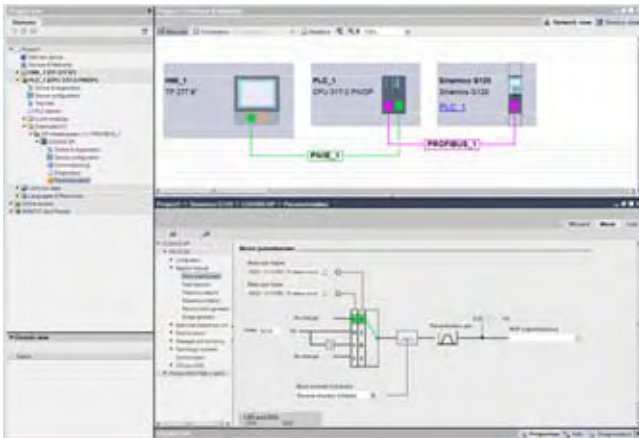
Description	Recommended accessories for communication between the drive unit and the programming device or PC	Order No.
<b>SINAMICS S110</b>		
• RS232	<b>SIMATIC S7 connecting cable</b> Null modem cable, 6 m (19.7 ft)	<b>6ES7901-1BF00-0XA0</b>
• PROFIBUS	<b>CP 5512 PROFIBUS communications module</b> PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/Windows XP Professional and PCMCIA 32	<b>6GK1551-2AA00</b>
	<b>CP 5711 PROFIBUS communications module</b> USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m/6.56 ft) included in scope of delivery	<b>6GK1571-1AA00</b>
	<b>SIMATIC DP plug-in cable</b> 12 MBaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	<b>6ES7901-4BD00-0XA0</b>
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–
<b>SINAMICS S120</b>		
• RS232	<b>SIMATIC S7 connecting cable</b> Null modem cable, 6 m (19.7 ft)	<b>6ES7901-1BF00-0XA0</b>
• PROFIBUS	<b>CP 5512 PROFIBUS communications module</b> PCMCIA type 2 card + adapter with 9-pin SUB-D socket, for Windows 2000/Windows XP Professional and PCMCIA 32	<b>6GK1551-2AA00</b>
	<b>CP 5711 PROFIBUS communications module</b> USB adapter for connecting a PG or notebook to PROFIBUS or MPI USB cable (2 m/6.56 ft) included in scope of delivery	<b>6GK1571-1AA00</b>
	<b>SIMATIC DP plug-in cable</b> 12 MBaud, for PG connector, pre-assembled with 2 × 9-pin SUB-D connector, 3 m (9.84 ft)	<b>6ES7901-4BD00-0XA0</b>
• PROFINET/ Ethernet	Standard CAT5 Ethernet cable or PROFINET cable	–

#### More information

The STARTER commissioning tool is also available for update purposes on the Internet at [www.siemens.com/starter](http://www.siemens.com/starter)

## SINAMICS StartDrive commissioning tool

## 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

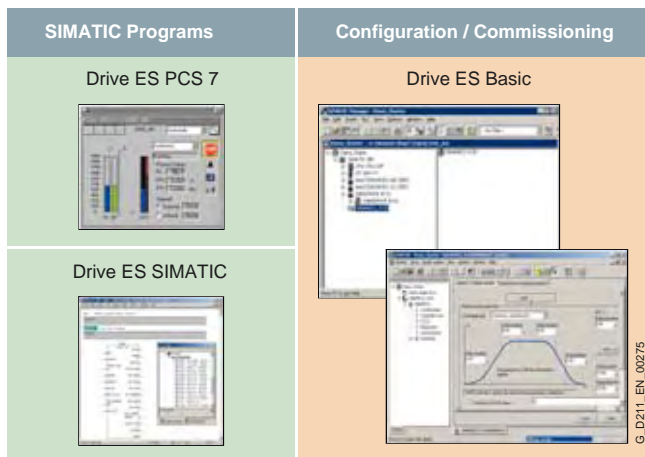
- PG or PC with 2.0 GHz Core 2 Duo processor
- DVD drive
- SVGA 1024 × 768
- 1 GB RAM
- Free hard disk memory: 2 GB
- Operating system:
  - Windows 2003 Server R2 StdE SP2
  - Windows 2008 Server R2 StdE SP2
  - Windows XP Professional SP3
  - Windows 7 Professional / Enterprise / Ultimate 32 bit
  -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

## Selection and ordering data

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

## 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 DRVDP7, POSMO), SIMATIC S7-400 with CPUs with integrated DP interface or with CP 443-5 (DRVDP7, POSMO function block libraries) and SIMATIC S7-300 with CP 342-5 (DRVDP7C function block library)
- **"USS protocol" communications software** for SIMATIC S7-300 with integral PtP interfaces or with CP 340/341 and SIMATIC S7-400 with CP 441 (DRVUSS7 function block library)
- **STEP 7 slave object manager** for easy configuration of drives 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 (DRVDP7 function block library, respectively). PROFINET IO and PROFIBUS DP use the same blocks from the DRVDP7 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

## Selection and ordering data

Description	Order No.
<p><b>Drive ES Basic V5.5 SPx <sup>*)</sup></b>            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</p> <ul style="list-style-type: none"> <li>• Floating license, 1 user</li> <li>• Floating license (copy license), 60 users</li> <li>• Update service for single-user license</li> <li>• Update service for copy license, 60 users</li> <li>• Upgrade from V5.x to V5.5 SPx <sup>*)</sup></li> </ul>	<p><b>6SW1700-5JA00-5AA0</b>  <b>6SW1700-5JA00-5AA1</b>  <b>6SW1700-0JA00-0AB2</b>  <b>6SW1700-0JA00-1AB2</b>  <b>6SW1700-5JA00-5AA4</b></p>
<p><b>Drive ES SIMATIC V5.5 SPx <sup>*)</sup></b>            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</p> <ul style="list-style-type: none"> <li>• Single-user license incl. 1 runtime license</li> <li>• Runtime license (without data carrier)</li> <li>• Upgrade from V5.x to V5.5 SPx <sup>*)</sup></li> </ul>	<p><b>6SW1700-5JC00-5AA0</b>  <b>6SW1700-5JC00-1AC0</b>  <b>6SW1700-5JC00-5AA4</b></p>
<p><b>Drive ES PCS 7 V6.1 SPx <sup>*)</sup></b>            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</p> <ul style="list-style-type: none"> <li>• Single-user license incl. 1 runtime license</li> <li>• Runtime license (without data carrier)</li> <li>• Update service for single-user license</li> </ul>	<p><b>6SW1700-6JD00-1AA0</b>  <b>6SW1700-5JD00-1AC0</b>  <b>6SW1700-0JD00-0AB2</b></p>
<p><b>Drive ES PCS 7 V7.0 SPx <sup>*)</sup></b>            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</p> <ul style="list-style-type: none"> <li>• Single-user license incl. 1 runtime license</li> <li>• Runtime license (without data carrier)</li> <li>• Update service for single-user license</li> <li>• Upgrade from V5.x to V7.0 SPx <sup>*)</sup></li> </ul>	<p><b>6SW1700-7JD00-0AA0</b>  <b>6SW1700-5JD00-1AC0</b>  <b>6SW1700-0JD00-0AB2</b>  <b>6SW1700-7JD00-0AA4</b></p>
<p><b>Drive ES PCS 7 V7.1 SPx <sup>*)</sup></b>            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</p> <ul style="list-style-type: none"> <li>• Single-user license incl. 1 runtime license</li> <li>• Runtime license (without data carrier)</li> <li>• Update service for single-user license</li> <li>• Upgrade from V6.x to V7.1 SPx <sup>*)</sup></li> </ul>	<p><b>6SW1700-7JD00-1AA0</b>  <b>6SW1700-5JD00-1AC0</b>  <b>6SW1700-0JD00-0AB2</b>  <b>6SW1700-7JD00-1AA4</b></p>

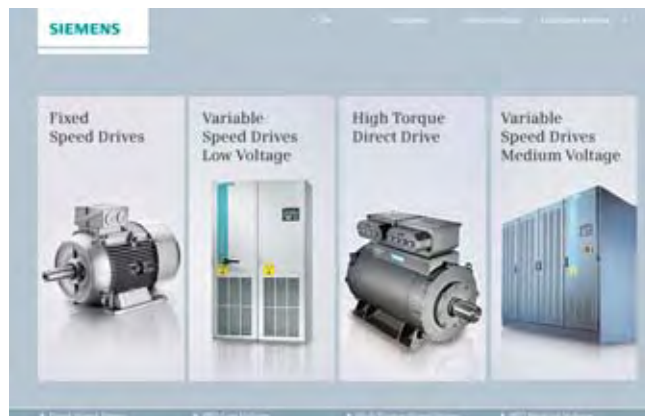
## More information

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

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

## SinaSave energy-saving program

## Overview



## SinaSave

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.

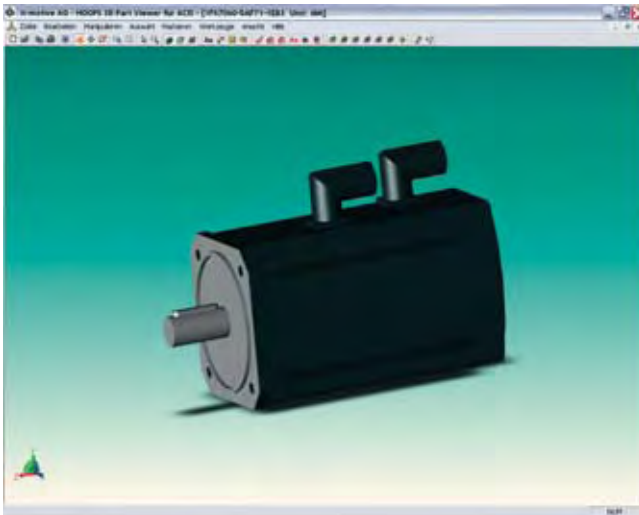
The motors section was supplemented with high-torque motors and information on motors from the mechanical perspective. User-friendly functionalities such as an automatic update function and an up-to-date currency table round off the content of the energy saving tool.

**More information**

SinaSave is available free on the Internet at:  
[www.siemens.com/sinasave](http://www.siemens.com/sinasave)

More information about services for energy saving is available on the Internet:  
[www.siemens.com/energy-saving](http://www.siemens.com/energy-saving)



**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.
<b>CAD CREATOR</b> Dimension drawing and 2D/3D CAD generator on DVD-ROM English, French, German, Italian, Spanish	<b>6SL3075-0AA00-0AG0</b>

**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](http://www.siemens.com/cadcreator)

# Engineering tools

Notes

## Services and documentation



<b>15/2</b>	<b>Applications</b>
<b>15/3</b>	<b>Training</b>
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<b>15/13</b>	<b>Mechatronic Support</b>
<b>15/14</b>	<b>SparesOnWeb</b>
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<b>15/16</b>	<b>Documentation</b>
15/17	General documentation
15/18	SINAMICS S110
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15/19	Measuring systems

## 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](http://www.siemens.com/motioncontrol/apc)

**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](http://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](mailto:info@sitrain.com)

**Training office, US:**

Phone: 1-800-241-4453  
E-mail: [sitrain.register.sea@siemens.com](mailto: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.



# Services and documentation

## 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 (all courses are available in English and German)	Target group						Duration	Course code
	Decision-makers, sales personnel	Project managers, project assistants	Programmers	Commissioning engineers, configuring engineers	Service engineers	Maintenance personnel		
<b>Basic courses</b>								
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
<b>Follow-up courses</b>								
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

## Training SINAMICS G110 training case

### 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

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

### Selection and ordering data

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

### More information

Information on additional SINAMICS training cases including G120 and S120 is available on the Internet at [www.siemens.com/sidemo](http://www.siemens.com/sidemo)

# Services and documentation

## 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*

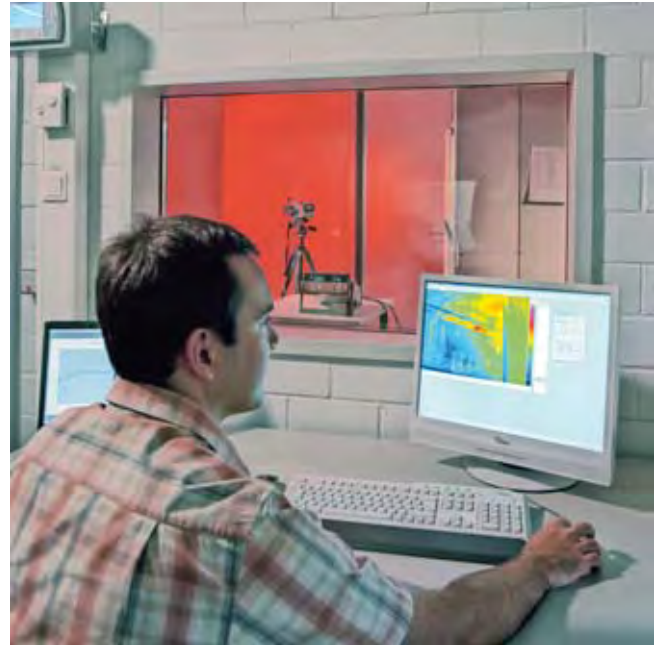
Siemens supports you with advice on design in accordance with standards and concepts for drive systems, control, operation and safety.

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



**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**

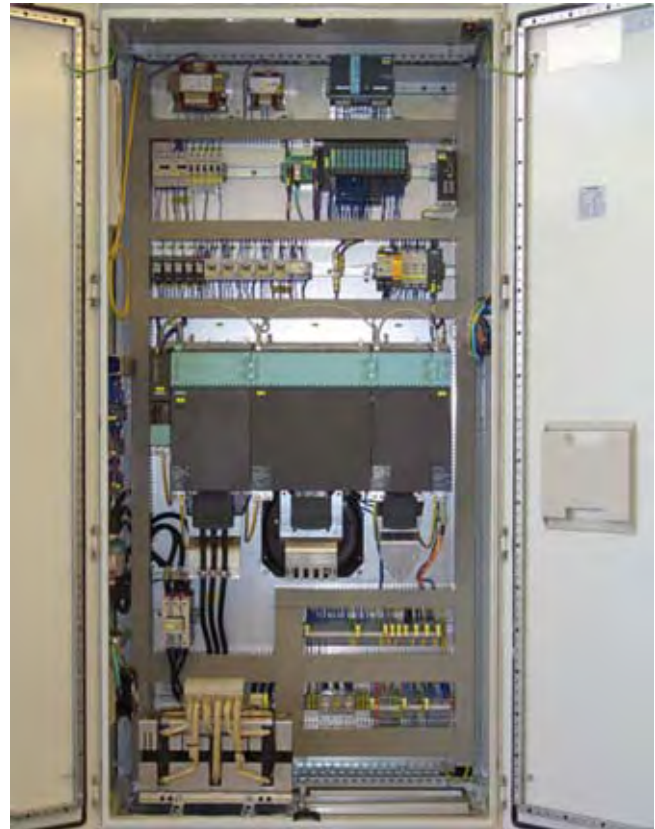
Of course we accept the same liability for defects for our complete equipment as for our SINUMERIK, SIMODRIVE and SINAMICS products.

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

# Services and documentation

## Repair service contract RSC

### Overview

#### RSC description of performance

In the context of the repair service contract (RSC), Siemens eliminates faults on components from Siemens Industry Sector, I IA&DT specified in the contract (with the exception of complete motor spindles) at the machine location on behalf of the machine tool/production machinery manufacturer and dealer.

#### RSC services

- Provision of servicing personnel
- On-site diagnostics
- 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: dismantling/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<sup>1)</sup>.

The following components are not defined as spare parts:

- Motors <sup>2)</sup>
- Cables <sup>3)</sup>
- Special or customer-specific modules and components not available from Siemens as spare parts.

Faulty components <sup>4)</sup> are replaced free-of-charge within the agreed contract period. See under Service exclusions.

#### Contract prerequisites

- Final destination certificate
- Data backup at the user'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<sup>5)</sup>.

#### 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"<sup>4)</sup>. In the case of parts subject to wear (e.g., motor bearings and fans or cables), replacements will be provided free-of-charge within 12 months of commencement of the RSC in the case of proper use, irrespective of the actual duration of the 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.

<sup>1)</sup> 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**.

<sup>2)</sup> 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.

<sup>3)</sup> The delivery times known to you usually apply.

<sup>4)</sup> 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

<sup>5)</sup> 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).

## Repair service contract RSC

## Overview

## Data handling

To improve the service availability, Siemens Drive Technologies offers users the opportunity to register machines online and to save what is known as an identSNAPSHOT file. In addition to the component list and the software requirements of machines, this also includes information for machine manufacturers/and where relevant, dealers and end customers.

To simplify data handling, information about the final destination certificate can be saved using the XML function of identSNAPSHOT and transferred to Siemens using an online registration. This data can also be kept with the machine as data backup.

[www.siemens.com/identsnapshot/register](http://www.siemens.com/identsnapshot/register)

## 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
<b>Country group 1</b>	
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
<b>Country group 2</b>	
Africa	South Africa
America	Argentina, Canada, Mexico
Asia	India, Indonesia, Malaysia, South Korea, Taiwan, Thailand
Australia	Australia
Europe	Bulgaria, Greece, Russia, Turkey
<b>Country group 3</b>	
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.
<b>Repair service contract RSC</b>	
For Siemens I IA&DT components on production machines for countries in country groups 1 to 3	
• 12 month contract period <sup>1)</sup>	<b>6FC8507-0RX12-■■■■0</b>
• 24 month contract period <sup>2)</sup>	<b>6FC8507-0RX24-■■■■0</b>
Equipment value in €	↑
0,-	<b>0</b>
100000,-	<b>1</b>
200000,-	<b>2</b>
300000,-	<b>3</b>
400000,-	<b>4</b>
500000,-	<b>5</b>
600000,-	<b>6</b>
700000,-	<b>7</b>
800000,-	<b>8</b>
900000,-	<b>9</b>
	↑
0,-	<b>A</b>
10000,-	<b>B</b>
20000,-	<b>C</b>
30000,-	<b>D</b>
40000,-	<b>E</b>
50000,-	<b>F</b>
60000,-	<b>G</b>
70000,-	<b>H</b>
80000,-	<b>J</b>
90000,-	<b>K</b>
	↑
0,-	<b>A</b>
1000,-	<b>B</b>
2000,-	<b>C</b>
3000,-	<b>D</b>
4000,-	<b>E</b>
5000,-	<b>F</b>
6000,-	<b>G</b>
7000,-	<b>H</b>
8000,-	<b>J</b>
9000,-	<b>K</b>

Ordering example:

Validity period of the contract 12 months and equipment value € 96000,-

6FC8507-0RX12-0KG0

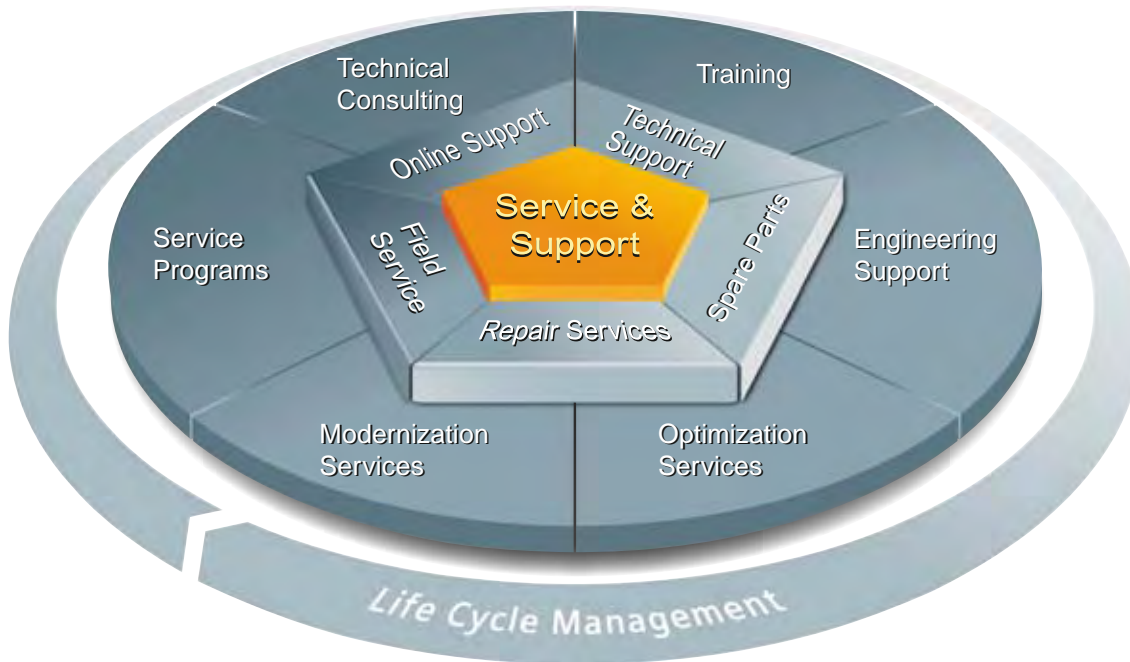
<sup>1)</sup> Max. 24 months from the transfer of risk (delivery of components).

<sup>2)</sup> Max. 36 months from the transfer of risk (delivery of components).

# Services and documentation

## 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](http://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](http://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

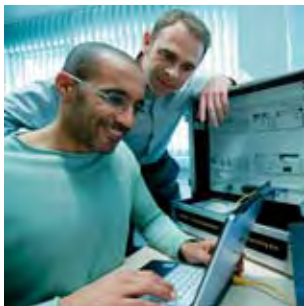


Extend your competitive edge – through practical know-how directly from the manufacturer.

[www.siemens.com/sitrain](http://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](http://www.siemens.com/automation/partner)

**Engineering Support**

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

**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.

**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

**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.

**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

**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.

**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

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

# Services and documentation

## 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



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	<b>6ES7997-0BA00-0XA0</b>
500	<b>6ES7997-0BB00-0XA0</b>
1000	<b>6ES7997-0BC00-0XA0</b>
10000	<b>6ES7997-0BG00-0XA0</b>

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

[www.siemens.com/automation/service&support](http://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

#### 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.

## 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.

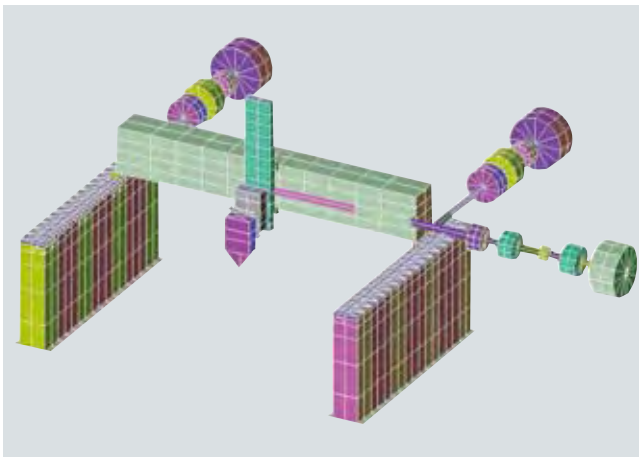
### *Virtual simulation, real construction*

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

## More information

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

# Services and documentation

## 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>



## 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 A&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.

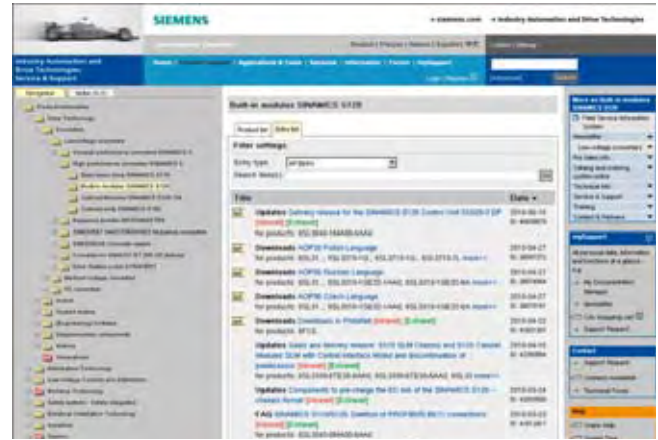
You must register for configuring and generating/managing (the existing login can be used, e.g. Industry Mall) [www.siemens.com/industrymall](http://www.siemens.com/industrymall)

### Benefits

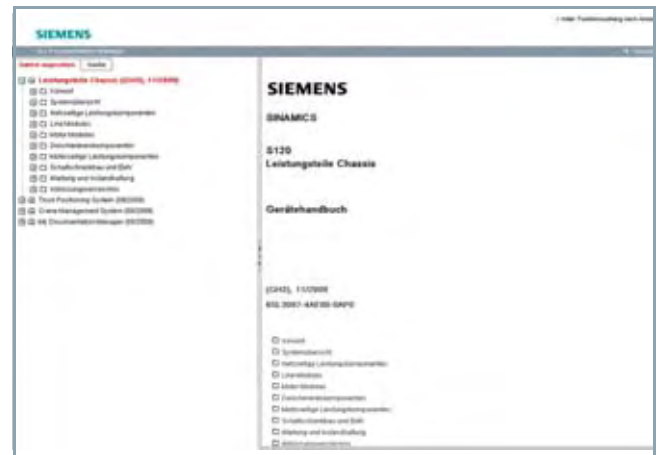
- Display  
View, print or download standard documents or personalized documents
- Configure  
Transfer standard documents or parts of them to personalized documents
- Generate/Manage  
Produce and manage personalized documents in the formats PDF, RTF or XML

### Design

My Documentation Manager is the web-based system to generate personalized documentation based on standard documents. It is part of the 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](http://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/](http://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](http://www.siemens.com/mdm)

## 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](http://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/WWW/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](mailto:docu.motioncontrol@siemens.com)

## Selection and ordering data

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

Description	Order No.
<b>User/Manufacturer Documentation</b>	
<b>SINAMICS Manual Collection</b> 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	<b>6SL3097-4CA00-0YG0</b>
<b>Manufacturer and service documentation</b>	
<b>EMC Installation Guidelines</b> <b>SINUMERIK, SIROTEC,</b> <b>SIMODRIVE, SIMOTION,</b> <b>SINAMICS S120</b>	
• German	<b>6FC5297-0AD30-0AP2</b>
• English	<b>6FC5297-0AD30-0BP2</b>

1) Available soon.

# Services and documentation

## Documentation SINAMICS S110

### Selection and ordering data

Description	Order No.
<b>Manufacturer and service documentation</b>	
<b>Manual SINAMICS S110</b>	
• German	6SL3097-4AC10-0AP2
• English	6SL3097-4AC10-0BP2
• Italian	6SL3097-4AC10-0CP2
• French	6SL3097-4AC10-0DP2
• Spanish	6SL3097-4AC10-0EP2
<b>List Manual SINAMICS S110</b>	
• German	6SL3097-4AP10-0AP2
• English	6SL3097-4AP10-0BP2
• Italian	6SL3097-4AP10-0CP2
• French	6SL3097-4AP10-0DP2
• Spanish	6SL3097-4AP10-0EP2
<b>Getting Started SINAMICS S110</b>	
• German	6SL3097-4AG10-0AP0
• English	6SL3097-4AG10-0BP0
• Italian	6SL3097-4AG10-0CP0
• French	6SL3097-4AG10-0DP0
• Spanish	6SL3097-4AG10-0EP0
<b>Function Manual SINAMICS S110</b>	
• 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.
<b>Manufacturer and service documentation</b>	
<b>Manual SINAMICS S120 AC Drive</b>	
• German	6SL3097-4AL00-0AP1
• English	6SL3097-4AL00-0BP1
• Italian	6SL3097-4AL00-0CP1
• French	6SL3097-4AL00-0DP1
• Spanish	6SL3097-4AL00-0EP1
<b>Commissioning Manual SINAMICS S120</b>	
• German	6SL3097-4AF00-0AP1
• English	6SL3097-4AF00-0BP1
• Italian	6SL3097-4AF00-0CP1
• French	6SL3097-4AF00-0DP1
• Spanish	6SL3097-4AF00-0EP1
<b>List Manual SINAMICS S120/SINAMICS S150</b>	
• German	6SL3097-4AP00-0AP2
• English	6SL3097-4AP00-0BP2
• Italian	6SL3097-4AP00-0CP2
• French	6SL3097-4AP00-0DP2
• Spanish	6SL3097-4AP00-0EP2
<b>Getting Started SINAMICS S120</b>	
• German	6SL3097-4AG00-0AP0
• English	6SL3097-4AG00-0BP0
• Italian	6SL3097-4AG00-0CP0
• French	6SL3097-4AG00-0DP0
• Spanish	6SL3097-4AG00-0EP0
<b>Function Manual SINAMICS S120 Drive Functions</b>	
• German	6SL3097-4AB00-0AP1
• English	6SL3097-4AB00-0BP1
• Italian	6SL3097-4AB00-0CP1
• French	6SL3097-4AB00-0DP1
• Spanish	6SL3097-4AB00-0EP1
<b>Function Manual SINAMICS S120 Safety Integrated</b>	
• German	6SL3097-4AR00-0AP2
• English	6SL3097-4AR00-0BP2
• Italian	6SL3097-4AR00-0CP2
• French	6SL3097-4AR00-0DP2
• Spanish	6SL3097-4AR00-0EP2

Documentation  
MotorsDocumentation  
Measuring systems

## Selection and ordering data

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

## Selection and ordering data

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

# Services and documentation

Notes

## Appendix



<b>16/2</b>	<b>Approvals</b>
<b>16/3</b>	<b>Partner at Industry Automation and Drive Technologies</b>
<b>16/4</b>	<b>Online services</b>
16/4	Information and ordering in the Internet and on DVD
<b>16/5</b>	<b>Notes on software</b>
16/5	Software licenses
16/6	Setup texts and software update services
<b>16/7</b>	<b>Indexes</b>
16/7	Subject index
16/12	Order number index
<b>16/15</b>	<b>Catalog improvement suggestions</b>
16/15	Fax form
<b>16/16</b>	<b>Conversion tables</b>
<b>16/18</b>	<b>Metal surcharges</b>
<b>16/20</b>	<b>Conditions of sale and delivery/ Export regulations</b>

# Appendix

## Approvals

### Overview



Many products in this catalog are in compliance with UL/CSA requirements and are labeled with the appropriate certification markings.

All certifications, certificates, declarations of conformance, test certificates, e.g. CE, UL, Safety Integrated have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals.

The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose.

For cases that deviate from these conditions, the company or person marketing these products is responsible in having the certificates appropriately re-issued.

#### **UL: Underwriters Laboratories** *Independent public testing institution in North America*

Approval marks:

- **UL** for end products, tested by UL in accordance with UL standard
- **cUL** for end products, tested by UL in accordance with CSA standard
- **cULus** for end products, tested by UL in accordance with UL and CSA standards
- **UR** for mounting parts in end products, tested by UL in accordance with UL standard
- **cUR** for mounting parts in end products, tested by UL in accordance with CSA standard
- **cURus** for mounting parts in end products, tested by UL in accordance with UL and CSA standards

Test standards:

- SINAMICS: Standard UL 508C
- Motors: Standard UL 547

Product category/File No.:

- SINAMICS: E192450
- Motors: E93429

#### **TUV: TUV Rheinland of North America Inc.** *Independent public testing institution in North America* *National recognized testing laboratory (NRTL)*

Approval mark:

- **cTUVus** tested by TUV in accordance with UL and CSA standards

#### **CSA: Canadian Standards Association** *Independent public testing institution in Canada*

Approval mark:

- **CSA** tested by CSA in accordance with CSA standard

Test standard:

- Standard CAN/CSA-C22.2/No. 0-M91/No. 14-05/No. 142-M1987



# 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.

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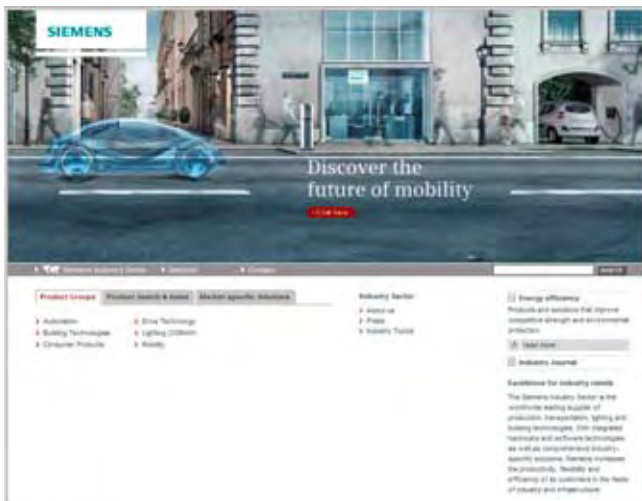


# Appendix

## Online services

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](http://www.siemens.com/industry)

you will find everything you need to know about products, systems and services.

### Product Selection Using the Interactive Catalog CA 01 of Industry



Detailed information together with convenient interactive functions:

The interactive catalog CA 01 covers more than 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. All information is linked into a user interface which is easy to work with and intuitive.

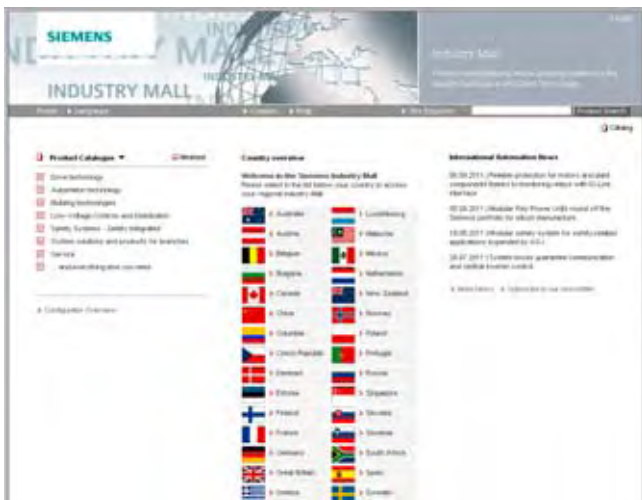
After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the interactive catalog CA 01 can be found in the Internet at

[www.siemens.com/automation/ca01](http://www.siemens.com/automation/ca01)

or on DVD.

### Easy Shopping with the Industry Mall



The Industry Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the Industry Mall on the Internet at:

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)

### Overview

#### Software types

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

- Engineering software
- Runtime software

#### Engineering software

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

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

#### Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

#### License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

- Floating License
- Single License
- Rental License
- Trial License
- Factory License

#### Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started. A license is required for each concurrent user.

#### Single license

Unlike the floating license, a single license permits only one installation of the software.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per device, per axis, per channel, etc.

One single license is required for each type of use defined.

#### Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific number of hours (the operating hours do not have to be consecutive).

One license is required for each installation of the software.

#### Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

#### Factory License

With the Factory License the user has the right to install and use the software at one permanent establishment only. The permanent establishment is defined by one address only. The number of hardware devices on which the software may be installed results from the order data or the Certificate of License (CoL).

#### Certificate of license

The Certificate of License (CoL) is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

#### Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

#### Delivery versions

Software is constantly being updated. The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

#### PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.

A separate PowerPack must be purchased for each original license of the software to be replaced.

#### Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.

The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.

A separate upgrade must be purchased for each original license of the software to be upgraded.

#### ServicePack

ServicePacks are used to debug existing products.

ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

#### License key

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Detailed explanations concerning license conditions can be found in the "Terms and Conditions of Siemens AG" or at

[www.siemens.com/industrymall](http://www.siemens.com/industrymall)  
(Industry Mall Online-Help System)

# Appendix

## Notes on software

### Setup texts and software update services

#### Overview

The "General License Conditions for Software Products for Automation and Drives" are applicable for supplies and deliveries of I DT software products.

#### *Legal notes during setup for new software products*

All software products feature a uniform reference to the license conditions. The license conditions are enclosed either with the documentation or in the software pack. When software is downloaded from the Internet, the license contract is displayed before the ordering procedure and must be accepted by the user before downloading can continue.

#### Notice:

This software is protected by German and/or US copyright laws and the regulations of international agreements. Unauthorized reproduction or sale of this software or parts of it is a criminal offense. This will lead to criminal and civil prosecution, and may result in significant fines and/or claims for damages. Prior to installing and using the software, please read the applicable license conditions for this software. You will find these in the documentation or packaging.

If you have received this software on a CD-ROM that is marked "Trial version", or accompanying software that is licensed for your use, the software is only permitted to be used for test and validation purposes in accordance with the accompanying conditions for the trial license. To this end, it is necessary for programs, software libraries, etc. are installed on your computer. We therefore urgently recommend that installation is performed on a single-user computer or on a computer that is not used in the production process or for storing important data, since it cannot be completely excluded that existing files will be modified or overwritten. We accept no liability whatsoever for damage and/or data losses that result from this installation or the non-observance of this warning. Every other type of use of this software is only permitted if you are in possession of a valid license from Siemens.

If you are not in possession of a valid license that can be proven by presenting an appropriate Certificate of License/software product certificate, please abort installation immediately and contact a Siemens office without delay to avoid claims for damages.

#### *Software update services*

#### **Order**

To order the software update service, an order number must be specified. The software update service can be ordered when the software products are ordered or at a later date. Subsequent orders require that the ordering party is in possession at least of a single license.

#### Note:

It is recommended that the software update service is ordered as early as possible. If a new software version of a software product is released for delivery by Siemens, only those customers will receive it automatically who are entered in the appropriate delivery list at Siemens at this time. Previous software versions, or the current software version are not supplied when the software update service is ordered. The software update service requires that the software product is up-to-date at the time of completion of the contract for the software update service.

#### **Delivery**

When a software update service is ordered, you will be sent the contractual conditions of this service and the price is due for payment. At the same time, you will be included in a delivery list for the software product to be updated. If Siemens releases a new software version for the corresponding software product for general sale (function version or product version), it will be delivered automatically to the goods recipient specified in the delivery address within the contract period.

#### **More information**

#### **Security note**

In the case of software for remote maintenance or connection to higher-level networks, suitable protection measures must be taken (including IT security, e.g. network segmentation) to guarantee safe operation of the system. You can find more information on Industrial Security on the Internet at:

[www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity)

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# Appendix

## Catalog improvement suggestions

Fax form

**To**

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Our catalog should be an important and frequently used document.

For this reason we are continuously endeavoring to improve it.

A small request on our part to you:

Please take time to fill in the following form and fax it to us.  
 Or send us an e-mail.

Thank You!

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

Do the contents of the catalog live up to your expectations?

Do the technical details meet your expectations?

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?**

# Appendix

## Conversion tables

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

A \ B	lb-in <sup>2</sup>	lb-ft <sup>2</sup>	lb-in-s <sup>2</sup>	lb-ft-s <sup>2</sup> slug-ft <sup>2</sup>	kg-cm <sup>2</sup>	kg-cm-s <sup>2</sup>	gm-cm <sup>2</sup>	gm-cm-s <sup>2</sup>	oz-in <sup>2</sup>	oz-in-s <sup>2</sup>
lb-in <sup>2</sup>	1	$6.94 \times 10^{-3}$	$2.59 \times 10^{-3}$	$2.15 \times 10^{-4}$	2.926	$2.98 \times 10^{-3}$	$2.92 \times 10^3$	2.984	16	$4.14 \times 10^{-2}$
lb-ft <sup>2</sup>	144	1	0.3729	$3.10 \times 10^{-2}$	421.40	0.4297	$4.21 \times 10^5$	429.71	2304	5.967
lb-in-s <sup>2</sup>	386.08	2.681	1	$8.33 \times 10^{-2}$	$1.129 \times 10^3$	1.152	$1.129 \times 10^6$	$1.152 \times 10^3$	$6.177 \times 10^3$	16
lb-ft-s <sup>2</sup> slug-ft <sup>2</sup>	$4.63 \times 10^3$	32.17	12	1	$1.35 \times 10^4$	13.825	$1.355 \times 10^7$	$1.38 \times 10^4$	$7.41 \times 10^4$	192
kg-cm <sup>2</sup>	0.3417	$2.37 \times 10^{-3}$	$8.85 \times 10^{-4}$	$7.37 \times 10^{-5}$	1	$1.019 \times 10^{-3}$	1000	1.019	5.46	$1.41 \times 10^{-2}$
kg-cm-s <sup>2</sup>	335.1	2.327	0.8679	$7.23 \times 10^{-2}$	980.66	1	$9.8 \times 10^5$	1000	$5.36 \times 10^3$	13.887
gm-cm <sup>2</sup>	$3.417 \times 10^{-4}$	$2.37 \times 10^{-6}$	$8.85 \times 10^{-7}$	$7.37 \times 10^{-8}$	$1 \times 10^{-3}$	$1.01 \times 10^{-6}$	1	$1.01 \times 10^{-3}$	$5.46 \times 10^{-3}$	$1.41 \times 10^{-5}$
gm-cm-s <sup>2</sup>	0.335	$2.32 \times 10^{-3}$	$8.67 \times 10^{-4}$	$7.23 \times 10^{-5}$	0.9806	$1 \times 10^{-3}$	980.6	1	5.36	$1.38 \times 10^{-2}$
oz-in <sup>2</sup>	0.0625	$4.34 \times 10^{-4}$	$1.61 \times 10^{-4}$	$1.34 \times 10^{-5}$	0.182	$1.86 \times 10^{-4}$	182.9	0.186	1	$2.59 \times 10^{-3}$
oz-in-s <sup>2</sup>	24.13	0.1675	$6.25 \times 10^{-2}$	$5.20 \times 10^{-3}$	70.615	$7.20 \times 10^{-2}$	$7.09 \times 10^4$	72.0	386.08	1

### Torque (to convert from A to B, multiply by entry in table)

A \ B	lb-in	lb-ft	oz-in	N-m	kg-cm	kg-m	gm-cm	dyne-cm
lb-in	1	$8.333 \times 10^{-2}$	16	0.113	1.152	$1.152 \times 10^{-2}$	$1.152 \times 10^3$	$1.129 \times 10^6$
lb-ft	12	1	192	1.355	13.825	0.138	$1.382 \times 10^4$	$1.355 \times 10^7$
oz-in	$6.25 \times 10^{-2}$	$5.208 \times 10^{-3}$	1	$7.061 \times 10^{-3}$	$7.200 \times 10^{-2}$	$7.200 \times 10^{-4}$	72.007	$7.061 \times 10^4$
N-m	8.850	0.737	141.612	1	10.197	0.102	$1.019 \times 10^4$	$1 \times 10^7$
kg-cm	0.8679	$7.233 \times 10^{-2}$	13.877	$9.806 \times 10^{-2}$	1	$10^{-2}$	1000	$9.806 \times 10^5$
kg-m	86.796	7.233	$1.388 \times 10^3$	9.806	100	1	$1 \times 10^5$	$9.806 \times 10^7$
gm-cm	$8.679 \times 10^{-4}$	$7.233 \times 10^{-5}$	$1.388 \times 10^{-2}$	$9.806 \times 10^{-5}$	$1 \times 10^{-3}$	$1 \times 10^{-5}$	1	980.665
dyne-cm	$8.850 \times 10^{-7}$	$7.375 \times 10^{-8}$	$1.416 \times 10^{-5}$	$10^{-7}$	$1.0197 \times 10^{-6}$	$1.019 \times 10^{-8}$	$1.019 \times 10^{-3}$	1

### Length (to convert from A to B, multiply by entry in table)

A \ B	inches	feet	cm	yd	mm	m
inches	1	0.0833	2.54	0.028	25.4	0.0254
feet	12	1	30.48	0.333	304.8	0.3048
cm	0.3937	0.03281	1	$1.09 \times 10^{-2}$	10	0.01
yd	36	3	91.44	1	914.4	0.914
mm	0.03937	0.00328	0.1	$1.09 \times 10^{-3}$	1	0.001
m	39.37	3.281	100	1.09	1000	1

### Force (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	dyne	N
lb	1	16	453.6	$4.448 \times 10^5$	4.4482
oz	0.0625	1	28.35	$2.780 \times 10^4$	0.27801
gm	$2.205 \times 10^{-3}$	0.03527	1	$1.02 \times 10^{-3}$	N.A.
dyne	$2.248 \times 10^{-6}$	$3.59 \times 10^{-5}$	980.7	1	0.00001
N	0.22481	3.5967	N.A.	100000	1

### Mass (to convert from A to B, multiply by entry in table)

A \ B	lb	oz	gm	kg	slug
lb	1	16	453.6	0.4536	0.0311
oz	$6.25 \times 10^{-2}$	1	28.35	0.02835	$1.93 \times 10^{-3}$
gm	$2.205 \times 10^{-3}$	$3.527 \times 10^{-2}$	1	$10^{-3}$	$6.852 \times 10^{-5}$
kg	2.205	35.27	$10^3$	1	$6.852 \times 10^{-2}$
slug	32.17	514.8	$1.459 \times 10^4$	14.59	1

### Power (to convert from A to B, multiply by entry in table)

A \ B	hp	Watts
hp (English)	1	745.7
(lb-in) (deg./s)	$2.645 \times 10^{-6}$	$1.972 \times 10^{-3}$
(lb-in) (rpm)	$1.587 \times 10^{-5}$	$1.183 \times 10^{-2}$
(lb-ft) (deg./s)	$3.173 \times 10^{-5}$	$2.366 \times 10^{-2}$
(lb-ft) (rpm)	$1.904 \times 10^{-4}$	0.1420
Watts	$1.341 \times 10^{-3}$	1

### Rotation (to convert from A to B, multiply by entry in table)

A \ B	rpm	rad/s	degrees/s
rpm	1	0.105	6.0
rad/s	9.55	1	57.30
degrees/s	0.167	$1.745 \times 10^{-2}$	1

### Temperature Conversion

°F	°C	°C	°F
0	-17.8	-10	14
32	0	0	32
50	10	10	50
70	21.1	20	68
90	32.2	30	86
98.4	37	37	98.4
212	100	100	212
subtract 32 and multiply by $\frac{5}{9}$		multiply by $\frac{9}{5}$ and add 32	

### Mechanism Efficiencies

Acme-screw with brass nut	~0.35–0.65
Acme-screw with plastic nut	~0.50–0.85
Ball-screw	~0.85–0.95
Chain and sprocket	~0.95–0.98
Preloaded ball-screw	~0.75–0.85
Spur or bevel-gears	~0.90
Timing belts	~0.96–0.98
Worm gears	~0.45–0.85
Helical gear (1 reduction)	~0.92

### Friction Coefficients

Materials	$\mu$
Steel on steel (greased)	~0.15
Plastic on steel	~0.15–0.25
Copper on steel	~0.30
Brass on steel	~0.35
Aluminum on steel	~0.45
Steel on steel	~0.58
Mechanism	$\mu$
Ball bushings	<0.001
Linear bearings	<0.001
Dove-tail slides	~0.2++
Gibb ways	~0.5++

### Material Densities

Material	lb-in <sup>3</sup>	gm-cm <sup>3</sup>
Aluminum	0.096	2.66
Brass	0.299	8.30
Bronze	0.295	8.17
Copper	0.322	8.91
Hard wood	0.029	0.80
Soft wood	0.018	0.48
Plastic	0.040	1.11
Glass	0.079–0.090	2.2–2.5
Titanium	0.163	4.51
Paper	0.025–0.043	0.7–1.2
Polyvinyl chloride	0.047–0.050	1.3–1.4
Rubber	0.033–0.036	0.92–0.99
Silicone rubber, without filler	0.043	1.2
Cast iron, gray	0.274	7.6
Steel	0.280	7.75

### Wire Gauges<sup>1)</sup>

Cross-section mm <sup>2</sup>	Standard Wire Gauge (SWG)	American Wire Gauge (AWG)
0.2	25	24
0.3	23	22
0.5	21	20
0.75	20	19
1.0	19	18
1.5	17	16
2.5	15	13
4	13	11
6	12	9
10	9	7
16	7	6
25	5	3
35	3	2
50	0	1/0
70	000	2/0
95	00000	3/0
120	0000000	4/0
150	–	6/0
185	–	7/0

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

# Appendix

## Metal surcharges

### 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](http://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](http://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

<b>LEA---</b>	<ul style="list-style-type: none"> <li>Basis for % surcharge: List price</li> <li>Silver: basis 150 €, step range 50 €, 0.5 %</li> <li>Copper: basis 150 €, step range 50 €, 0.1 %</li> <li>No surcharge for aluminum</li> <li>No surcharge for lead</li> <li>No surcharge for gold</li> </ul>
<b>N-A6--</b>	<ul style="list-style-type: none"> <li>Basis for % surcharge: Customer net price</li> <li>No surcharge for silver</li> <li>Copper: basis 150 €, step range 50 €, 0.1 %</li> <li>Aluminum acc. to weight, basic offic. price 225 €</li> <li>No surcharge for lead</li> <li>No surcharge for gold</li> </ul>
<b>--3--</b>	<ul style="list-style-type: none"> <li>No basis necessary</li> <li>No surcharge for silver</li> <li>Copper acc. to weight, basic official price 150 €</li> <li>No surcharge for aluminum</li> <li>No surcharge for lead</li> <li>No surcharge for gold</li> </ul>

I 1A/DT/BT LV / MZ\_1/En 12.05.09



### 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 151 € – 200 €	Official price 201 € – 250 €	Official price 251 € – 300 €	Official price 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
<b>Price basis (1st digit)</b>							
L	Charged on the list price						
N	Charged on the customer net price or discounted list price						
<b>Weight method</b>	<b>Basic official price</b>						
2	100						
3	150						
4	175						
5	200	Calculation based on raw material weight					
6	225						
7	300						
8	400						
9	555						
<b>Misc.</b>							
-	No metal surcharge						

IA/DT/BT MZ En 16.10.09

# Appendix

## Conditions of sale and delivery/Export regulations

### 1. General Provisions

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following Terms and Conditions of Sale and Delivery (hereinafter referred to as "T&C"). Please note! The scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside of Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following T&C apply exclusively for orders placed with Siemens Aktiengesellschaft, Germany.

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- the "General Terms of Payment"<sup>1)</sup> and
- for software products the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office in Germany"<sup>1)</sup> and
- for other supplies and/or services the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"<sup>1)</sup>.

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- for other supplies and/or services the "General Conditions for Supplies of Siemens, Automation and Drives for Customers with a Seat or registered Office outside of Germany"<sup>1)</sup>.

### 2. Prices

The prices are in € (Euro) ex works, exclusive packaging.

The sales tax (value added tax) is not included in the prices.

It shall be debited separately at the respective rate according to the applicable legal regulations.

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".

In the event of an increase or decrease of the purchase price for Rare Earths (e.g. Neodymium, Dysprosium) or in case of a change of prices by our suppliers based on the increase or decrease of the purchase price for Rare Earths between conclusion of the contract and delivery, you or we are additionally entitled to demand for an adjustment of the agreed prices according to the proven cost change for any delivery which contains Rare Earths. The same applies for such cost changes occurred between submission of our binding offer and your acceptance.

### 3. Additional Terms and Conditions

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches only apply to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

### 4. Export regulations

We shall not be obligated to fulfill this agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes or other sanctions.

Export of goods listed in this catalog may be subject to license. We shall indicate in the delivery details whether licenses are required under German, European and US export lists. Goods labeled with "AL" not equal to "N" are subject to European or German export authorization when being exported out of the EU. Goods labeled with "ECCN" not equal to "N" are subject to US re-export authorization.

The export label is made available with the information of the respective goods on Industry Mall, our online-catalog-system, additionally. The deciding factors are the export label "AL" or "ECCN" indicated on order confirmations, delivery notes and invoices.

Even without a label, or with label "AL:N" or "ECCN:N", authorization may be required due to the final whereabouts and purpose for which the goods are to be used.

If you transfer goods (hardware and/or software and/or technology as well as corresponding documentation, regardless of the mode of provision) delivered by us or works and services (including all kinds of technical support) performed by us to a third party worldwide, you shall comply with all applicable national and international (re-) export control regulations.

If required to conduct export control checks, you, upon request by us, shall promptly provide us with all information pertaining to particular end customer, destination and intended use of goods, works and services provided by us, as well as any export control restrictions existing.

Errors excepted and subject to change without prior notice.

1) The text of the Comprehensive Terms and Conditions of Sale and Delivery can be downloaded at:  
[www.siemens.com/automation/salesmaterial-as/catalog/en/terms\\_of\\_trade\\_en.pdf](http://www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf)

## Industry Automation, Drive Technologies and Low-Voltage Power Distribution

Further information can be obtained from our branch offices listed in the appendix or at [www.siemens.com/automation/partner](http://www.siemens.com/automation/partner)

<b>Interactive Catalog on DVD</b>	<i>Catalog</i>	<b>Motion Control</b>	<i>Catalog</i>
for Industry Automation, Drive Technologies and Low Voltage Distribution	<b>CA 01</b>	SINAMICS and Motors for Single-Axis Drives	D 31
<b>Drive Systems</b>		SINUMERIK & SIMODRIVE	NC 60
<u>Variable-Speed Drives</u>		Automation Systems for Machine Tools	
SINAMICS G130 Drive Converter Chassis Units	D 11	SINUMERIK & SINAMICS	NC 61
SINAMICS G150 Drive Converter Cabinet Units		Equipment for Machine Tools	
SINAMICS GM150, SINAMICS SM150	D 12	SINUMERIK 828D BASIC T/BASIC M, SINAMICS S120 Combi and 1FK7/1PH8 motors	NC 82
Medium-Voltage Converters		SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21
SINAMICS S120 Chassis Format Units and Cabinet Modules	D 21.3	Drive and Control Components for Cranes	CR 1
SINAMICS S150 Converter Cabinet Units			
SINAMICS DCM Converter Units	D 23.1	<b>Power Supply and System Cabling</b>	
SINAMICS and Motors for Single-Axis Drives	D 31	Power supply SITOP	KT 10.1
<u>Three-phase Induction Motors</u>	D 84.1	System cabling SIMATIC TOP connect	KT 10.2
• H-compact		<b>Process Instrumentation and Analytics</b>	
• H-compact PLUS		Field Instruments for Process Automation	FI 01
Asynchronous Motors Standardline	D 86.1	SIREC Recorders and Accessories	MP 20
Synchronous Motors with Permanent-Magnet Technology, HT-direct	D 86.2	SIPART, Controllers and Software	MP 31
DC Motors	DA 12	Products for Weighing Technology	WT 10
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1	<i>PDF: Process Analytical Instruments</i>	PA 01
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2	<i>PDF: Process Analytics, Components for the System Integration</i>	PA 11
<i>PDF: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units</i>	DA 22		
SIMOVERT PM Modular Converter Systems	DA 45	<b>Safety Integrated</b>	
SIEMOSYN Motors	DA 48	Safety Technology for Factory Automation	SI 10
MICROMASTER 420/430/440 Inverters	DA 51.2	<b>SIMATIC HMI/PC-based Automation</b>	
MICROMASTER 411/COMBIMASTER 411	DA 51.3	Human Machine Interface Systems/ PC-based Automation	ST 80/ ST PC
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Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES	DA 65.3	<b>SIMATIC Industrial Automation Systems</b>	
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SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21	SIMATIC PCS 7 Process Control System	ST PCS 7
SINUMERIK, SIMODRIVE and Motors for Machine Tools	NC 60	Add-ons for the SIMATIC PCS 7 Process Control System	ST PCS 7.1
SINUMERIK, SINAMICS S120 and Motors for Machine Tools	NC 61	<i>PDF: Migration solutions with the SIMATIC PCS 7 Process Control System</i>	ST PCS 7.2
<u>Low-Voltage Three-Phase-Motors</u>		<b>SIMATIC NET</b>	
IEC Squirrel-Cage Motors	D 81.1	Industrial Communication	IK PI
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