SINAMICS G110, SINAMICS G120 Inverter Chassis Units
SINAMICS G120D Distributed Frequency Inverters

Catalog D 11.1 · 2008

SINAMICS Drives

SIEMENS

Related catalogs

SINAMICS G130 D 11
Drive Converter Chassis Units
SINAMICS G150
Drive Converter Cabinet Units

E86060-K5511-A101-A3-7600

MICROMASTER DA 51.2
MICROMASTER 420/430/440
Inverters
0.12 kw to 250 kW

E86060-K5151-A121-A6-7600

MICROMASTER/COMBIMASTER DA 51.3
MICROMASTER 411 Inverters
COMBIMASTER 411
Distributed Drive Solutions

E86060-K5251-A131-A2-7600

Low-Voltage Motors D 81.1
IEC Squirrel-Cage Motors
Frame sizes 56 to 450

E86060-K5581-A111-A2-7600

Low-Voltage Motors D 81.1
IEC Squirrel-Cage Motors News
New Generation 1LE1
Frame sizes 100 to 160

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AC NEMA & IEC Motors D 81.2
Furter details available on the U.S./
Internet at: Canada

http://www.sea.siemens.com/motors

Industrial Communication IK PI
Industrial communication
for Automation & Drives

E86060-K6710-A101-B5-7600
E86060-K6710-A121-A2-7600 (News)

SITRAIN ITC
Training for Automation and
Industrial Solutions

E86060-K6850-A101-B8 [1)]

Low-Voltage Controls and Distribution LV 1
SIRIUS · SENTRON · SIVACON

E86060-K1002-A101-A7-7600

Technical Information incl. LV 1 T

Catalog CA 01 CA 01
The Offline-Mall of
Automation and Drives
Order No.:
CD: E86060-D4001-A110-C6-7600
DVD: E86060-D4001-A510-C6-7600

A&D Mall

Internet:
http://www.siemens.com/automation/mall

Additional documentation

You will find all information material, such as brochures, catalogs, manuals and operating instructions for standard drive systems up-to-date on the Internet at the addresses

http://www.siemens.com/sinamics-g110/printmaterial

http://www.siemens.com/sinamics-g120/printmaterial

http://www.siemens.com/sinamics-g120d/printmaterial

You can order the listed documentation or download it in common file formats (PDF, ZIP).

[1)] German

SINAMICS Drives

SINAMICS G110, SINAMICS G120 Inverter Chassis Units
SINAMICS G120D Distributed Frequency Inverters

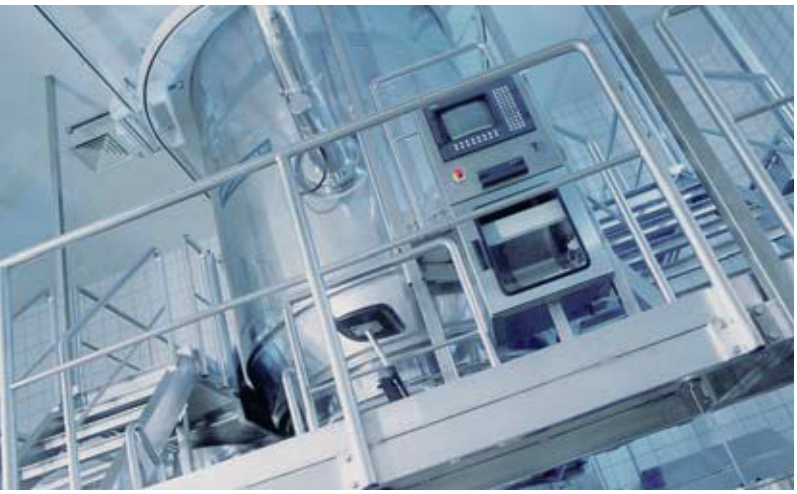
Catalog D 11.1 · 2008

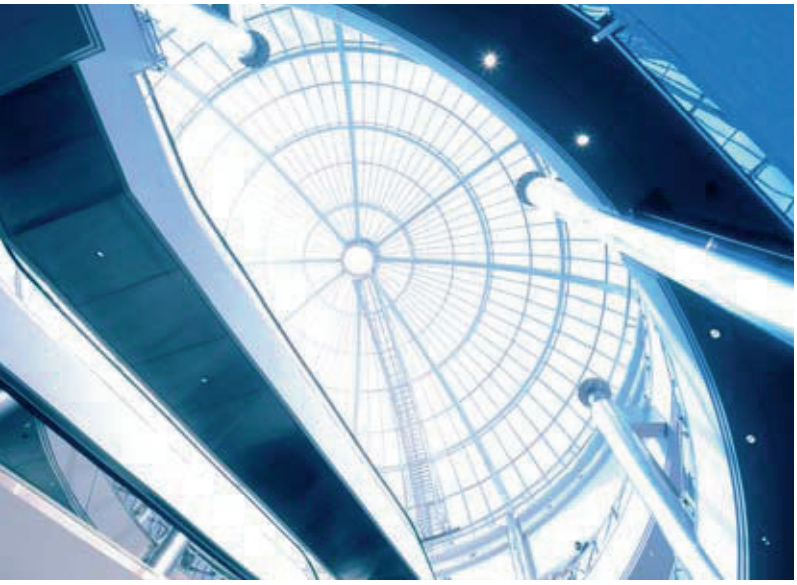
The products and systems described in this catalog are manufactured/distributed under application of a certified quality management system in accordance with DIN EN ISO 9001 (Certified Registration No. DE-000357 QM) and DIN EN ISO 14001 (Certificate Registration No. 0813420 UM and EMS 57390). The certificate is recognized by all IQNet countries.

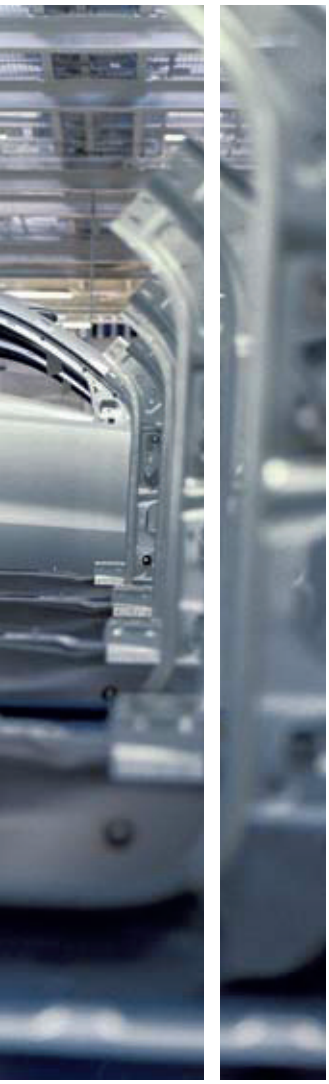
Supersedes:
Catalog D 11.1 · 2007

The products contained in this catalog can also be found in the e-catalog CA 01.
Order No.:
E86060-D4001-A110-C6-7600 (CD-ROM)
E86060-D4001-A510-C6-7600 (DVD)

Please contact your local Siemens branch







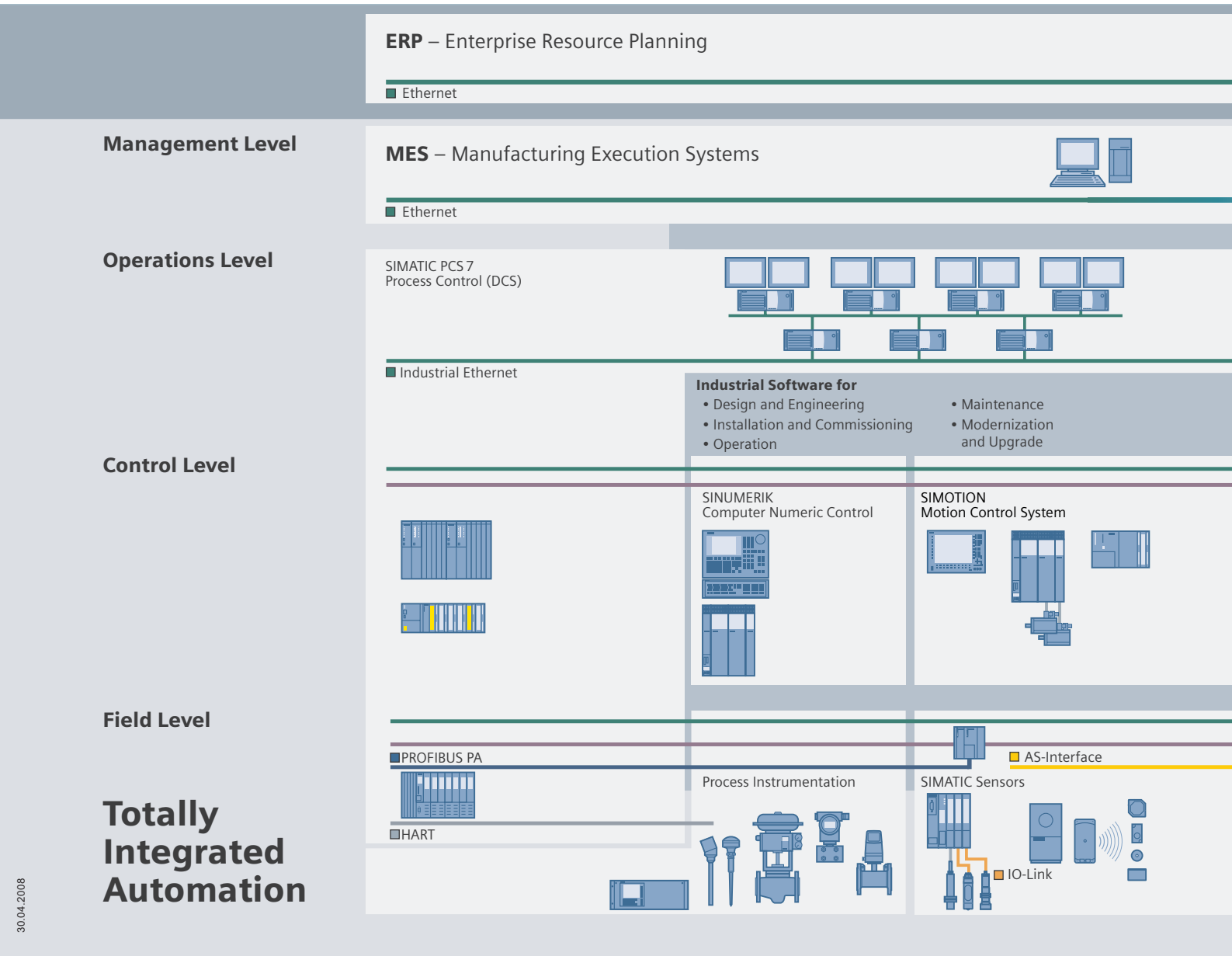
Answers for Industry.

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.

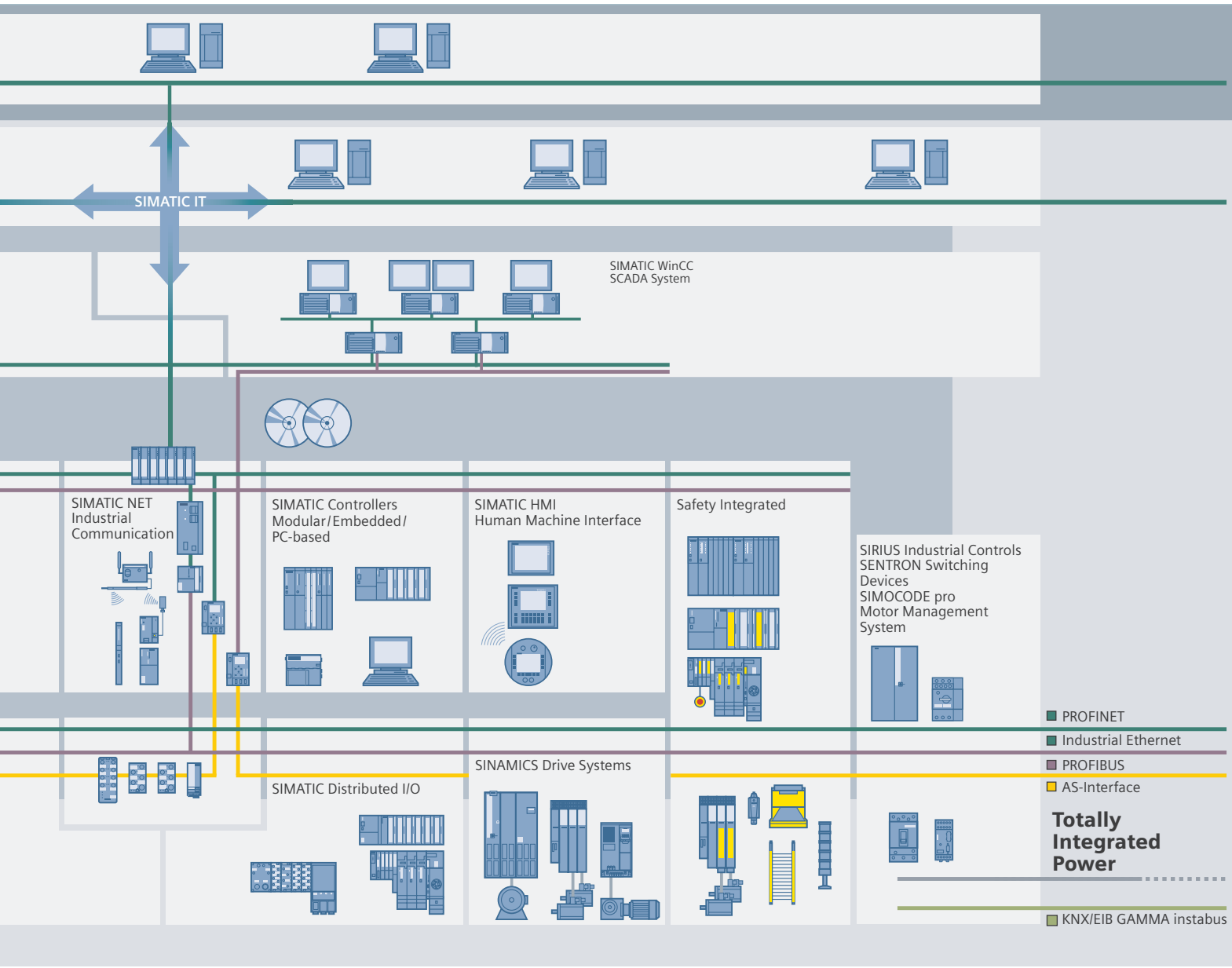


30.04.2008

Setting standards in productivity and competitiveness.

Totally Integrated Automation.

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



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.

Introduction

The SINAMICS drive family

Applications of the SINAMICS drive family

Applications

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

- Simple pump and fan applications in the process industry
- Applied 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

Versions

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

- SINAMICS S handles complex drive tasks with synchronous and asynchronous (induction) motors and fulfills stringent requirements regarding
  - dynamics and accuracy,
  - integration of extensive technological functions in the drive control system
- SINAMICS G is designed for standard applications with asynchronous (induction) motors. These applications have less stringent requirements regarding the dynamics and accuracy of the motor speed.

Platform concept and Totally Integrated Automation

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

SINAMICS is a part 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 SIMOTION, SINUMERIK and SIMATIC control systems.

SINAMICS as part of the Siemens modular automation system

Quality in accordance with EN ISO 9001

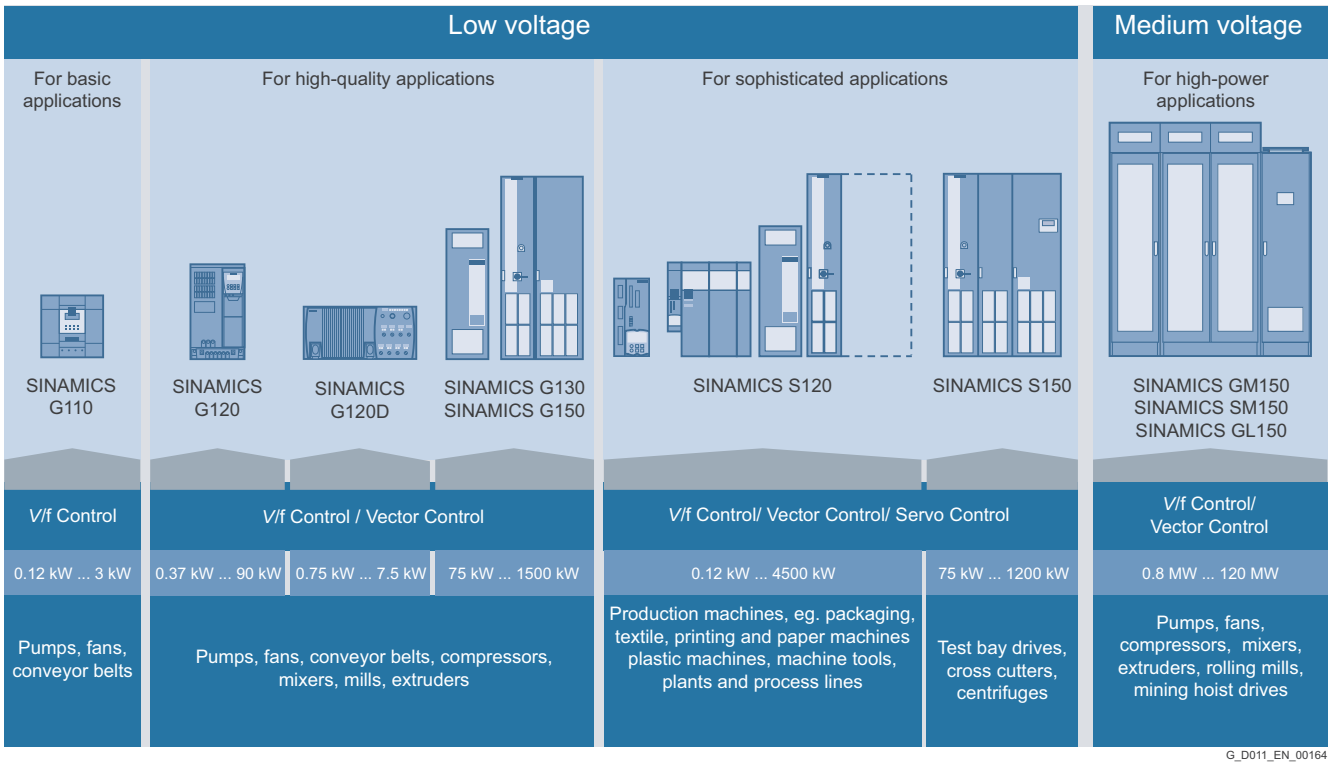
SINAMICS conforms to the most exacting quality requirements. Comprehensive quality assurance measures in all development and production processes ensure a consistently high level of quality.

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

Suitable for global use

SINAMICS meets the requirements of relevant international standards and regulations – from the EN standards and IEC standards to UL and cULus regulations.

The SINAMICS drive family



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The SINAMICS drive family

Tailored to the respective areas of application, SINAMICS is divided into the following family members:

Low-voltage drives (line supply < 1000 V)

- **SINAMICS G110** – the versatile drive for low power ranges
- **SINAMICS G120** – the modular single drive for low to medium power ranges
- **SINAMICS G120D** – the distributed single drive with high degree of protection for design without control cabinet
- **SINAMICS G130** and **SINAMICS G150** – the universal drive solution for high-power single drives
- **SINAMICS S120** – the flexible, modular drive system for complex tasks
- **SINAMICS S150** – the sophisticated drive solution for high-performance single drives

Medium-voltage drives (line supply > 1000 V)

- **SINAMICS GM150** – the universal drive solution for single drives
- **SINAMICS SM150** – the sophisticated drive solution for single and multi-motor drives
- **SINAMICS GL150** – the drive solution for synchronous motors up to 100 MW

The SINAMICS range is characterized by the following system features:

- uniform functionality based on a single platform concept
- standardized engineering
- high degree of flexibility and combination
- wide power range
- designed for global use
- SINAMICS Safety Integrated
- greater efficiency and effectivity
- multiple communications options to higher-level controls
- Totally Integrated Automation

The members of the SINAMICS drive family

SINAMICS Low-voltage inverter

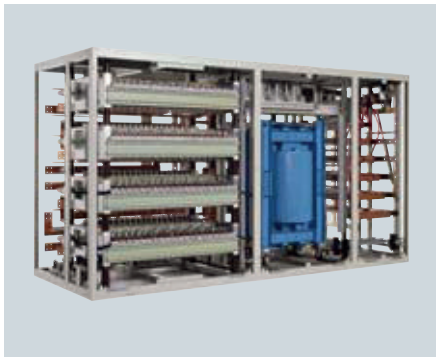
SINAMICS G110	SINAMICS G120	SINAMICS G120D
		
The versatile drive for low power ranges	*The modular single drive for low to medium power ranges*	*The distributed single drive with a high degree of protection for a design without control cabinet*
Main applications		
• Machines and plants for industrial and commercial applications	• Machines and plants for industrial and commercial applications (mechanical engineering, automotive, textiles, chemicals, printing, steel)	• Machines and plants in the process and production industry, particularly for automotive applications; also suitable for high-performance applications, e.g. in airports and in the food processing industry and luxury food processing industry (dry part)
Application examples		
• Pumps and fans • Auxiliary drives • Conveyor belts • Billboards • Door/gate operating mechanisms • Centrifuges	• Pumps and fans • Compressors • Conveyor belts	• Conveyor belts • Electric suspension monorails in the logistics of distribution
Highlights		
• Compact • Flexible adaptation to different applications • Simple, fast commissioning • Clear terminal layout • Optimum interaction with SIMATIC and LOGO!	• Modular • Flexible expansion capability • Simple, fast commissioning • Regenerative feedback • Innovative cooling concept • Optimum interaction with SIMOTION and SIMATIC • SINAMICS Safety Integrated	• Flat design with uniform drilling dimensions (constant footprint) with degree of protection IP65 • Modular • Flexible expansion capability • Simple, fast commissioning • Regenerative feedback • Optimum interaction with SIMOTION and SIMATIC • SINAMICS Safety Integrated
Catalog D 11.1	**Catalog D 11.1**	**Catalog D 11.1**

SINAMICS Low-voltage inverters

SINAMICS G130/SINAMICS G150	SINAMICS S120	SINAMICS S150
		
The universal drive solution for high-power single drives without regenerative feedback	*The flexible modular drive system for complex drive tasks*	*The sophisticated drive solution for high-performance single drives*
Main applications		
• Machines and plants in the process and production industry, water/waste, power stations, oil and gas, petrochemicals, chemical raw materials, paper, cement, stone, steel	• Machines and plants for industrial applications (packaging, plastics, textile, printing, wood, glass, ceramics, presses, paper, lifting equipment, semiconductors, automated assembly and testing equipment, handling, machine tools)	• Machines and plants in the process and production industry, food, beverages and tobacco, automotive and steel industry, mining/open-cast mining, shipbuilding, lifting equipment, conveyors
Application examples		
• Pumps and fans • Compressors • Extruders and mixers • Mills	• Motion Control applications (positioning, synchronous operation) • Numeric Control, interpolated motion control • Converting • Technological applications	• Test bay drives • Centrifuges • Elevators and cranes • Cross cutters and shears • Conveyor belts • Presses • Cable winches
Highlights		
• Space-saving • Low-noise • Simple and fast commissioning • SINAMICS G130: modular components • SINAMICS G150: ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• For universal use • Flexible and modular • Scalable in terms of power, function, number of axes, performance • Simple, fast commissioning, auto-configuration • Innovative, future-oriented system architecture • Scaled infeed/regenerative feedback concept • Wide range of motors • Optimum interaction with SIMOTION, SIMATIC and SINUMERIK • SINAMICS Safety Integrated	• Four-quadrant operation as standard • High control accuracy and dynamic response • Almost no line harmonic distortions; THD acc. to IEEE 519 is widely undercut • Tolerant to fluctuations in line voltage • Possibility of power factor compensation • Simple, fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC
Catalog D 11	**Catalog PM 21**	**Catalog D 21.3**

1

The members of the SINAMICS drive family

SINAMICS Medium-voltage inverters		
SINAMICS GM150	**SINAMICS SM150**	**SINAMICS GL150**
		
The drive solution for variable-speed drives	***The drive solution for high-performance variable-speed single and multi-motor drives***	***The drive solution for synchronous machines up to 100 MW***
Main applications		
• Machines and plants in the process industry	• Machines and plants e.g. steel manufacture and mining	• Machines and plants in the process industry, particularly in the petrol, gas and petrochemical sector
Application examples		
• Pumps and fans • Compressors • Extruders and mixers • Mills • Marine drives	• Roller mills • Skips • Test bay drives • Conveyors	• Compressors • Pumps and fans • Extruders and kneaders • Marine drives • Steel furnace
Highlights		
• Space-saving • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Four-quadrant operation as standard • High-efficiency and motor-friendly operation • High level of control accuracy and dynamic response • Almost no line harmonic distorsions • Possibility of reactive power compensation • Simple and fast commissioning • Ready-to-connect cabinet unit • Optimum interaction with SIMATIC	• Compact design and high power density • Simple operator control and monitoring • Extreme operational reliability and almost maintenance-free • All-digital transvector regulation • Two directions of rotation by switching the spin box • Can be inserted seamlessly into superior automation systems
Catalog D 12	**Catalog D 12**	**–**

SINAMICS G110
Inverter chassis units
0.12 kW to 3 kW (0.16 hp to 4.0 hp)

2

Inverter chassis units 0.12 kW to 3 kW (0.16 hp to 4.0 hp)

SINAMICS G110 chassis units

Overview

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

SINAMICS G110, frame sizes FSB and FSC

SINAMICS G110 is a frequency inverter with basic functions for a variety of industrial variable-speed drive applications.

The particularly compact SINAMICS G110 inverter operates with voltage frequency control on single-phase supplies with 200 V to 240 V.

It is the ideal low-cost frequency inverter solution for the lower power range of the SINAMICS family.

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

- EMC filters
- Line reactors
- Fuses
- Circuit-breakers

The following **accessories** are also available:

- Operator panels
- Mounting accessories
- Commissioning tool

The latest technical documentation (catalogs, dimensional drawings, certificates, user manuals and operating instructions) is available on the internet at:

http://www.siemens.com/sinamics-g110

and also on CD-ROM CA 01 Vol. 2 “Configuring” in the SD configurator, which can be ordered from the following address:

http://www.siemens.com/automation/CA01

Benefits

- Simple installation, parameterization, and commissioning
- Robust EMC design
- Large parameter range enables configurations for a wide range of applications
- Simple cable connection
- Scalable functionality with analog and USS variants
- Low-noise motor operation resulting from 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, repeatable digital input response time for rapid-response applications
- Fine adjustment of setpoint using a high-resolution 10-bit analog input (analog variants only)
- LED for status information
- Variants with internal 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 (RS485)
- Bus-capable serial RS485 interface (USS variants only) enables integration in a networked drive system
- 2/3-wire method (static/pulsated signals) for universal control via digital inputs
- Variable lower voltage limit in DC link to ensure controlled motor braking if the power fails

Accessories (overview)

- BOP operator panel
- Adapter for DIN rail attachment (frame sizes A and B)
- PC inverter connection kit
- STARTER commissioning tool

Line-side power components (overview)

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

International standards

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

Application

SINAMICS G110 is especially suited for use with pumps and fans, or as a drive in various industrial sectors, such as the food, textile and packaging industries, as well as for conveyor systems, factory gate and garage door operating mechanisms, and as a universal drive for moving billboards.

Design

The SINAMICS G110 inverter chassis units are equipped with a control and power module and provide CPM 110 inverters (Controlled Power Module) with a compact and efficient design. They operate with the latest IGBT technology and digital microprocessor control.

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

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

With frame size FSA, cooling is achieved through a heat sink and natural convection. The 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. With frame sizes FSB and FSC, an integrated fan is used to cool the heat sink which has resulted in the compact design.

The connections for all inverter 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

- Careful handling of the machine mechanical system due to a skipped frequency band in case of resonance, parameterizable ramp up/ramp down times up to 650 s, ramp smoothing, as well as bringing the inverter into circuit on turning motor (flying start)
- Increased installation availability by automatic restart facility following power failure or fault
- Fast current limit (FCL) for trip-free operation in case of sudden load changes
- Programmable V/f characteristic (e.g. for synchronous motors)
- Fast DC and compound braking without external braking resistor
- Limitation of DC link voltage by means of the V_{DCmax} controller
- Slip compensation, electronic motor potentiometer function and three fixed speed setpoints
- Configurable voltage boost for higher dynamic response when starting and accelerating
- Motor holding brake function to control an external mechanical brake

2

Selection and Ordering Data

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

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

The last digit of the complete order number for the SINAMICS G110 inverters represents the release version. When ordering, a different digit from the one specified may be present as a result of further technical development.

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

[1] The **highlighted** filter class is quoted on the rating plate of the inverter.

[2] Class B also with additional filter.

Technical specifications

	Controlled Power Modules
Power range	0.12 … 3.0 kW (0.16 … 4.0 hp)
Line voltage	200 ... 240 V 1 AC ± 10 %
Line frequency	47 … 63 Hz
Output frequency	0 … 650 Hz
cos φ	≥ 0.95
Inverter efficiency • with devices < 0.75 kW (1.0 hp) • with devices ≥ 0.75 kW (1.0 hp)	 90 … 94 % ≥ 95 %
Overload capability	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
Inrush current	Less than rated input current
Control methods	Linear *V/f* characteristic (with parameterizable voltage boost); quadratic *V/f* characteristic; multipoint characteristic (parameterizable *V/f* characteristic)
Pulse frequency	8 kHz (standard) 2 … 16 kHz (in 2 kHz increments)
Fixed frequencies	3, programmable
Skipped frequency range	1, programmable
Setpoint resolution	0.01 Hz digital 0.01 Hz serial 10 bit analog (motorized potentiometer 0.1 Hz)
Digital inputs	3 programmable digital inputs, non-floating, PNP, SIMATIC-compatible
Analog input (analog variant)	1, for setpoint (0 V ... 10 V, scalable or for use as 4th digital input)
Digital output	1 isolated optocoupler output (24 V DC, 50 mA, ohmic, NPN type)
Universal serial interface (USS variant)	RS485, for operation with USS protocol
Motor cable length, max. • Shielded • Unshielded	 25 m 50 m
Electromagnetic compatibility	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 also fulfill the limit values of EN 55011, class B for conducted interference.
Braking	DC braking, compound braking
Degree of protection	IP20
Operating temperature	–10 … +40 °C up to +50 °C with derating
Storage temperature	–40 … +70 °C
Relative humidity	95 % (non-condensing)
Installation altitude	Up to 1000 m above sea level without derating • Rated output current at 4000 m above sea level: 90 % • Line voltage up to 2000 m above sea level: 100 % at 4000 m above sea level: 75 %
Standard SCCR (Short Circuit Current Rating) [1]	10 kA
Protective functions for	• Undervoltage • Overvoltage • Ground fault • Short-circuit • Stall prevention • Thermal motor protection I^2t • Inverter overtemperature • Motor overtemperature
Compliance with standards	UL, cUL, CE, c-tick
CE mark	Conformity with Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EC

[1] Applies to industrial control cabinet installations to NEC article 409/UL 508A. For further information, visit us on the Internet at:
http://support.automation.siemens.com/WW/view/en/23995621

Technical specifications (continued)

	Controlled Power Modules						
	• **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)
Dimensions (without accessories)							
• Width	90	90	90	90	140	184	184
• Height	150	150	150	150	160	181	181
• Depth	116	131	101	101	142	152	152
Weight, approx.							
• Without filter	0.7	0.8	0.6	0.7	1.4	1.9	2.0
• With filter	0.8	0.9	0.7	0.8	1.5	2.1	2.2

Technical specifications for variant with flat heat sink

The design with flat heat sink offers space-saving and favorable heat dissipation since an additional heat sink can be installed outside the control cabinet.

	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)**
Operating temperature	–10 … +50 °C	–10 … +50 °C	–10 … +50 °C	–10 … +50 °C	–10 … +40 °C
Total power losses at full load and maximum operating temperature as specified	22 W	28 W	36 W	43 W	54 W
Line-side and control electronics losses	9 W	10 W	12 W	13 W	15 W
Recommended thermal resistance of heat sink	3.0 K/W	2.2 K/W	1.6 K/W	1.2 K/W	1.2 K/W
Recommended output current	0.9 A	1.7 A	2.3 A	3.2 A	3.9 A

Derating data and power loss

Pulse frequency

Output		**Power loss**	**Rated output current in A** at a pulse frequency of							
kW	hp	**W**	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.12	0.16	22	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
0.25	0.33	28	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
0.37	0.5	36	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
0.55	0.75	43	3.2	3.2	3.2	3.2	3.0	2.7	2.5	2.2
0.75 (at 40 °C)	1.0 (at 40 °C)	54	3.9	3.9	3.9	3.9	3.6	3.3	3.0	2.7
0.75	1.0	54	3.2	3.2	3.2	3.2	3.0	2.7	2.5	2.2
1.1	1.5	86	6.0	6.0	6.0	6.0	5.9	5.7	5.6	5.4
1.5 (at 40 °C)	2.0 (at 40 °C)	118	7.8	7.8	7.8	7.8	7.6	7.4	7.2	7.0
1.5	2.0	118	6.0	6.0	6.0	6.0	5.9	5.7	5.6	5.4
2.2	3.0	174	11.0	11.0	11.0	11.0	10.8	10.5	10.2	9.9
3.0 (at 40 °C)	4.0 (at 40 °C)	210	13.6	13.6	13.6	13.6	13.3	12.9	12.6	12.3
3.0	4.0	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 unless specified otherwise.

Technical specifications (continued)

Compliance with standards

CE mark

CE

The SINAMICS G110 inverters meet the requirements of the Low-Voltage Directive 73/23/EEC.

Low-voltage directive

The inverters comply with the following standards listed in the EU gazette:

- EN 60204
  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

c UL us LISTED

Converter devices in UL category NMMS certified to UL and cUL, in compliance with UL508C. UL list number E121068.

For use in environment with contamination degree 2.

On the Internet at
http://www.ul.com

Machinery directive

The inverters are suitable for installation in machines. Compliance with the machinery directive 98/37/EEC requires a separate certificate of conformity. This must be provided by the plant constructor or the installer of the machine.

EMC directive

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

The modified EMC product standard EN 61800-3 for electrical drive systems is valid since 07/01/2005. The transition period for the predecessor standard EN 61800-3/A11 from February 2001 ended on October 1, 2007. The following information applies to the SINAMICS G110 frequency inverters from Siemens AG:

- 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 Instruction Manual, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to a PDS. The EMC directive in the EU is complied with for a PDS by observance of the product standard EN 61800-3 for variable-speed electrical drive systems. The frequency inverters on their own do not generally require identification according to the EMC directive.
- In the new EN 61800-3 of July 2005, a distinction is no longer made between "general availability" and "restricted availability". Instead, different categories have been defined, C1 to C4, in accordance with the environment of the PDS at the operating site:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in environment 1
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in environment 1, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use environment 2. A warning is required.
  - **Category C4:** Drive systems for rated voltages ≥ 1000 V, for rated currents ≥ 400 A, or for use in complex systems in environment 2. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for "environment 2" (= 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 installed in a system that contains line filters on the higher-level infeed side.
- With SINAMICS G110 Power Drive Systems (PDS) that fulfill EMC product standard EN 61800-3 can be set up (see the setup instructions). 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.
- Regarding the compliance of limit values for line harmonics, EMC product standard EN 61800-3 for PDS refers to compliance with EN 61000-3-2 and EN 61000-3-12.
- Regardless of the configuration with SINAMICS G110 and its components, the mechanical engineer can also implement 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 interferences at the line supply connection point and outside the machine remain below the relevant limit values. Any suitable technical means can be used to ensure this.

Technical specifications (continued)

Overview of SINAMICS G110 components and PDS categories

Environment 1 (Residential, commercial)			Environment 2 (Industrial)
	Category C1 Unfiltered devices and external filter class B with low leakage currents (shielded motor cable up to 5 m)		
	Category C2 All devices with integrated filter (shielded motor cable up to 5 m) or All devices with integrated filter (frame size FSA: up to 10 m; frame sizes FSB and FSC: shielded motor cable up to 25 m) + warning or All devices with integrated filter + external filter class B (shielded motor cable up to 25 m)	**Category C2** All devices with integrated filter (shielded motor cable up to 5 m) or All devices with integrated filter (frame size FSA: up to 10 m; frame sizes FSB and FSC: shielded motor cable up to 25 m) or All devices with integrated filter + external filter, class B (shielded motor cable up to 25 m) Note: When devices with an integrated filter and a max. motor cable length of 5 m or external class B filters are used, this exceeds the requirements of EN 61800-3 by a considerable margin!	
	Category C3 All devices with integrated filter (frame size FSA: up to 10 m; frame sizes FSB and FSC: shielded motor cable up to 25 m) or All devices with integrated filter + external filter, class B (shielded motor cable up to 25 m) A warning 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!		
	Category C4 Not applicable to SINAMICS G110		

Electromagnetic compatibility

No impermissible electromagnetic radiation occurs if the installation guidelines specific to the product are correctly observed.

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 directives 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 to 30 MHz	Unfiltered devices: not tested All devices with internal/external filter: Depending on filter type and planned PDS installation: Category C1: limit complies with EN 55011, class B. Category C2: limit complies with EN 55011, class A, group 1 All devices with an internal/external filter also fulfill the limit for category C3 installations. Limit complies with EN 55011, class A, group 2.
	Emitted by the drive	30 MHz to 1 GHz	All devices Limit complies with 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 to 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 to 80 MHz 80 % AM (1 kHz)	10 V

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 offers a function that enables you to copy parameters quickly and easily. 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) and the STARTER commissioning tool [1] on DVD.

Commissioning tool

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

Selection and Ordering Data

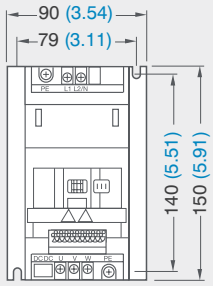
The accessories listed here are suitable for all SINAMICS G110 inverters.

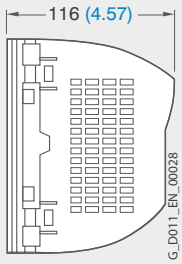
Accessories	Order No.
BOP (Basic Operator Panel)	**6SL3255-0AA00-4BA1**
PC inverter connection kit incl. 9-pin Sub-D connector, standard RS232 cable (3 m), and STARTER commissioning tool [1] on DVD	**6SL3255-0AA00-2AA1**
Adapter for DIN rail attachment	
• Size 1 (frame size FSA)	**6SL3261-1BA00-0AA0**
• Size 2 (frame size FSB)	**6SL3261-1BB00-0AA0**
Documentation DVD, with operating instructions, parameter list and Getting Started guide	**6SL3271-0CA00-0AG0**
STARTER commissioning tool [1] on DVD	**6SL3072-0AA00-0AG0**

[1] STARTER commissioning tool also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

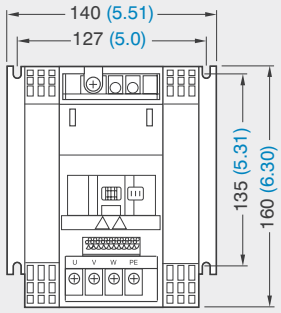
2

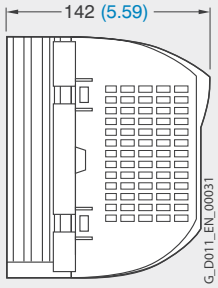
Dimensional drawings



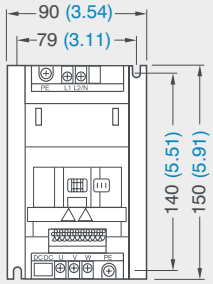


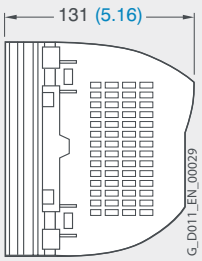
Inverter frame size FSA; 0.12 kW (0.16 hp) to 0.37 kW (0.5 hp)



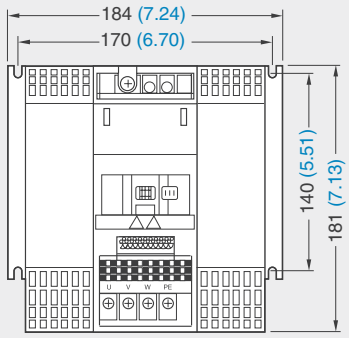


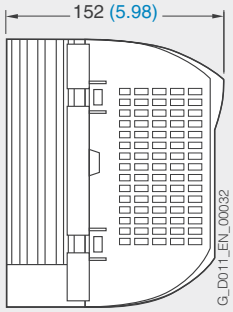
Inverter frame size FSB; 1.1 kW (1.5 hp) to 1.5 kW (2.0 hp)





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





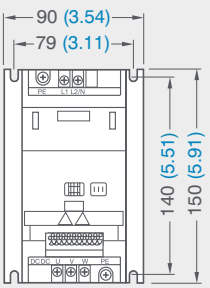
Inverter frame size FSC; 2.2 kW (3.0 hp) to 3.0 kW (4.0 hp)

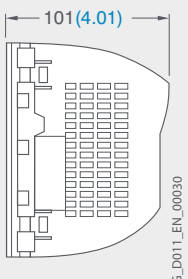
Fixing with screws and washers
(not included in the scope of supply)

- 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).

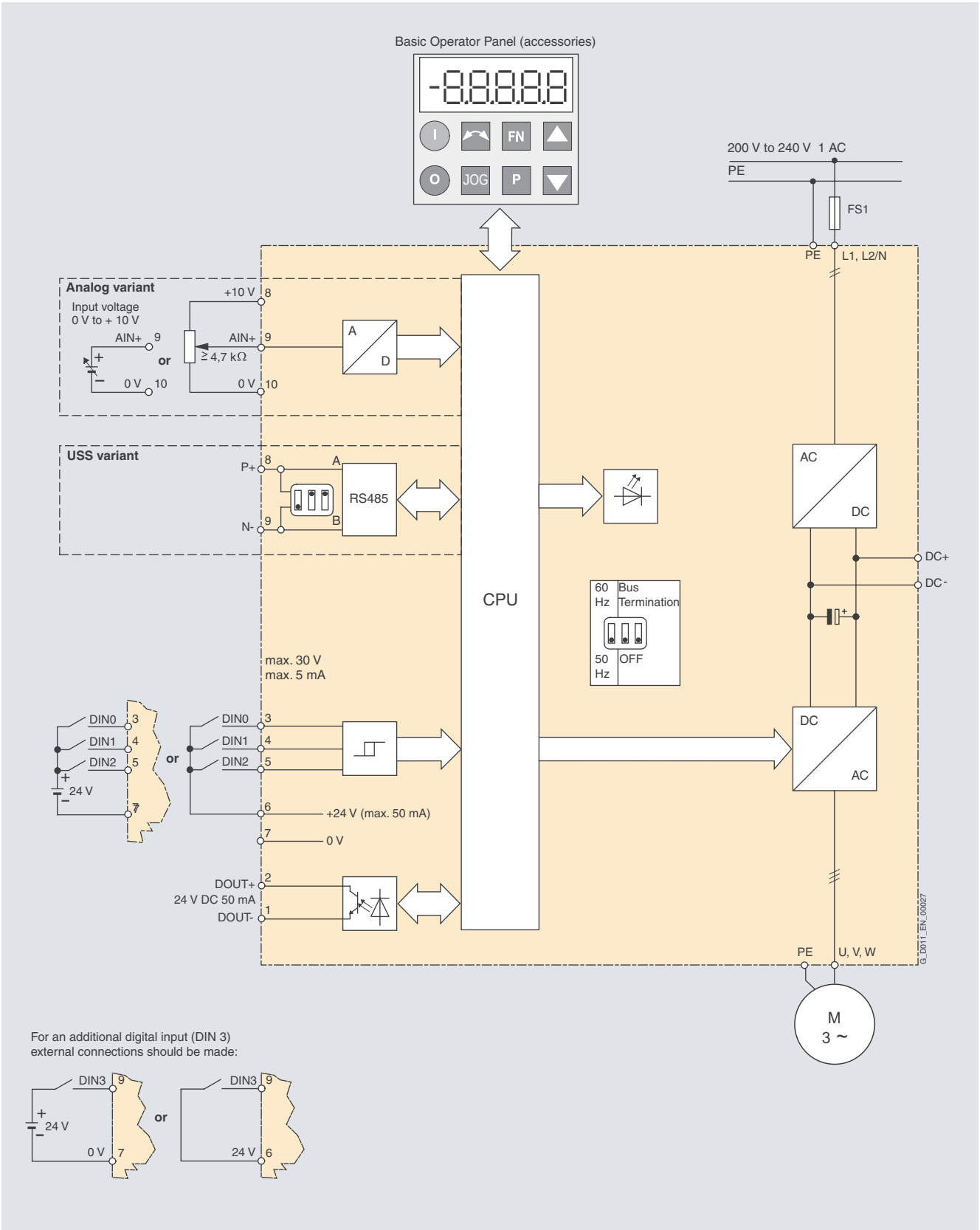




Inverter frame size FSA with flat heat sink; 0.12 kW (0.16 hp) to 0.75 kW (1.0 hp)

Schematics

General circuit diagram



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
- Short description, operating instructions, and parameter list (hard copy, in German)
- STARTER commissioning tool [1] on DVD incl. operating instructions, parameter list and Getting Started guide
- Screwdriver

Selection and Ordering Data

	Order No.
Starter kit 0.75 kW (1.0 hp), German	**6SL3200-0AB10-0AA0**

[1] STARTER commissioning tool also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

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 (for frame size FSA) or 25 m (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 are used. The limits comply with EN 55011 class B for conducted interference.

An inverter with an integrated 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 “filter class B with low leakage currents”, have a leakage current of < 3.5 mA (up to 5 m shielded motor cable).

Additional EMC filter, class B

Available for inverters with an internal 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.

Filter class B with low leakage currents

With this filter, the 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
- 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 converter 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 a permission obtained from the power supplier 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”, a permission to operate drives on the public low-voltage network must be obtained from the power supplier. For limits of the harmonic currents, see the instruction manual.

Line-side power components

Selection and Ordering Data

The line-side power components listed here must be selected in accordance with the inverter. EMC filters and line reactors are not suitable for base-type installation

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). Fuses of type 3NA3 are recommended for European countries. Further information about the listed fuses and circuit-breakers can be found in Catalogs LV 1 and LV 1 T.

UL-listed fuses such as the class NON fuse series from Bussmann are required for North American countries.

Output		Filter class B with low leakage currents	Line reactor	Additional EMC filter, class B	Fuse	Circuit-breakers
kW	hp	Order No.	Order No.	Order No.	Order No.	Order No.
Line-side power components for inverters without filter						
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**
Line-side power components for inverters with integrated filter class A/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 G120
Inverter chassis units
0.37 kW to 132 kW (0.5 hp to 200 hp)

3

SINAMICS G120 chassis units

Overview

The SINAMICS G120 series of frequency inverters is designed to provide precise and cost-effective speed/torque control of AC motors.

With different device versions (frame sizes FSA to FSF) in a power range of 0.37 kW to 132 kW (0.5 hp to 200 hp), it is suitable for a wide variety of drive solutions.

Examples of SINAMICS G120, frame sizes FSA, FSB and FSC; each with Power Module, Control Unit and Basic Operator Panel

Examples of SINAMICS G120, frame sizes FSD, FSE and FSF; each with Power Module, Control Unit and Basic Operator Panel

Overview (continued)

Modularity

SINAMICS G120 is a modular converter system comprising a variety of functional units. The two main units are

- the Control Unit (CU) and
- the 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 132 kW (0.5 hp to 200 hp). The Power Module is controlled by a microprocessor in the Control Unit. It features state-of-the-art IGBT technology with pulse-width-modulated motor voltage. It also features a range of protective functions offering a high degree of protection for the Power Module and motor.

Furthermore, a large number of additional components is available, such as:

- Basic Operator Panel (BOP) for parameterizing, diagnosing, controlling, and copying drive parameters
- Line filter, classes A and B
- Line reactors
- Braking resistors
- Output reactors

Safety Integrated

The SINAMICS G120 inverter chassis units are available in a number of different variants 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 G120 fail-safe frequency inverter provides four 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
- Safe Brake Control (SBC) for driving motor brakes which are active in the de-energized state, e.g. motor holding brakes

The functions “Safe Stop 1” and “Safely Limited Speed” can both be implemented without a motor sensor or 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 safety functions “Safely Limited Speed” and “Safe Stop 1” are certified for asynchronous motors without encoders – these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

For further information, please refer to section Safety Integrated in chapter Innovations.

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 on standard inverters to be fed back into the supply system. The control cabinet can be designed even more compactly thanks to the omission of extra cooling equipment and components such as braking resistors, brake choppers and line reactors. The time and expense involved in planning and wiring the system are significantly reduced. At the same time, considerable savings can be achieved in terms of energy consumption and operating costs.

For further information, please refer to section Efficient Infeed Technology in chapter Innovations.

Innovative cooling concept and paint finish of electronic modules

The new cooling system and the paint finish for the electronic modules significantly increase the service life or useful life of the device. These features are based on the following principles:

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

STARTER commissioning tool

The STARTER commissioning tool supports the commissioning and maintenance of SINAMICS G120 inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allows you to commission the device quickly and easily.

SINAMICS G120 chassis units

Benefits

- Modularity ensures flexibility for an advanced drive concept
  - Module replacement when system is running (hot swapping)
  - Pluggable terminals
  - The modules can be easily replaced, which makes the system extremely service friendly.
- The safety functions make it easier to integrate drives into safety-oriented machines or plants
- Capable of communicating via PROFINET or PROFIBUS with PROFIdrive Profil 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 Power Modules PM250 and PM260 are implemented. This feedback capability provides enormous potential for savings because generated energy no longer has to be converted into heat in a braking resistor
- 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 output
- A new cooling concept and paint finish for the electronic modules increase robustness and service life
- Simple unit replacement and quick copying of parameters using the optional Basic Operator Panel or the optional MMC memory card
- Low-noise motor operation resulting from high pulse frequency
- Compact, space-saving construction
- Software parameters for easy adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- 2/3-wire control (static/pulsated signals) for universal control via digital inputs
- Engineering and commissioning with uniform engineering tools such as SIZER, STARTER, and Drive ES: ensure rapid engineering and easy commissioning – STARTER is integrated in 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, Safety Integrated to IEC 61508 SIL 2

Application

SINAMICS G120 is ideal

- as a universal drive in all industrial and commercial applications
- in the automotive, textiles, printing, and chemical industries
- for end-to-end applications, e.g. in conveyor systems

Design

The SINAMICS G120 inverter chassis units are modular frequency inverters for standard drives. Each SINAMICS G120 comprises two operative units – the Power Module and Control Unit. Each Control Unit can be combined with each Power Module.

Guide for module selection

The steps to be taken for the selection of a complete SINAMICS G120 frequency inverter should be as follows:

1st	Selection of the appropriate Control Unit (in dependence of the required style depth of communication, hardware and software)
2nd	Selection of the appropriate Power Module (in dependence of the necessary performance and technology)
3rd	Selection of the optional additional components. A large number of components for expanding the system is available, e. g. line-side power components, DC link components, load-side power components, and supplementary system components. Please note that not every component is required for every Power Module (example: Braking resistors are not necessary for PM250 and PM260 Power Modules!). You can find the exact indications in the technical data tables of the respective components.

Control Units

The following Control Units and an MMC memory card are available as accessories for SINAMICS G120 inverter chassis units:

CU240 Control Units

The Control Unit performs closed-loop control functions for the inverter. In addition to control functions, the Control Unit can also perform other tasks which can be adapted to the relevant application by parameterization. A number of Control Units are available in different versions:

- CU240E
- CU240S
- CU240S DP
- CU240S DP-F
- CU240S PN
- CU240S PN-F

MMC memory card (not available for Control Unit CU240E)

The parameter settings for an inverter can be stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data. The associated slot is located on top of the Control Unit.

Design (continued)

Power Modules

The following Power Modules are available for SINAMICS G120 inverter chassis units:

PM240 Power Modules

PM240 Power Modules feature an integrated brake chopper and are designed for drives without energy recovery capability to the supply. Generator energy produced during braking is converted to heat via externally connected braking resistors.

PM250 Power Modules

PM250 Power Modules use an innovative circuit design which allows line-commutated energy recovery to the supply. This innovative circuit permits generator energy to be fed back into the supply system and therefore saves energy.

PM260 Power Modules

PM260 Power Modules also use an innovative circuit design which allows line-commutated energy recovery to the supply. This innovative circuit permits generator energy to be fed back into the supply system and, therefore, saves energy. The PM260 Power Modules also have an integrated sine-wave filter that limits the rate of rise of voltage and the capacitive charge/discharge currents usually associated with converter operation.

Line-side power components

The following line-side power components are available for SINAMICS G120 inverter chassis units:

Line filters

The Power Module complies with a higher radio interference class with one additional line filter.

Line reactors (for PM240 Power Modules only)

A line reactor reduces the system perturbations caused by harmonics. This is valid in particular for low power supplies (system fault level u_K > 1 %).

Recommended line components

This is a recommendation for further line-side components, such as fuses and circuit-breakers (line-side components must be dimensioned in accordance with IEC standards). Further information about the listed fuses and circuit-breakers can be found in Catalogs LV 1 and LV 1 T.

DC link components

The following DC link components are available for SINAMICS G120 inverter chassis units:

Braking resistors (for PM240 Power Modules only)

Excess power in the DC link is dissipated via the braking resistor. The braking resistors are designed for use with PM240 Power Modules. They are equipped with an integrated brake chopper (electronic switch).

Load-side power components

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

Output reactors (for PM240 Power Modules only)

Output reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents, which place an additional load on the power section when long motor cables are used, are reduced.

Sine-wave filter (available soon, not available for PM260 Power Modules)

The sine-wave filter limits the rate of rise of voltage and the capacitive charge/discharge currents usually associated with converter operation. An output reactor is not required.

Design (continued)

Available optional power and DC link components depending on the used Power Module

The following line-side power components, DC link components and load-side power components are optionally available for the Power Modules in the corresponding frame sizes:

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
Power Module PM240 with integrated brake chopper						
Available frame sizes	✓	✓	✓	✓	✓	✓
Line-side power components						
Line filter class A	U	F	F	F	F	F/S [3]
Line filter class B	U	U	U	–	–	–
Line reactor	U	U	U	U	U	S
DC link components						
Braking resistor	U	U	S	S	S	S
Load-side power components						
Output reactor	U	U	U	S	S	S
Sine-wave filter	Available soon	Available soon	Available soon	Available soon	Available soon	Available soon
Power Module PM250 with line-commutated regenerative feedback and intergrated line filter class A						
Available frame sizes	–	–	✓	✓	✓	✓
Line-side power components						
Line filter class A	–	–	I	I	I	I
Line filter class B	–	–	U	–	–	–
Line reactor [1]	–	–	– [1]	– [1]	– [1]	– [1]
DC link components						
Braking resistor [2]	–	–	– [2]	– [2]	– [2]	– [2]
Load-side power components						
Output reactor	–	–	U	S	S	S
Sine-wave filter	–	–	Available soon	Available soon	Available soon	Available soon
Power Module PM260 with line-commutated regenerative feedback and intergrated sine-wave filter						
Available frame sizes	–	–	–	✓	–	✓
Line-side power components						
Line filter class A	–	–	–	F	–	F
Line filter class B	–	–	–	–	–	–
Line reactor [1]	–	–	–	– [1]	–	– [1]
DC link components						
Braking resistor [2]	–	–	–	– [2]	–	– [2]
Load-side power components						
Output reactor	–	–	–	–	–	–
Sine-wave filter	–	–	–	I	–	I

U = Base component
S = Lateral mounting
I = Integrated
F = Power Modules available without and with integrated filter class A
– = Not possible

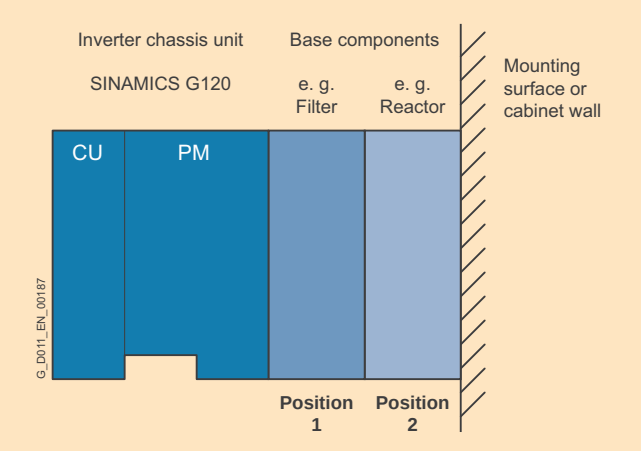
[1] In connection with a PM250 or PM260 Power Module a line reactor is not necessary and may not be used.

[2] In connection with a PM250 or PM260 Power Module a line-commutated regenerative feedback is carried out. A braking resistor cannot be connected and is not necessary.

[3] PM240 FSF Power Modules from 110 kW (150 hp) on are only available without integrated filter class A. Therefore an optional line filter class A is available for lateral mounting.

Design (continued)

General information on design



Frequency converters, consisting of Power Module (PM) and Control Unit (CU) and two base components at positions 1 and 2

- Max. two base components plus converter are possible.
- The line filter has to be mounted directly underneath the frequency inverter (position 1).
- With lateral mounting, the line-side components have to be mounted on the left side of the frequency 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.

Recommended installation combinations of converter and optional power and DC link components

Power Module	**Base component**		**Lateral mounting**	
Frame size	**Position 1**	**Position 2**	On the left side of the converter (for line-side power components)	On the right side of the converter (for output-side power components and DC link components)
FSA and FSB	Line filter	Line reactor	–	Output reactor 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	–	–	–
FSC	Line filter	Line reactor	–	Output reactor and/or Braking resistor
	Line filter or Line reactor	Output reactor	–	Braking resistor
FSD and FSE	Line reactor	–	Line filter	Output reactor and/or Braking resistor
FSF	–	–	Line filter and/or Line reactor	Output reactor and/or Braking resistor

Design (continued)

Supplementary system components

The following supplementary system components are available for SINAMICS G120 inverter chassis units:

Basic Operator Panel BOP

The Basic Operator Panel BOP can be plugged onto the Control Unit and can be used to commission drives, monitor drives in operation and input individual parameter settings. The BOP also provides a function for a quick copying of parameters.

PC inverter connection kit

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool) has been installed.
The STARTER commissioning tool is supplied with the PC inverter connection kit on DVD.

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.

Safe Brake Relay

The Safe Brake Relay allows the Power Module to be connected to an electromechanical motor brake, allowing the brake to be directly and safely controlled by the Control Unit in accordance with EN 954-1, category 3 and IEC 61508 SIL 2.

Adapter for DIN rail attachment

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

Shield connection kit

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

Configuration

The following electronic configuration and engineering tools are available for SINAMICS G120 inverter chassis units:

SD configurator selection aid within the CA 01

The interactive catalog CA 01 – the offline mall of Siemens Automation and Drives (A&D) – contains over 100000 products with approximately 5 million potential drive system product variants. The SD configurator has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of Standard Drives products. The configurator is integrated in this catalog with the selection and configuration tools as a “selection help” on CD 2 “Configuring”.

SIZER configuration tool

The SIZER PC tool provides an easy-to-use means of configuring the SINAMICS and MICROMASTER 4 drive family. It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER supports the complete configuration of the drive system, from simple individual drives to complex multi-axis applications.

STARTER commissioning tool

The STARTER commissioning tool provides menu-guided assistance with commissioning, optimization and diagnostics. STARTER is not only designed for use on SINAMICS drives but also for MICROMASTER 4 units and frequency inverters for the distributed I/Os SIMATIC ET 200S FC and SIMATIC ET 200pro FC.

Drive ES engineering system

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. The STEP 7 Manager user interface provides the basis for this procedure. A variety of software packages, i.e. Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7, is available for SINAMICS.

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for the following components of the SINAMICS G120 inverter chassis unit.

Mechanical specifications	
Vibratory load	
• Transport [1]	Class 2M3 to EN 60068-2-6
• Operation	Class 3M4 to EN 60068-2-6 10 … 58 Hz: Constant deflection 0.075 mm 58 … 200 Hz: Constant acceleration = 9.81 m/s^2 (1 *g*)
Shock load	
• Transport [1]	Class 2M2 to EN 60068-2-27
• Operation	Class 3M4 to EN 60068-2-27 49 m/s^2 (5 *g*)/30 ms
Ambient conditions	
Protection class	Class I (with protective conductor system) and class III (PELV) to EN 61800-5-1
Shock protection	according to EN 61800-5-1 when used properly
Permissible ambient and coolant temperature (air) during operation for line-side power components and Power Modules	
• High overload (HO)	–10 … +50 °C (14 … 122 °F) without derating, > 50 … 60 °C see derating characteristics
• Light overload (LO)	–10 … +40 °C (14 … 104 °F) without derating, > 40 … 60 °C see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units, additional system components and DC link components	–10 … +50 °C (14 … 122 °F) with CU240S DP-F: 0 … 45 °C with CU240S PN-F: 0 ... 40 °C up to 2000 m above sea level
Climatic ambient conditions	
• Storage [1]	Class 1K3 to EN 60721-3-1 Temperature –25 … +55 °C
• Transport [1]	Class 2K4 to EN 60721-3-2 Temperature –40 … +70 °C Max. air humidity 95 % at 40 °C
• Operation	Class 3K5 to EN 60721-3-3 Condensation, splashwater and ice formation are not permitted (EN 60204, Part 1)

Ambient conditions (continued)	
Environmental class/harmful chemical substances	
• Storage [1]	Class 1C2 to EN 60721-3-1
• Transport [1]	Class 2C2 to EN 60721-3-2
• Operation	Class 3C2 to EN 60721-3-3
Organic/biological influences	
• Storage [1]	Class 1B1 to EN 60721-3-1
• Transport [1]	Class 2B1 to EN 60721-3-2
• Operation	Class 3B1 to EN 60721-3-3
Degree of contamination	2 to EN 61800-5-1
Standards	
Standards conformance	UL, cUL, CE, c-tick
CE mark	To Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EEC
EMC directive	
• Frame sizes FSA to FSF without integrated line filter class A	Category C3 [2] to EN 61800-3
• Frame sizes FSB to FSF with integrated line filter class A	Category C2 [3] to EN 61800-3 (corresponds to class A to EN 55011 for conducted interference)
• Frame size FSA without integrated line filter and with additional line filter class A	Category C2 [3] to EN 61800-3 (corresponds to class A to EN 55011 for conducted interference)
• Frame sizes FSA with additional line filter class A and with additional line filter class B	Category C2 [3] to EN 61800-3 (corresponds to class B to EN 55011 for conducted interference)
• Frame sizes FSB and FSC with integrated line filter class A and with additional line filter class B	Category C2 [3] to EN 61800-3 (corresponds to class B to EN 55011 for conducted interference)
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.	

[1] In transport packaging.

[2] Unfiltered inverters can be used in industrial environments as long as they are installed in a system that contains line filters on the higher-level infeed side. Then a PDS (Power Drive System) Category C3 can be installed.

[3] With shielded motor cable up to 25 m.

Technical specifications (continued)

Compliance with standards

CE mark

CE

The SINAMICS G120 inverters meet the requirements of the Low-Voltage Directive 73/23/EEC.

Low-voltage directive

The inverters comply with the following standards listed in the EU gazette:

- EN 60204
  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

c UL us LISTED

Converter devices in UL category NMMS certified to UL and cUL, in compliance with UL508C. UL list numbers E121068 and E192450.

For use in environment with contamination degree 2.

On the Internet at
http://www.ul.com

Machinery directive

The devices are suitable for installation in machines. Compliance with the machinery directive 98/37/EEC requires a separate certificate of conformity. This must be provided by the plant constructor or the installer of the machine.

EMC directive

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

The modified EMC product standard EN 61800-3 for electrical drive systems is valid since 07/01/2005. The transition period for the predecessor standard EN 61800-3/A11 from February 2001 ended on October 1, 2007. The following information applies to the SINAMICS G120 frequency inverters from Siemens AG:

- 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 Instruction Manual, however, specifies the conditions regarding compliance with the product standard if the frequency inverter is expanded to a PDS. The EMC directive in the EU is complied with for a PDS by observance of the product standard EN 61800-3 for variable-speed electrical drive systems. The frequency inverters on their own do not generally require identification according to the EMC directive.
- In the new EN 61800-3 of July 2005, a distinction is no longer made between "general availability" and "restricted availability". Instead, different categories have been defined, C1 to C4, in accordance with the environment of the PDS at the operating site:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in environment 1
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in environment 1, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in environment 2. A warning is required.
  - **Category C4:** Drive systems for rated voltages ≥ 1000 V, for rated currents ≥ 400 A, or for use in complex systems in environment 2. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for "environment 2" (= 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 installed in a system that contains line filters on the higher-level infeed side.
- With SINAMICS G120 Power Drive Systems (PDS) that fulfill EMC product standard EN 61800-3 can be set up upon following the setup instructions.
- 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.
- Regarding the compliance of limit values for line harmonics, EMC product standard EN 61800-3 for PDS refers to compliance with EN 61000-3-2 and EN 61000-3-12.
- Regardless of the configuration with SINAMICS G120 and its components, the mechanical engineer can also implement 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 interferences at the line supply connection point and outside the machine remain below the relevant limit values. Any suitable technical means can be used to ensure this.

Overview

Example of CU240S DP-F Control Unit

The Control Unit performs closed-loop control functions for the inverter. In addition to control functions, the Control Unit can also perform other tasks which can be adapted to the relevant application by parameterization. A number of Control Units are available in different versions:

- CU240E
- CU240S
- CU240S DP
- CU240S DP-F
- CU240S PN
- CU240S PN-F

Safety Integrated functions

The following Safety Integrated functions are integrated in the CU240S DP-F and CU240S PN-F Control Units and, with the exception of the Safe Brake Control (SBC), can be implemented without external circuit elements:

The SINAMICS G120 fail-safe frequency inverter provides four 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
- Safe Brake Control (SBC) for driving motor brakes which are active in the de-energized state, e.g. motor holding brakes

The functions “Safe Stop 1” and “Safely Limited Speed” can both be implemented without a motor sensor or 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 safety functions “Safely Limited Speed” and “Safe Stop 1” are certified for asynchronous motors without encoders – these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

For further information, please refer to section Safety Integrated in chapter Innovations.

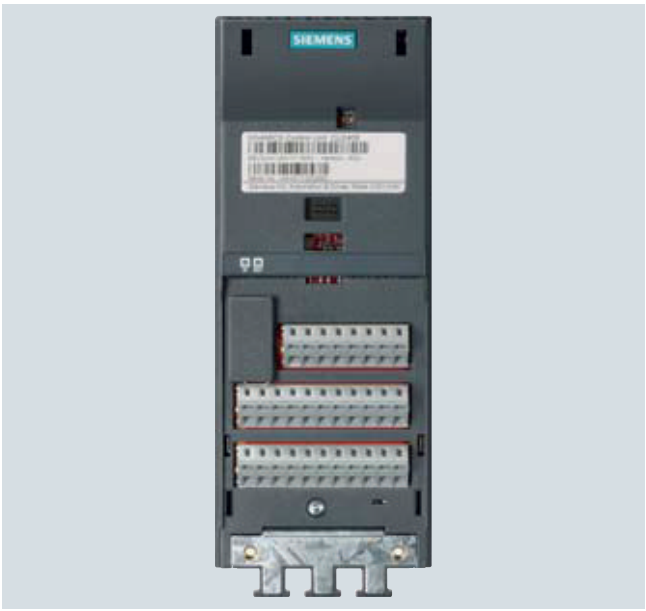
Selection and Ordering Data

Communication	Digital inputs Standard	Digital inputs Fail-safe	Digital outputs	Encoder interfaces	Designation	**Control Unit** Order No.
Standard						
RS485/USS	6	–	3	–	CU240E	**6SL3244-0BA10-0BA0**
RS485/USS	9	–	3	1	CU240S	**6SL3244-0BA20-1BA0**
PROFIBUS DP	9	–	3	1	CU240S DP	**6SL3244-0BA20-1PA0**
PROFINET	9	–	3	1	CU240S PN	**6SL3244-0BA20-1FA0**
Fail-safe for Safety Integrated						
PROFIBUS DP	6	2	3	1	CU240S DP-F	**6SL3244-0BA21-1PA0**
PROFINET	6	2	3	1	CU240S PN-F	**6SL3244-0BA21-1FA0**

CU240 Control Units

Design

Control Unit CU240E



CU240E Control Unit without terminal cover

Terminal No.	Signal	Features
Digital inputs (DI)		
5 … 8, 16,17	DI0 … DI5	Freely programmable (isolated) 5,5 mA/24 V
Digital outputs (DO)		
18	DO0, NC	Relay output 1 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output 1 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output 1 Common contact (0.5 A, 30 V DC)
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 (0.5 A, 30 V DC)
24	DO2, NO	Relay output 3 NO contact (0.5 A, 30 V DC)
25	DO2, COM	Relay output 3 Common contact (0.5 A, 30 V DC)
Analog inputs (AI)		
3	AI0+	0 … 10 V, –10 … +10 V, 0/2 … 10 V or 0/4 … 20 mA
4	AI0–	
10	AI1+	0 … 10 V, 0 … 20 mA
11	AI1–	
Analog outputs (AO)		
12	AO0+	Freely programmable (0/4 ... 20 mA with max. 500 Ω, 0/2 ... 10 V with min. 500 Ω)
13	AO0–	M (GND)
26	AO1+	Freely programmable (0/4 ... 20 mA with max. 500 Ω)
27	AO1–	M (GND)
PTC/KTY interface		
14	PTC+	Positive PTC/KTY input
15	PTC–	Negative PTC/KTY input
Serial RS485 interface		
29	P+	RS485 A, USS protocol
30	N–	RS485 B, USS protocol
Power supply		
9	U 24 V	Isolated user power supply +24 V with 100 mA
28	U 0 V	Isolated user reference voltage
1	+10 V	Non-isolated, stabilized 10 V power supply for I/O – max. 10 mA
2	0 V	Power supply reference

Design (continued)

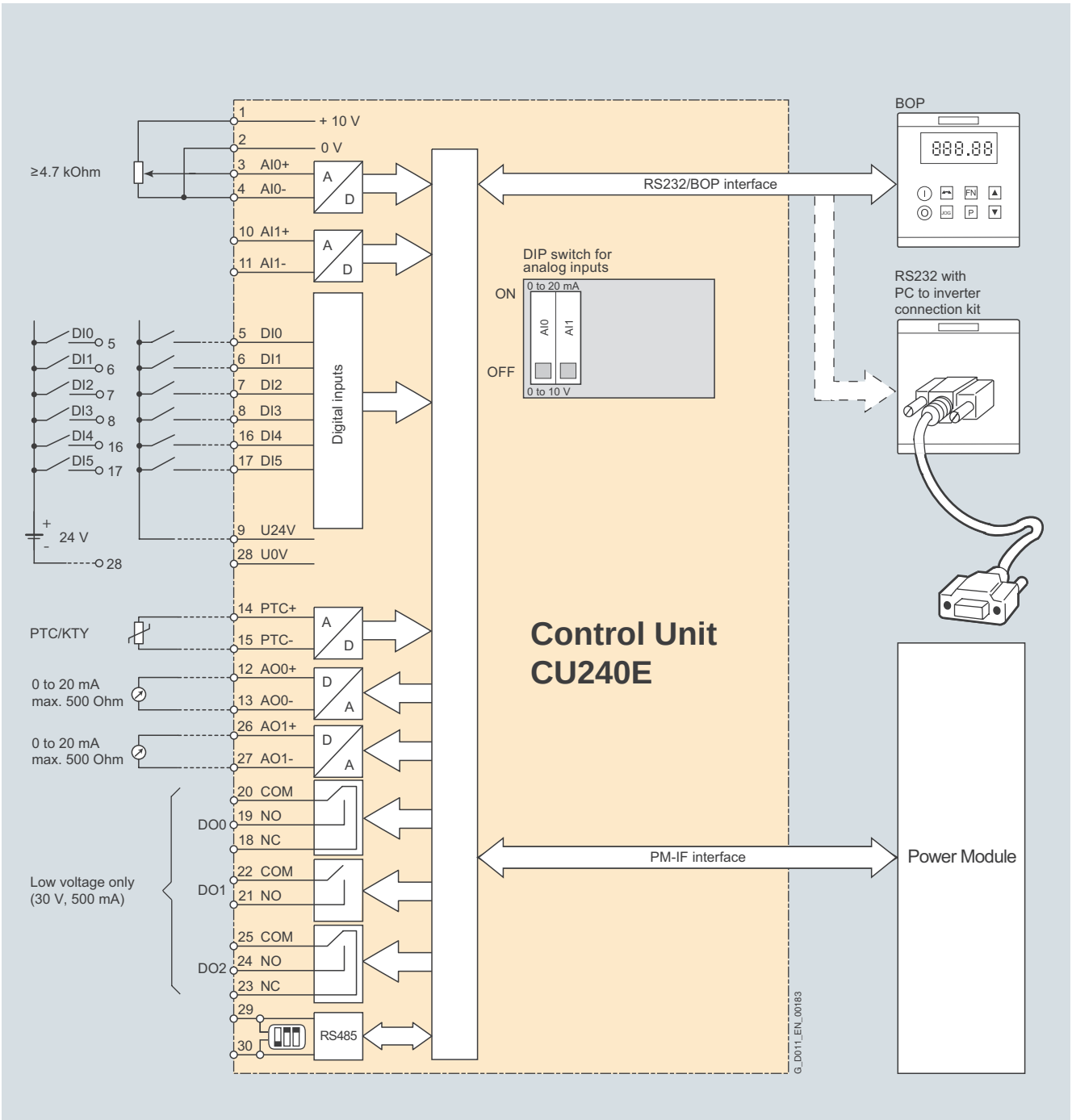
CU240S, CU240S DP, CU240S DP-F, CU240S PN and CU240S PN-F Control Units

Example: CU240S DP-F Control Unit
(right without terminal cover, with plug-in terminals)

Terminal No.	Signal	Features
Digital inputs (DI) – standard		
5 … 8, 16, 17	DI0 … DI5	Freely programmable (isolated) 5.5 mA/24 V
40 … 42 (with CU240S, CU240S DP, and CU240S PN only)	DI6 … DI8	Freely programmable (isolated) 5.5 mA/24 V
Digital inputs (DI) – Fail-safe (for CU240S DP-F and CU240S PN-F only)		
60 … 63 (with CU240S DP-F and CU240S PN-F only)	FDI0A FDI0B FDI1A FDI1B	Fail-safe digital inputs, 2 channels (redundant), freely programmable (isolated) 5.5 mA / 24 V
Digital outputs (DO)		
18	DO0, NC	Relay output 1 NC contact (0.5 A, 30 V DC)
19	DO0, NO	Relay output 1 NO contact (0.5 A, 30 V DC)
20	DO0, COM	Relay output 1 Common contact (0.5 A, 30 V DC)
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 (0.5 A, 30 V DC)
24	DO2, NO	Relay output 3 NO contact (0.5 A, 30 V DC)
25	DO2, COM	Relay output 3 Common contact (0.5 A, 30 V DC)

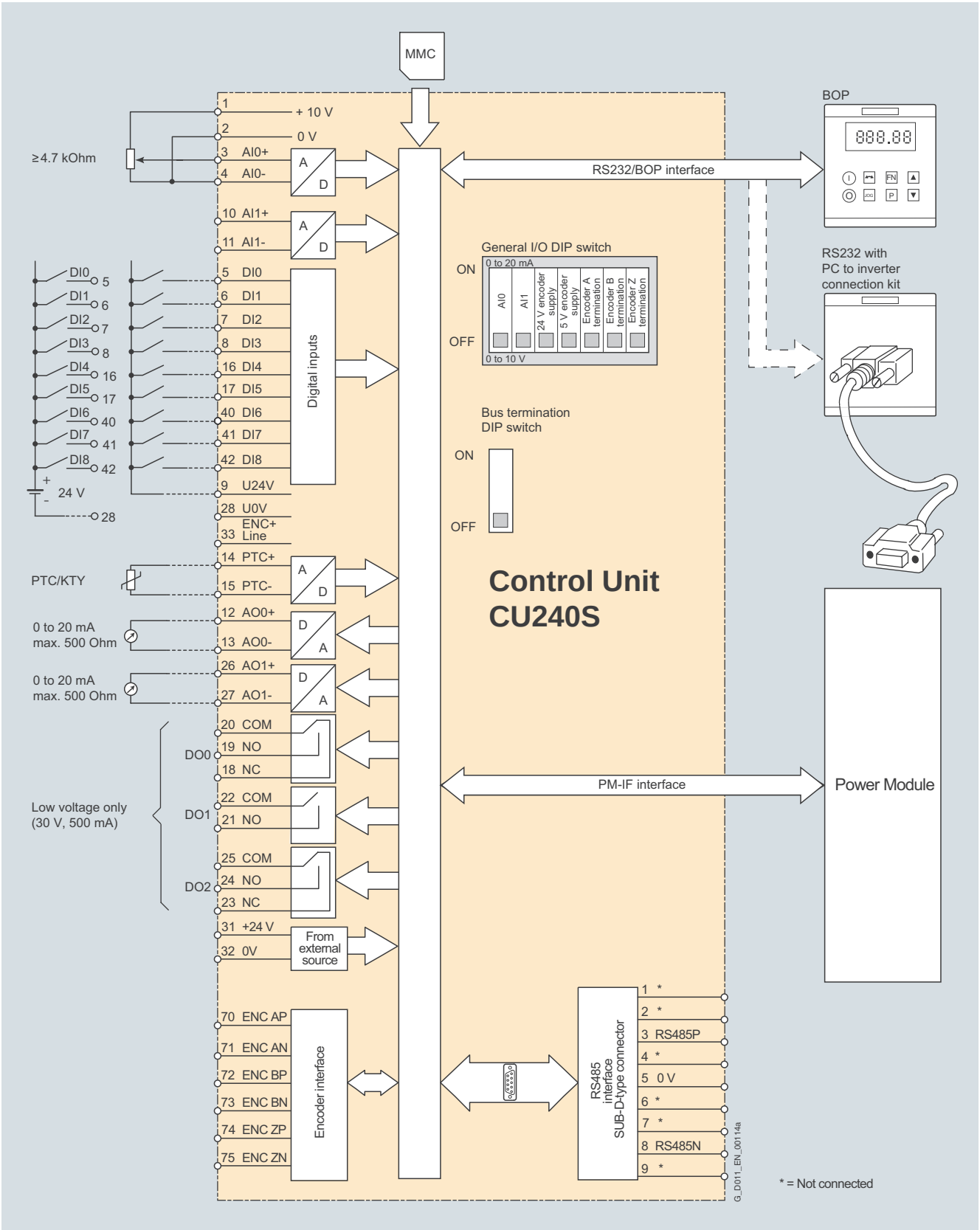
Terminal No.	Signal	Features
Analog inputs (AI)		
3	AI0+	0 … 10 V, –10 … +10 V, 0/2 … 10 V or 0/4 … 20 mA
4	AI0–	
10	AI1+	0 … 10 V, 0 … 20 mA
11	AI1–	
Analog outputs (AO)		
12	AO0+	Freely programmable (0/4 ... 20 mA with max. 500 Ω, 0/2 ... 10 V with min. 500 Ω)
13	AO0–	M (GND)
26	AO1+	Freely programmable (0/4 ... 20 mA with max. 500 Ω)
27	AO1–	M (GND)
Encoder interface		
70	ENC AP	Encoder AP – channel A non-negating input
71	ENC AN	Encoder AN – channel A negating input
72	ENC BP	Encoder BP – channel B non-negating input
73	ENC BN	Encoder BN – channel B negating input
74	ENC ZP	Encoder ZP – zero pulse non-negating input
75	ENC ZN	Encoder ZN – zero pulse negating input
PTC/KTY interface		
14	PTC+	Positive PTC/KTY input
15	PTC–	Negative PTC/KTY input
Power supply		
33	ENC+ supply	Isolated encoder power supply (+24 V with 100 mA, +5 V with 300 mA), configured via DIP switches
9	U 24 V	Isolated user power supply +24 V with 100 mA
28	U 0 V	Isolated encoder power supply and user reference voltage
1	+10 V	Non-isolated, stabilized 10 V power supply for I/O – max. 10 mA
2	0 V	Power supply reference
31	+24 V	24 V power supply input
32	0 V	24 V power supply reference

Integration



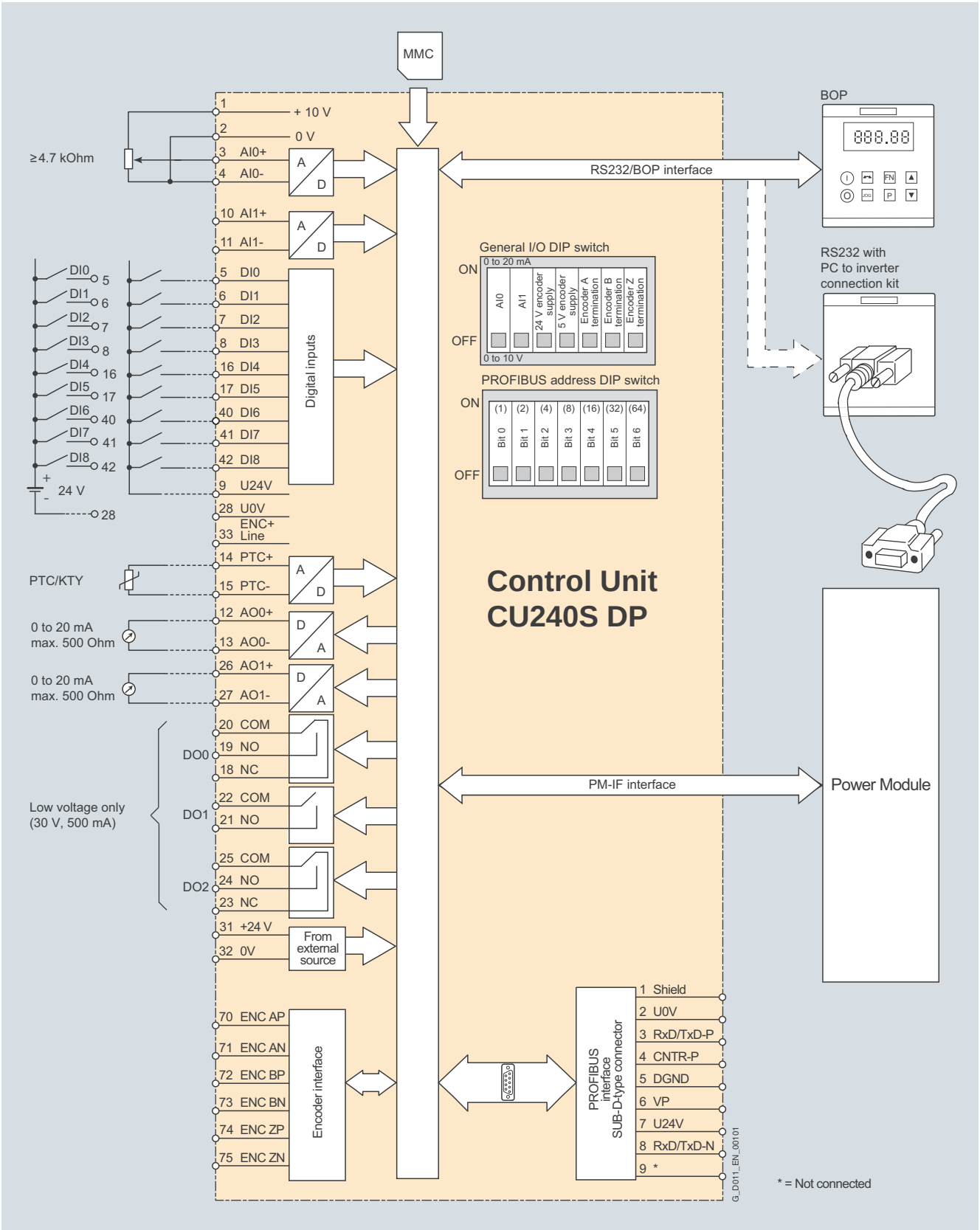
Connection diagram for CU240E Control Unit

Integration (continued)



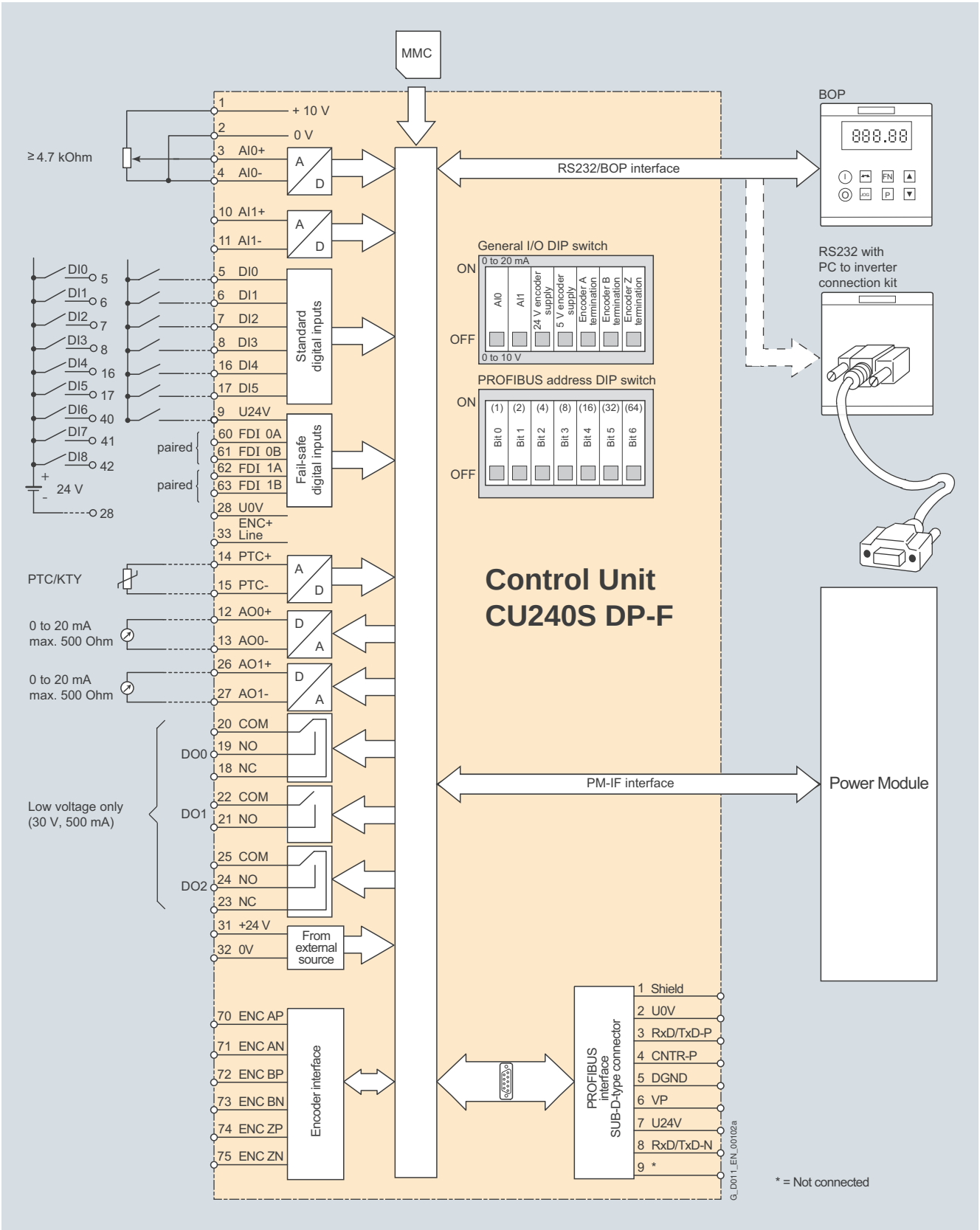
Connection diagram for CU240S Control Unit

Integration (continued)



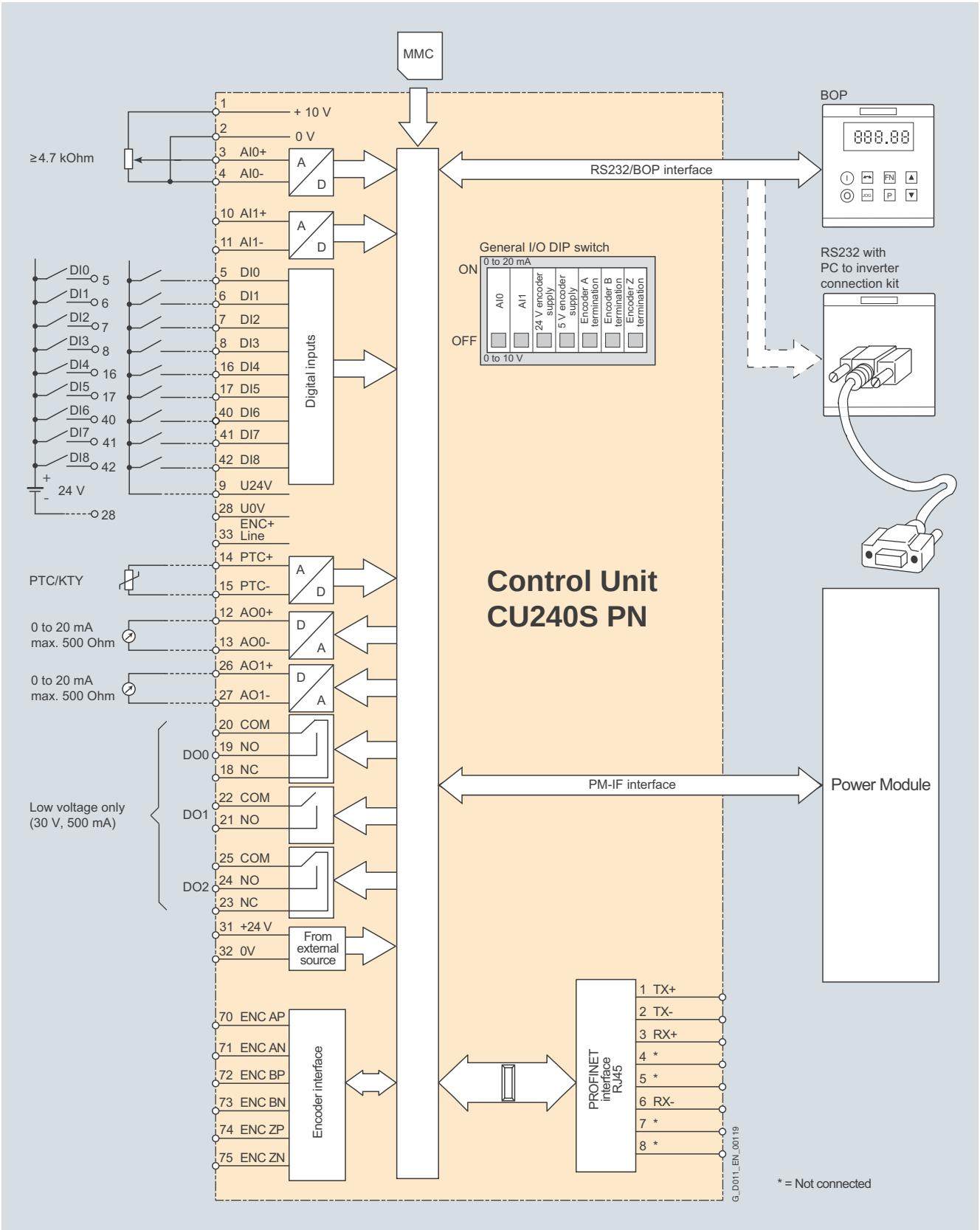
Connection diagram for CU240S DP Control Unit

Integration (continued)



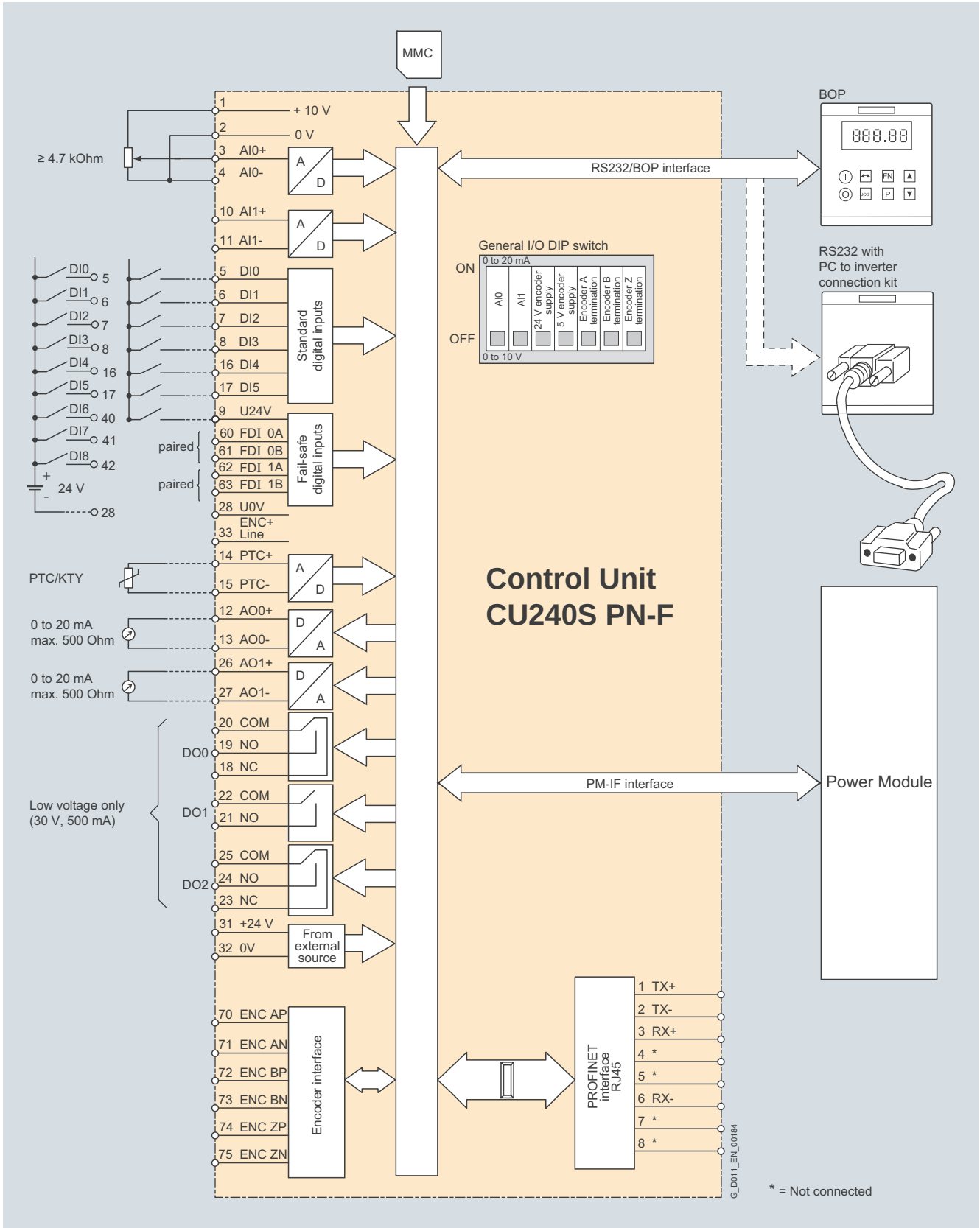
Connection diagram for CU240S DP-F Control Unit

Integration (continued)



Connection diagram for CU240S PN Control Unit

Integration (continued)



Connection diagram for CU240S PN-F Control Unit

CU240 Control Units

Technical specifications

	Control Unit CU240E 6SL3244-0BA10-0BA0	Control Unit CU240S 6SL3244-0BA20-1BA0	Control Unit CU240S DP 6SL3244-0BA20-1PA0	Control Unit CU240S PN 6SL3244-0BA20-1FA0	Control Unit CU240S DP-F 6SL3244-0BA21-1PA0	Control Unit CU240S PN-F 6SL3244-0BA21-1FA0
Electrical data						
Operating voltage	24 V DC via the Power Module	24 V DC via the Power Module or an external 24 V DC supply	24 V DC via the Power Module or an external 24 V DC supply	24 V DC via the Power Module or an external 24 V DC supply	24 V DC via the Power Module or an external 24 V DC supply	24 V DC via the Power Module or an external 24 V DC supply
Power loss	< 40 W	< 40 W	< 40 W	< 40 W	< 40 W	< 40 W
Interfaces						
Digital inputs – standard	6	9	9	9	6	6
Digital inputs – Fail-safe	–	–	–	–	2	2
Digital outputs	3	3	3	3	3	3
Analog inputs	2	2	2	2	2	2
	Both analog inputs can be configured as supplementary digital inputs if an additional function is required. Switching thresholds: 0 → 1: Rated voltage 2 V 1 → 0: Rated voltage 0.8 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.					
Analog outputs	2	2	2	2	2	2
	Analog outputs have short-circuit protection, but are not isolated. Maximum output voltage = 10 V in current mode, maximum output current = 20 mA in voltage mode. The reaction time should equal approximately 1 ms with a load of maximum 10 kΩ in voltage mode.					
Bus interface	RS485/USS	RS485/USS	PROFIBUS DP	PROFINET	PROFIBUS DP, PROFIsafe	PROFINET, PROFIsafe
Encoder interfaces	–	1	1	1	1	1
PTC/KTY interface	✓	✓	✓	✓	✓	✓
Brake Relay interface / Safe Brake Relay interface (connection via Power Module)	✓	✓	✓	✓	✓	✓
MMC memory card slot	–	✓	✓	✓	✓	✓
RS232/USS interface (connection via PC inverter connection kit)	✓	✓	✓	✓	✓	✓
Safety functions						
Integral safety functions to Category 3 of EN 954-1 and SIL2 of IEC 61508	–	–	–	–	• Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Brake Control (SBC) • Safe Torque Off (STO)	• Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Brake Control (SBC) • Safe Torque Off (STO)
Open-loop and closed-loop control functions						
V/f linear/quadratic/parameterizable	✓	✓	✓	✓	✓	✓
V/f with flux current control (FCC)	✓	✓	✓	✓	✓	✓
Vector control, encoderless	✓	✓	✓	✓	✓	✓
Vector control with encoder	–	✓	✓	✓	✓	✓
Torque control, encoderless	✓	✓	✓	✓	✓	✓
Torque control with encoder	–	✓	✓	✓	✓	✓

Technical specifications (continued)

	Control Unit CU240E 6SL3244-0BA10-0BA0	Control Unit CU240S 6SL3244-0BA20-1BA0	Control Unit CU240S DP 6SL3244-0BA20-1PA0	Control Unit CU240S PN 6SL3244-0BA20-1FA0	Control Unit CU240S DP-F 6SL3244-0BA21-1PA0	Control Unit CU240S PN-F 6SL3244-0BA21-1FA0
Software functions						
Fixed frequencies	16, programmable	16, programmable	16, programmable	16, programmable	16, programmable	16, programmable
Signal interconnection with BICO technology	✓	✓	✓	✓	✓	✓
Automatic restart following line failure or operation fault	✓	✓	✓	✓	✓	✓
Positioning deceleration ramp	✓	✓	✓	✓	✓	✓
Slip compensation	✓	✓	✓	✓	✓	✓
Free function blocks (FFB) for logic and arithmetic operations	✓	✓	✓	✓	✓	✓
Ramp smoothing	✓	✓	✓	✓	✓	✓
3 switchable drive data sets	✓	✓	✓	✓	✓	✓
3 switchable command data sets (CDS) (manual/auto)	✓	✓	✓	✓	✓	✓
Flying restart	✓	✓	✓	✓	✓	✓
JOG	✓	✓	✓	✓	✓	✓
Technology controller (PID)	✓	✓	✓	✓	✓	✓
Thermal motor protection	✓	✓	✓	✓	✓	✓
Thermal inverter protection	✓	✓	✓	✓	✓	✓
Setpoint specification	✓	✓	✓	✓	✓	✓
Motor identification	✓	✓	✓	✓	✓	✓
Motor holding brake	✓	✓	✓	✓	✓	✓
V_{dcmax} controller	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)
Kinetic buffering	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)
Braking functions • DC injection braking • Compound braking • Dynamic braking with integrated brake chopper	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)	✓ (with PM240 only)
Mechanical specifications and ambient conditions						
Degree of protection	IP20	IP20	IP20	IP20	IP20	IP20
Signal cable cross-section						
• min.	0.05 mm^2 (AWG30)	0.05 mm^2 (AWG30)	0.05 mm^2 (AWG30)	0.05 mm^2 (AWG30)	0.05 mm^2 (AWG30)	0.05 mm^2 (AWG30)
• max.	2 mm^2 (AWG14)	2 mm^2 (AWG14)	2 mm^2 (AWG14)	2 mm^2 (AWG14)	2 mm^2 (AWG14)	2 mm^2 (AWG14)
Operating temperature	–10 ... +50 °C (14 ... 122 °F)	–10 ... +50 °C (14 ... 122 °F)	–10 ... +50 °C (14 ... 122 °F)	–10 ... +50 °C (14 ... 122 °F)	0 ... 45 °C (32 ... 113 °F)	0 ... 40 °C (32 ... 104 °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)	–40 ... +70 °C (–40 ... +158 °F)	–40 ... +70 °C (–40 ... +158 °F)
Relative humidity	< 95 % RH, non-condensing	< 95 % RH, non-condensing	< 95 % RH, non-condensing	< 95 % RH, non-condensing	< 95 % RH, non-condensing	< 95 % RH, non-condensing
Dimensions						
• Width	73 mm	73 mm	73 mm	73 mm	73 mm	73 mm
• Height	195 mm	177 mm	177 mm	177 mm	177 mm	177 mm
• Depth	37 mm	63 mm	63 mm	63 mm	63 mm	63 mm
Weight, approx.	0.21 kg	0.52 kg	0.52 kg	0.52 kg	0.52 kg	0.52 kg

Memory card for Control Units

Overview

The parameter settings for an inverter can be stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data.

- Parameter settings can be written from the MMC memory card to the inverter or saved from the inverter to the MMC memory card.
- Up to 100 parameter sets can be stored.
- Supports standard commissioning without the use of additional commissioning tools (e.g. BOP and STARTER).
- How the MMC memory card is commissioned can be defined by the user (parameter p8458):
  - 0 = Parameter set 0 is never automatically downloaded from the MMC ("never")
  - 1 = Parameter set 0 is downloaded once after PowerOn ("once")
  - 2 = Parameter set 0 is always downloaded once after Power On ("always")

Note:
The MMC memory card is not required when the inverter is running and does not have to remain inserted.

Note:
The MMC memory card function is not integrated in the CU240E Control Unit.

Selection and Ordering Data

	Order No.
MMC memory card (not for the CU240E Control Unit)	**6SL3254-0AM00-0AA0**

Integration

Inserting the MMC memory card into the Control Unit

Control Unit with inserted MMC memory card

Overview

PM240 Power Modules feature an integrated brake chopper to which an external braking resistor can be connected via terminals DCP/R1 and R2 (see DC-link components).

The PM240 Power Module can be used to couple the DC link of up to 10 Power Modules. This functionality is useful for applications such as safe power-down after power failure or kinetic buffering (the DC link is supplied in generator mode with kinetic load energy so that the DC link voltage can be maintained).

The PM240 Power Module is also designed for safety-oriented applications. In conjunction with a Fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive (see Control Units).

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 for minimizing system perturbations (see line-side power components).

Frame size FSA of the PM240 Power Module is available only without integrated line filter to class A. A base filter for compliance with class A is therefore available. A base filter for compliance with class B is available (see line-side power components).

Frame sizes FSB and FSC of the PM240 Power Module are available both with and without integrated line filter to class A. For compliance with class B, PM240 Power Modules with integrated line filter to class A must be fitted additionally with a base filter to class B (see line-side power components).

Power Modules with integrated line filter to class A are suitable for connection to TN supply systems. Power Modules without integrated line filter can be connected to grounded (TN, TT) and non-grounded (IT) supply systems.

Selection and Ordering Data

To ensure correct selection of the Power Module, it should be chosen according to the

- **rated output current for applications with light overload (LO) or**
- **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 standard low-voltage motors, e.g. the new 1LE1 motor series (please refer to the Appendix for further information). The rated power is merely a guide value. For a description of the overload performance, please refer to the general technical data of the Power Modules.

Rated power [1]		Rated output current [2] I_{rated}	Power based on the base load current [3]		Base load current [3] I_H	Frame size	SINAMICS G120 Power Module PM240 without integrated line filter	SINAMICS G120 Power Module PM240 with integrated line filter (class A)
kW	hp	A	**kW**	hp	A		Order No.	Order No.
380 … 480 V 3 AC								
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**	–

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the loading for light overload (LO).

[2] The rated output current I_{rated} is based on the loading for light overload (LO). These current values are quoted on the rating plate of the Power Module.

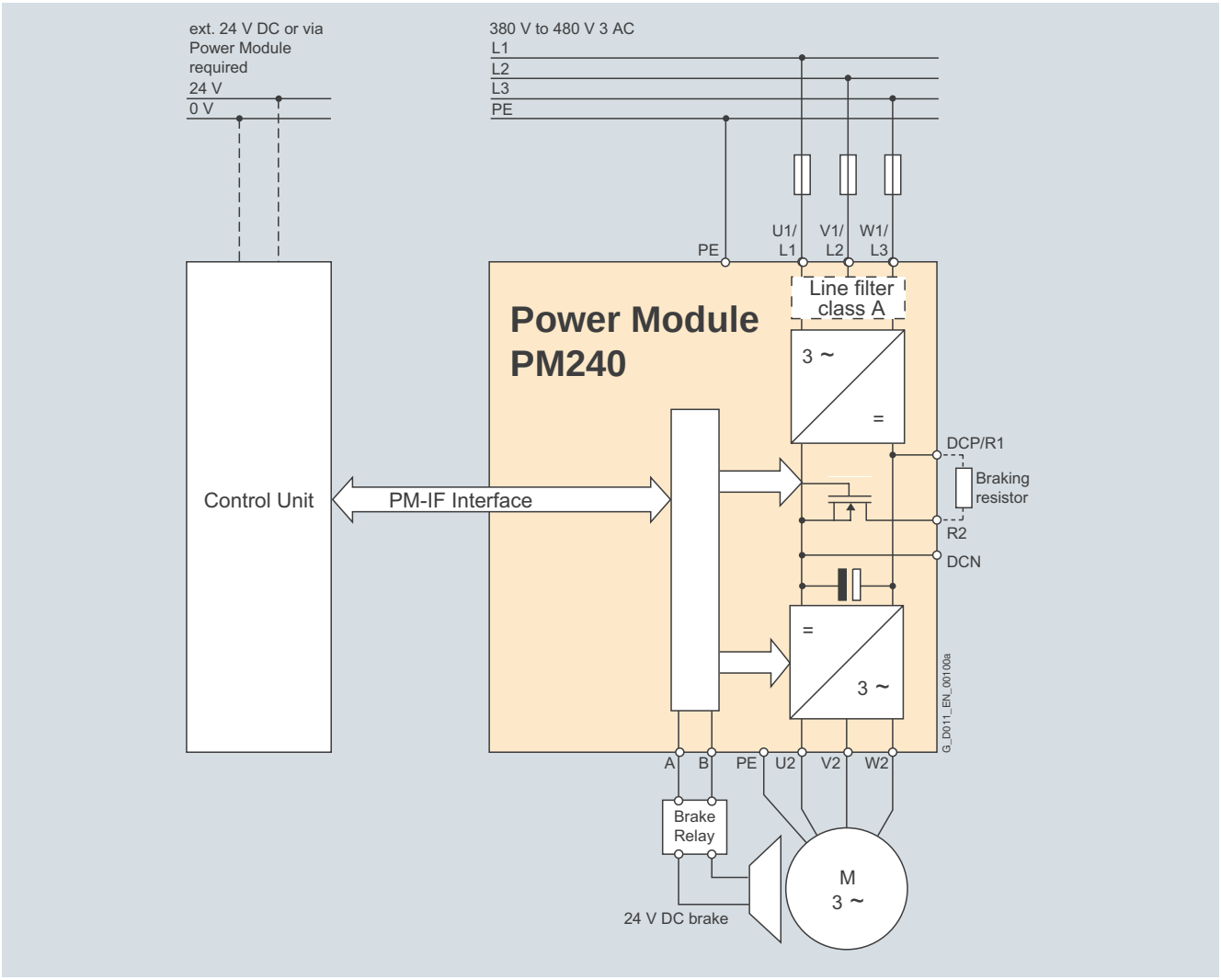
[3] The base load current I_H is based on the loading for high overload (HO).

Integration

PM240 Power Modules communicate with the Control Unit via the PM-IF interface.

PM240 Power Modules feature the following interfaces as standard:

- PM-IF interface for connection of the PM240 Power Module and Control Unit. The PM240 Power Module also supplies power to the Control Unit by means of an integrated power pack
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Motor connection made with screw terminals or screw studs
- Drive circuit for the Brake Relay or the Safe Brake Relay for controlling a motor brake
- 2 x PE (protective earth) connections



Connection diagram for PM240 Power Module with or without integrated line filter class A

Integration (continued)

Power and DC link components which 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 corresponding frames sizes for the Power Modules:

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240 Power Module with integrated brake chopper						
Available frame sizes	✓	✓	✓	✓	✓	✓
Line-side power components						
Line filter class A	U	F	F	F	F	F/S [1]
Line filter class B	U	U	U	–	–	–
Line reactor	U	U	U	U	U	S
DC link components						
Braking resistor	U	U	S	S	S	S
Load-side power components						
Output reactor	U	U	U	S	S	S
Sine-wave filter	Available soon	Available soon	Available soon	Available soon	Available soon	Available soon

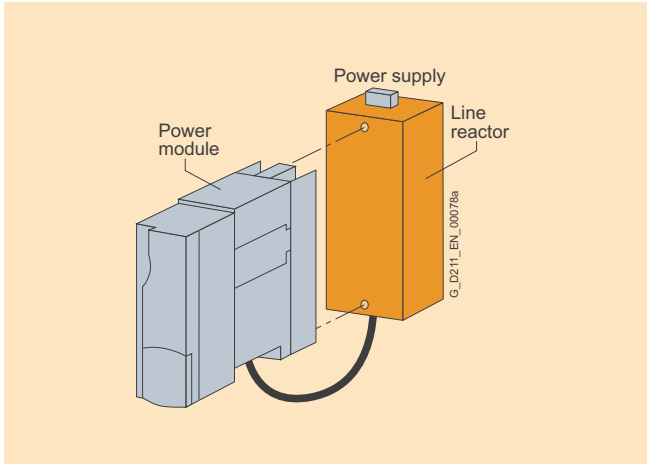
U = Base component
S = Lateral mounting
– = Not possible
F = Power Modules available without and with integrated filter class A

[1] PM240 FSF Power Modules, 110 kW (150 hp) and higher, are available only without an integrated class A filter. An optional class A line filter for lateral mounting is available instead.

Integration (continued)

Many system components for PM240 Power Modules are designed as base components, that is, the component is mounted on the baseplate and the PM240 Power Module above it in a space-saving construction. Up to two base components can be mounted above one another.

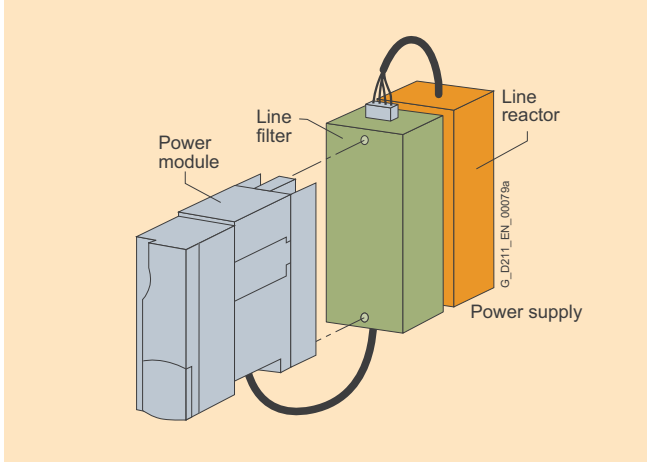
The following diagram shows the basic layout of a PM240 Power Module with line reactor as base component. The line-side reactors are equipped with terminals and the reactors at the Power Module end with a pre-assembled cable. In the final installation position, the mains terminals are at the top on frame sizes FSA to FSC, and at the bottom on frame sizes FSD to FSE.



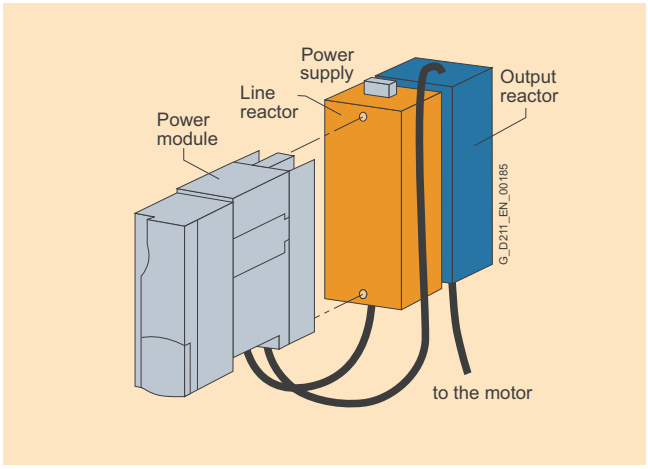
Basic layout of a PM240 Power Module with line reactor as base component

If a class 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 below. In this case, the line supply connection is below.

Power Modules of frame size FSB and higher are available with integrated class A line filters; an external class A line filter is not required in this case.

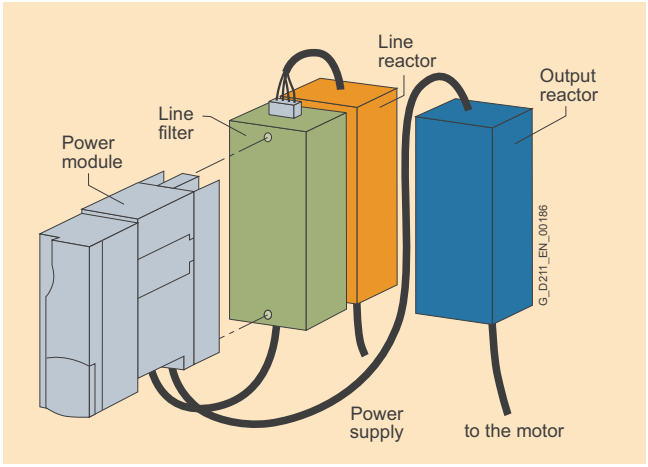


PM240 Power Module frame size FSA with line reactor and class A line filter



PM240 Power Module frame size FSA with line reactor and output reactor

For configurations involving more than two base-type system components, e.g. line filter + line reactor + output reactor, individual components must be mounted to the side of the Power Modules. In this instance, the line reactor and line filter must be installed under the Power Module and the output reactor to the side.



PM240 Power Module frame size FSA with line reactor, line filter and output reactor

Technical specifications

General technical data

	PM240 Power Modules
Line operating voltage	380 ... 480 V 3 AC ± 10 %
Line requirements Line short-circuit voltage u_K	no restriction
Input frequency	47 … 63 Hz
Output frequency	
• Control type *V/f*	0 … 650 Hz
• Control type Vector	0 … 200 Hz
Pulse frequency	4 kHz (standard), for higher pulse frequencies up to 16 kHz, see derating data
Power factor	0.7 … 0.85
Inverter efficiency	95 … 97 %
Control factor	93 %
Overload capability	
• High overload (HO)	1.5 x 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
• Light overload (LO)	1.1 x 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
Electromagnetic compatibility	Optional line filter class A or B to EN 55011 available
Possible braking methods	• DC injection braking • Compound braking • Dynamic braking with integrated brake chopper
Degree of protection	IP20
Operating temperature	
• High overload (HO)	–10 … +50 °C (14 … 122 °F) without derating, > 50 … 60 °C, see derating characteristics
• Light overload (LO)	–10 … +40 °C (14 … 104 °F) without derating, > 40 … 60 °C, see derating characteristics
Storage temperature	–40 … +70 °C (–40 … +158 °F)
Relative humidity	< 95 % RH, non-condensing
Cooling	Internal air cooling, power units with increased air cooling by built-in fans
Installation altitude	Up to 1000 m above sea level without derating, > 1000 m see derating characteristics
Standard SCCR (Short Circuit Current Rating) [1]	FSA, FSB, FSC: 10 kA FSD, FSE, FSF: 42 kA
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter interlock
Standards conformance	UL, cUL, CE, c-tick
CE mark	To Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EEC

[1] Applies to industrial control cabinet installations to NEC article 409/UL 508A. For further information, visit us on the Internet at: http://support.automation.siemens.com/WW/view/en/23995621

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		PM240 Power Modules				
Without integrated line filter		6SL3224-0BE13-7UA0	6SL3224-0BE15-5UA0	6SL3224-0BE17-5UA0	6SL3224-0BE21-1UA0	6SL3224-0BE21-5UA0
Output current at 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
Rated power						
• 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)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.97	0.97	0.97	0.97	0.97
Power loss	kW	0.1	0.1	0.1	0.1	0.11
Cooling air requirement	m^3/s	0.005	0.005	0.005	0.005	0.005
Sound pressure level L_{pA} (1 m)	dB	< 45	< 45	< 45	< 45	< 45
24 V DC power supply for Control Unit	A	1	1	1	1	1
Rated input current 3)						
• 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
Length of cable to braking resistor, max.	m	15	15	15	15	15
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 … 2.5	1 … 2.5	1 … 2.5	1 … 2.5	1 … 2.5
Motor connection U2, V2, W2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 … 2.5	1 … 2.5	1 … 2.5	1 … 2.5	1 … 2.5
DC link connection, connection for braking resistor DCP/R1, DCN, R2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 … 2.5	1 … 2.5	1 … 2.5	1 … 2.5	1 … 2.5
PE connection		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
Motor cable length 4), max.						
• Shielded	m	50	50	50	50	50
• Unshielded	m	100	100	100	100	100
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	73	73	73	73	73
• Height	mm	173	173	173	173	173
• Depth						
- without Control Unit	mm	145	145	145	145	145
- with Control Unit	mm	210	210	210	210	210
Frame size		FSA	FSA	FSA	FSA	FSA
Weight, approx.	kg	1.1	1.1	1.1	1.1	1.1

1) The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

2) The base load current I_H is based on the loading for high overload (HO).

3) The input current depends on the motor load and line impedance. The input currents apply for a load representing the rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are quoted on the rating plate of the Power Module.

4) Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		PM240 Power Modules				
Without integrated line filter		6SL3224-0BE22-2UA0	6SL3224-0BE23-0UA0	6SL3224-0BE24-0UA0	6SL3224-0BE25-5UA0	6SL3224-0BE27-5UA0
With integrated line filter		6SL3224-0BE22-2AA0	6SL3224-0BE23-0AA0	6SL3224-0BE24-0AA0	6SL3224-0BE25-5AA0	6SL3224-0BE27-5AA0
Output current at 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
Rated power						
• based on I_L	kW (hp)	2.2 (3.0)	3 (4.0)	4 (5.0)	7.5 (10)	11 (15)
• based on I_H	kW (hp)	2.2 (3.0)	3 (4.0)	4 (5.0)	5.5 (10)	7.5 (10)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		0.95	0.95	0.95	0.95	0.95
Power loss	kW	0.14	0.16	0.18	0.24	0.30
Cooling air requirement	m^3/s	0.024	0.024	0.024	0.055	0.055
Sound pressure level L_{pA} (1 m)	dB	< 50	< 50	< 50	< 60	< 60
24 V DC supply for Control Unit	A	1	1	1	1	1
Rated input current [3]						
• 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
Length of cable to braking resistor, max.	m	15	15	15	15	15
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 … 6	1 … 6	1 … 6	2.5 … 10	2.5 … 10
Motor connection U2, V2, W2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 … 6	1 … 6	1 … 6	2.5 … 10	2.5 … 10
DC link connection, connection for the braking resistor DCP/R1, DCN, R2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 … 6	1 … 6	1 … 6	2.5 … 10	2.5 … 10
PE connection		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
Motor cable length [4], max.						
• Shielded	m	50	50	50	50	50
• Unshielded	m	100	100	100	100	100
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	153	153	153	189	189
• Height	mm	270	270	270	334	334
• Depth						
- without Control Unit	mm	165	165	165	185	185
- with Control Unit	mm	230	230	230	250	250
Frame size		FSB	FSB	FSB	FSC	FSC
Weight, approx.	kg	4	4	4	7	7

[1] The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

[2] The base load current I_H is based on the loading for high overload (HO).

[3] The input current depends on the motor load and line impedance. The input currents apply for a load representing the rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are quoted on the rating plate of the Power Module.

[4] Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		PM240 Power Modules				
Without integrated line filter		6SL3224-0BE31-1UA0	6SL3224-0BE31-5UA0	6SL3224-0BE31-8UA0	6SL3224-0BE32-2UA0	6SL3224-0BE33-0UA0
With integrated line filter		6SL3224-0BE31-1AA0	6SL3224-0BE31-5AA0	6SL3224-0BE31-8AA0	6SL3224-0BE32-2AA0	6SL3224-0BE33-0AA0
Output current at 400 V 3 AC						
• Rated current I_{rated} [1]	A	32	38	45	60	75
• Base load current I_L [1]	A	32	38	45	60	75
• Base load current I_H [2]	A	26	32	38	45	60
• I_{max}	A	52	64	76	90	124
Rated power						
• based on I_L	kW (hp)	15 (20)	18.5 (25)	22 (30)	30 (40)	37 (50)
• based on I_H	kW (hp)	11 (15)	15 (20)	18.5 (25)	22 (30)	30 (40)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		> 0.97	> 0.97	> 0.97	> 0.97	> 0.97
Power loss	kW	0.4	0.44	0.55	0.72	1
Cooling air requirement	m^3/s	0.055	0.055	0.055	0.055	0.055
Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 60	< 61	< 60
24 V DC power supply for Control Unit	A	1	1	1	1	1
Rated input current [3]						
• with line reactor	A	33	40	47	63	78
• without line reactor	A	39	46	53	72	88
Length of cable to braking resistor, max.	m	15	15	15	15	15
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals	M6 screw studs	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	2.5 … 10	10 … 35	10 … 35	10 … 35	10 … 35
Motor connection U2, V2, W2		Screw terminals	M6 screw studs	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	2.5 … 10	10 … 35	10 … 35	10 … 35	10 … 35
DC link connection, connection for the braking resistor DCP/R1, DCN, R2		Screw terminals	M6 screw studs	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	2.5 … 10	10 … 35	10 … 35	10 … 35	10 … 35
PE connection		On housing with M5 screw	On housing with M6 screw	On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length [4], max.						
• Shielded	m	50	50	50	50	50
• Unshielded	m	100	100	100	100	100
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	189	275	275	275	275
• Height						
- without integrated filter	mm	334	419	419	419	499
- with integrated filter	mm	334	512	512	512	635
• Depth						
- without Control Unit	mm	185	204	204	204	204
- with Control Unit	mm	250	260	260	260	260
Frame size		FSC	FSD	FSD	FSD	FSE
Weight, approx.						
• without integrated filter	kg	7	13	13	13	16
• with integrated filter	kg	7	16	16	16	23

[1] The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

[2] The base load current I_H is based on the loading for high overload (HO).

[3] The input current depends on the motor load and line impedance. The input currents apply for a load representing the rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are quoted on the rating plate of the Power Module.

[4] Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Technical specifications (continued)

Line voltage 380 … 480 V 3 AC		PM240 Power Modules					
Without integrated line filter		6SL3224-0BE33-7UA0	6SL3224-0BE34-5UA0	6SL3224-0BE35-5UA0	6SL3224-0BE37-5UA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
With integrated line filter		6SL3224-0BE33-7AA0	6SL3224-0BE34-5AA0	6SL3224-0BE35-5AA0	6SL3224-0BE37-5AA0	–	–
Output current at 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
Rated power							
• 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)
Rated pulse frequency	kHz	4	4	4	4	4	4
Efficiency η		> 0.97	> 0.97	> 0.97	> 0.97	> 0.97	> 0.97
Power loss	kW	1.3	1.5	2	2.4	2.4	2.5
Cooling air requirement	m^3/s	2 × 0.055	0.15	0.15	0.15	0.15	0.15
Sound pressure level L_{pA} (1 m)	dB	< 62	< 60	< 60	< 65	< 65	< 65
24 V DC power supply for Control Unit	A	1	1	1	1	1	1
Rated input current [3]							
• with line reactor	A	94	115	151	186	210	250
• without line reactor	A	105	129	168	204	245	299
Length of cable to braking resistor, max.	m	15	15	15	15	15	15
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm^2	10 … 35	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50
Motor connection U2, V2, W2		M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm^2	10 … 35	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50
DC link connection, connection for the braking resistor DCP/R1, DCN, R2		M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm^2	10 … 35	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50
PE connection		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
Motor cable length [4], max.							
• Shielded	m	50	50	50	50	50	50
• Unshielded	m	100	100	100	100	100	100
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm	275	350	350	350	350	350
• Height							
- without integrated filter	mm	499	634	634	634	634	634
- with integrated filter	mm	635	934	934	934	–	–
• Depth							
- without Control Unit	mm	204	316	316	316	316	316
- with Control Unit	mm	260	372	372	372	372	372
Frame size		FSE	FSF	FSF	FSF	FSF	FSF
Weight, approx.							
• without integrated filter	kg	16	36	36	36	39	39
• with integrated filter	kg	23	52	52	52	–	–

[1] The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

[2] The base load current I_H is based on the loading for high overload (HO).

[3] The input current depends on the motor load and line impedance. The input currents apply for a load representing the rated power (based on I_{rated}) for a line impedance corresponding to u_K = 1 %. These current values without line reactor are quoted on the rating plate of the Power Module.

[4] Max. motor cable length 25 m (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

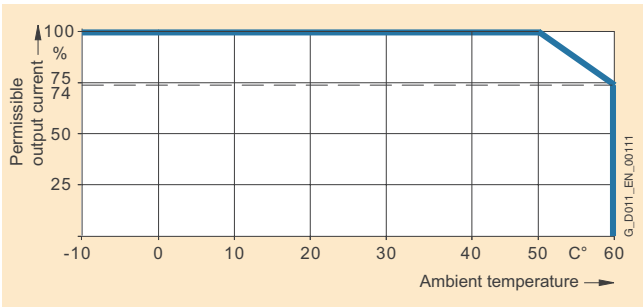
Characteristic curves

Derating data

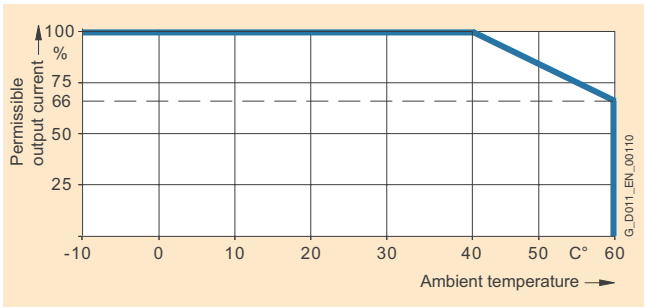
Pulse frequency

Rated power at 400 V 3 AC		**Rated output current in A** at a switching 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 [1]	178.0	–	–	–	–	–	–
132.0	200	250.0 [1]	205.0	–	–	–	–	–	–

Ambient temperature

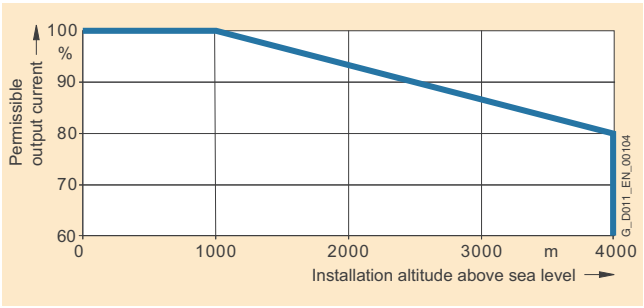


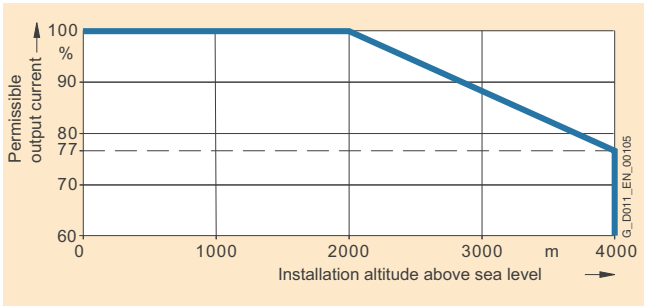
High overload (HO)



Light overload (LO)

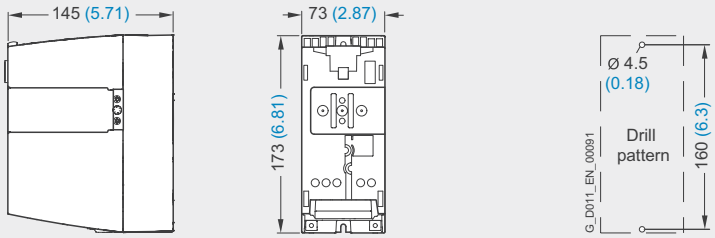
Installation altitude





[1] The pulse frequency can be switched over from 4 kHz (default) to 2 kHz only for the light overload (LO) duty cycle.

Dimensional drawings



PM240 Power Module frame size FSA

Fixing with 2 M4 studs, 2 M4 nuts, 2 M4 washers

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

Ventilation clearance required at sides:

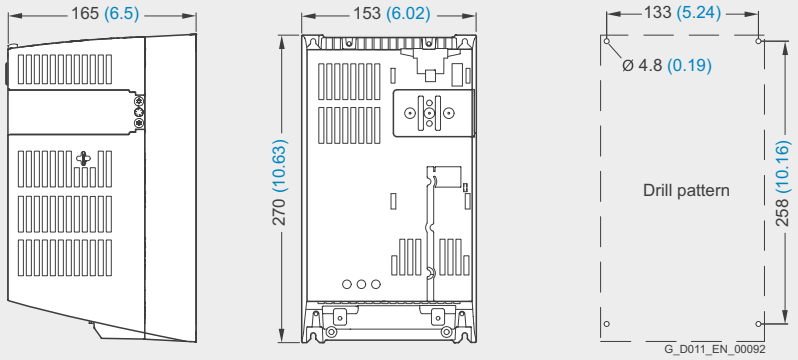
Ambient temperature ≤ 40 °C: 0 mm (0 inches)

Ambient temperature > 40 °C: 30 mm (1.18 inches)

When the Control Unit is plugged in, the mounting depth increases by 65 mm (2.56 inches) and the total height by 14 mm (0.55 inches).

Exception: Mounting depth on CU240E +39 mm (+1.54 inches), total height +32 mm (+1.26 inches).

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



PM240 Power Module frame size FSB

Fixing 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:

Ambient temperature ≤ 40 °C: 0 mm (0 inches)

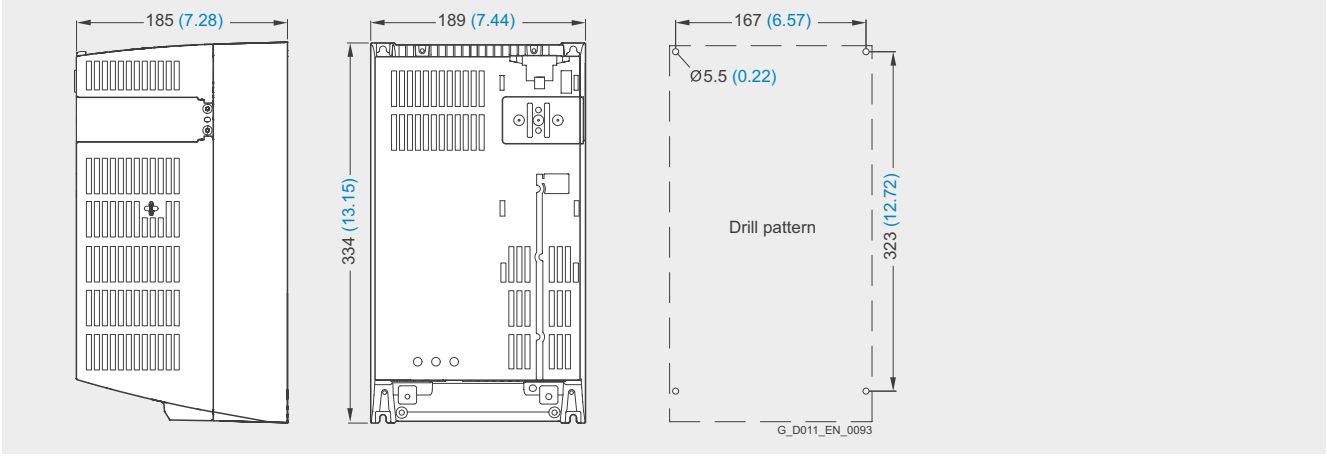
Ambient temperature > 40 °C: 40 mm (1.57 inches)

When the Control Unit is plugged in, the mounting depth increases by 65 mm (2.56 inches).

Exception: Mounting depth on CU240E +39 mm (+1.54 inches).

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

Dimensional drawings (continued)



PM240 Power Module frame size FSC

Fixing with 4 M5 studs, 4 M5 nuts, 4 M5 washers

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

Ventilation clearance required at sides:

Ambient temperature ≤ 40 °C: 0 mm (0 inches)

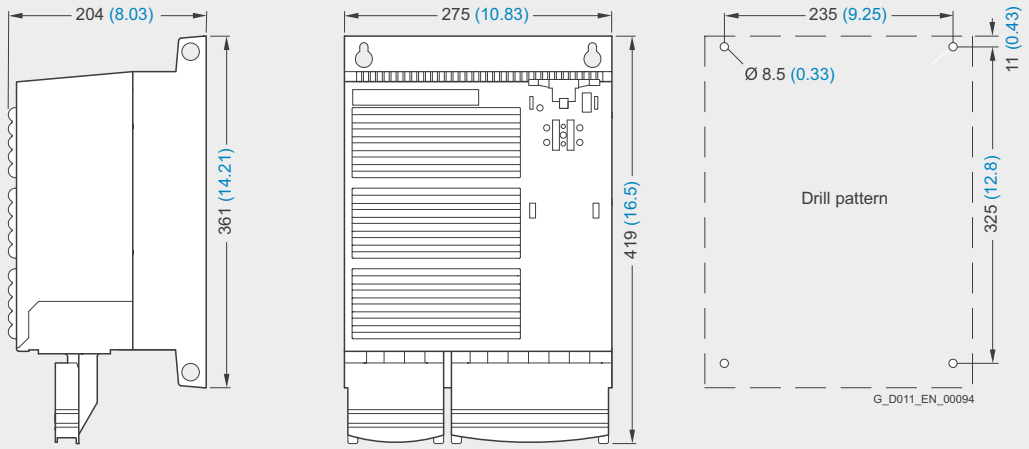
Ambient temperature > 40 °C: 50 mm (1.97 inches)

When the Control Unit is plugged in, the mounting depth increases by 65 mm (2.56 inches).

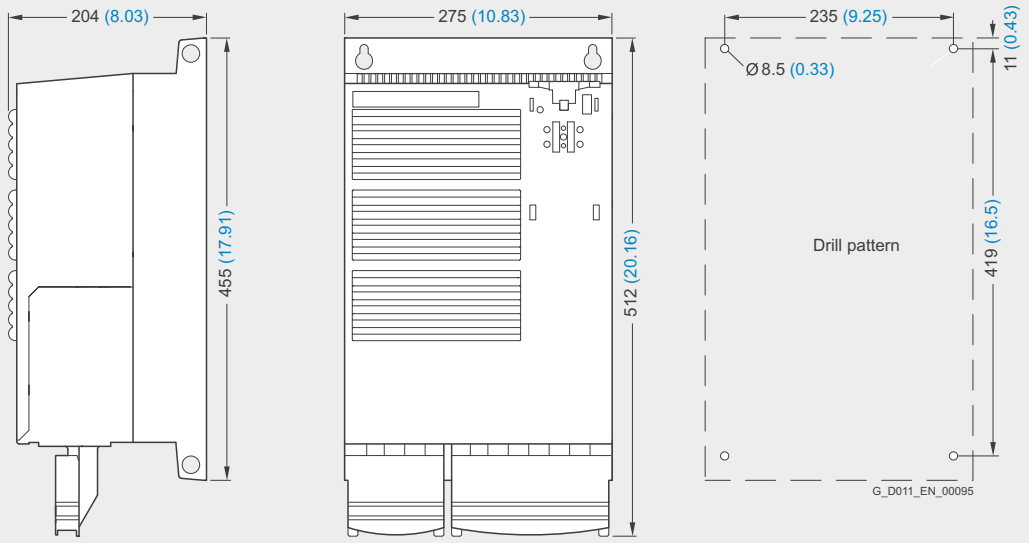
Exception: Mounting depth on CU240E +39 mm (+1.54 inches).

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

Dimensional drawings (continued)



PM240 Power Module frame size FSD without line filter



PM240 Power Module frame size FSD with integrated line filter class A

Fixing with 4 M6 studs, 4 M6 nuts, 4 M6 washers

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

Ventilation clearance required at front: 28 mm (1.1 inches)

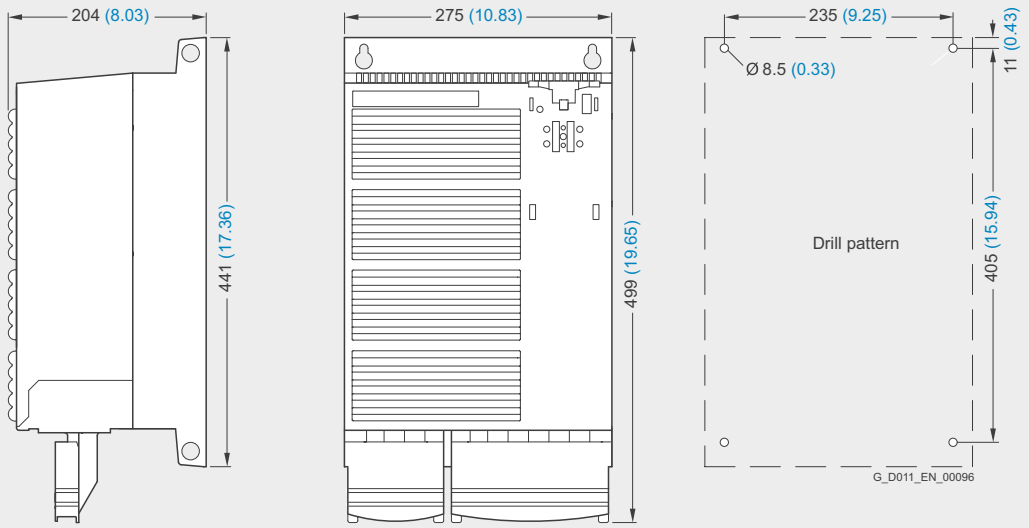
Ventilation clearance required at sides: 0 mm (0 inches)

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

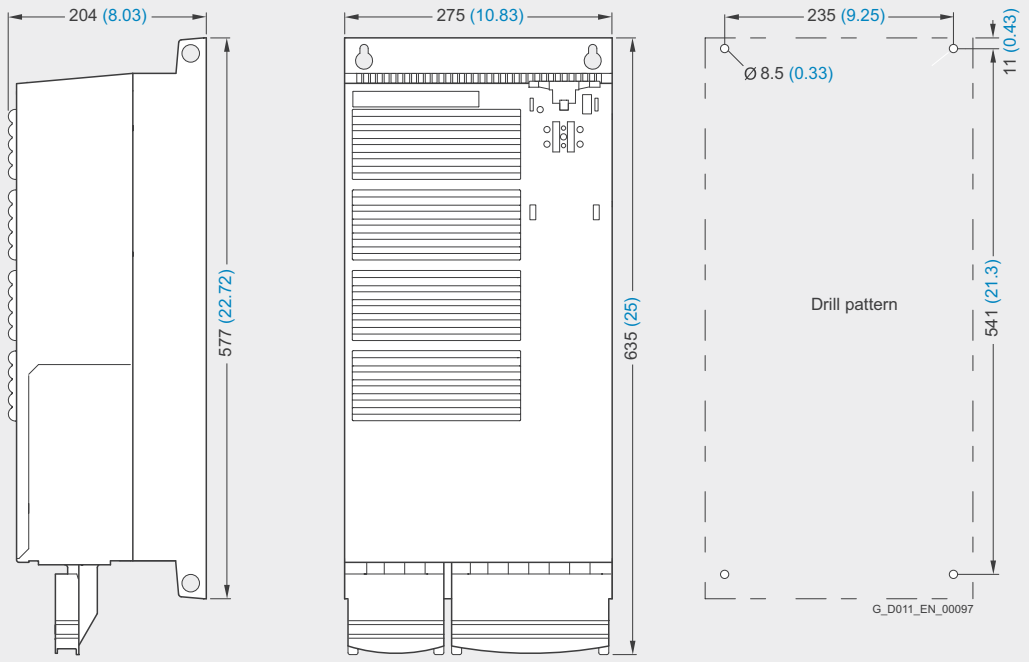
Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Dimensional drawings (continued)



PM240 Power Module frame size FSE without line filter



PM240 Power Module frame size FSE with integrated line filter class A

Fixing with 4 M6 studs, 4 M6 nuts, 4 M6 washers

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

Ventilation clearance required at front: 28 mm (1.1 inches)

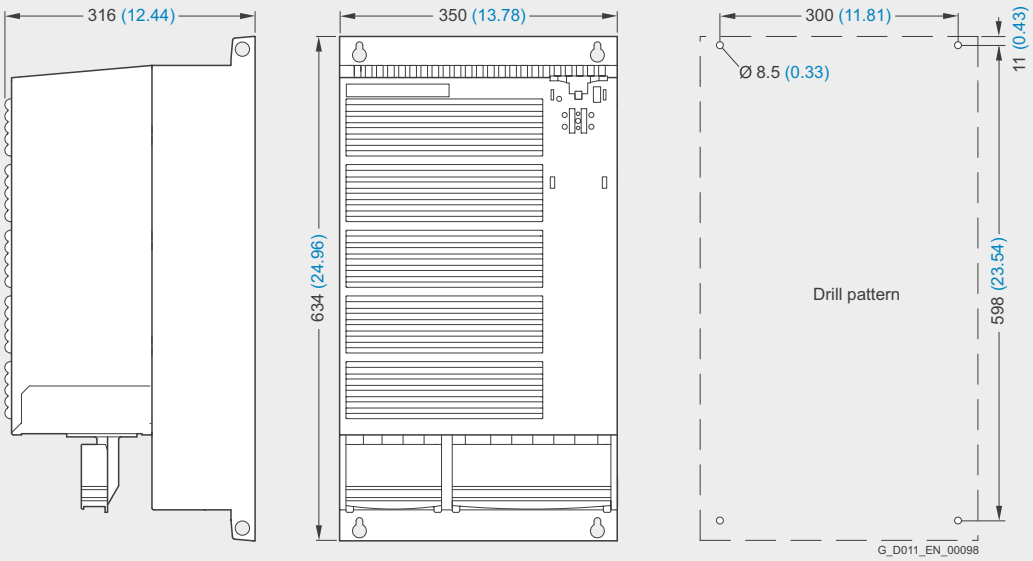
Ventilation clearance required at sides: 0 mm (0 inches)

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

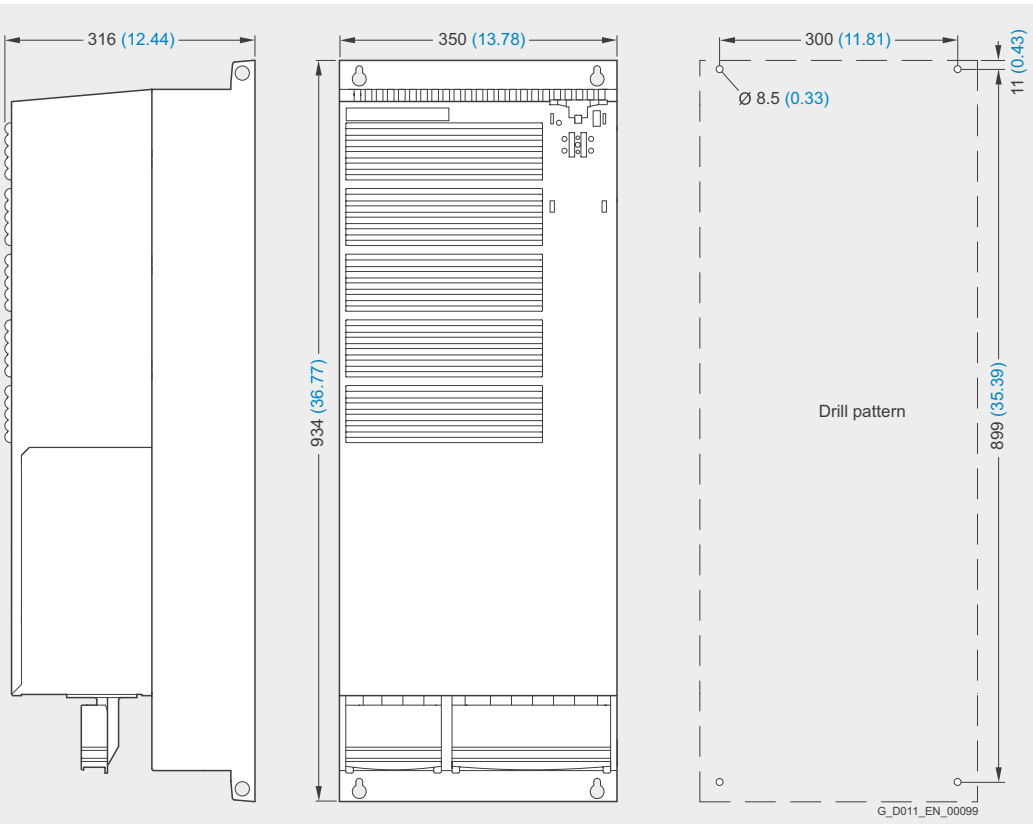
Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Dimensional drawings (continued)



PM240 Power Module frame size FSF without line filter



PM240 Power Module frame size FSF with integrated line filter class A

Fixing 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 front: 28 mm (1.1 inches)

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

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Overview

The PM250 Power Module features an absolutely unique technology which we have called “Efficient Infeed Technology”. This regenerative feedback capability of the PM260 Power Module in generating mode (electronic braking) means that energy is returned to the supply system and not destroyed in a braking resistor. This saves space in the control cabinet. The time-consuming dimensioning of the braking resistor as well as the wiring are eliminated. Generated heat is also reduced in the control cabinet.

The innovative circuit design used in Efficient Infeed Technology reduces supply 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 PM250 Power Module is also suitable for safety-oriented applications. In conjunction with a Fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive (see Control Units).

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).

For frame size FSC of Power Module PM250 with an integral line filter of class A, an additional base filter of class B is available for achieving class B (see line-side power components).

The PM250 Power Modules with integrated class A line filter are suitable for connection to TN supply systems.

Overview of how customers benefit from Efficient Infeed Technology

For more detailed information, please refer to section Efficient Infeed Technology in chapter Innovations.

	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

Selection and Ordering Data

To ensure correct selection of the Power Module, it should be chosen according to the

- **rated output current for applications with light overload (LO) or**
- **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 standard low-voltage motors, e.g. the new 1LE1 motor series (please refer to the Appendix for further information). The rated power is merely a guide value. For a description of the overload performance, please refer to the general technical data of the Power Modules.

Rated power [1]		Rated output current [2] I_{rated}	Power based on the base load current [3]		Base load current [3] I_H	Frame size	**SINAMICS G120 PM250 Power Module with integrated line filter (class A)**
kW	hp	A	**kW**	hp	A		Order No.
380 … 480 V 3 AC							
7.5	10	18	**5.5**	7.5	13.2	FSC	**6SL3225-0BE25-5AA0**
11.0	15	25	**7.5**	10	19	FSC	**6SL3225-0BE27-5AA0**
15.0	20	32	**11.0**	15	26	FSC	**6SL3225-0BE31-1AA0**
18.5	25	38	**15.0**	20	32	FSD	**6SL3225-0BE31-5AA0**
22	30	45	**18.5**	25	38	FSD	**6SL3225-0BE31-8AA0**
30	40	60	**22**	30	45	FSD	**6SL3225-0BE32-2AA0**
37	50	75	**30**	40	60	FSE	**6SL3225-0BE33-0AA0**
45	60	90	**37**	50	75	FSE	**6SL3225-0BE33-7AA0**
55	75	110	**45**	60	90	FSF	**6SL3225-0BE34-5AA0**
75	100	145	**55**	75	110	FSF	**6SL3225-0BE35-5AA0**
90	125	178	**75**	100	145	FSF	**6SL3225-0BE37-5AA0**

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the loading for light overload (LO).

[2] The rated output current I_{rated} is based on the loading for light overload (LO). These current values are quoted on the rating plate of the Power Module.

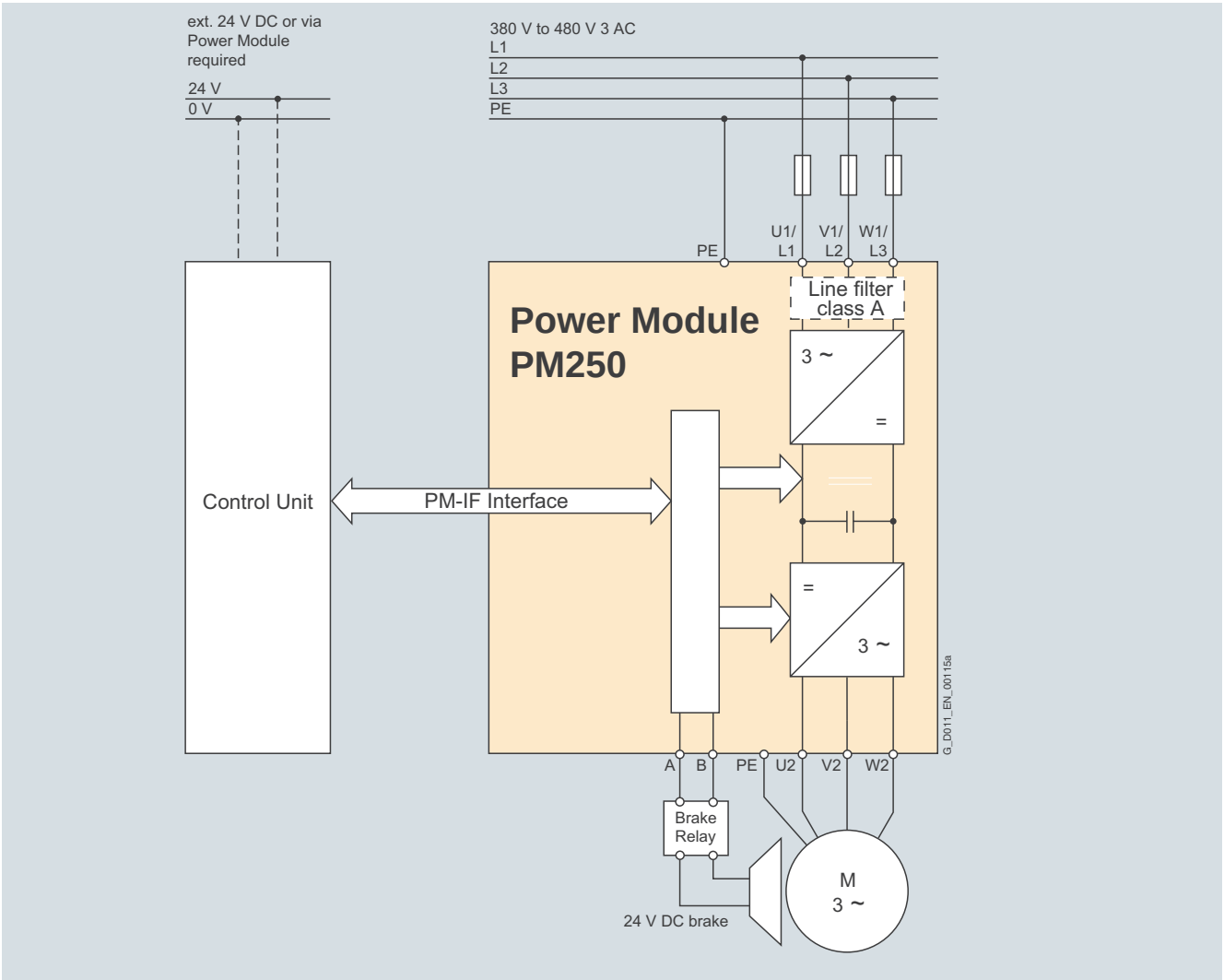
[3] The base load current I_H is based on the loading for high overload (HO).

Integration

PM250 Power Modules communicate with the Control Unit via the PM-IF interface.

PM250 Power Modules feature the following interfaces as standard:

- PM-IF interface for connection of the PM250 Power Module and Control Unit. The PM250 Power Module also supplies power to the Control Unit by means of an integrated power pack
- Motor connection made with screw terminals or screw studs
- Drive circuit for the Brake Relay or the Safe Brake Relay for controlling a motor brake
- 2 x PE (protective earth) connections



Connection diagram for PM250 Power Module with integrated line filter class A

Integration (continued)

Power and DC link components which 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:

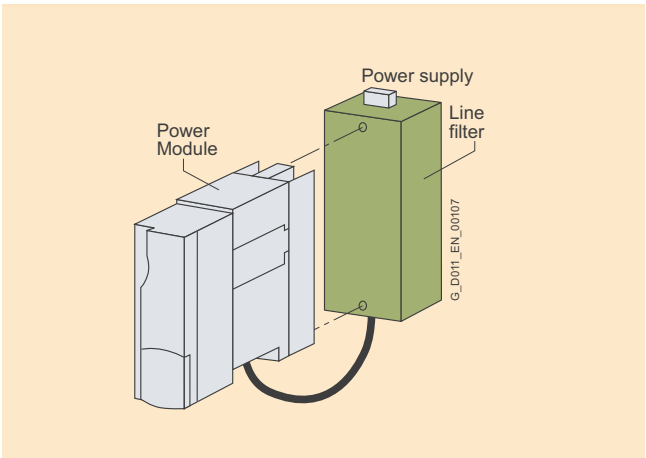
	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM250 Power Module with line-commutated energy feedback and integrated line filter class A						
Available frame sizes	–	–	✓	✓	✓	✓
Line-side power components						
Line filter class A	–	–	I	I	I	I
Line filter class B	–	–	U	–	–	–
Line reactor [1]	–	–	– [1]	– [1]	– [1]	– [1]
DC link components						
Braking resistor [2]	–	–	– [2]	– [2]	– [2]	– [2]
Load-side power components						
Output reactor	–	–	U	S	S	S
Sine-wave filter	–	–	Available soon	Available soon	Available soon	Available soon

U = Base component
S = Lateral mounting
I = Integrated
– = Not possible

Availability as base components

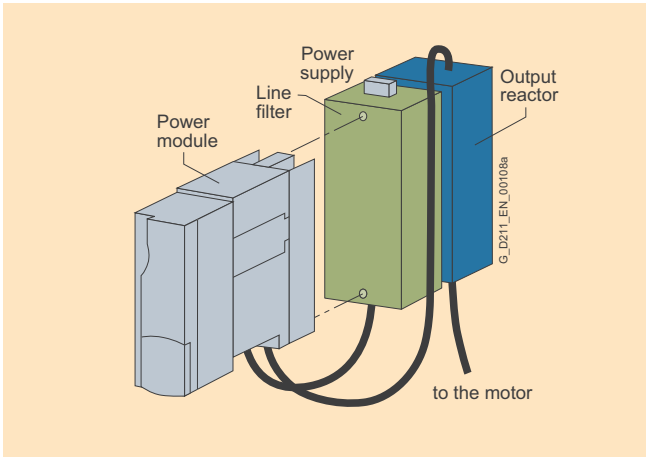
Many system components for PM250 Power Modules are designed as base components, i.e. the component is mounted on the baseplate and the PM250 Power Module above it in a space-saving construction. Up to two base components can be mounted above one another.

The following diagram shows the basic layout of a PM250 Power Module with additional line filter class B as base component.



Basic layout of a PM250 Power Module with line filter class B as base component

The following example shows the structure for two base components:



Basic layout of a PM250 Power Module with class B line filter as base component and output reactor

[1] A line reactor is not required and must not be used in conjunction with a Power Module of type PM250.

[2] A PM250 Power Module is capable of line-commutated energy feedback. A braking resistor cannot be connected to this module and and is not necessary.

Technical specifications

General technical data

	PM250 Power Modules
Line operating voltage	380 ... 480 V 3 AC ± 10 %
Line requirements Line short-circuit voltage u_K	≤ 1 %
Input frequency	47 … 63 Hz
Output frequency	
• Control type *V/f*	0 … 650 Hz
• Control type Vector	0 … 200 Hz
Pulse frequency	4 kHz (standard), for higher pulse frequencies up to 16 kHz, see derating data
Power factor	0.9
Inverter efficiency	95 … 97 %
Control factor	87 %
Overload capability	
• High overload (HO)	1.5 x 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
• Light overload (LO)	1.1 x 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
Electromagnetic compatibility	Integral line filter class A; optional line filter class B compliant with EN 55011 available
Possible braking methods	Regenerative feedback in generating mode
Degree of protection	IP20
Operating temperature	
• High overload (HO)	–10 … +50 °C (14 … 122 °F) without derating, > 50 … 60 °C, see derating characteristics
• Light overload (LO)	–10 … +40 °C (14 … 104 °F) without derating, > 40 … 60 °C, see derating characteristics
Storage temperature	–40 … +70 °C (–40 … +158 °F)
Relative humidity	< 95 % RH, non-condensing
Cooling	Internal air cooling, power units with increased air cooling by built-in fans
Installation altitude	Up to 1000 m above sea level without derating, > 1000 m see derating characteristics
Standard SCCR (Short Circuit Current Rating) [1]	FSC: 10 kA FSD, FSE, FSF: 42 kA
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter interlock
Standards conformance	UL, cUL, CE, c-tick
CE mark	To Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EEC

[1] Applies to industrial control cabinet installations to NEC article 409/UL 508A. For further information, visit us on the Internet at:
http://support.automation.siemens.com/WW/view/en/23995621

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM250 Power Modules		
With integrated line filter		6SL3225-0BE25-5AA0	6SL3225-0BE27-5AA0	6SL3225-0BE31-1AA0
Output current at 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
Rated power				
• 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)
Rated pulse frequency	kW	4	4	4
Efficiency η		0.95	0.95	0.95
Power loss	kW	Available soon	Available soon	Available soon
Cooling air requirement	m^3/s	0.038	0.038	0.038
Sound pressure level L_{pA} (1 m)	dB	Available soon	Available soon	Available soon
24 V DC power supply for the Control Unit	A	1	1	1
Input current 3)				
• Rated current 3)	A	18	25	32
• Current based on I_H 3)	A	13.2	19	26
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	2.5 … 10	2.5 … 10	2.5 … 10
Motor connection U2, V2, W2		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	2.5 … 10	2.5 … 10	2.5 … 10
PE connection		On housing with M5 screw	On housing with M5 screw	On housing with M5 screw
Motor cable length, max.				
• Shielded	m	25	25	25
• Unshielded	m	100	100	100
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm	189	189	189
• Height	mm	334	334	334
• Depth				
- without Control Unit	mm	185	185	185
- with Control Unit	mm	250	250	250
Frame size		FSC	FSC	FSC
Weight, approx.	kg	7.5	7.5	7.5

1) The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

2) The base load current I_H is based on the loading for high overload (HO).

3) The input current depends on the motor load and line impedance. It applies with a line impedance of u_K = 1 %. The rated input currents apply for a load representing the rated power (based on I_{rated}) – these current values are specified on the rating plate.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM250 Power Modules		
With integrated line filter		6SL3225-0BE31-5AA0	6SL3225-0BE31-8AA0	6SL3225-0BE32-2AA0
Output current at 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
Rated power				
• 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)
Rated pulse frequency	kHz	4	4	4
Efficiency η		> 0.97	> 0.97	> 0.97
Power loss	kW	0.44	0.55	0.72
Cooling air requirement	m^3/s	0.022	0.022	0.039
Sound pressure level L_{pA} (1 m)	dB	< 60	< 60	< 61
24 V DC power supply for the Control Unit	A	1	1	1
Input current				
• Rated current 3)	A	36	42	56
• based on I_H 3)	A	30	36	42
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35
Motor connection U2, V2, W2		M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length, max.				
• Shielded	m	25	25	25
• Unshielded	m	100	100	100
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm	275	275	275
• Height	mm	512	512	512
• Depth				
- without Control Unit	mm	204	204	204
- with Control Unit	mm	260	260	260
Frame size		FSD	FSD	FSD
Weight, approx.	kg	15	15	16

1) The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

2) The base load current I_H is based on the loading for high overload (HO).

3) The input current depends on the motor load and line impedance. It applies with a line impedance of u_K = 1 %. The rated input currents apply for a load representing the rated power (based on I_{rated}) – these current values are specified on the rating plate.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM250 Power Modules				
With integrated line filter		6SL3225-0BE33-0AA0	6SL3225-0BE33-7AA0	6SL3225-0BE34-5AA0	6SL3225-0BE35-5AA0	6SL3225-0BE37-5AA0
Output current at 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
Rated power						
• 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)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η		> 0.97	> 0.97	> 0.97	> 0.97	> 0.97
Power loss	kW	1	1.3	1.5	2	2.4
Cooling air requirement	m^3/s	0.022	0.039	0.094	0.094	0.117
Sound pressure level L_{pA} (1 m)	dB	< 60	< 62	< 60	< 60	< 65
24 V DC power supply for the Control Unit	A	1	1	1	1	1
Input current						
• Rated current 3)	A	70	84	102	135	166
• based on I_H 3)	A	56	70	84	102	135
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw studs	M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section, max.	mm^2	10 … 35	10 … 35	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50
Motor connection U2, V2, W2		M6 screw studs	M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section, max.	mm^2	10 … 35	10 … 35	1 × 120 or 2 × 50	1 × 120 or 2 × 50	1 × 120 or 2 × 50
PE connection		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
Motor cable length, max.						
• Shielded	m	25	25	25	25	25
• Unshielded	m	100	100	100	100	100
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm	275	275	350	350	350
• Height	mm	635	635	934	934	934
• Depth						
- without Control Unit	mm	204	204	316	316	316
- with Control Unit	mm	260	260	372	372	372
Frame size		FSE	FSE	FSF	FSF	FSF
Weight, approx.	kg	21	21	51	51	51

1) The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

2) The base load current I_H is based on the loading for high overload (HO).

3) The input current depends on the motor load and line impedance. It applies with a line impedance of u_K = 1 %. The rated input currents apply for a load representing the rated power (based on I_{rated}) – these current values are specified on the rating plate.

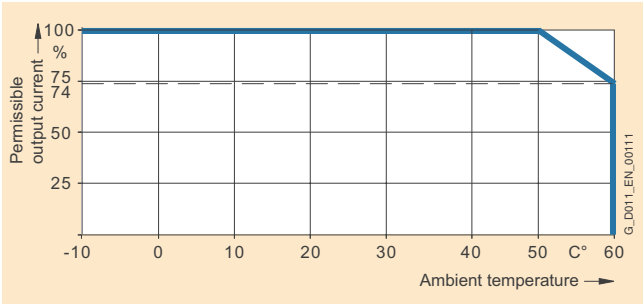
Characteristic curves

Derating data

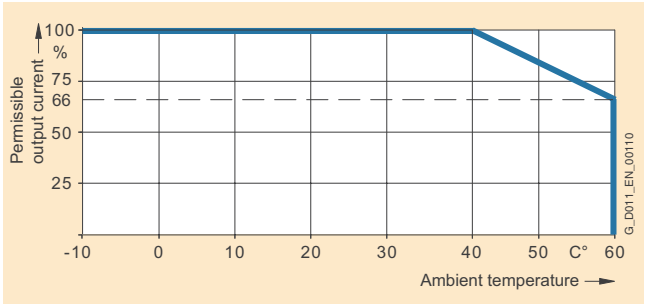
Pulse frequency

Rated power at 400 V 3 AC		**Rated output current in A** at a switching 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	–	–	–	–

Ambient temperature

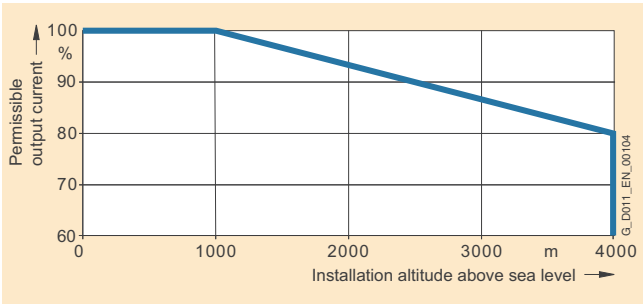


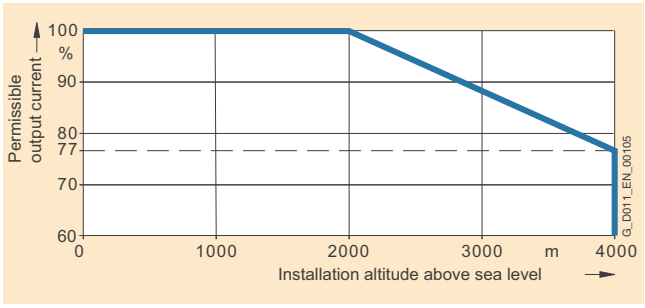
High overload (HO)



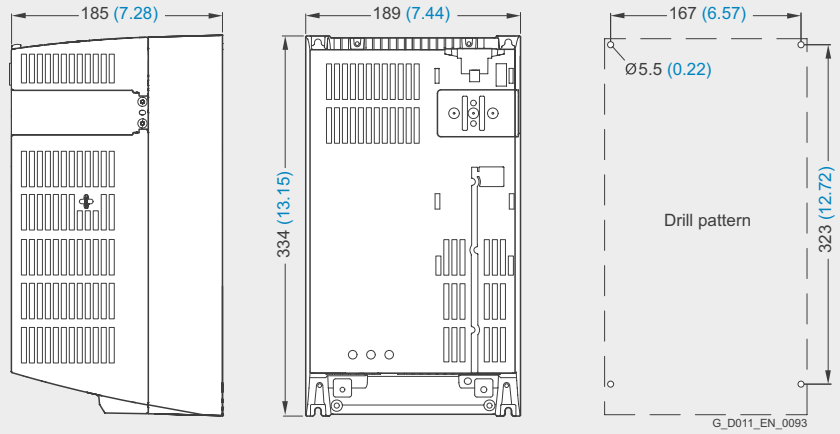
Light overload (LO)

Installation altitude





Dimensional drawings



PM250 Power Module frame size FSC with integrated line filter class A

Fixing 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:

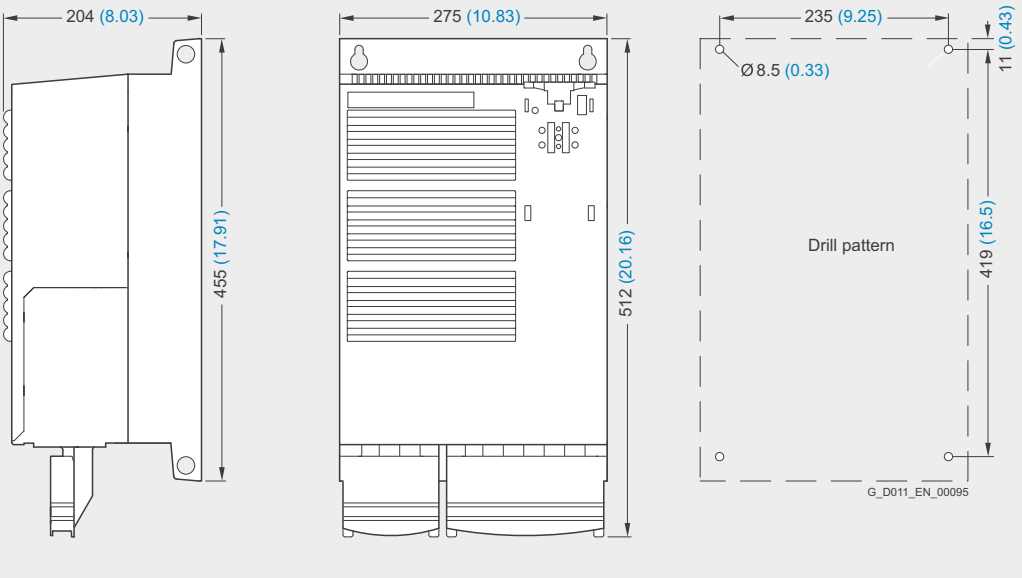
Ambient temperature ≤ 40 °C: 0 mm (0 inches)

Ambient temperature > 40 °C: 50 mm (1.97 inches)

When the Control Unit is plugged in, the mounting depth increases by 65 mm (2.56 inches).

Exception: Mounting depth on CU240E +39 mm (+1.54 inches).

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



PM250 Power Module frame size FSD with integrated line filter class A

Fixing with 4 M6 studs, 4 M6 nuts, 4 M6 washers

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

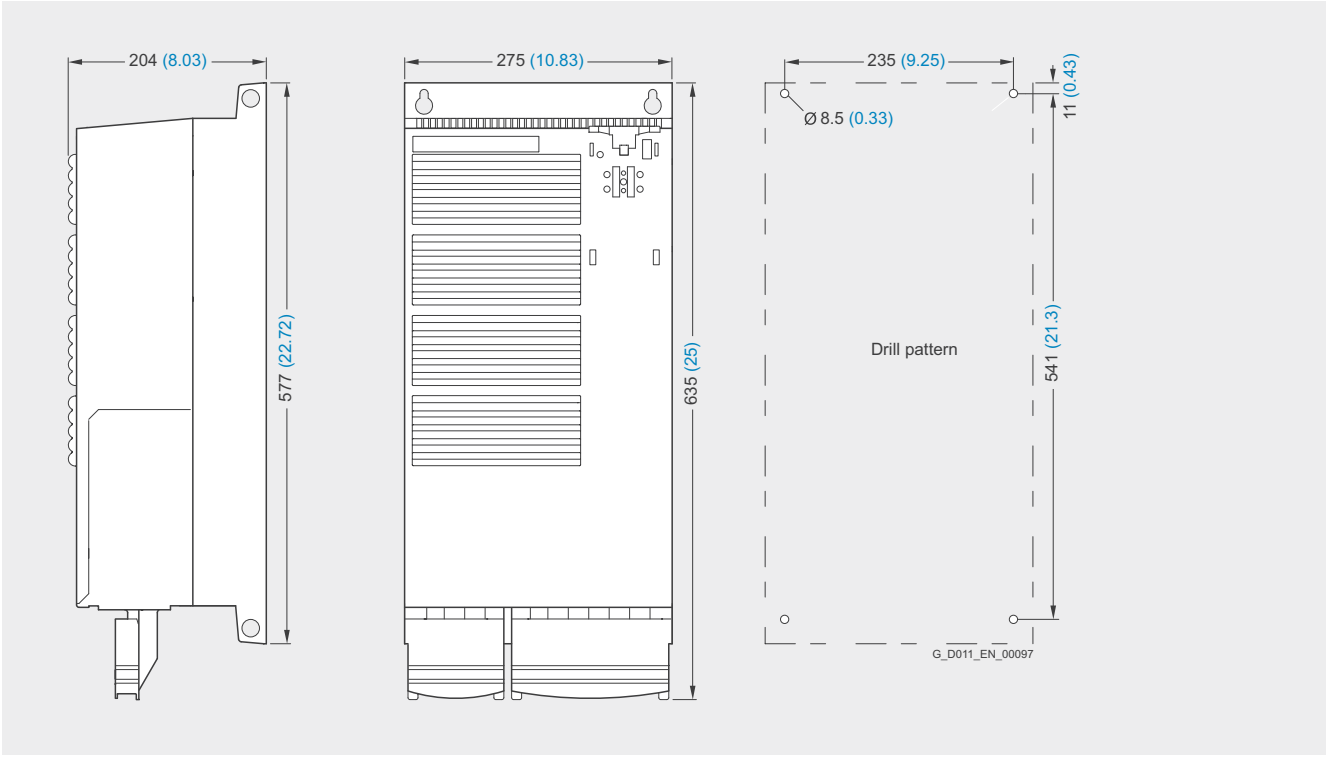
Ventilation clearance required at sides: 0 mm (0 inches)

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Dimensional drawings (continued)



PM250 Power Module frame size FSE with integrated line filter class A

Fixing with 4 M6 studs, 4 M6 nuts, 4 M6 washers

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

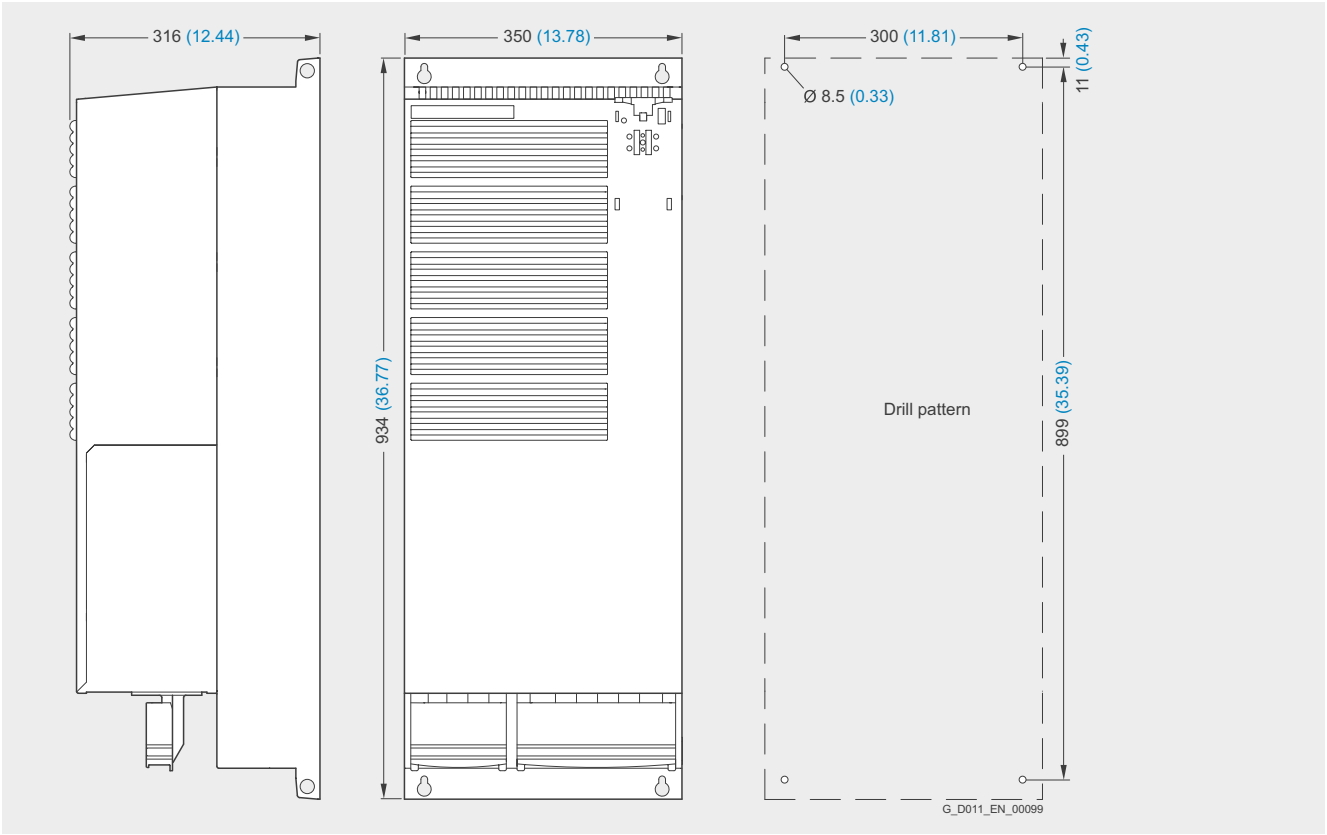
Ventilation clearance required at sides: 0 mm (0 inches)

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Dimensional drawings (continued)



PM250 Power Module frame size FSF with integrated line filter class A

Fixing 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: 0 mm (0 inches)

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Overview

Example of PM260 FSD Power Module

The PM260 Power Module features an absolutely unique technology which we have called “Efficient Infeed Technology”. The regenerative feedback capability of the PM260 Power Module in generating mode (electronic braking) means that energy is returned so the supply system and not destroyed in a braking resistor. This saves space in the control cabinet. The time-consuming dimensioning of the braking resistor as well as the wiring are eliminated. Generated heat is also reduced in the control cabinet.

The innovative circuit design used in Efficient Infeed Technology reduces supply 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 outstanding efficiency and an integral sine-wave filter. The integral sine-wave filter ensures that the inverter output current is sinusoidal and supports cable lengths of up to 200 m shielded and 300 m unshielded. An output reactor is therefore not required. Furthermore, lower bearing currents and voltage stress are generated, which reduces stress on the motor.

The incorporation 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 runs very quietly thanks to its high pulse frequencies.

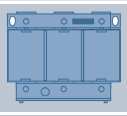
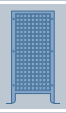
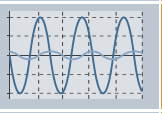
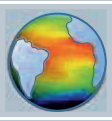
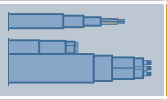
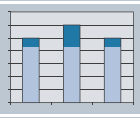
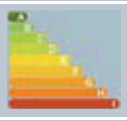
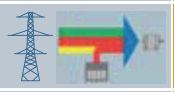
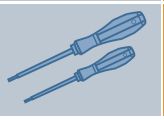
Standard motors can be used in conjunction with the PM260 Power Module. An increased dielectric strength of the winding system is not required.

The PM260 Power Module is suitable for safety-oriented applications. In conjunction with a Fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive (see Control Units).

The PM260 Power Modules with integrated class A line filter are suitable for connection to TN supply systems. Power Modules without integrated line filter can be connected to grounded (TN, TT) and non-grounded (IT) supply systems

Overview of how customers benefit from Efficient Infeed Technology

For more detailed information, please refer to section Efficient Infeed Technology in chapter Innovations.

	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

Overview of how customers benefit from SiC free-wheeling diodes

- Low switching losses at high fundamental frequency
- High speeds possible
- Quiet in operation thanks to pulse frequency = 16 kHz
- High thermal load capacity (small heatsinks)
- Very compact units
- Increased ruggedness
- High efficiency
- Low forward losses
- Power unit with regenerative feedback capability
- Integrated sine-wave filter, long unshielded cables can be used
- Suitable for use on motors without special insulation
- Very low bearing currents, no bearing insulation required

Selection and Ordering Data

To ensure correct selection of the Power Module, it should be chosen according to the

- **rated output current for applications with light overload (LO) or**
- **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 standard low-voltage motors, e.g. the new 1LE1 motor series (please refer to the Appendix for further information). The rated power is merely a guide value. For a description of the overload performance, please refer to the general technical data of the Power Modules.

Rated power [1]		Rated output current [2] I_{rated}	Power based on the base load current [3]		Base load current [3] I_H	Frame size	SINAMICS G120 PM260 Power Module without integrated line filter	SINAMICS G120 PM260 Power Module with integrated line filter (class A)
kW	hp	A	**kW**	hp	A		Order No.	Order No.
660 … 690 V 3 AC								
11.0	15	14	**7.5**	10	10	FSD	**6SL3225-0BH27-5UA0**	**6SL3225-0BH27-5AA0**
15.0	20	19	**11**	15	14	FSD	**6SL3225-0BH31-1UA0**	**6SL3225-0BH31-1AA0**
18.5	25	23	**15**	20	19	FSD	**6SL3225-0BH31-5UA0**	**6SL3225-0BH31-5AA0**
30	40	35	**22**	30	26	FSF	**6SL3225-0BH32-2UA0**	**6SL3225-0BH32-2AA0**
37	50	42	**30**	40	35	FSF	**6SL3225-0BH33-0UA0**	**6SL3225-0BH33-0AA0**
55	75	62	**37**	50	42	FSF	**6SL3225-0BH33-7UA0**	**6SL3225-0BH33-7AA0**

Accessories

	Order No.
Replacement connector for PM260 Power Modules (ingoing and outgoing connector)	**6SL3200-0ST04-0AA0**

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the loading for light overload (LO).

[2] The rated output current I_{rated} is based on the loading for light overload (LO). These current values are quoted on the rating plate of the Power Module.

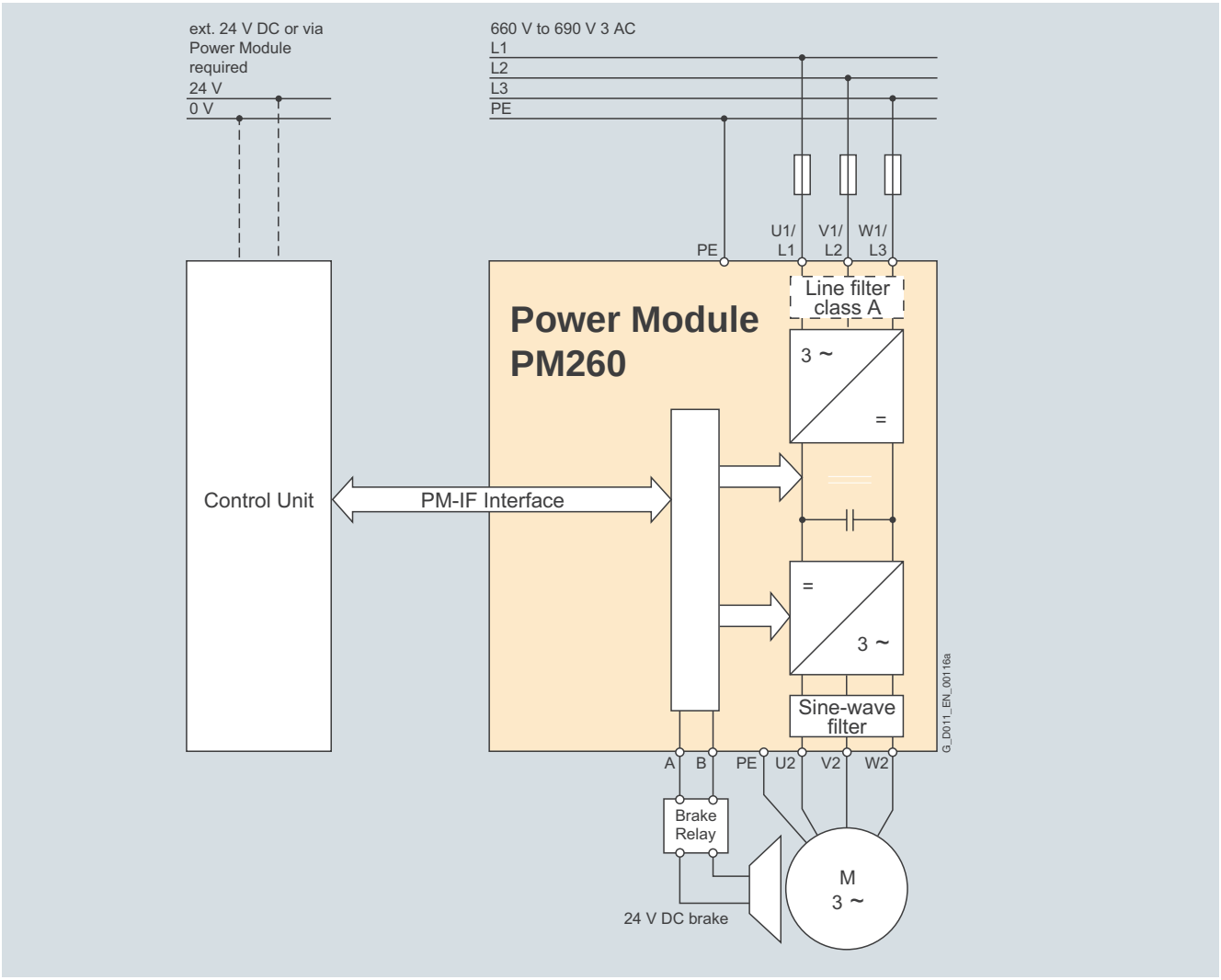
[3] The base load current I_H is based on the loading for high overload (HO).

Integration

PM260 Power Modules communicate with the Control Unit via the PM-IF interface.

PM260 Power Modules feature the following interfaces as standard:

- PM-IF interface for connection of the PM260 Power Module and Control Unit. The PM260 Power Module also supplies power to the Control Unit by means of an integrated power pack
- Motor connection made with screw terminals or screw studs
- Drive circuit for the Brake Relay or the Safe Brake Relay for controlling a motor brake
- 2 x PE (protective earth) connections



Connection diagram for PM260 Power Module with or without integrated line filter class A

Integration (continued)

Power and DC link components which 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**
PM260 Power Module with line-commutated energy feedback and integrated sine-wave filter						
Available frame sizes	–	–	–	✓	–	✓
Line-side power components						
Line filter class A	–	–	–	F	–	F
Line filter class B	–	–	–	–	–	–
Line reactor [1]	–	–	–	– [1]	–	– [1]
DC link components						
Braking resistor [2]	–	–	–	– [2]	–	– [2]
Load-side power components						
Output reactor	–	–	–	–	–	–
Sine-wave filter	–	–	–	I	–	I

I = Integrated
– = Not possible
F = Power Modules available without and with integrated filter class A

[1] A line reactor is not required and must not be used in conjunction with a Power Module of type PM260.

[2] A PM260 Power Module is capable of line-commutated energy feedback. A braking resistor cannot be connected to this module and must not be used.

Technical specifications

General technical data

	PM260 Power Modules
Line operating voltage	660 … 690 V 3 AC ±10 % The power units can also be operated with a minimal voltage of 500 V –10 %. In this case, the power is reduced linearly – see derating characteristics.
Line requirements Line short-circuit voltage u_K	≤ 1 %
Input frequency	47 … 63 Hz
Output frequency	
• Control type *V/f*	0 … 200 Hz
• Control type Vector	0 … 200 Hz
Pulse frequency	16 kHz (standard)
Power factor	0.95
Inverter efficiency	95 … 97 %
Control factor	87 %
Overload capability	
• High overload (HO)	1.5 x 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
• Light overload (LO)	1.1 x rated output current (i.e. 110 % overload) for 57 s with a cycle time of 300 s 1.4 × rated output current (i.e. 140 % overload) for 3 s with a cycle time of 300 s
Electromagnetic compatibility	Optional line filter class A compliant with EN 55011
Possible braking methods	Regenerative feedback in generating mode
Degree of protection	IP20
Operating temperature	
• High overload (HO)	–10 … +50 °C (14 … 122 °F) without derating, > 50 … 60 °C, see derating characteristics
• Light overload (LO)	–10 … +40 °C (14 … 104 °F) without derating, > 40 … 60 °C, see derating characteristics
Storage temperature	–40 … +70 °C (–40 … +158 °F)
Relative humidity	< 95 % RH, non-condensing
Cooling	Internal air cooling, power units with increased air cooling by built-in fans
Installation altitude	Up to 1000 m above sea level without derating, > 1000 m see derating characteristics
Standard SCCR (Short Circuit Current Rating) [1]	42 kA
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter interlock
Standards conformance	CE
CE mark	To Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EEC

[1] Applies to industrial control cabinet installations to NEC article 409/UL 508A. For further information, visit us on the Internet at: http://support.automation.siemens.com/WW/view/en/23995621

Technical specifications (continued)

Line voltage 660 ... 690 V 3 AC		PM260 Power Modules		
Without integrated line filter		6SL3225-0BH27-5UA0	6SL3225-0BH31-1UA0	6SL3225-0BH31-5UA0
With integrated line filter		6SL3225-0BH27-5AA0	6SL3225-0BH31-1AA0	6SL3225-0BH31-5AA0
Output current at 400 V 3 AC				
• Rated current I_{rated} 1)	A	14	19	23
• Base load current I_L 1)	A	14	19	23
• Base load current I_H 2)	A	10	14	19
• I_{max}	A	20	28	38
Rated power				
• 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)
Rated pulse frequency	kHz	16	16	16
Efficiency η		0.95	0.95	0.95
Power loss	kW	Available soon	Available soon	Available soon
Cooling air requirement	m^3/s	0.022	0.022	0.039
Sound pressure level L_{pA} (1 m)	dB	< 64	< 64	< 64
24 V DC power supply for the Control Unit	A	1	1	1
Input current				
• Rated current 3)	A	13	18	22
• based on I_H 3)	A	10	13	18
Line supply connection U1/L1, V1/L2, W1/L3		Terminal strip	Terminal strip	Terminal strip
• Conductor cross-section	mm^2	2.5 … 16	2.5 … 16	2.5 … 16
Motor connection U2, V2, W2		Terminal block	Terminal block	Terminal block
• Conductor cross-section	mm^2	2.5 … 16	2.5 … 16	2.5 … 16
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length, max.				
• Shielded	m	200	200	200
• Unshielded	m	300	300	300
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm	275	275	275
• Height	mm	512	512	512
• Depth				
- without Control Unit	mm	204	204	204
- with Control Unit	mm	260	260	260
Frame size		FSD	FSD	FSD
Weight, approx.				
• without integrated filter	kg	20	20	20
• with integrated filter	kg	21	21	21

1) The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

2) The base load current I_H is based on the loading for high overload (HO).

3) The input current depends on the motor load and line impedance. It applies with a line impedance of u_K = 1 %. The rated input currents apply for a load representing the rated power (based on I_{rated}) – these current values are specified on the rating plate.

Technical specifications (continued)

Line voltage 660 ... 690 V 3 AC		PM260 Power Modules		
Without integrated line filter		6SL3225-0BH32-2UA0	6SL3225-0BH33-0UA0	6SL3225-0BH33-7UA0
With integrated line filter		6SL3225-0BH32-2AA0	6SL3225-0BH33-0AA0	6SL3225-0BH33-7AA0
Output current at 400 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
Rated power				
• based on I_L	kW (hp)	30 (40)	37 (50)	55 (75)
• based on I_H	kW (hp)	22 (30)	30 (40)	37 (50)
Rated pulse frequency	kHz	16	16	16
Efficiency η		0.95	0.95	0.95
Power loss	kW	Available soon	Available soon	Available soon
Cooling air requirement	m^3/s	0.094	0.094	0.117
Sound pressure level L_{pA} (1 m)	dB	< 70	< 70	< 70
24 V DC power supply for the Control Unit	A	1	1	1
Input current				
• Rated current [3]	A	34	41	60
• based on I_H [3]	A	26	34	41
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35
Motor connection U2, V2, W2		M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm^2	10 … 35	10 … 35	10 … 35
PE connection		On housing with M6 screw	On housing with M6 screw	On housing with M6 screw
Motor cable length, max.				
• Shielded	m	200	200	200
• Unshielded	m	300	300	300
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm	350	350	350
• Height	mm	634	634	634
• Depth				
- without Control Unit	mm	316	316	316
- with Control Unit	mm	372	372	372
Frame size		FSF	FSF	FSF
Weight, approx.				
• without integrated filter	kg	46	46	46
• with integrated filter	kg	48	48	48

[1] The rated output current I_{rated} and the base load current I_L are based on the loading for light overload (LO).

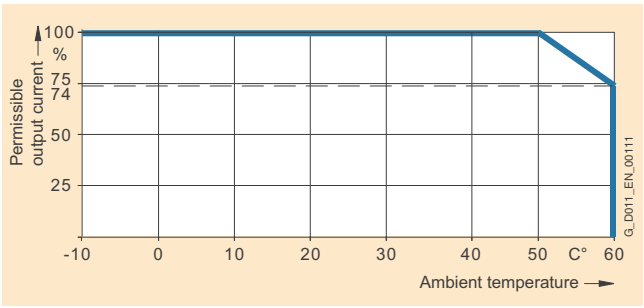
[2] The base load current I_H is based on the loading for high overload (HO).

[3] The input current depends on the motor load and line impedance. It applies with a line impedance of u_K = 1 %. The rated input currents apply for a load representing the rated power (based on I_{rated}) – these current values are specified on the rating plate.

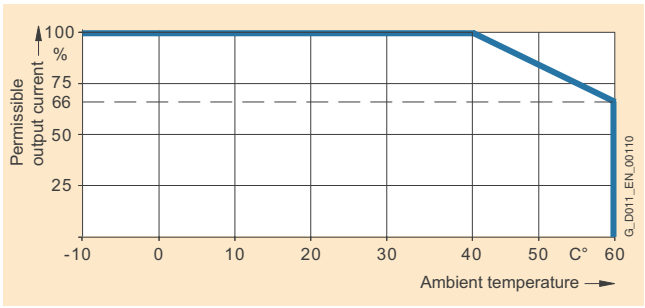
Characteristic curves

Derating data

Ambient temperature

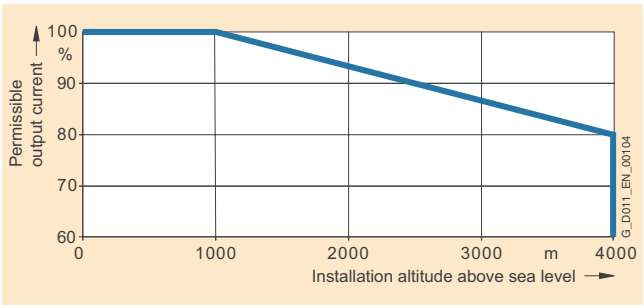


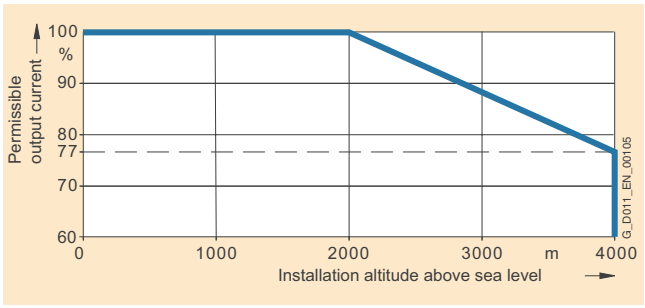
High overload (HO)



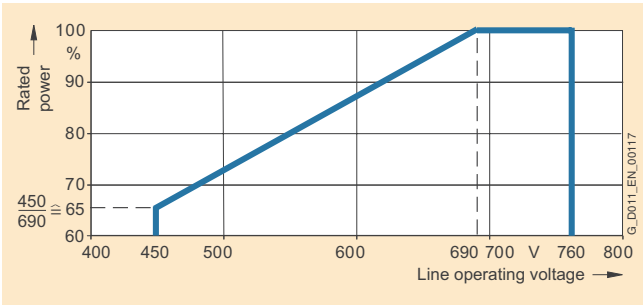
Light overload (LO)

Installation altitude



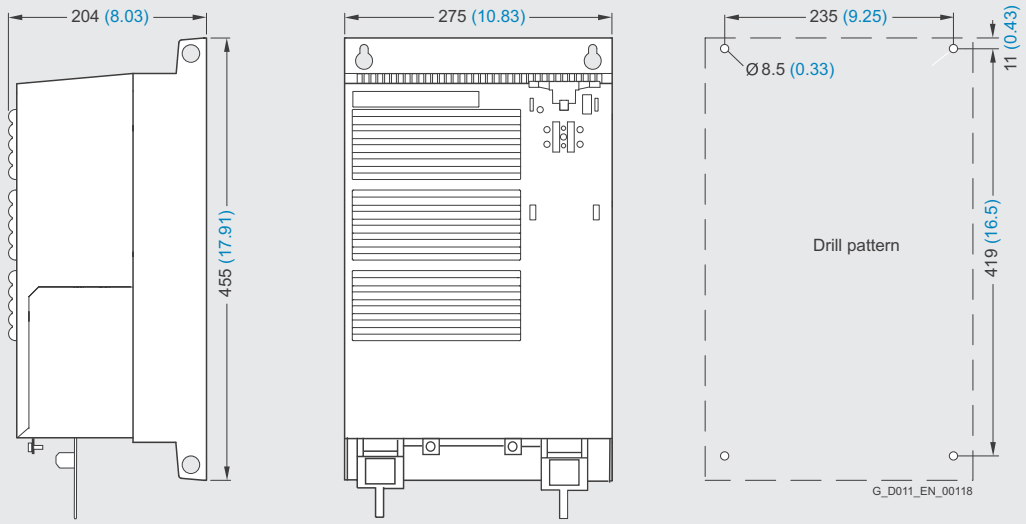


Line operating voltage



The power units can also be operated on a minimum voltage of 500 V –10 %. In this case, the power is reduced linearly as required.

Dimensional drawings



PM260 Power Module frame size FSD with and without integrated line filter class A

Fixing with 4 M6 studs, 4 M6 nuts, 4 M6 washers

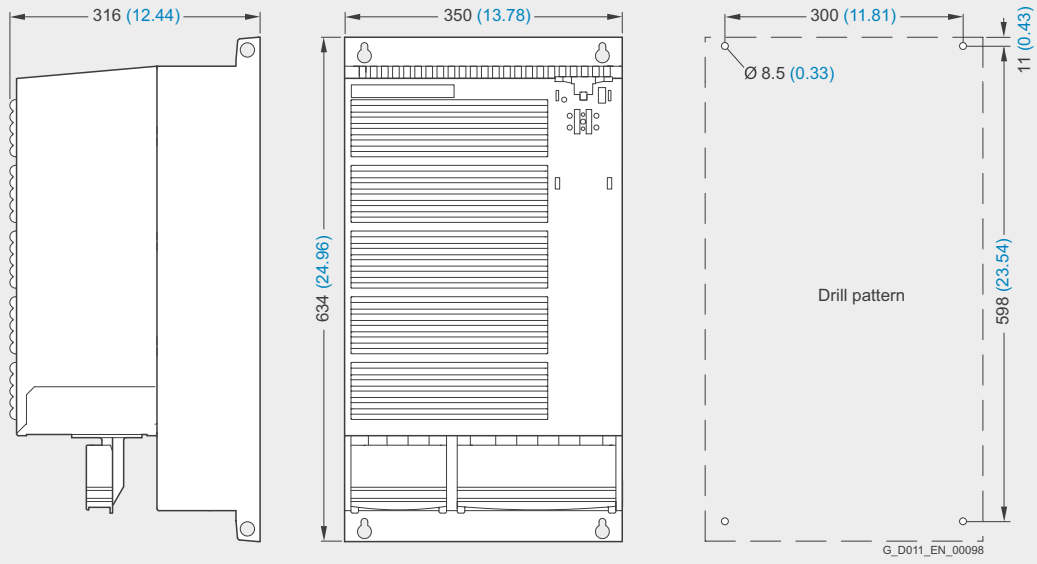
Ventilation clearance required at top and bottom:
300 mm (11.81 inches)

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

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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



PM260 Power Module frame size FSF with and without integrated line filter class A

Fixing 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: 0 mm (0 inches)

When the Control Unit is plugged in, the mounting depth increases by 56 mm (2.2 inches).

Exception: Mounting depth on CU240E +30 mm (+1.18 inches).

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

Overview

Example: Line filter for Power Modules frame size FSA

The Power Module complies with a higher radio interference class when an additional line filter is used.

Frame size FSA of the PM240 Power Module is available only without integrated line filter to class A. A base filter for compliance with class A is therefore provided. For compliance with class B, a base filter to class B is available.

Frame sizes FSB and FSC for the PM240 Power Module are available both with and without integrated line filter to class A. For compliance with class B, PM240 Power Modules with integrated line filter to class A must be fitted additionally with a base filter to class B.

Frame size FSC of the PM250 Power Module is available only with integrated line filter to class A. For compliance with class B, PM250 Power Modules with integrated line filter to class A must be fitted additionally with a base filter to class B.

Additional line filters to class B are not available for the PM260 Power Module

Line filters optionally available depending on the used Power Module

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240 Power Modules with integrated brake chopper						
Available frame sizes	✓	✓	✓	✓	✓	✓
Line-side power components						
Line filter class A	U	F	F	F	F	F/S [1]
Line filter class B	U	U	U	–	–	–
PM250 Power Modules with line-commutated energy recovery to the supply and integrated line filter class A						
Available frame sizes	–	–	✓	✓	✓	✓
Line-side power components						
Line filter class A	–	–	I	I	I	I
Line filter class B	–	–	U	–	–	–
PM260 Power Modules with line-commutated energy recovery to the supply an integrated sine-wave filter						
Available frame sizes	–	–	–	✓	–	✓
Line-side power components						
Line filter class A	–	–	–	F	–	F
Line filter class B	–	–	–	–	–	–

U = Base component
S = Lateral mounting
I = Integrated
– = Not possible
F = Power Modules available without and with integrated filter class A

[1] PM240 Power Modules FSF 110 kW (150 hp) and higher available only without integrated filter class A. An optional line filter class A for lateral mounting is available.

Selection and Ordering Data

Rated power		SINAMICS G120 Power Module PM240		**Line filter to class A** according to EN 55011
kW	hp	Type 6SL3224-...	Frame size	Order No.
380 … 480 V 3 AC				
0.37	0.50	0BE13-7UA0	FSA	**6SE6400-2FA00-6AD0**
0.55	0.75	0BE15-5UA0	FSA	
0.75	1.0	0BE17-5UA0	FSA	
1.1	1.5	0BE21-1UA0	FSA	
1.5	2.0	0BE21-5UA0	FSA	
110	150	0BE38-8UA0	FSF	**6SL3203-0BE32-5AA0**
132	200	0BE41-1UA0	FSF	

Rated power		SINAMICS G120 Power Module PM240		**Line filter to class B** according to EN 55011
kW	hp	Type 6SL3224-...	Frame size	Order No.
380 … 480 V 3 AC				
0.37	0.50	0BE13-7UA0	FSA	**6SE6400-2FB00-6AD0**
0.55	0.75	0BE15-5UA0	FSA	
0.75	1.0	0BE17-5UA0	FSA	
1.1	1.5	0BE21-1UA0	FSA	
1.5	2	0BE21-5UA0	FSA	
2.2	3	0BE22-2AA0	FSB	**6SL3203-0BE21-6SA0**
3.0	4	0BE23-0AA0	FSB	
4.0	5	0BE24-0AA0	FSB	
7.5	10	0BE25-5AA0	FSC	**6SL3203-0BD23-8SA0**
11	15	0BE27-5AA0	FSC	
15	20	0BE31-1AA0	FSC	

Rated power		SINAMICS G120 PM250 Power Module		**Line filter to class B** according to EN 55011
kW	hp	Type 6SL3225-...	Frame size	Order No.
380 … 480 V 3 AC				
7.5	10	0BE25-5AA0	FSC	**6SL3203-0BD23-8SA0**
11	15	0BE27-5AA0	FSC	
15	20	0BE31-1AA0	FSC	

Technical specifications

Line voltage 380 … 480 V 3 AC		Line filter class A		Line filter class B		
		6SE6400-2FA00-6AD0	**6SL3203-0BE32-5AA0**	**6SE6400-2FB00-6AD0**	**6SL3203-0BE21-6SA0**	**6SL3203-0BD23-8SA0**
Rated current	A	6	250	6	10.2	39.4
Line supply connection L1, L2, L3		Screw terminals	On housing via M8 screw stud	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	2.5	–	2.5	2.5	4
Load connection U, V, W		Shielded cable	On housing via M8 screw stud	Shielded cable	Shielded cable	Shielded cable
• Conductor cross-section	mm^2	3 × 2.5	–	3 × 2.5	3 × 2.5	3 × 4
• Length	m	0.4	–	0.4	0.4	0.4
PE connection		On housing via M4 screw studs	Flat connector for M10 screw	On housing via M4 screw studs	On housing via M4 screw studs	On housing via M4 screw studs
Degree of protection		IP20	IP00	IP20	IP20	IP20
Dimensions						
• Width	mm	73	240	73	153	190
• Height	mm	200	360	200	296	362
• Depth	mm	42.5	116	42.5	50	55
Possible as base component		yes	no	yes	yes	yes
Weight, approx.	kg	0.5	12.4	0.5	1.5	2.3
Suitable for PM240 Power Module	Type	6SL3224-0BE13-7UA0 6SL3224-0BE15-5UA0 6SL3224-0BE17-5UA0 6SL3224-0BE21-1UA0 6SL3224-0BE21-5UA0	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0	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
Suitable for PM250 Power Module		–	–	–	–	6SL3225-0BE25-5AA0 6SL3225-0BE27-5AA0 6SL3225-0BE31-1AA0
Frame size		FSA	FSF	FSA	FSB	FSC

Overview

Example: Line reactors for Power Modules frame sizes FSA to FSE

Example: Power Module frame size FSB with base line reactor and shield connection plate

The purpose of a line reactor is to reduce line-side harmonic currents and harmonic effects. This applies particularly in the case of weak power supplies (network short-circuit power u_K > 1 %).

Note: A line reactor must not be used in combination with a PM250 or PM260 Power Module.

Benefits

Only AC reactors are available as inverter reactors.

- Only an AC reactor offers protection for the input rectifier of the inverter.
- The capacitor service life of the inverter doubles when using an AC reactor compared to the service life when using a DC reactor.
- The harmonic response of AC reactors is almost constant during the whole service life. DC reactors are changing in their harmonic response by and by (over months).
- An AC reactor reduces a possible asymmetry of one current phase to another. A DC reactor would be inefficient in this case.

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 to the line reactor.

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

Line reactors which are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240 Power Module with integrated brake chopper						
Available frame sizes	✓	✓	✓	✓	✓	✓
Line-side power components						
Line reactor	U	U	U	U	U	S
PM250 Power Module with line-commutated energy feedback and integrated line filter class A						
Available frame sizes	–	–	✓	✓	✓	✓
Line-side power components						
Line reactor [1]	–	–	– [1]	– [1]	– [1]	– [1]
PM260 Power Module with line-commutated energy feedback and integrated sine-wave filter						
Available frame sizes	–	–	–	✓	–	✓
Line-side power components						
Line reactor [1]	–	–	–	– [1]	–	– [1]

U = Base component
S = Lateral mounting
– = Not possible

Selection and Ordering Data

Rated power		SINAMICS G120 PM240 Power Module		**Line reactor**
kW	hp	Type 6SL3224-...	Frame size	Order No.
380 … 480 V 3 AC				
0.37	0.50	0BE13-7UA0	FSA	**6SE6400-3CC00-2AD3**
0.55	0.75	0BE15-5UA0	FSA	
0.75	1.0	0BE17-5UA0	FSA	**6SE6400-3CC00-4AD3**
1.1	1.5	0BE21-1UA0	FSA	
1.5	2	0BE21-5UA0	FSA	**6SE6400-3CC00-6AD3**
2.2	3	0BE22-2 . A0	FSB	**6SL3203-0CD21-0AA0**
3.0	4	0BE23-0 . A0	FSB	
4.0	5	0BE24-0 . A0	FSB	**6SL3203-0CD21-4AA0**
7.5	10	0BE25-5 . A0	FSC	**6SL3203-0CD22-2AA0**
11.0	15	0BE27-5 . A0	FSC	
15.0	20	0BE31-1 . A0	FSC	**6SL3203-0CD23-5AA0**
18.5	25	0BE31-5 . A0	FSD	**6SL3203-0CJ24-5AA0**
22	30	0BE31-8 . A0	FSD	
30	40	0BE32-2 . A0	FSD	**6SL3203-0CD25-3AA0**
37	50	0BE33-0 . A0	FSE	**6SL3203-0CJ28-6AA0**
45	60	0BE33-7 . A0	FSE	
55	75	0BE34-5 . A0	FSF	**6SE6400-3CC11-2FD0**
75	100	0BE35-5 . A0	FSF	
90	125	0BE37-5 . A0	FSF	**6SE6400-3CC11-7FD0**
110	150	0BE38-8UA0	FSF	**6SL3000-0CE32-3AA0**
132	200	0BE41-1UA0	FSF	**6SL3000-0CE32-8AA0**

[1] A line reactor is not required and must not be used in conjunction with a PM250 or PM260 Power Module.

Technical specifications

Line voltage 380 … 480 V 3 AC		Line reactor			
		6SE6400-3CC00-2AD3	6SE6400-3CC00-4AD3	6SE6400-3CC00-6AD3	6SL3203-0CD21-0AA0
Rated current	A	1.9	3.5	4.8	9
Power loss at 50/60 Hz, approx.	W	6/7	12.5/15	7.5/9	9/11
Line supply connection U1, V1, W1		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	6	6	6	6
Load connection		Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)
• Length, approx.	m	0.38	0.38	0.38	0.46
PE connection		On housing with M5 screw stud	On housing with M5 screw stud	On housing with M5 screw stud	On housing with M5 screw stud
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm	75.5	75.5	75.5	153
• Height	mm	200	200	200	290
• Depth	mm	50	50	50	70
Possible as base component		yes	yes	yes	yes
Weight, approx.	kg	0.6	0.8	0.6	3.4
Suitable for PM240 Power Module	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
Rated current	A	11.6	25	31.3	47
Power loss at 50/60 Hz, approx.	W	27/32	98/118	37/44	90/115
Line supply connection U1, V1, W1		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	6	6	16	16
Load connection		Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG16 (1.5 mm^2)	4 × AWG10 (2.5 mm^2)	4 × AWG10 (2.5 mm^2)	4 × 16 mm^2
• Length, approx.	m	0.46	0.49	0.49	0.7
PE connection		On housing with M5 screw stud	On housing with M5 screw stud	On housing with M5 screw stud	On housing with M8 screw
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm	153	189	189	275
• Height	mm	290	371	371	455
• Depth	mm	70	50	50	84
Possible as base component		yes	yes	yes	yes
Weight, approx.	kg	3.4	5.2	5.9	13
Suitable for PM240 Power Module	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

Technical specifications (continued)

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
Rated current	A	63	94	151	186	224	278
Power loss at 50/60 Hz, approx.	W	90/115	170/215	280/360	280/360	240/270	210/250
Line supply connection 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^2	16	50	–	–	–	–
Load connection		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^2	4 × 16	4 × 35	–	–	–	–
• Length, approx.	m	0.7	0.7	–	–	–	–
PE connection		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
Degree of protection		IP20	IP20	IP00	IP00	IP00	IP00
Dimensions							
• Width	mm	275	275	240	240	270	270
• Height	mm	455	577	228	228	248	248
• Depth	mm	84	94	141	141	200	200
Possible as base component		yes	yes	no	no	no	no
Weight, approx.	kg	13	19	25	25	24	24
Suitable for PM240 Power Module	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

Overview

The following table lists recommendations for further 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. Fuses of type 3NA3 are recommended for European countries. 3NE1 fuses are UL-compliant (corresponds to RU).

Further information about the listed fuses and circuit-breakers can be found in Catalogs LV 1 and LV 1 T.

Selection and Ordering Data

Rated power		SINAMICS G120 Power Modules PM240		**Fuse**		**Circuit-breakers**
kW	hp	Type 6SL3224-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (RU) Order No.	Order No.
380 … 480 V 3 AC						
0.37	0.50	0BE13-7UA0	FSA	**3NA3803**	UL-listed fuses such as the class NON fuse series from Bussmann are required for North American countries.	**3RV1021-1CA10**
0.55	0.75	0BE15-5UA0	FSA			**3RV1021-1DA10**
0.75	1.0	0BE17-5UA0	FSA			**3RV1021-1FA10**
1.1	1.5	0BE21-1UA0	FSA			**3RV1021-1GA10**
1.5	2	0BE21-5UA0	FSA			**3RV1021-1JA10**
2.2	3	0BE22-2 . A0	FSB	**3NA3805**		**3RV1021-1KA10**
3.0	4	0BE23-0 . A0	FSB			**3RV1021-4AA10**
4.0	5	0BE24-0 . A0	FSB	**3NA3807**		**3RV1021-4BA10**
7.5	10	0BE25-5 . A0	FSC			**3RV1031-4EA10**
11.0	15	0BE27-5 . A0	FSC			**3RV1031-4FA10**
15.0	20	0BE31-1 . A0	FSC	**3NA3812**		**3RV1031-4HA10**
18.5	25	0BE31-5 . A0	FSD	**3NA3820**	**3NE1817-0**	**3RV1042-4KA10**
22	30	0BE31-8 . A0	FSD	**3NA3822**	**3NE1818-0**	
30	40	0BE32-2 . A0	FSD	**3NA3824**	**3NE1820-0**	**3RV1042-4MA10**
37	50	0BE33-0 . A0	FSE	**3NA3830**	**3NE1021-0**	**3VL1712-.DD33-....**
45	60	0BE33-7 . A0	FSE	**3NA3832**	**3NE1022-0**	**3VL1716-.DD33-....**
55	75	0BE34-5 . A0	FSF	**3NA3836**	**3NE1224-0**	**3VL3720-.DC36-....**
75	100	0BE35-5 . A0	FSF	**3NA3140**	**3NE1225-0**	**3VL3725-.DC36-....**
90	125	0BE37-5 . A0	FSF	**3NA3144**	**3NE1227-0**	**3VL4731-.DC36-....**
110	150	0BE38-8UA0	FSF	**–**	**3NE1227-0**	**3VL4731-.DC36-....**
132	200	0BE41-1UA0	FSF	**–**	**3NE1230-0**	**3VL4731-.DC36-....**

Selection and Ordering Data (continued)

Rated power		SINAMICS G120 Power Modules PM250		Fuse		Circuit-breakers
kW	hp	Type 6SL3225-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (RU) Order No.	Order No.
380 … 480 V 3 AC						
7.5	10	0BE25-5AA0	FSC	**3NA3807**	UL-listed fuses such as the class NON fuse series from Bussmann are required for North American countries.	**3RV1031-4EA10**
11.0	15	0BE27-5AA0	FSC	**3NA3812**		**3RV1031-4FA10**
15.0	20	0BE31-1AA0	FSC	**3NA3814**		**3RV1031-4HA10**
18.5	25	0BE31-5AA0	FSD	**3NA3820**	**3NE1817-0**	**3RV1042-4KA10**
22	30	0BE31-8AA0	FSD	**3NA3822**	**3NE1818-0**	
30	40	0BE32-2AA0	FSD	**3NA3824**	**3NE1820-0**	**3RV1042-4MA10**
37	50	0BE33-0AA0	FSE	**3NA3830**	**3NE1021-0**	**3VL1712-.DD33-....**
45	60	0BE33-7AA0	FSE	**3NA3832**	**3NE1022-0**	**3VL1716-.DD33-....**
55	75	0BE34-5AA0	FSF	**3NA3836**	**3NE1224-0**	**3VL3720-.DC36-....**
75	100	0BE35-5AA0	FSF	**3NA3140**	**3NE1225-0**	**3VL3725-.DC36-....**
90	125	0BE37-5AA0	FSF	**3NA3144**	**3NE1227-0**	**3VL4731-.DC36-....**

Rated power		SINAMICS G120 Power Modules PM260		Fuse		Circuit-breakers
kW	hp	Type 6SL3225-...	Frame size	Type 3NA3 Order No.	Type 3NE1 (RU) Order No.	Order No.
660 … 690 V 3 AC						
11.0	15	0BH27-5 . A0	FSD	**3NA3120-6**	–	**3RV1041-4FA10**
15.0	20	0BH31-1 . A0	FSD			
18.5	25	0BH31-5 . A0	FSD			
30	40	0BH32-2 . A0	FSF	**3NA3122-6**		**3RV1041-4JA10**
37	50	0BH33-0 . A0	FSE			**3RV1041-4KA10**
55	75	0BH33-7 . A0	FSF	**3NA3130-6**		**3RV1041-4MA10**

Overview

Example: Braking resistors for Power Modules, frame sizes FSA and FSC

Excess power in the DC link is dissipated via the braking resistor. The braking resistors are intended for use with PM240 Power Modules which feature an integrated brake chopper, but cannot regenerate energy to the supply system. 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 of the FSC to FSF frame sizes should be placed outside the control cabinet or outside the control room in order to dissipate the resulting heat loss from the area of the Power Modules, thereby allowing a corresponding reduction in the level of air conditioning required.

Every braking resistor is designed with a temperature switch (UL-listed). The temperature switch can be evaluated to prevent consequential damage if the braking resistor overheats.

3

Braking resistors which are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240 Power Module with integrated brake chopper						
Available frame sizes	✓	✓	✓	✓	✓	✓
DC link components						
Braking resistor	U	U	S	S	S	S
PM250 Power Module with line-commutated energy feedback and integrated line filter class A						
Available frame sizes	–	–	✓	✓	✓	✓
DC link components						
Braking resistor [1]	–	–	– [1]	– [1]	– [1]	– [1]
PM260 Power Module with line-commutated energy feedback and integrated sine-wave filter						
Available frame sizes	–	–	–	✓	–	✓
DC link components						
Braking resistor [1]	–	–	–	– [1]	–	– [1]

U = Base component
S = Lateral mounting
– = Not possible

[1] PM250 and PM260 Power Modules are capable of line-commutated energy feedback. A braking resistor cannot be connected to these modules and would be superfluous.

Selection and Ordering Data

Rated power		SINAMICS G120 Power Module PM240		**Braking resistor**
kW	hp	Type 6SL3224-...	Frame size	Order No.
380 … 480 V 3 AC				
0.37	0.50	0BE13-7UA0	FSA	**6SE6400-4BD11-0AA0**
0.55	0.75	0BE15-5UA0	FSA	
0.75	1.0	0BE17-5UA0	FSA	
1.1	1.5	0BE21-1UA0	FSA	
1.5	2	0BE21-5UA0	FSA	
2.2	3	0BE22-2 . A0	FSB	**6SL3201-0BE12-0AA0**
3.0	4	0BE23-0 . A0	FSB	
4.0	5	0BE24-0 . A0	FSB	
7.5	10	0BE25-5 . A0	FSC	**6SE6400-4BD16-5CA0**
11.0	15	0BE27-5 . A0	FSC	
15.0	20	0BE31-1 . A0	FSC	
18.5	25	0BE31-5 . A0	FSD	**6SE6400-4BD21-2DA0**
22	30	0BE31-8 . A0	FSD	
30	40	0BE32-2 . A0	FSD	
37	50	0BE33-0 . A0	FSE	**6SE6400-4BD22-2EA0**
45	60	0BE33-7 . A0	FSE	
55	75	0BE34-5 . A0	FSF	**6SE6400-4BD24-0FA0**
75	100	0BE35-5 . A0	FSF	
90	125	0BE37-5 . A0	FSF	
110	150	0BE38-8UA0	FSF	**6SE6400-4BD26-0FA0**
132	200	0BE41-1UA0	FSF	

Technical specifications

Line voltage 380 V … 480 V 3 AC		Braking resistor		
		6SE6400-4BD11-0AA0	6SL3201-0BE12-0AA0	6SE6400-4BD16-5CA0
Resistor	Ω	390	160	56
Rated power P_{DB}	kW	0.1	0.2	0.65
Peak power P_{max} (cycle time 12 s)	kW	2	4	11
Power connections		Shielded cable	Shielded cable	Shielded cable
• Conductor cross-section	mm^2	3 × 2.5	3 × 2.5	3 × 2.5
• Length	m	0.5	0.5	0.9
Thermostatic switch (NC contact) Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
Degree of protection		IP20	IP20	IP20
Frame size		FSA	FSB	FSC
Dimensions				
• Width	mm	72	153	185
• Height	mm	230	329	285
• Depth	mm	43.5	43.5	150
Possible as base component		yes	yes	no
Weight, approx.	kg	1	2	3.8
Suitable for PM240 Power Module	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

Line voltage 380 V … 480 V 3 AC		Braking resistor			
		6SE6400-4BD21-2DA0	6SE6400-4BD22-2EA0	6SE6400-4BD24-0FA0	6SE6400-4BD26-0FA0
Resistor	Ω	27	15	8.2	5.5
Rated power P_{DB}	kW	1.2	2.2	4	6
Peak power P_{max} (cycle time 12 s)	kW	24	44	80	120
Power connections		M6 screw studs	M6 screw studs	M6 screw studs	M6 screw studs
Thermostatic switch (NC contact) Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/0.2 A	250 V AC/0.2 A
Degree of protection		IP20	IP20	IP20	IP20
Frame size		FSD	FSE	FSF	FSF
Dimensions					
• Width	mm	270	270	395	483
• Height	mm	515	645	650	526
• Depth	mm	175	175	315	301
Possible as base component		no	no	no	no
Weight, approx.	kg	7.4	10.6	16.7	21
Suitable for PM240 Power Module	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	6SL3224-0BE38-8UA0 6SL3224-0BE41-1UA0
Frame size		FSD	FSE	FSF	FSF

Load-side power components
Output reactors

Overview

Example: Output reactors for Power Modules frame sizes FSA and FSB

Output reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents, which place an additional load on the power section 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.

Output reactors which are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240 Power Module with integrated brake chopper						
Available frame sizes	✓	✓	✓	✓	✓	✓
Load-side power components						
Output reactor	U	U	U	S	S	S
Sine-wave filter	Available soon	Available soon	Available soon	Available soon	Available soon	Available soon
PM250 Power Module with line-commutated energy feedback and integrated line filter class A						
Available frame sizes	–	–	✓	✓	✓	✓
Load-side power components						
Output reactor	–	–	U	S	S	S
Sine-wave filter	–	–	Available soon	Available soon	Available soon	Available soon
PM260 Power Module with line-commutated energy feedback and integrated sine-wave filter						
Available frame sizes	–	–	–	✓	–	✓
Load-side power components						
Output reactor [1)]	–	–	–	–	–	–
Sine-wave filter	–	–	–	I	–	I

U = Base component
S = Lateral mounting
I = Integrated
– = Not possible

1) PM260 Power Modules do not require output reactors as they are already equipped with sine-wave filters.

Selection and Ordering Data

Rated power		SINAMICS G120 Power Modules PM240		Output reactor
kW	hp	Type 6SL3224-...	Frame size	Order No.
380 … 480 V 3 AC				
0.37	0.50	0BE13-7UA0	FSA	**6SE6400-3TC00-4AD2**
0.55	0.75	0BE15-5UA0	FSA	
0.75	1.0	0BE17-5UA0	FSA	
1.1	1.5	0BE21-1UA0	FSA	
1.5	2	0BE21-5UA0	FSA	
2.2	3	0BE22-2 . A0	FSB	**6SL3202-0AE21-0CA0**
3.0	4	0BE23-0 . A0	FSB	
4.0	5	0BE24-0 . A0	FSB	
7.5	10	0BE25-5 . A0	FSC	**6SL3202-0AJ23-2CA0**
11.0	15	0BE27-5 . A0	FSC	
15.0	20	0BE31-1 . A0	FSC	
18.5	25	0BE31-5 . A0	FSD	**6SE6400-3TC05-4DD0**
22	30	0BE31-8 . A0	FSD	**6SE6400-3TC03-8DD0**
30	40	0BE32-2 . A0	FSD	**6SE6400-3TC05-4DD0**
37	50	0BE33-0 . A0	FSE	**6SE6400-3TC08-0ED0**
45	60	0BE33-7 . A0	FSE	**6SE6400-3TC07-5ED0**
55	75	0BE34-5 . A0	FSF	**6SE6400-3TC14-5FD0**
75	100	0BE35-5 . A0	FSF	**6SE6400-3TC15-4FD0**
90	125	0BE37-5 . A0	FSF	**6SE6400-3TC14-5FD0**
110	150	0BE38-8UA0	FSF	**6SL3000-2BE32-1AA0**
132	200	0BE41-1UA0	FSF	**6SL3000-2BE32-6AA0**

Rated power		SINAMICS G120 Power Modules PM250		Output reactor
kW	hp	Type 6SL3225-...	Frame size	Order No.
380 … 480 V 3 AC				
7.5	10	0BE25-5 . A0	FSC	**6SL3202-0AJ23-2CA0**
11.0	15	0BE27-5 . A0	FSC	
15.0	20	0BE31-1 . A0	FSC	
18.5	25	0BE31-5 . A0	FSD	**6SE6400-3TC05-4DD0**
22	30	0BE31-8 . A0	FSD	**6SE6400-3TC03-8DD0**
30	40	0BE32-2 . A0	FSD	**6SE6400-3TC05-4DD0**
37	50	0BE33-0 . A0	FSE	**6SE6400-3TC08-0ED0**
45	60	0BE33-7 . A0	FSE	**6SE6400-3TC07-5ED0**
55	75	0BE34-5 . A0	FSF	**6SE6400-3TC14-5FD0**
75	100	0BE35-5 . A0	FSF	**6SE6400-3TC15-4FD0**
90	125	0BE37-5 . A0	FSF	**6SE6400-3TC14-5FD0**

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Output reactor** (for a 4 kHz pulse frequency) 6SE6400-3TC00-4AD2				
Rated current	A	4	4	4	4	4
Power loss	kW	0.005	0.005	0.005	0.005	0.005
Connection to the Power Module		Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)	4 × AWG16 (1.5 mm^2)
• Length, approx.	m	0.3	0.3	0.3	0.3	0.3
Motor connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	6	6	6	6	6
PE connection		M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor						
• Shielded	m	100	100	100	100	100
• Unshielded	m	150	150	150	150	150
Dimensions						
• Width	mm	75.5	75.5	75.5	75.5	75.5
• Height	mm	200	200	200	200	200
• Depth	mm	110	110	110	110	110
Possible as base component		yes	yes	yes	yes	yes
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg	2	2	2	2	2
Suitable for PM240 Power Module	Type	6SL3224-0BE13-7UA0	6SL3224-0BE15-5UA0	6SL3224-0BE17-5UA0	6SL3224-0BE21-1UA0	6SL3224-0BE21-5UA0
Rated output 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

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)					
		6SL3202-0AE21-0CA0			6SL3202-0AJ23-2CA0		
Rated current	A	9.4	9.4	9.4	32	32	32
Power loss	kW	0.02	0.02	0.02	0.06	0.06	0.06
Connection to the Power Module		Cable	Cable	Cable	Cable	Cable	Cable
• Conductor cross-section		4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)	4 × AWG14 (1.5 mm^2)
• Length, approx.	m	0.4	0.4	0.4	0.35	0.35	0.35
Motor connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	6	6	6	6	6	6
PE connection		M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor							
• Shielded	m	100	100	100	100	100	100
• Unshielded	m	150	150	150	150	150	150
Dimensions							
• Width	mm	154	154	154	189	189	189
• Height	mm	270	270	270	334	334	334
• Depth	mm	70	70	70	80	80	80
Possible as base component		yes	yes	yes	yes	yes	yes
Degree of protection		IP00	IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg	4.4	4.4	4.4	9.1	9.1	9.1
Suitable for PM240 Power Module	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
Suitable for PM250 Power Module	Type	–	–	–	6SL3225-0BE25-5AA0	6SL3225-0BE27-5AA0	6SL3225-0BE31-1AA0
Rated output of the Power Module	kW (hp)	2.2 (3.0)	3 (4.0)	4 (5.0)	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

Technical specifications (continued)

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
Rated current	A	68	45	68	104	90
Power loss	kW	0.2	0.2	0.2	0.17	0.27
Connection to the Power Module		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
Motor connection		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
PE connection		M6 screw	M6 screw	M6 screw	M6 screw	M6 screw
Cable length, max. between output reactor and motor						
• Shielded	m	200	200	200	200	200
• Unshielded	m	300	300	300	300	300
Dimensions						
• Width	mm	225	225	225	225	270
• Height	mm	210	210	210	210	248
• Depth	mm	150	179	150	150	209
Possible as base component		no	no	no	no	no
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg	10.7	16.1	10.7	10.4	24.9
Suitable for PM240 Power Module	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
Suitable for PM250 Power Module	Type	6SL3225-0BE31-5AA0	6SL3225-0BE31-8AA0	6SL3225-0BE32-2AA0	6SL3225-0BE33-0AA0	6SL3225-0BE33-7AA0
Rated output 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

Technical specifications (continued)

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
Rated current	A	178	178	178	210	260
Power loss	kW	0.47	0.25	0.47	0.49	0.5
Connection to the Power Module		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
Motor connection		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
PE connection		M8 screw	M6 screw	M8 screw	M8 screw	M8 screw
Cable length, max. between output reactor and motor						
• Shielded	m	200	200	200	300	300
• Unshielded	m	300	300	300	450	450
Dimensions						
• Width	mm	350	270	350	300	300
• Height	mm	321	248	321	285	315
• Depth	mm	288	209	288	257	277
Possible as base component		no	no	no	no	no
Degree of protection		IP00	IP00	IP00	IP00	IP00
Weight, approx.	kg	51.5	24	51.5	60	66
Suitable for PM240 Power Module	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
Suitable for PM250 Power Module	Type	6SL3225-0BE34-5AA0	6SL3225-0BE35-5AA0	6SL3225-0BE37-5AA0	–	–
Rated output 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

Overview

The Basic Operator Panel BOP can be used to commission drives, monitor drives in operation and input 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 Control Unit.

The BOP offers a function that enables you to copy parameters quickly and easily. A parameter set of one inverter can be saved and then loaded to another inverter.

Selection and Ordering Data

	Order No.
Basic Operator Panel BOP	**6SL3255-0AA00-4BA1**

Integration

Control Unit with mounted Basic Operator Panel BOP

Overview

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

This is an isolated RS232 adapter module for a reliable point-to-point connection to a PC with a serial RS232 interface. A USB/RS232 adapter can be used as an alternative (type 12.02.1086R supplied by Roline has been successfully tested).

The scope of supply includes a 9-pin Sub-D connector, an RS232 standard cable (3 m), and the STARTER commissioning tool [1] on DVD.

With these, the inverter can be

- parameterized (commissioning, optimization),
- monitored (diagnostics) and
- controlled (master control via STARTER for test purposes).

Selection and Ordering Data

	Order No.
PC inverter connection kit including a 9-pin Sub-D connector, an RS232 standard cable (3 m), and the STARTER commissioning tool [1] on DVD	**6SL3255-0AA00-2AA1**

[1] STARTER commissioning tool also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

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

	Order No.
Brake Relay including cable harness for connection to the Power Module	**6SL3252-0BB00-0AA0**

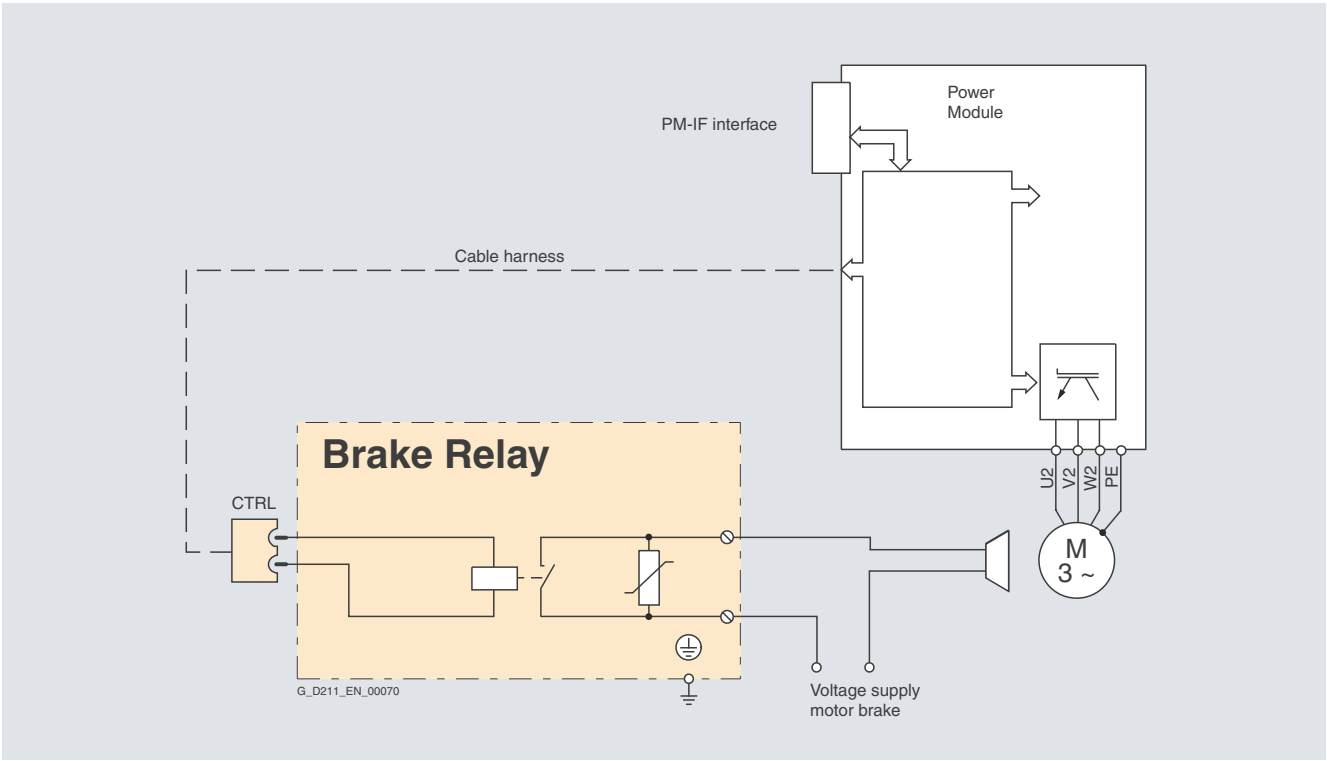
Integration

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.



Connection example for Brake Relay

Technical specifications

	Brake Relay
Switching capability of the NO contact, max.	440 V AC / 3.5 A 30 V DC / 12 A
Conductor cross-section, max.	2.5 mm^2
Degree of protection	IP20
Dimensions	
• Width	68 mm
• Height	63 mm
• Depth	33 mm
Weight, approx.	0.17 kg

Overview

The Safe Brake Relay allows the Power Module to be safely connected to an electromechanical motor brake, allowing the brake to be directly and safely controlled by the Control Unit in accordance with EN 954-1, safety category 3, and IEC 61508 SIL 2.

Selection and Ordering Data

	Order No.
Safe Brake Relay including cable harness for connection to the Power Module	**6SL3252-0BB01-0AA0**

Integration

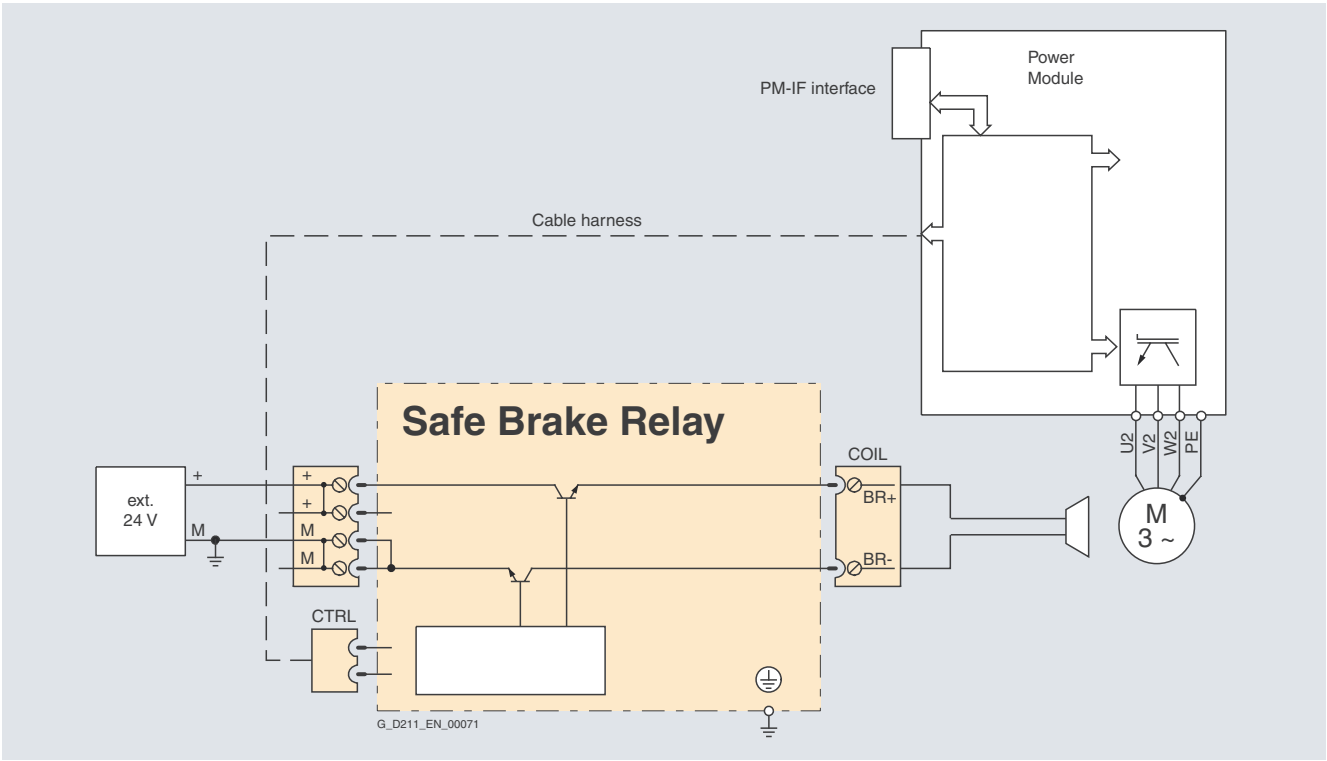
The Safe Brake Relay has the following interfaces:

- A two-channel transistor output stage to control the motor brake solenoid
- A connection for a 24 V DC voltage supply
- A connection for the cable harness (CTRL) for connection to the Power Module

The Safe Brake Relay can be mounted on the shield bonding plate near the power terminals of the Power Module.

The supplied Safe Brake Relay includes the cable harness for connection with the Power Module.

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.



Typical connection of Safe Brake Relay

Technical specifications

	Safe Brake Relay
Supply voltage	20.4 … 28.8 V DC Recommended rated value of the supply voltage 26 V DC (to equalize and compensate for the voltage drop along the feeder cable to the 24 V DC solenoid of the motor brake)
Current requirement of motor brake, max.	2 A
Current requirement at 24 V DC, max.	0.005 A + current drain of motor brake

	Safe Brake Relay
Conductor cross-section, max.	2.5 mm^2
Degree of protection	IP20
Dimensions	
• Width	68 mm
• Height	63 mm
• Depth	33 mm
Weight, approx.	0.17 kg

Supplementary system components
Adapter for DIN rail attachment

Overview

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

Furthermore, the motor cable shield connection and other cable shields required for DIN-rail mounting of inverters 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 inverters 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.

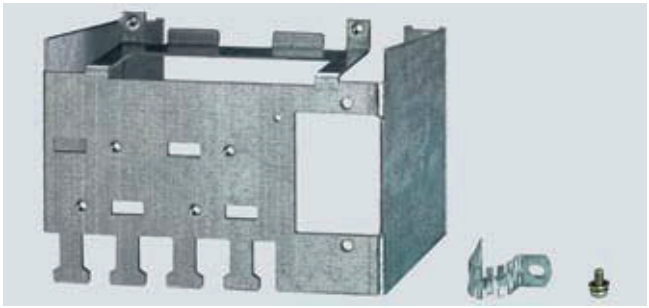
Selection and Ordering Data

Adapter for DIN rail attachment	Order No.
• for Power Module frame size FSA	**6SL3262-1BA00-0BA0**
• for Power Module frame size FSB	**6SL3262-1BB00-0BA0**

3

Shield connection kit

Overview



Example of shield connection kit for Power Module frame size FSB

The shield connection kit

- makes it easier to bond the shields of supply and control cables
- provides mechanical strain relief
- ensures optimum EMC performance

The shield connection kit includes

- a shield bonding plate for the required Power Module
- a shield bonding plate for a Control Unit
- connection elements and clamps for mounting
- mounting device for Brake Relay or Safe Brake Relay – frame sizes FSB to FSF

Selection and Ordering Data

Shield connection kit	Order No.
• for PM240/PM250 Power Modules	
- Frame size FSA	**6SL3262-1AA00-0BA0**
- Frame size FSB	**6SL3262-1AB00-0DA0**
- Frame size FSC	**6SL3262-1AC00-0DA0**
- Frame sizes FSD and FSE	**6SL3262-1AD00-0DA0**
- Frame size FSF	**6SL3262-1AF00-0DA0**
• for PM260 Power Modules	
- Frame size FSD	**6SL3262-1FD00-0CA0**
- Frame size FSF	**6SL3262-1FF00-0CA0**

SINAMICS G120D
Distributed frequency inverters
0.75 kW to 7.5 kW (1.0 hp to 10 hp)

4

Distributed frequency inverters SINAMICS G120D

Overview

The new SINAMICS G120D distributed frequency inverter series is the solution for demanding drive tasks especially in the field of conveyor systems. SINAMICS G120D supports bump-free, closed-loop speed control of three-phase asynchronous motors and fulfills all the requirements of conveyor system applications from simple frequency control through to demanding vector control. With its well-thought-out modular type of construction to the IP65 degree of protection (tested to UL50 type 3), it is seamlessly integrated into the plant and supports a high plant availability and minimizes spare parts inventories. The innovative power module concept with regenerative feedback capability helps to save energy. Safety functions that are unique worldwide support enhanced plant concepts with increased 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 an output range of 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 Power Module PM250D and Fail-Safe Control Unit CU240D DP-F

Reasons for using distributed drive systems

- Modular drive solutions providing standardized mechatronic elements that can be individually tested
- No need for a control cabinet, resulting in a smaller space requirement and less air-conditioning
- Long cables between the inverter and motor can be avoided (which means lower output losses, reduced interference 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)

Modularity

SINAMICS G120D is a modular inverter system to IP65 degree of protection comprising a variety of functional units. The two main units are

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

The Control Unit controls and monitors the Power Module and the connected motor in several different control modes. The digital inputs and digital outputs on the device support the simple wiring of sensors and actuators directly on the drive. The input signals can either be directly linked within the Control Unit and trigger local responses automatically or they can be transferred to the central controller via PROFIBUS or PROFINET for processing within the context of the overall plant.

The Power Module supplies the motor in the power range 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. It also features a range of safety functions offering a high degree of protection for the Power Module and motor. The unusually slimline type of construction is optimized for use directly in the plant. The Power Module also has the same drilling template for all outputs (constant footprint).

Safety Integrated

The SINAMICS G120D distributed frequency inverters are available in a number of different variants 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 frequency 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 a motor sensor or 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 safety functions “Safely Limited Speed” and “Safe Stop 1” are certified for asynchronous motors without encoders – these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

For further information, please refer to section Safety Integrated in chapter Innovations.

Efficient Infeed Technology

The advanced Efficient Infeed Technology is employed in PM250D Power Modules. This technology allows the energy produced by motors operating in generator mode on 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.

For further information, please refer to section Efficient Infeed Technology in chapter Innovations.

STARTER commissioning tool

The STARTER commissioning tool (STARTER Version 4.1, 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.

Benefits

- Compact and space-saving design with slimline type of construction and identical drilling template for all outputs
- Wide output 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 supply system. This feedback capability provides enormous savings 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 space requirement and installation costs for the high IP65 degree of protection.
- Enhanced ruggedness and longer service life due to coating of the electronic modules
- Flexibility due to modularity for a future-oriented distributed drive concept in the high IP65 degree of protection
  - Module replacement when system is running (hot swapping)
  - The modules can be easily replaced, which makes the system extremely service friendly.
- Capable of communicating via PROFINET or PROFIBUS with PROFIdrive Profile 4.0
  - Reduced number of interfaces
  - Plant-wide engineering
  - Easy to handle
- The ability to connect up to six sensors and up to two actuators directly to the Control Unit means that almost all drive information can be directly managed; local preprocessing of the signals takes the load off the fieldbus at a high and reproducible response time.
- Integrated EMC filter of class A (according to EN 55011), integrated braking control (400 V 1 AC rectified, corresponds to 180 V DC) and integrated motor protection due to thermal motor model and evaluation of PTC or KTY 84 temperature sensors
- Software parameters for easy adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- Easy replacement of devices and time-saving copying of parameters with the optional MMC memory card
- Engineering and commissioning with uniform engineering tools such as SIZER (Version 2.9 and higher), STARTER (Version 4.1, SP1 and higher) and Drive ES: Ensure rapid engineering and easy commissioning – STARTER is integrated in 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, Cat. 3 and IEC 61508 SIL 2

Application

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. assembly lines.

SINAMICS G120D is also suitable for further high-performance applications, e.g. in the airport sector, food and beverages industry (without tensides) and in distribution logistics (e.g. monorail overhead conveyors).

Configuration

The following electronic configuration and engineering tools are available for SINAMICS G120D distributed frequency inverters:

SD configurator selection aid within the CA 01

The interactive catalog CA 01 – the offline mall of Siemens Automation and Drives (A&D) – contains over 100000 products with approximately 5 million potential drive system product variants. The SD configurator has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of Standard Drives products. The configurator is integrated in this catalog with the selection and configuration tools as a "selection guide" on CD 2 "Configuring".

SIZER configuration tool

The SIZER PC tool provides an easy-to-use means of configuring the SINAMICS and MICROMASTER 4 drive family. It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER supports the complete configuration of the drive system, from simple individual drives to complex multi-axis applications. For SINAMICS G120D as from SIZER Version 2.9.

STARTER commissioning tool

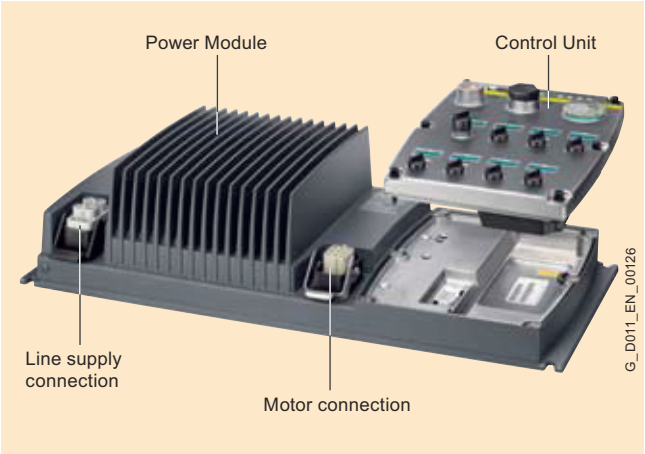
The STARTER commissioning tool provides menu-guided assistance with commissioning, optimization and diagnostics. STARTER is not only designed for use on SINAMICS drives but also for MICROMASTER4 units and frequency inverters for the distributed I/O SIMATIC ET 200S FC and SIMATIC ET 200pro FC. For SINAMICS G120D from STARTER Version 4.1, SP1.

Drive ES engineering system

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. The STEP 7 Manager user interface provides the basis for this procedure. A variety of software packages, i.e. Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7, is available for SINAMICS.

Design

The SINAMICS G120D distributed frequency inverters are modular frequency inverters for standard drives. Each SINAMICS G120D comprises two operative units – the Power Module and Control Unit.



Power Module PM250D with line and motor connections and Control Unit CU240D

Power Modules

The following Power Modules are available for SINAMICS G120D distributed frequency inverters:

PM250D Power Modules

PM250D Power Modules use an innovative circuit design which allows line-commutated energy recovery to the supply. This innovative circuit permits generator energy to be fed back into the supply system and, therefore, saves energy.

Accessories

Connector sets for line infeed, the outgoing motor feeder, as well as pre-assembled motor cables are available as accessories for connection to the motor.

Control Units

The following Control Units are available for SINAMICS G120D distributed frequency inverters:

CU240D Control Units

The Control Unit performs closed-loop control functions for the inverter. In addition to control functions, the Control Unit can also perform other tasks which can be adapted to the relevant application by parameterization. A number of Control Units are available in different versions:

- CU240D DP
- CU240D DP-F
- CU240D PN
- CU240D PN-F

Accessories

- MMC memory card

The parameter settings for an inverter can be stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data. 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 (commissioning tool STARTER Version 4.1, SP1 and higher) has been installed.

- Spare parts kit

A spare parts kit is available which comprises small parts such as seals, cover caps, PROFIBUS address windows and screws.

- Connecting cable

Flexible connecting cables for data transfer between Industrial Ethernet participants or PROFIBUS participants, as well as for power supply of the Control Unit.

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for the following components of the distributed SINAMICS G120D frequency inverters.

SINAMICS G120D	
Mechanical specifications	
Vibratory load	
• Transport [1]	EN 60068-2-6 5 … 9 Hz: Constant deflection 3.1 mm 9 … 200 Hz: Constant acceleration = 9.81 m/s^2 (1 *g*)
• Operation	EN 60068-2-6 10 … 58 Hz: Constant deflection 0.15 mm 58 … 200 Hz: Constant acceleration = 19.62 m/s^2 (2 *g*)
Shock load	
• Transport [1]	EN 60068-2-27 147.15 m/s^2 (15 *g*)/11 ms; 3 shocks in each axis and direction
• Operation	EN 60068-2-27 147.15 m/s^2 (15 *g*)/11 ms; 3 shocks in each axis and direction
Ambient conditions	
Protection class	Class III (PELV) to EN 61800-5-1
Shock protection	Class I (with PE conductor system) acc. to EN 61800-5-1
Permissible ambient and coolant temperature (air) during operation for Power Modules	–10 … +40 °C without derating, > 40 … 55 °C, see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units	–10 … +55 °C with CU240D DP-F and/or CU240D PN-F: 0 … 40 °C up to 2000 m above sea level
Climatic ambient conditions	
• Storage [1]	EN 60068-2-1 Temperature –40 … +70 °C
• Transport [1]	EN 60068-2-1 Temperature –40 … +70 °C max. air humidity 95 % at 40 °C
• Operation	EN 60068-2-2 Temperature–10 … +40 °C without derating
Environmental class/harmful chemical substances	
• Operation	Class 3C2 to EN 60721-3-3
Degree of contamination	2 to EN 61800-5-1
Standards	
Standards conformance	UL, cUL, CE, c-tick
CE mark	To Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EEC
EMC directive [2]	
• Frame sizes FSA to FSC with integrated line filter class A	Category C2 [3] to EN 61800-3 (corresponds to class A to EN 55011)
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	

[1] In transport packaging.

[2] For further, general information, see also SINAMICS G110 sections "Technical specifications" and "Compliance with standards".

[3] With shielded motor cable up to 15 m.

CU240D Control Units

Overview

Example of CU240D DP-F Control Unit

Example of CU240D PN-F Control Unit

The Control Unit performs closed-loop control functions for the inverter. In addition to control functions, the Control Unit can also perform other tasks which can be adapted to the relevant application by parameterization. Control Units are available in different versions:

- CU240D DP
- CU240D DP-F
- CU240D PN
- CU240D PN-F

Safety Integrated functions

The SINAMICS G120D fail-safe frequency 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 a motor sensor or 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.

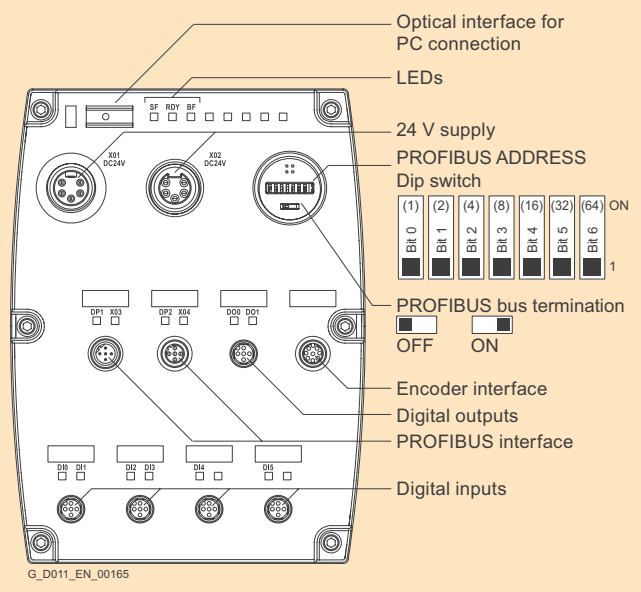
The safety functions “Safely Limited Speed” and “Safe Stop 1” are certified for asynchronous motors without encoders – these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

For further information, please refer to section Safety Integrated in chapter Innovations.

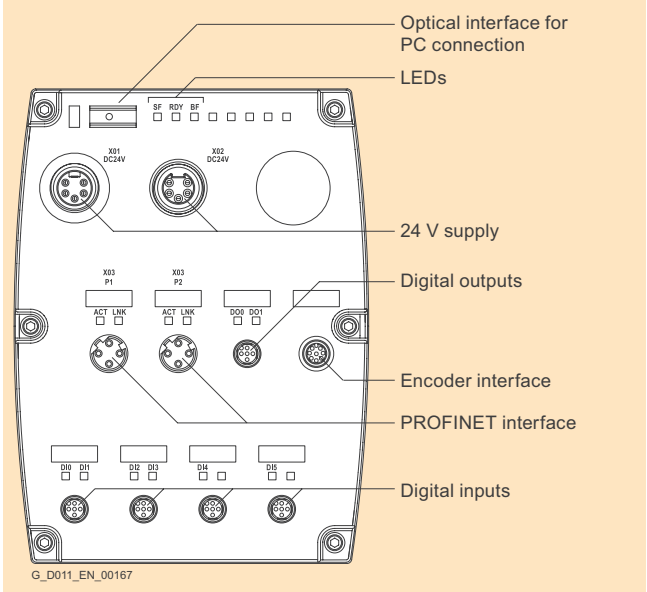
Selection and Ordering Data

Communication	Digital inputs	Digital outputs	Encoder interfaces	Designation	**Control Unit** Order No.
Standard					
PROFIBUS DP	6	2	1	CU240D DP	**6SL3544-0FA20-1PA0**
PROFINET	6	2	1	CU240D PN	**6SL3544-0FA20-1FA0**
Fail-safe for Safety Integrated					
PROFIBUS DP	6	2	1	CU240D DP-F	**6SL3544-0FA21-1PA0**
PROFINET	6	2	1	CU240D PN-F	**6SL3544-0FA21-1FA0**

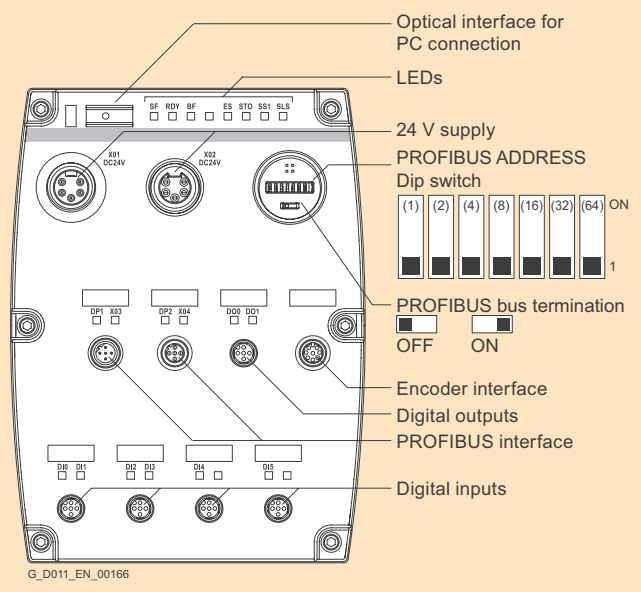
Design



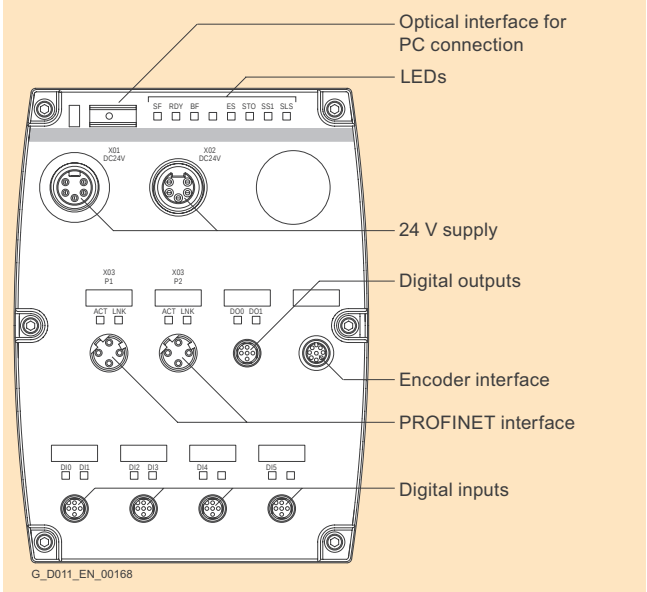
CU240D DP Control Unit



CU240D PN Control Unit



CU240D DP-F Control Unit



CU240D PN-F Control Unit

Control Unit, view of rear panel,
MMC slot on top and PM-IF interface in center at bottom

CU240D Control Units

Technical specifications

	Control Unit CU240D DP 6SL3544-0FA20-1PA0	Control Unit CU240D PN 6SL3544-0FA20-1FA0	Control Unit CU240D DP-F 6SL3544-0FA21-1PA0	Control Unit CU240D PN-F 6SL3544-0FA21-1FA0
Electrical data				
Operating voltage	External 24 V DC required	External 24 V DC required	External 24 V DC required	External 24 V DC required
Power consumption [1] (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
Interfaces				
Digital inputs	6	6	6	6
Digital outputs (0.5 A, supplied over switched 24 V DC)	2	2	2	2
Bus interface	PROFIBUS DP	PROFINET	PROFIBUS DP, PROFIsafe	PROFINET, PROFIsafe
Encoder interfaces	1	1	1	1
PTC/KTY interface (connected via Power Module)	✓	✓	✓	✓
Activation of a mechanical motor brake (connected via Power Module)	✓	✓	✓	✓
MMC memory card slot	✓	✓	✓	✓
RS232 interface (connected with RS232 interface cable via the optical interface of the Control Unit)	✓	✓	✓	✓
Safety functions				
Integral safety functions to Category 3 of EN 954-1 and SIL2 of IEC 61508	–		• Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Torque Off (STO) • The safety functions "Safely Limited Speed" and "Safe Stop 1" are certified for asynchronous motors without encoders – these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.	• Safe Stop 1 (SS1) • Safely Limited Speed (SLS) • Safe Torque Off (STO) • The safety functions "Safely Limited Speed" and "Safe Stop 1" are certified for asynchronous motors without encoders – these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.
Open-loop and closed-loop control functions				
V/f linear/quadratic/ parameterizable	✓	✓	✓	✓
V/f with flux current control (FCC)	✓	✓	✓	✓
Vector control, encoderless	✓	✓	✓	✓
Vector control with encoder	✓	✓	✓	✓
Torque control, encoderless	✓	✓	✓	✓
Torque control with encoder	✓	✓	✓	✓

[1] To this must be added the power consumption of connected encoders and sensors and the power draw on the digital outputs.

Technical specifications (continued)

	Control Unit CU240D DP 6SL3544-0FA20-1PA0	Control Unit CU240D PN 6SL3544-0FA20-1FA0	Control Unit CU240D DP-F 6SL3544-0FA21-1PA0	Control Unit CU240D PN-F 6SL3544-0FA21-1FA0
Software functions				
Fixed frequencies	16, programmable	16, programmable	16, programmable	16, programmable
Signal interconnection with BICO technology	✓	✓	✓	✓
Automatic restart following line failure or fault	✓	✓	✓	✓
Positioning deceleration ramp	✓	✓	✓	✓
Slip compensation	✓	✓	✓	✓
Free function blocks (FFB) for logic 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 specification	✓	✓	✓	✓
Motor identification	✓	✓	✓	✓
Motor holding brake	✓	✓	✓	✓
Mechanical specifications and ambient conditions				
Degree of protection	IP65	IP65	IP65	IP65
Operating temperature	–10 … +55 °C (14 … 131 °F)	–10 … +55 °C (14 … 131 °F)	0 … 40 °C (32 … 104 °F)	0 … 40 °C (32 … 104 °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, non-condensing	< 95 % RH, non-condensing	< 95 % RH, non-condensing	< 95 % RH, non-condensing
Dimensions				
• Width	150 mm	150 mm	150 mm	150 mm
• Height	210 mm	210 mm	210 mm	210 mm
• Depth	40 mm	40 mm	40 mm	40 mm
Weight, approx.	0.7 kg	0.7 kg	0.7 kg	0.7 kg

Accessories

MMC memory card

The parameter settings for an inverter can be stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data. The associated slot is located on the rear of the Control Unit.

	Order No.
MMC memory card	**6SL3254-0AM00-0AA0**

RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC over a point-to-point link if the appropriate software (STARTER commissioning tool [1], Version 4.1, SP1 and higher) has been installed.

	Order No.
RS232 interface cable for communication with a PC	**3RK1922-2BP00**

STARTER commissioning tool

The STARTER commissioning tool (STARTER Version 4.1, 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.

	Order No.
STARTER commissioning tool [1] on DVD	**6SL3072-0AA00-0AG0**

Spare parts kit

A spare parts kit can be ordered which comprises small parts such as replacement seals, cover caps, PROFIBUS address windows and screws.

	Order No.
Spare parts kit for SINAMICS G120D Control Units comprising replacement seals, cover caps, PROFIBUS address windows and screws	**6SL3500-0SK01-0AA0**

[1] STARTER commissioning tool also available on the Internet at http://support.automation.siemens.com/WW/view/en/10804985/133100

Accessories (continued)

PROFINET connecting cable

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.

	Order No.
IE connecting cable M12-180/M12-180	
Pre-assembled IE FC TP trailing cable GP 2 x 2 PROFINET type C) with two 4-pole M12 connector (4-pole, D-coded), IP65/IP67 degree of protection	
Length:	
• 0.3 m	**6XV1870-8AE30**
• 0.5 m	**6XV1870-8AE50**
• 1.0 m	**6XV1870-8AH10**
• 1.5 m	**6XV1870-8AH15**
• 2.0 m	**6XV1870-8AH20**
• 3.0 m	**6XV1870-8AH30**
• 5.0 m	**6XV1870-8AH50**
• 10 m	**6XV1870-8AN10**
• 15 m	**6XV1870-8AN15**
IE M12 plug PRO	
For assembly in the field, M12 plug-in connector (D-coded), metal enclosure, fast connection method, for SCALANCE X208PRO and IM 154-4 PN	
• 1 unit	**6GK1901-0DB10-6AA0**
• 8 units	**6GK1901-0DB10-6AA8**

PROFIBUS connecting cable

Flexible connecting cables/plug-in connectors for transmission of data (up to 12 Mbit/s) from PROFIBUS stations

	Order No.
PROFIBUS M12 connecting cable	
Pre-assembled with two 5-pole M12 male/female connectors	
Length:	
• 0.3 m	**6XV1830-3DE30**
• 0.5 m	**6XV1830-3DE50**
• 1.0 m	**6XV1830-3DH10**
• 1.5 m	**6XV1830-3DH15**
• 2.0 m	**6XV1830-3DH20**
• 3.0 m	**6XV1830-3DH30**
• 5.0 m	**6XV1830-3DH50**
• 10 m	**6XV1830-3DN10**
• 15 m	**6XV1830-3DN15**
PROFIBUS M12 cable connector	
5-pole, B-coded, metal enclosure, 1 pack = 5 units	
• Male insert	**6GK1905-0EA00**
• Socket insert	**6GK1905-0EB00**

Connecting cable/plug-in connector for supplying the Control Unit with power

	Order No.
7/8" connecting cable	
For power supply, pre-assembled with two 5-pole 7/8" male/female connectors	
Length:	
• 0.3 m	**6XV1822-5BE30**
• 0.5 m	**6XV1822-5BE50**
• 1.0 m	**6XV1822-5BH10**
• 1.5 m	**6XV1822-5BH15**
• 2.0 m	**6XV1822-5BH20**
• 3.0 m	**6XV1822-5BH30**
• 5.0 m	**6XV1822-5BH50**
• 10 m	**6XV1822-5BN10**
• 15 m	**6XV1822-5BN15**
7/8" plug-in connector	
5-pole, B-coded, plastic enclosure, 1 pack = 5 units	
• Male insert	**6GK1905-0FA00**
• Socket insert	**6GK1905-0FB00**

Additional information

For further information about the connecting cables and plug-in connectors listed above, please refer to Catalog IK PI.

Further selected accessories are available from Siemens Solution Partners. Please go to the “Solution Partner Finder”

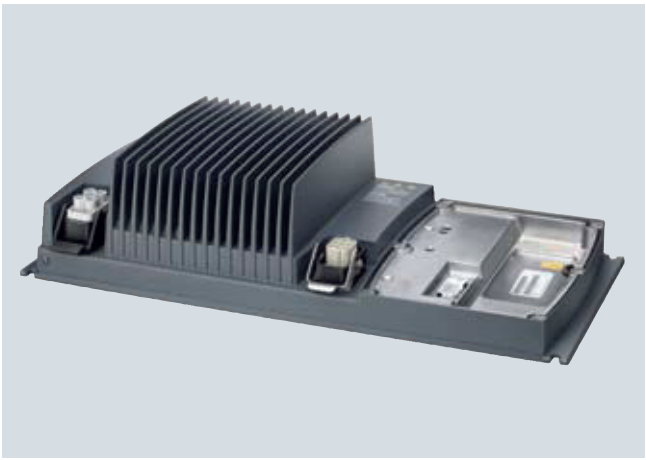
http://www.siemens.com/automation/partnerfinder

and select “Distributed Field Installation System” as technology.

4

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 destroyed in a braking resistor. This saves space, time-consuming dimensioning of the braking resistor as well as its wiring. Generated heat is also reduced. For further information, please refer to section Efficient Infeed Technology in chapter Innovations.

An innovative circuit design reduces supply harmonics. There is no need to use a line reactor. 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 turned into a Safety Integrated Drive (see Control Units).

The PM250D Power Modules with integrated line filter to class A are suitable for connection to TN and TT supply systems.

Selection and Ordering Data

Rated power [1]		Rated output current [2]	Input current	Frame size	**SINAMICS G120D PM250D Power Module with integrated line filter class A**
kW	hp	A	A		Order No.
380 … 480 V 3 AC [3]					
0.75	1	2.2	2.1	FSA	**6SL3525-0PE17-5AA0**
1.5	1.5 [4]	4.1	3.8	FSA	**6SL3525-0PE21-5AA0**
3	4	7.7	7.2	FSB	**6SL3525-0PE23-0AA0**
4	5	10.2	9.5	FSC	**6SL3525-0PE24-0AA0**
5.5	7.5	13.2	12.2	FSC	**6SL3525-0PE25-5AA0**
7.5	10	19.0	17.7	FSC	**6SL3525-0PE27-5AA0**

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the loading for high overload (HO).

[2] The rated output current I_{rated} is based on the loading for high overload (HO).

[3] 500 V +10 % is possible outside the UL range.

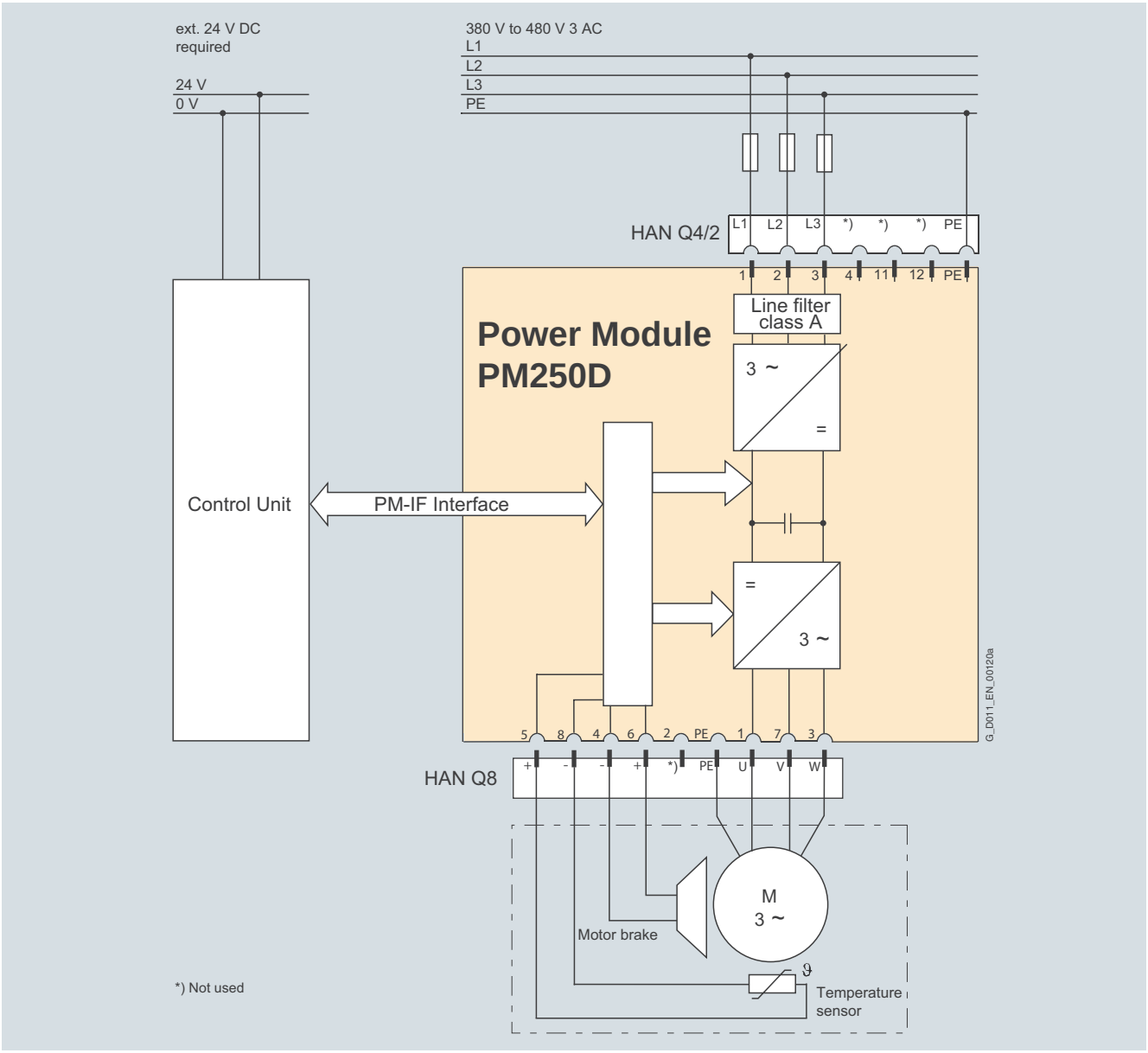
[4] Not governed by a specific standard.

Integration

PM250D Power Modules communicate with the Control Unit via the PM-IF interface.

PM250D Power Modules feature the following interfaces as standard:

- PM-IF interface for connection of the PM250D Power Module and Control Unit.
- Motor is connected through HAN Q8 (male connector) including activation of the motor brake and temperature sensor
- Input voltage is connected through HAN Q4/2 (female connector)



Connection diagram for PM250D Power Module with integrated line filter class A

Technical specifications

General technical data

	PM250D Power Modules
Line operating voltage	380 ... 480 V 3 AC ± 10 %
Line requirements Line short-circuit voltage u_K	≤ 1 %
Input frequency	47 ... 63 Hz
Output frequency	
• Control type *V/f*	0 ... 650 Hz
• Control type Vector	0 ... 200 Hz
Pulse frequency	4 kHz (standard), for higher pulse frequencies up to 16 kHz, see derating data
Power factor	0.95
Inverter efficiency	95 … 97 %
Control factor	87 %
Overload capability	
• High overload (HO)	• Average maximum rated output current during a cycle time of 300 s • 1.5 × rated output current (i.e. 150 % overload) over 60 s at a cycle time of 300 s • 2 × rated output current (i.e. 200 % overload) over 3 s at a cycle time of 300 s
Electromagnetic compatibility	Integrated line filter class A according to EN 55011
Possible braking methods	Regenerative feedback in generating mode; integrated braking control 180 V DC (corresponds to 400 V 1 AC rectified)
Degree of protection	IP65
Operating temperature	
• with standard Control Unit	–10 ... +40 °C (14 … 104 °F) without derating, > 40 ... 55 °C, see derating characteristics
• with Fail-Safe Control Unit	0 ... 40 °C (32 ... 104 °F)
Storage temperature	–40 ... +70 °C (-40 ... +158 °F)
Permitted mounting position	Horizontal wall mounting and free-standing
Relative humidity	< 95 % RH, non-condensing
Cooling	FSA and FSB: Convection FSC: Air cooling as required through built-in fan
Installation altitude	Up to 1000 m above sea level without derating, > 1000 m see derating characteristics
Standard SCCR (Short Circuit Current Rating) [1]	10 kA
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter interlock
Standards conformance	UL, cUL, CE, c-tick
CE mark	To Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EEC

[1] Applies to industrial control cabinet installations to NEC article 409/UL 508A. For further information, visit us on the Internet at: http://support.automation.siemens.com/WW/view/en/23995621

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM250D Power Modules		
		6SL3525-0PE17-5AA0	6SL3525-0PE21-5AA0	6SL3525-0PE23-0AA0
Rated output current I_{rated} [1]	A	2.2	4.1	7.7
Output current I_{max}	A	4.4	8.2	15.4
Rated power	kW (hp)	0.75 (1.0)	1.5 (1.5 [3])	3 (4.0)
Rated pulse frequency	kHz	4	4	4
Efficiency η		0.97	0.97	0.97
Power loss	kW	0.047	0.061	0.103
Cooling air requirement	m^3/s	0.004	0.005	0.009
Sound pressure level L_{pA} (1 m)	dB	–	–	–
Rated input current [2]	A	2.1	3.8	7.2
Line supply connection U1/L1, V1/L2, W1/L3, PE		HAN Q4/2 (male connector)	HAN Q4/2 (male connector)	HAN Q4/2 (male connector)
• Conductor cross-section	mm^2	1.5 … 6	1.5 … 6	2.5 … 6
Motor connection U2, V2, W2, PE, motor brake, temperature sensor		HAN Q8 (female connector)	HAN Q8 (female connector)	HAN Q8 (female connector)
• Conductor cross-section	mm^2	1 … 4	1 … 4	2.5 … 4
Motor cable length, max.	m	15	15	15
Degree of protection		IP65	IP65	IP65
Dimensions				
• Width	mm	450	450	450
• Height	mm	210	210	210
• Depth	mm	110	110	180
Frame size		FSA	FSA	FSB
Weight, approx.	kg	5.7	5.7	8

[1] The rated output current I_{rated} is based on the loading for high overload (HO).

[2] The input current depends on the motor load and line impedance. The input currents apply for rated power loading for a line impedance corresponding to u_K = 1 %.

[3] Not governed by a specific standard.

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM250D Power Modules		
		6SL3525-0PE24-0AA0	6SL3525-0PE25-5AA0	6SL3525-0PE27-5AA0
Rated output current I_{rated} [1]	A	10.2	13.2	19
Output current I_{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 η		0.97	0.97	0.97
Power loss	kW	0.141	0.209	0.295
Cooling air requirement	m^3/s	0.012	0.018	0.025
Sound pressure level L_{pA} (1 m)	dB	74.5	74.5	74.5
Rated input current [2]	A	9.5	12.2	17.7
Line supply connection U1/L1, V1/L2, W1/L3, PE		HAN Q4/2 (male connector)	HAN Q4/2 (male connector)	HAN Q4/2 (male connector)
• Conductor cross-section	mm^2	2.5 … 6	4 … 6	4 … 6
Motor connection U2, V2, W2, PE, motor brake, temperature sensor		HAN Q8 (female connector)	HAN Q8 (female connector)	HAN Q8 (female connector)
• Conductor cross-section	mm^2	2.5 … 4	4	4
Motor cable length, max.	m	15	15	15
Degree of protection		IP65	IP65	IP65
Dimensions				
• Width	mm	450	450	450
• Height	mm	210	210	210
• Depth	mm	220	220	220
Frame size		FSC	FSC	FSC
Weight, approx.	kg	8.5	8.5	8.5

[1] The rated output current I_{rated} is based on the loading for high overload (HO).

[2] The input current depends on the motor load and line impedance. The input currents apply for rated power loading for a line impedance corresponding to u_K = 1 %.

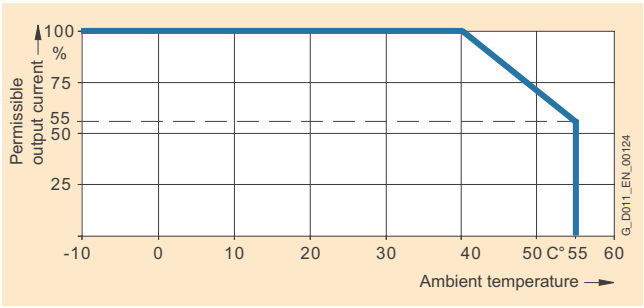
Characteristic curves

Derating data

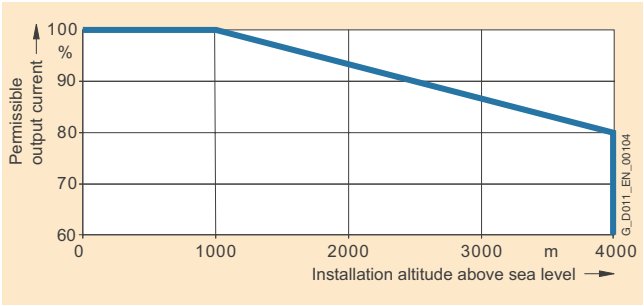
Pulse frequency

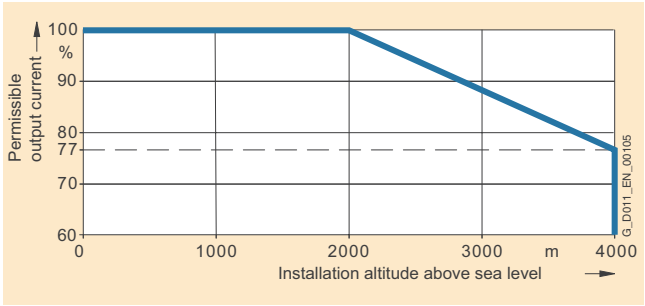
Rated power at 400 V 3 AC		**Rated output current in A** at a switching frequency of						
kW	hp	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.75	1.0	2.2	1.9	1.5	1.3	1.1	1.0	0.9
1.5	1.5 [1)]	4.1	3.5	2.9	2.5	2.1	1.8	1.6
3.0	4.0	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4.0	5.0	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	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



Installation altitude





[1)] Not governed by a specific standard.

Accessories

Connecting cables pre-assembled on one end and connector sets for line infeed

	Order No.
Connecting cables pre-assembled on one end, power supply cable, open at one end, for HAN Q4/2, angled, 4 × 4 mm^2	
Length:	
• 1.5 m	**3RK1911-0DB13**
• 5 m	**3RK1911-0DB33**
Connector set for power supply, HAN Q4/2	
• 2.5 mm^2	**3RK1911-2BE50**
• 4 mm^2	**3RK1911-2BE10**
• 6 mm^2	**3RK1911-2BE30**

Motor cables pre-assembled on one end and connector sets for the connection between the Power Module and the motor

	Order No. (supplied by Harting)		
Motor cables pre-assembled on one end, for motors with brake and temperature encoder with HAN Q8 male connector, shielded	Cross-section 1.5 mm^2	2.5 mm^2	4 mm^2
Length:			
• 1.5 m	**HTG: 61 88 201 0288**	**HTG: 61 88 201 0291**	**HTG: 61 88 201 0303**
• 3 m	**HTG: 61 88 201 0289**	**HTG: 61 88 201 0292**	**HTG: 61 88 201 0304**
• 5 m	**HTG: 61 88 201 0290**	**HTG: 61 88 201 0293**	**HTG: 61 88 201 0305**
• 10 m	**HTG: 61 88 201 0299**	**HTG: 61 88 201 0301**	**HTG: 61 88 201 0306**

	Order No.
Connector set for motor cable, shielded, HAN Q8	
• Up to 1.5 mm^2	**6ES7194-1AB01-0XA0**

	Order No. (supplied by Harting)		
Connector set for motor cable, shielded, HAN Q8			
• Up to 2.5 mm^2		**HTG: 61 83 401 0118**	
• Up to 4 mm^2			**HTG: 61 83 401 0119**

Additional information

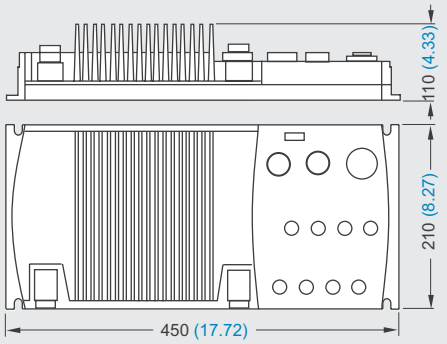
For further information about the connecting cables and connector sets listed above, please refer to Catalog IK PI.

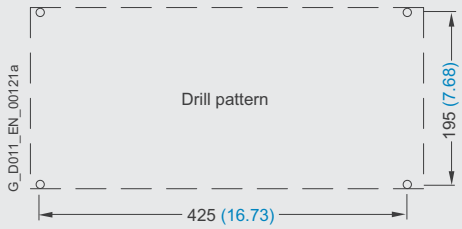
Further selected accessories – particularly motor cables for motors without brake or temperature encoder – are available from Siemens Solution Partners. Please go to the "Solution Partner Finder"

http://www.siemens.com/automation/partnerfinder

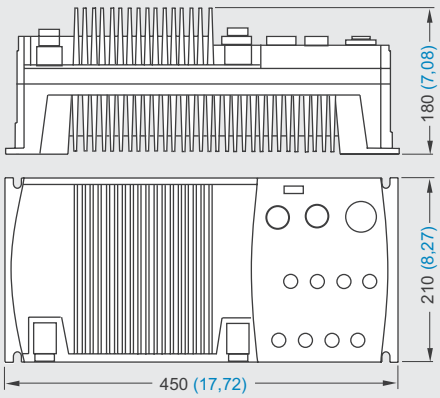
and select "Distributed Field Installation System" as technology.

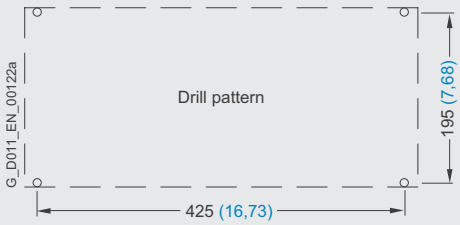
Dimensional drawings



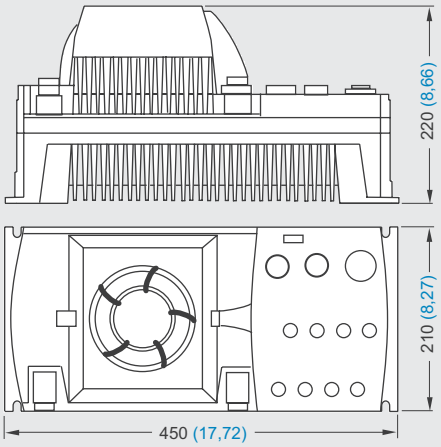


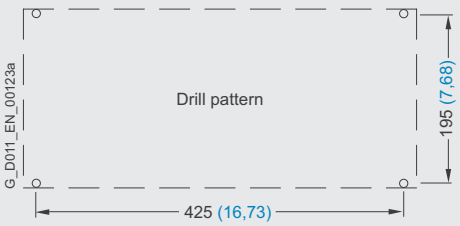
PM250D Power Module frame size FSA with integrated line filter class A and plugged-in Control Unit





PM250D Power Module frame size FSB with integrated line filter class A and plugged-in Control Unit





PM250D Power Module frame size FSC with integrated line filter class A and plugged-in Control Unit

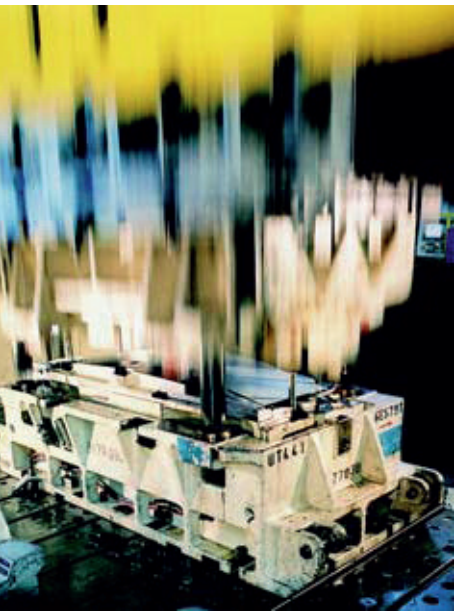
Fixing with 4 M5 studs, 4 M5 nuts, 4 M5 washers

Ventilation clearance required (for wall mounting) at top and bottom: 150 mm (5.9 inches)

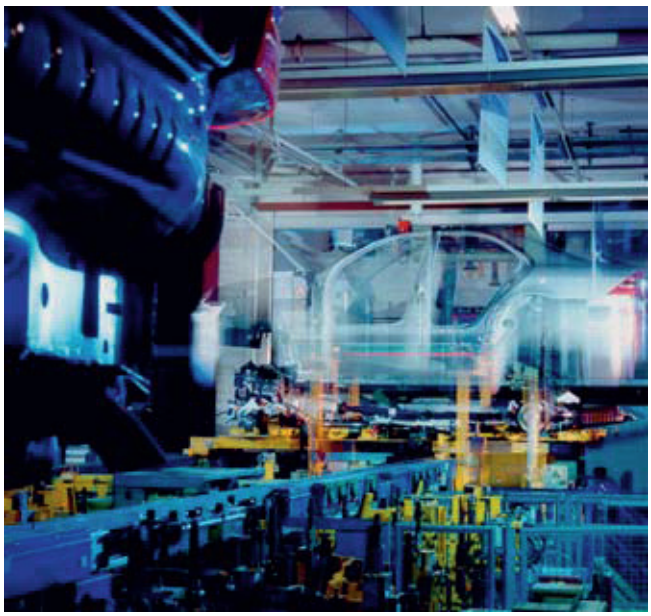
All dimensions in mm (values in brackets are in Inches).

Notes

Innovations



Overview



The integrated safety functions of SINAMICS G120 and SINAMICS G120D provide highly effective application-oriented protection for personnel and machinery.

SINAMICS G120 and SINAMICS G120D offer the following Safety Integrated functions (terms as defined in IEC 61800-5-2):

- Safe Torque Off (STO)
- Safe Stop 1 (SS1)
- Safely Limited Speed (SLS)
- Safe Brake Control (SBC) (SINAMICS G120 only)

The Safety Integrated functions are completely integrated into the drive system. They can be activated as follows:

- via safe digital inputs on the Control Unit (SINAMICS G120 only) without the need for an additional safety switching device
- via PROFIBUS with PROFIsafe
- via PROFINET with PROFIsafe

The Safety Integrated functions are implemented electronically and therefore offer short response times in comparison to solutions with externally implemented monitoring functions. This system is absolutely unique in that it does not require speed feedback through sensors or encoders.

The STO and SBC functions can be used without restriction for all applications.

The SS1 and SLS functions may be used for any application in which the load never accelerates when the frequency inverter is switched off. They are therefore not suitable for applications involving pull-through loads such as lifting gear and winders.

Legal framework

Machine manufacturers and plant constructors must ensure that their machines or plants cannot cause danger due to malfunctions apart from the general risks of electric shock, heat or radiation.

In Europe, for example, compliance with the machinery directive is required in law by the EU industrial 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 from 2009, 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 greater complexity 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 complex 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, safety measures controlled by integrated safety systems are perceived as less interfering by the operator of the machine due to the faster action, so the motivation to consciously bypass safety functions is significantly reduced.

Function

Safety functions integral to the SINAMICS G120 and SINAMICS G120D drive systems

SINAMICS G120 and SINAMICS G120D are characterized by a large number of integrated safety functions.

They satisfy the requirements of

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

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

and at the following address for SINAMICS G120:

http://support.automation.siemens.com/WW/view/en/22339653/134200

and at the following address for SINAMICS G120D:

http://support.automation.siemens.com/WW/view/en/25021636/134200

The Safety Integrated functions currently available in SINAMICS G120 and SINAMICS G120D are listed below (terms as defined in IEC 61800-5-2):

Safe Torque Off (STO)

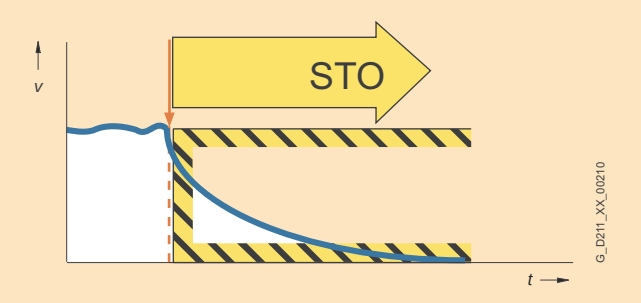
Description of functions

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

Application, customer benefits

STO has the immediate effect that the drive cannot supply any torque-generating energy.

STO can be used wherever the drive will reach a standstill autonomously due to the load torque or friction in a sufficiently short time or when coasting down of the drive will not have any relevance for safety.



Safe Stop 1 (SS1)

Description of functions

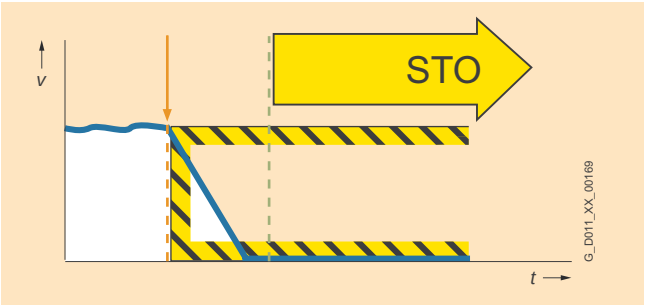
The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes autonomously along an adjustable, monitored ramp and automatically activates the Safe Torque Off and Safe Brake Control functions (if used) when 2 Hz is reached.

If the drive does not brake along the parameterized ramp when the stop function is activated, Safe Torque Off and Safe Brake Control (if used) are activated instantaneously.

Application, customer benefits

This integrated fast-brake function eliminates the need for complex external monitoring equipment. Furthermore, it is often possible to eliminate mechanical brakes which wear, or to lessen the load on them, so that maintenance costs and the stresses on the machine can be reduced.

Safe Stop 1 is employed for applications which require monitored braking, e.g. on centrifuges, conveyor vehicles, etc.



Function (continued)

Safely Limited Speed (SLS)

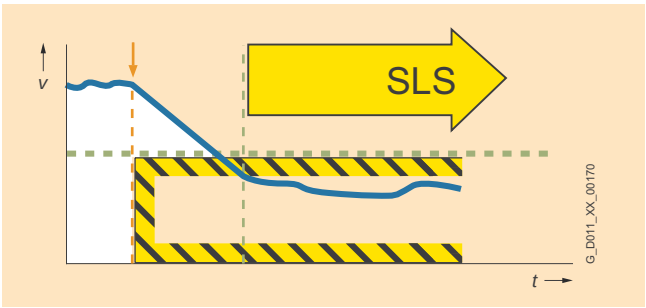
Description of functions

The Safely Limited Speed function monitors the drive and, depending on the mode selected, either limits the motor speed to a safe value or monitors the system directly for a parameterized maximum speed.

If the drive does not follow the parameterized ramp or exceeds the maximum speed when the function is activated, it is either braked along the Safe Stop 1 ramp or Safe Torque Off and Safe Brake Control (if used) are activated (depending on which mode is selected).

Application, customer benefits

When many machines are being set up, the operating personnel must work on the moving machine. This either occurs in stages because the operator must exit the danger area repeatedly when the machine is started up, or the operator works on the moving machine and is therefore exposed to increased risk. The SLS function can save a considerable amount of time here and still increase the safety of operating personnel.



Safe Brake Control (SBC)

Description of functions

Safe Brake Control SBC is used to control motor brakes which are operative at zero current, e.g. motor holding brakes. The brake control circuit is a fail-safe, two-channel design.

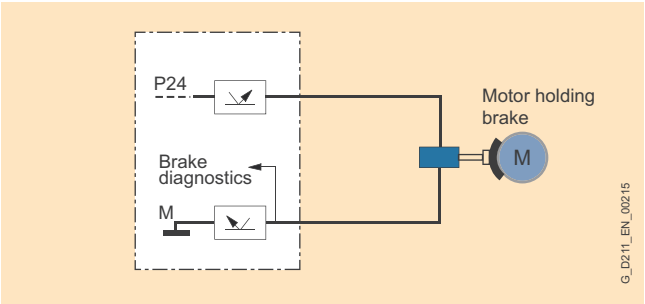
The Safe Brake Control is activated when the Safe Torque Off function is selected and when safety monitors with safe pulse disable are tripped.

- This function is available only for the SINAMICS G120 system. It requires an additional Safe Brake Relay.
- The Safe Brake Control does not detect mechanical faults in the brake itself, such as worn brake linings.
- The Safe Brake Relay is only capable of controlling 24 V motor brakes.

Application, customer benefits

SBC can also be activated in combination with STO and SS1. SBC provides the option of safely controlling a motor brake on the motor when the torque-generating energy has been disconnected.

As the Safe Brake Control module does not contain any mechanical components, there are no restrictions on switching frequency.



5

Function (continued)

PROFIsafe

PROFIsafe is an open communications standard that supports standard and safety-related communication over the same communications cable (wired or wireless). A second, separate bus system is therefore not necessary. To ensure safe communication, the transmitted message frames are continuously monitored. Possible errors, such as lost or repeated messages or those received in the wrong order are avoided in that safety-related messages are numbered consecutively, their arrival is monitored within a defined period, and an identifier for the sender and receiver of a message is transferred. A CRC (cyclic redundancy check) data security mechanism is also used.

PROFIsafe can be implemented on PROFIBUS and PROFINET on the SINAMICS G120 and SINAMICS G120D systems.

Licensing

The Safety Integrated functions for SINAMICS G120 and SINAMICS G120D 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 given in the following table:

Function	Activation	Underlying function	Reaction to limit overshoot	External setpoint input effective	Encoder required
STO	• PROFIsafe over PROFIBUS or PROFINET • Fail-safe digital inputs (with SINAMICS G120 only)	SBC (if parameterized)	–	no	no
SS1	• PROFIsafe over PROFIBUS or PROFINET • Fail-safe digital inputs (with SINAMICS G120 only)	STO when 2 Hz is reached, followed by SBC (if parameterized)	Activation of STO Activation of SBC (if parameterized)	no	no
SLS	• PROFIsafe over PROFIBUS or PROFINET • Fail-safe digital inputs (with SINAMICS G120 only)	–	Activation of STO or SS1 Activation of SBC (if parameterized)	yes (depending on mode)	no
SBC (with SINAMICS G120 only)	• With STO • With SS1 when 2Hz is reached	–	–	–	no

The operating principle of Safety Integrated

Two independent switch-off signal paths

Two independent switch-off signal paths are available. All switch-off signal paths are low active, thereby ensuring that the system is always switched to a safe state if a component fails or in the event of an open circuit. If an error is discovered in the switch-off signal paths, the “Safe Torque Off” function is activated and a system restart inhibited.

Two-channel monitoring structure

All the main hardware and software functions for Safety Integrated are implemented in two independent monitoring channels (e.g. switch-off signal paths, data management and data comparison). A cyclic crosswise comparison of the safety-relevant data in the two monitoring channels is carried out.

The monitoring functions in each monitoring channel work on the principle that a defined status must prevail before each action is carried out and a specific acknowledgement must be made after each action. If these expectations of a monitoring channel are not fulfilled, the drive coasts to a two-channel standstill and an appropriate message is output.

Forced dormant error detection using test stop

The functions and switch-off signal paths must be tested at least once within a defined time in order to meet requirements as per EN 954-1 and IEC 61508 in terms of timely fault detection. This functionality must be implemented by means of test stop triggering either in cyclic manual mode or by the automated process. The test stop cycle is monitored and a warning is output following a timeout.

A test stop does not require Power On. The acknowledgment is set by canceling the test stop request.

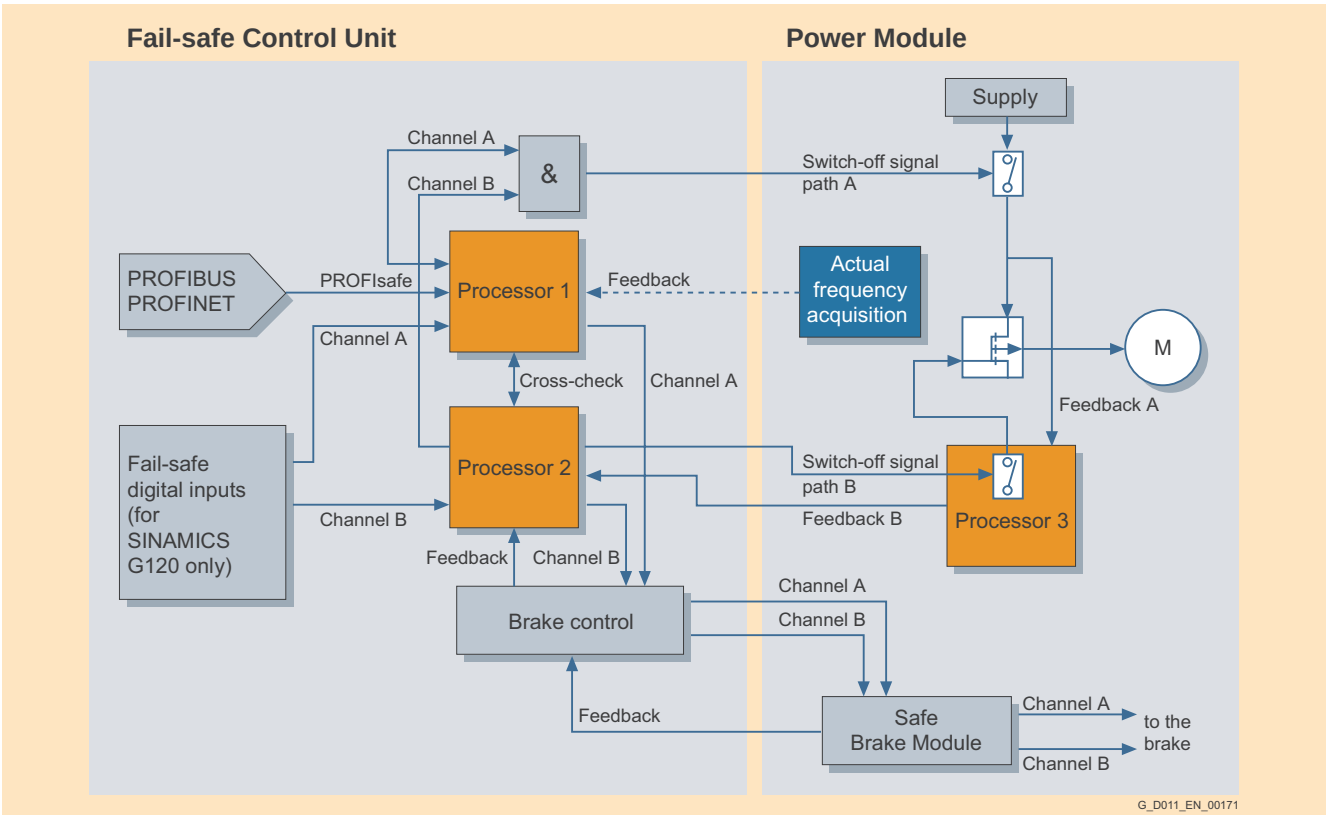
When the appropriate safety devices are implemented (e.g. protective doors), it can be assumed that running machinery will not pose any risk to personnel. For this reason, only an alarm is output to inform the user that a forced dormant error detection run is due, thereby requesting that this be carried out at the next available opportunity.

Examples of when forced dormant error detection runs are required:

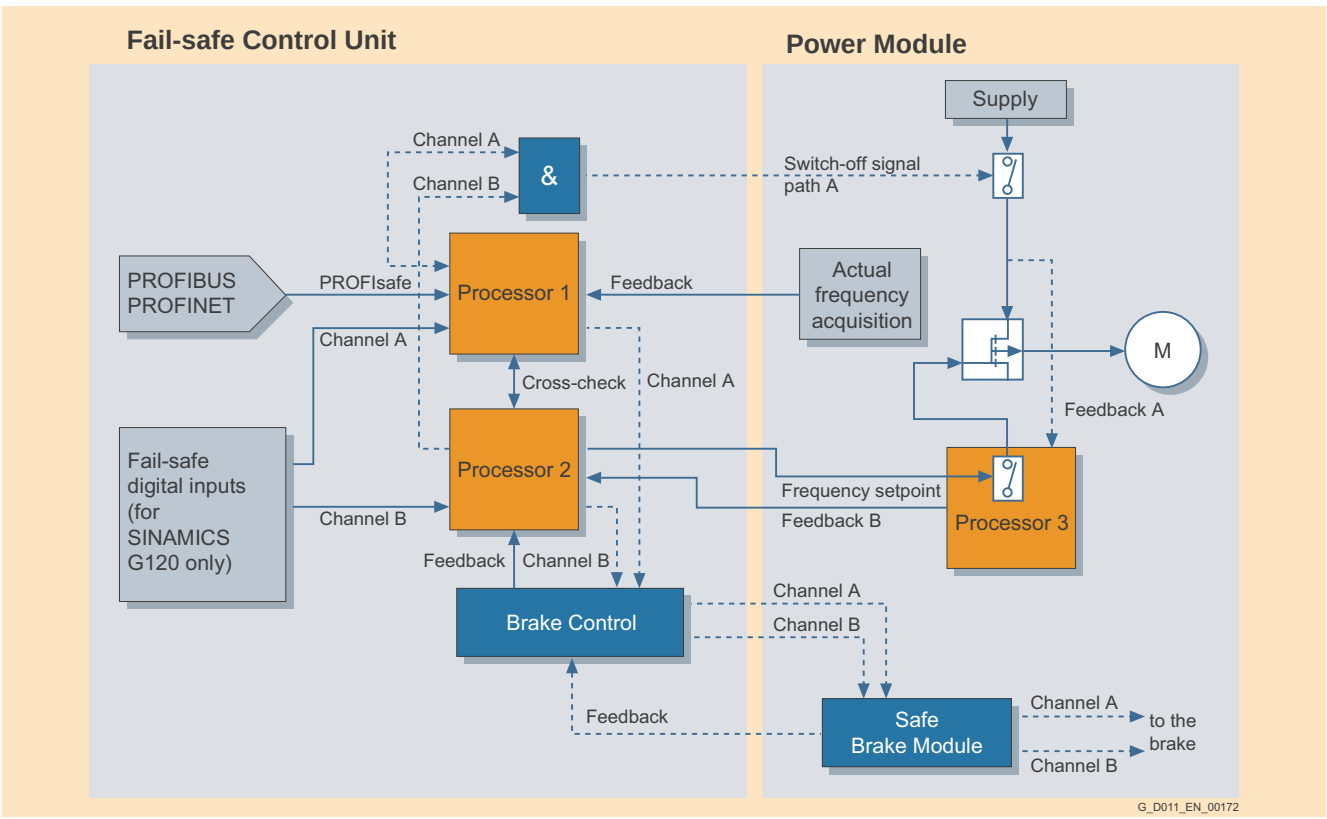
- When the drives are at a standstill after the system has been switched on
- Before the protective door is opened
- At defined intervals (e.g. every 8 hours)
- In automatic mode, time- and event-driven

Function (continued)

STO function structure on the SINAMICS G120 and SINAMICS G120D drive systems



SS1 and SLS function structure on the SINAMICS G120 and SINAMICS G120D drive systems



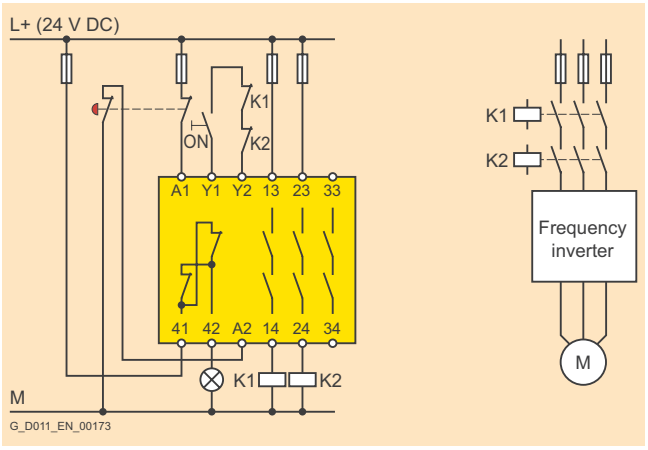
Function (continued)

Comparison between conventional and integrated safety systems

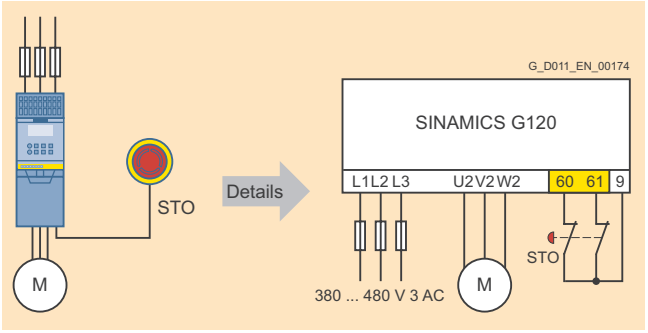
The implementation of safety functions on drives demands solutions which can be complex and costly.

The safety functions integrated in the SINAMICS G120 and SINAMICS G120D systems are significantly simpler and cheaper than conventional solutions.

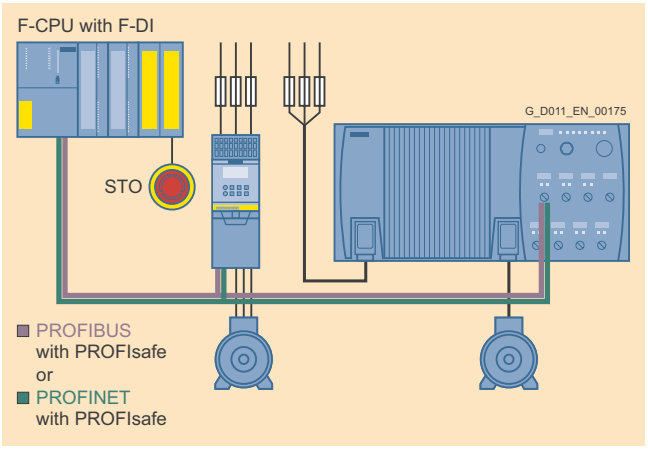
Safe Torque Off (STO)



Conventional wiring

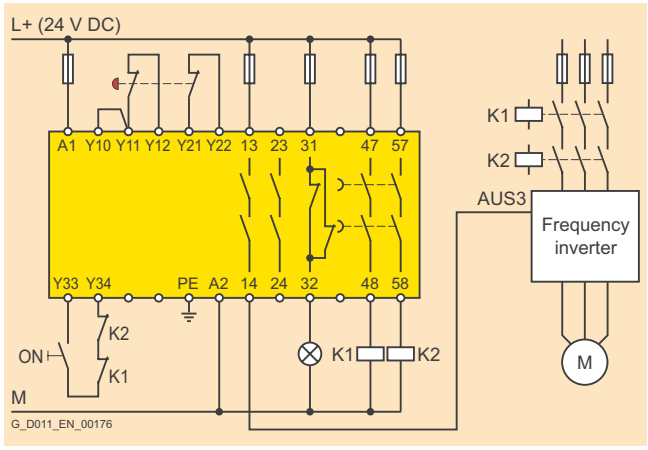


Integrated safety via fail-safe inputs

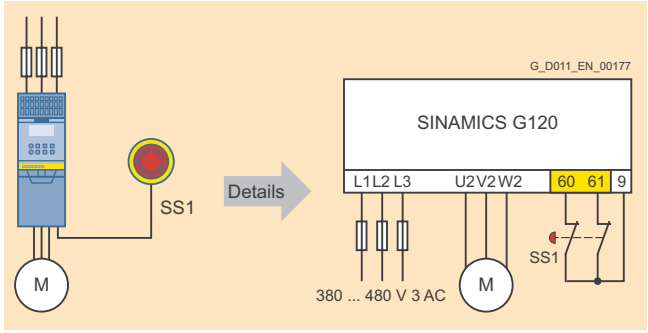


Integrated safety via PROFIsafe

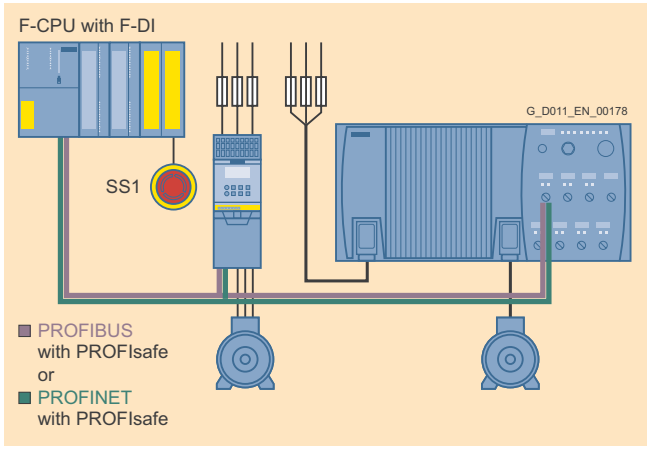
Safe Stop 1 (SS1)



Conventional wiring



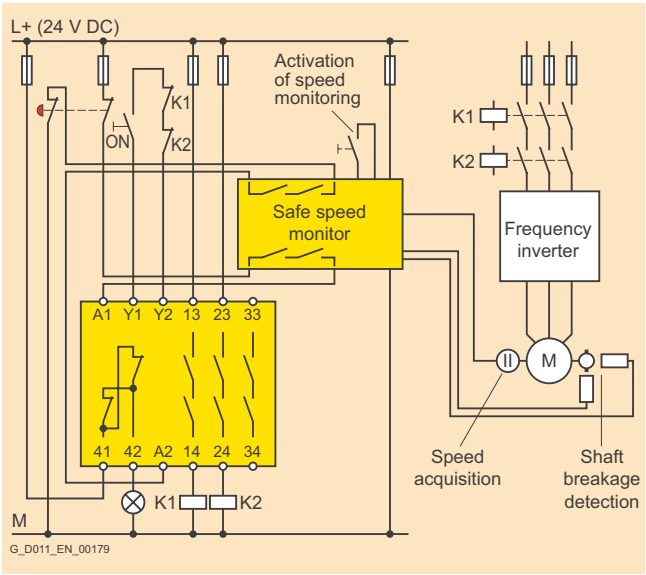
Integrated safety via fail-safe inputs



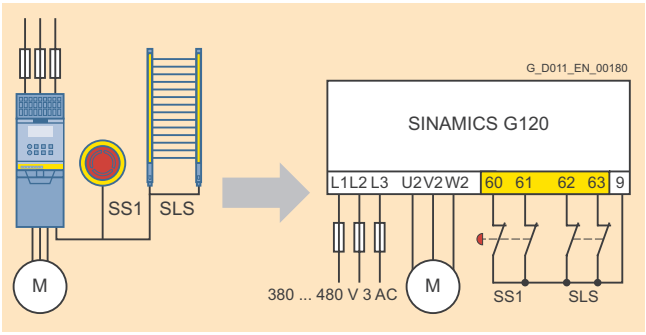
Integrated safety via PROFIsafe

Function (continued)

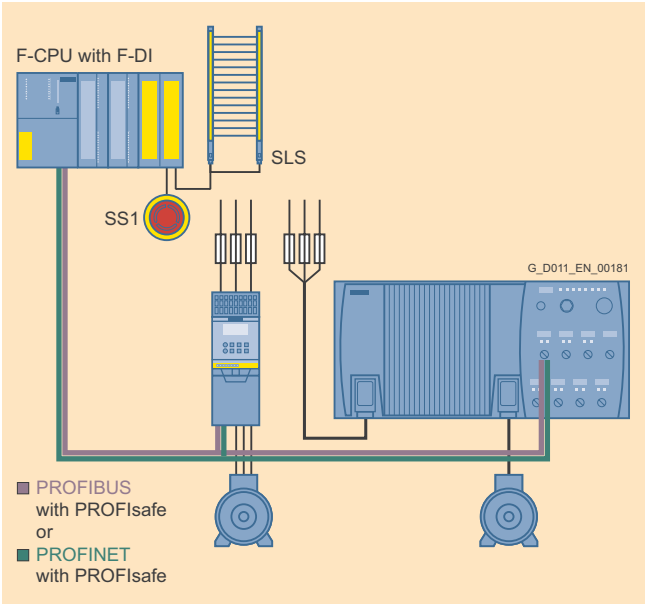
Safely Limited Speed (SLS)



Conventional wiring



Integrated safety via fail-safe inputs



Integrated safety via PROFIsafe

Overview

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

Available inverters with Efficient Infeed Technology

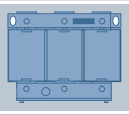
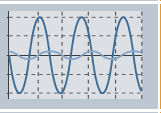
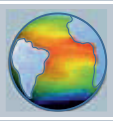
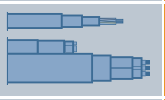
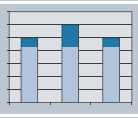
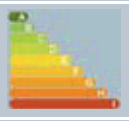
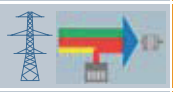
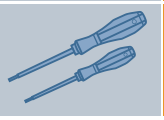
The following inverters are equipped with Efficient Infeed Technology:

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

You will find SINAMICS G120 and SINAMICS G120D in this catalog (sections 3 and 4).
For information about the two SIMATIC ET 200 inverters, please refer to section 8 and Catalog IK PI.

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, heat dissipation monitoring, etc. for external components
- Minimal reactive power distortion
  - Power consumption is not “spiky”, but almost like a block, so a minimal transformer throughput rating is required and reduced reactive power distortion
  - To achieve these low harmonics using an inverter with standard DC link, a line reactor with u_K = 6 % is required.
  - Results in approx. 22 % lower power consumption which corresponds to approximately 40 % lower losses in the supply system
  - Burden on the power supply system is thus lessened
- Reactive power compensation, improvement cos φ
  - Slightly capacitive at input ~ 0.94
  - Compensates the reactive power of motors and other inductive loads on the same supply
  - The power draw of the entire system is reduced. In a system comprising one inverter with motor and another motor on the same supply, the total power draw is reduced by up to 12 %.

Line supply conditions

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

The requirements of the supply system are no more stringent than for comparable standard frequency inverters. Experience has proven that this technology can be applied worldwide. Sole exception: In “island networks” with a separate generator (without mains connection), an external capacitor must be used to reduce resonance. This must be dimensioned according to the individual installation.

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

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

Benefits

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

Efficient Infeed Technology

Application

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

Below are listed some of the relevant applications:

- Applications with vertical movements in general
- Drives for conveyor vehicles
- Machines with a high moment of inertia
- Centrifuges
- Renewable energies (water power, wind power)
- Applications with high braking power over long periods

Example of an application with a hoist drive of a stacker crane

The following example shows the total cost calculation for a hoist drive of a stacker crane. A generally available compact inverter without regenerative feedback is compared to an inverter with Efficient Infeed Technology (e.g. SINAMICS G120 with PM250 and regenerative feedback). The configuration overhead and installation costs must still be considered separately. This results in additional savings in time and costs through Efficient Infeed Technology.

	Price example Euro	Space requirement (equipment only) cm^3
Standard technology		
Standard inverter without PROFIBUS or encoder without regenerative feedback, 22 kW high overload	2830	35035
Braking resistor (2 in series, 2 in parallel)	1480	80100
Line reactor	240	12155
Energy costs [1]	8850	–
Total	**13400**	**127290**
Efficient Infeed Technology		
SINAMICS G120 with PM250 and CU240E with regenerative feedback, 22 kW high overload	3780	29610
Energy costs [1]	4220	–
Total	**8000**	**29610**
	40 % cost saving	**77 % space saving**

This application example is based on the following data:

Hoist drive (technical specifications)

m_{total} = 1900 kg

m_{load} = 1000 kg

m_{own} = 900 kg

v_{hoist} = 60 m/min = 1 m/s

$a_{starting/braking}$ = ±0.5 m/s^2 ($t_{starting/braking}$ = 2 s)

η_{total} = 0.85

Total height = 24 m

Hoisting height = 18 m

Motor (technical specifications)

P_{rated} = 11.0 kW

$n_{50\ Hz}$ = 1460 rev/min

n_{max} = 2980 rev/min (102 Hz)

M_{rated} = 71.9 Nm

η = 0.89

I_{rated} = 37.2 A (at 230 V)

87 Hz characteristic

Gearing (technical specifications):

Bevel helical gear unit with i = 40.5

η = 0.96

More information

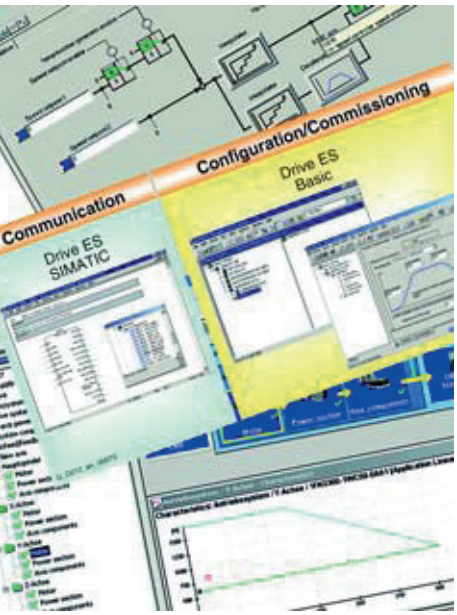
SINAMICS Infeed concepts

The Efficient Infeed concept is one of four different designs of SINAMICS inverter infeed circuit currently available on the market. An overview of the different concepts is shown below:

Concept	Characteristic features
Basic Infeed	• No regenerative feedback capability • Braking resistor required for braking operation • High harmonic content (reactor available as option) • …
Smart Infeed	• Regenerative feedback capability • Line reactor essential • Efficiency approx. 96 % to 97 % • …
Efficient Infeed	• Regenerative feedback capability • Line reactor not required/not permitted • Efficiency approx. 98 % • High energy efficiency and active current component • Low harmonic component • …
Active Infeed	• Regenerative feedback capability • Sine-wave current in motor and generator modes • High DC link voltage, compensation of line fluctuations • …

[1] For a total service life of 12500 h, FEM 9.512 basis for calculation for stacker cranes.

Engineering Tools

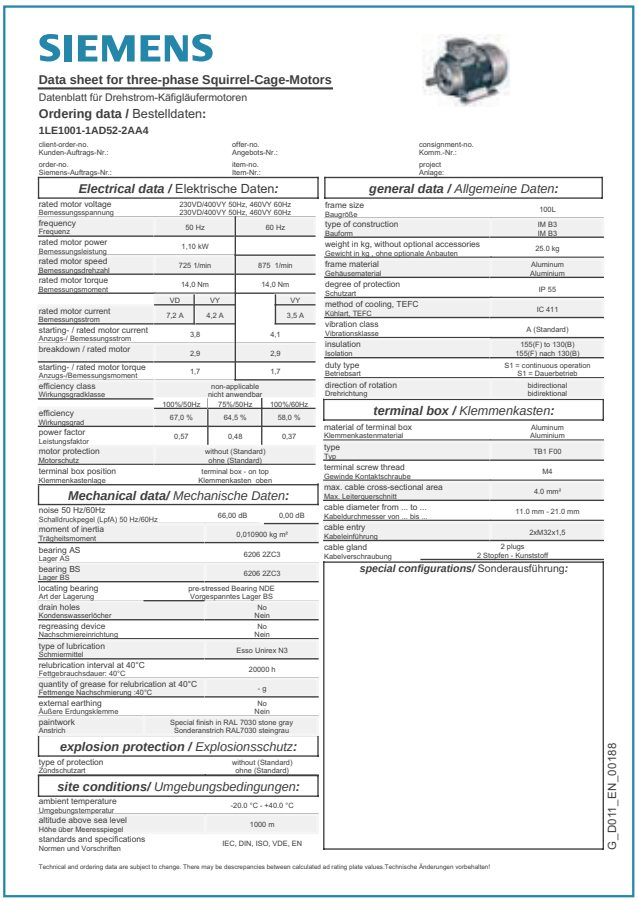


SD configurator selection aid

Overview

The interactive catalog CA 01 – the offline mall of Siemens Automation and Drives (A&D) – on CD 2 "Configuring" contains over 100000 products with approximately 5 million potential drive system product variants.

The SD configurator has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of A&D SD products. It is integrated as a "selection help" in this catalog. The SD configurator is used to help locate the correct drive solution and delivers both the correct order number and relevant documentation.


SIEMENS

Data sheet for three-phase Squirrel-Cage-Motors

Datenblatt für Drehstrom-Käfigläufermotoren

Ordering data / Bestelldaten:

1LE1001-1AD52-2AA4

client-order-no. Kunden-Auftrags-Nr.:		offer-no. Angebots-Nr.:	consignment-no. Komm.-Nr.:
order-no. Siemens-Auftrags-Nr.:		item-no. Item-Nr.:	project Anlage:

Electrical data / Elektrische Daten:

rated motor voltage Bemessungsspannung	230VD/400VY 50Hz, 460VY 60Hz 230VD/400VY 50Hz, 460VY 60Hz		
frequency Frequenz	50 Hz	60 Hz	
rated motor power Bemessungsleistung	1,10 kW		
rated motor speed Bemessungsdrehzahl	725 1/min	875 1/min	
rated motor torque Bemessungsmoment	14,0 Nm	14,0 Nm	
	VD	VY	VY
rated motor current Bemessungsstrom	7,2 A	4,2 A	3,5 A
starting- / rated motor current Anzugs-/ Bemessungsstrom	3,8		4,1
breakdown / rated motor	2,9		2,9
starting- / rated motor torque Anzugs-/Bemessungsmoment	1,7		1,7
efficiency class Wirkungsgradklasse	non-applicable nicht anwendbar		
	100%/50Hz	75%/50Hz	100%/60Hz
efficiency Wirkungsgrad	67,0 %	64,5 %	58,0 %
power factor Leistungsfaktor	0,57	0,48	0,37
motor protection Motorschutz	without (Standard) ohne (Standard)		
terminal box position Klemmenkastenlage	terminal box - on top Klemmenkasten oben		

Mechanical data/ Mechanische Daten:

noise 50 Hz/60Hz Schalldruckpegel (LpfA) 50 Hz/60Hz	66,00 dB	0,00 dB
moment of inertia Trägheitsmoment	0,010900 kg m²	
bearing AS Lager AS	6206 2ZC3	
bearing BS Lager BS	6206 2ZC3	
locating bearing Art der Lagerung	pre-stressed Bearing NDE Vorgespanntes Lager BS	
drain holes Kondenswasserlöcher	No Nein	
regreasing device Nachschmiereinrichtung	No Nein	
type of lubrication Schmiermittel	Esso Unirex N3	
relubrication interval at 40°C Fettgebrauchsdauer: 40°C	20000 h	
quantity of grease for relubrication at 40°C Fettmenge Nachschmierung :40°C	- g	
external earthing Äußere Erdungsklemme	No Nein	
paintwork Anstrich	Special finish in RAL 7030 stone gray Sonderanstrich RAL7030 steingrau	

explosion protection / Explosionsschutz:

type of protection Zündschutzart	without (Standard) ohne (Standard)

site conditions/ Umgebungsbedingungen:

ambient temperature Umgebungstemperatur	-20.0 °C - +40.0 °C
altitude above sea level Höhe über Meeresspiegel	1000 m
standards and specifications Normen und Vorschriften	IEC, DIN, ISO, VDE, EN

general data / Allgemeine Daten:

frame size Baugröße	100L
type of construction Bauform	IM B3 IM B3
weight in kg, without optional accessories Gewicht in kg, ohne optionale Anbauten	25.0 kg
frame material Gehäusematerial	Aluminum Aluminium
degree of protection Schutzart	IP 55
method of cooling, TEFC Kühlart, TEFC	IC 411
vibration class Vibrationsklasse	A (Standard)
insulation Isolation	155(F) to 130(B) 155(F) nach 130(B)
duty type Betriebsart	S1 = continuous operation S1 = Dauerbetrieb
direction of rotation Drehrichtung	bidirectional bidirektional

terminal box / Klemmenkasten:

material of terminal box Klemmenkastenmaterial	Aluminum Aluminium
type Typ	TB1 F00
terminal screw thread Gewinde Kontaktschraube	M4
max. cable cross-sectional area Max. Leiterquerschnitt	4.0 mm²
cable diameter from ... to ... Kabeldurchmesser von ... bis ...	11.0 mm - 21.0 mm
cable entry Kabeleinführung	2xM32x1.5
cable gland Kabelverschraubung	2 plugs 2 Stopfen - Kunststoff

special configurations/ Sonderausführung:

Technical and ordering data are subject to change. There may be descrepancies between calculated ad rating plate values.Technische Änderungen vorbehalten!

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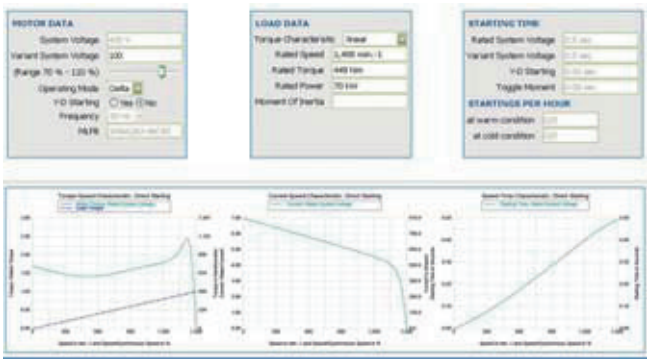
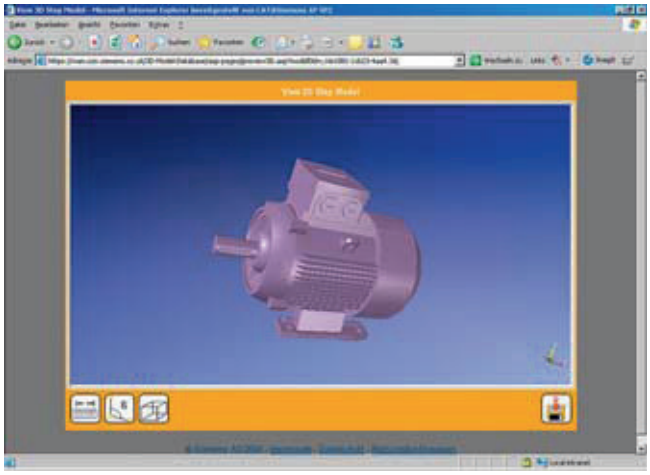
It can display operating instructions, factory test certificates, terminal box documentation, etc. and generates data sheets, dimension drawings and a start-up calculation for the relevant products. It can also be used to identify a suitable inverter for the selected motor.



3D models in a wide variety of 3D formats are also available.

Overview (continued)



The comprehensive help system not only explains the program functions, but also provides access to detailed technical background knowledge.

Product range

The SD configurator covers the product range of low-voltage motors (energy-saving and explosion-protected motors) with associated documentation and dimension drawings, low-voltage inverters in the MICROMASTER 4 range, SINAMICS G110 and G120 inverter chassis units, SINAMICS G120D distributed frequency inverters and the frequency inverters for the SIMATIC ET 200S FC and SIMATIC ET 200pro distributed I/Os.

Hardware and software requirements

- PC with 1.5 GHz CPU or faster
- Operating systems
  - Windows 98/ME
  - Windows 2000
  - Windows XP
  - Windows NT (Service Pack 6 and higher)
  - Windows VISTA
- At least 512 MB RAM user memory
- Screen resolution 1024 × 768, graphics with more than 256 colors/small fonts
- CD-ROM/DVD drive
- Windows-compatible sound card
- Windows-compatible mouse

Installation

You can install this catalog on your hard disk or network directly from the CD-ROM/DVD as a light or full version.

Selection and Ordering Data

Description	Order No.
Interactive catalog CA 01 on CD-ROM including selection help SD configurator, English	**E86060-D4001-A110-C6-7600**
Interactive catalog CA 01 on DVD including selection help SD configurator, English	**E86060-D4001-A510-C6-7600**

More information

The interactive catalog CA 01 can be ordered from the relevant Siemens sales office or via the Internet:

http://www.siemens.com/automation/CA01

Links to hints, tricks and downloads for functional or content updates can be found at this address.

For technical advice and hotline support, you can also contact our hotline for catalog CA 01:

Tel.: +49 (0) 180 50 50 22 2

Email: adsupport@siemens.com

Sizer configuration tool

Overview

The SIZER configuration tool provides an easy-to-use means of configuring the SINAMICS and MICROMASTER 4 drive families, as well as the SINUMERIK solution line CNC control and SIMOTION Motion Control. It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER supports the complete configuration of the drive system, from simple individual drives to complex multi-axis applications.

SIZER supports all of the engineering steps in one workflow:

- Configuring the power supply
- Motor and gearbox design, including calculation of mechanical transmission elements
- Configuring the drive components
- Selecting the required accessories
- Selecting the line-side and motor-side power options, e.g. cables, filters, and reactors

When SIZER was being designed, particular importance was placed on high usability and a universal, function-based approach to the drive task. The extensive user guidance makes using the tool easy. Status information keeps you continually informed of the progress of the configuration process.

The SIZER user interface is available in German and English.

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 components required (export to Excel, use of the Excel data sheet for import to VSR)
- Technical specifications of the system
- Characteristic curves
- Comments on system reactions
- Location diagram of drive and control components and dimension drawings of motors

These results are displayed in a results tree and can be reused for documentation purposes.

User support is provided by the technological online help menu, which provides the following information:

- Detailed technical data
- Information about the drive systems and their components
- Decision-making criteria for the selection of components
- Online help in German and English

Minimum system requirements

PG or PC with Pentium II 400 MHz (Windows 2000), Pentium III 500 MHz (Windows XP)

256 MB RAM (512 MB RAM recommended)

At least 2.3 GB of free hard disk space

An additional 100 MB of free hard disk space on Windows system drive

Screen resolution 1024 × 768 pixels

Windows 2000 SP2 / XP Professional SP1 / XP Home Edition SP1

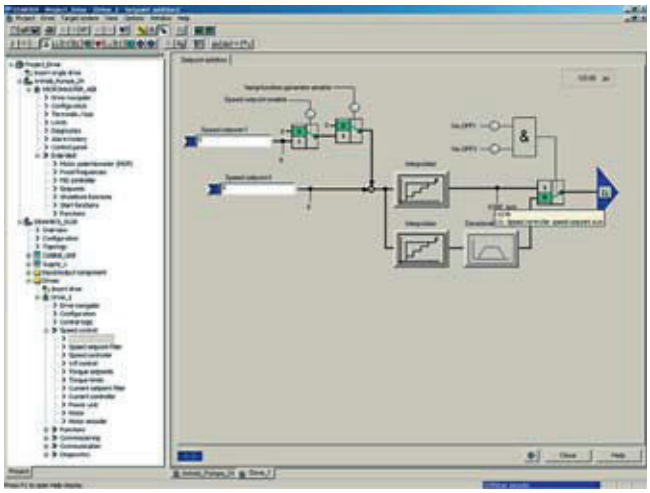
Microsoft Internet Explorer 5.5 SP2

Selection and Ordering Data

	Order No.
SINAMICS MICROMASTER SIZER configuration tool English/German	**6SL3070-0AA00-0AG0**

STARTER commissioning tool

Overview



The easy-to-use STARTER commissioning tool can be used to:

- Start up
- Optimize and
- Diagnose

This software can be operated either as a stand-alone PC application or can be integrated into the SCOUT engineering system (on SIMOTION) or STEP 7 (with Drive ES Basic). The basic functions and handling are the same regardless.

In addition to the SINAMICS drives, the current version of STARTER also supports MICROMASTER 4 devices and inverters for the SIMATIC ET 200S FC distributed I/O system.

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 wizards, which make all the basic settings in the drive. This ensures that even though only a small number of parameter settings have been made, the drive configuration has already progressed far enough to permit axis movement.

The individual settings required are made using graphics-based parameterization screen forms, which also display the mode of operation.

Examples of individual settings that can be made include:

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

Experts can gain rapid access to the individual parameters via the Expert List and do not have to navigate dialogs.

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

- Self-optimization (depending on drive)
- Trace (depending on drive)

Diagnostics functions provide information about:

- Control/status Words
- Parameter status
- Operating conditions
- Communication states

Performance

- Easy to use: Only a small number of settings need to be made for successful first commissioning: Axis turning
- Solution-oriented dialog-based user guidance simplifies commissioning.
- Self-optimization functions reduce manual effort for optimization.
- The built-in trace function provides optimum support during commissioning, optimization and troubleshooting

Minimum hardware and software requirements

PG device or PC with Pentium III 1 GHz (Windows 2000), Pentium III 1 GHz (Windows XP)

512 MB RAM (1 GB RAM recommended)

Screen resolution 1024 × 768 pixels, 16-bit color depth

Free hard disk memory: 1.6 GB, 2.3 GB for SCOUT stand-alone

Windows XP Professional SP2

Microsoft Internet Explorer 6.0

Integration

Depending on the system configuration, the Control Unit (CU) or the complete inverter can communicate with the programming device (PG) or PC by means of a serial interface, via PROFIBUS or PROFINET.

PC inverter connection kits are available for MICROMASTER 4, SINAMICS G110 and SINAMICS G120 for a safe point-to-point connection to the PC.

Selection and Ordering Data

	Order No.
STARTER commissioning tool for SINAMICS and MICROMASTER German / English / French / Italian	**6SL3072-0AA00-0AG0**
PC inverter connection kit for SINAMICS G110/G120 the scope of supply includes a 9-pin Sub-D connector, an RS232 standard cable (3 m) and the STARTER startup tool on CD-ROM.	**6SL3255-0AA00-2AA1**

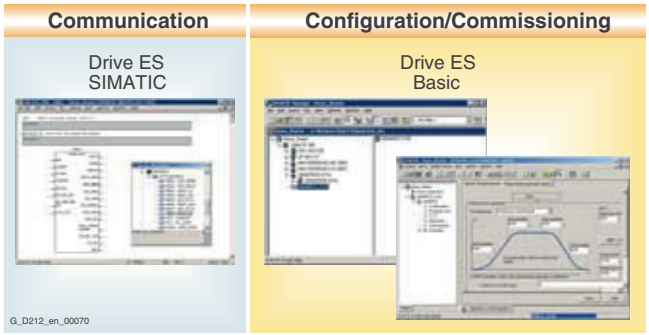
More information

The commissioning tool STARTER is also available on the Internet under

http://support.automation.siemens.com/WW/view/en/10804985/133100

Drive ES engineering system

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. The STEP 7 Manager user interface provides the basis for this procedure.

Various software packages are available for SINAMICS:

- **Drive ES Basic**
  for first-time users of the world of Totally Integrated Automation and the option for routing beyond network limits and the use of the SIMATIC teleservice.
  Drive ES Basic is the basic software program for setting the parameters of all drives online and offline.
  Drive ES Basic processes the automated system and drives on the interface of the SIMATIC Manager. 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 engineering tools for the new motion control functions – peer-to-peer data traffic, equidistance and isochronous operation with PROFIBUS DP.
- **Drive ES SIMATIC**
  Simply parameterize the STEP 7 communication instead of programming.
  In order to use Drive ES SIMATIC STEP 7 must be installed. It features a SIMATIC function block library, thereby making the programming of the PROFIBUS 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
  - Complete parameter sets are automatically downloaded into the drive from the SIMATIC CPU – e.g. when a device has to be replaced.
  - Part parameter sets (e.g. for recipe and product change) are automatically downloaded into the drive from the SIMATIC-CPU
  - Complete parameterization or part parameter sets are uploaded from the drive into the SIMATIC-CPU, i.e. updated.
- **Drive ES PCS 7**
  integrates drives with the PROFIBUS interface into the SIMATIC PCS 7 process control system.
  Drive ES PCS 7 can only be used with SIMATIC PCS 7 Version 5.2 and higher. 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.

For further information please visit us on the Internet at:

http://www.siemens.com/drivesolutions

Selection and Ordering Data

	Order No.
Drive ES Basic V 5.4 • Configuration software for the integration of drives into Totally Integrated Automation • Requirement: STEP 7 V 5.3 and higher, SP 3 • Supply format: on CD-ROM de, en, fr, es, it with electronic documentation	
Single-user license	**6SW1700-5JA00-4AA0**
Multi-user license, 60 pieces	**6SW1700-5JA00-4AA1**
Update service for single-user license	**6SW1700-0JA00-0AB2**
Update service for multi-user license	**6SW1700-0JA00-1AB2**
Upgrade from V 5.x to V 5.4	**6SW1700-5JA00-4AA4**
Drive ES SIMATIC V 5.4 • Function block library for SIMATIC for the parameterization of communication with the drives • Requirement: STEP 7 V 5.3 and higher, SP 3 • Supply format: on CD-ROM de, en, fr, es, it with electronic documentation	
Single-user license incl. 1 runtime license	**6SW1700-5JC00-4AA0**
Runtime license	**6SW1700-5JC00-1AC0**
Update service for single-user license	**6SW1700-0JC00-0AB2**
Upgrade from V 5.x to V 5.4	**6SW1700-5JC00-4AA4**
Drive ES PCS 7 V 6.1 • Function block library for PCS 7 for the integration of drives • Requirement: PCS 7 V 6.1 • Supply format: on CD-ROM de, en, fr, es, it with electronic documentation	
Single-user license incl. 1 runtime license	**6SW1700-6JD00-1AA0**
Runtime license	**6SW1700-5JD00-1AC0**
Update service for single-user license	**6SW1700-0JD00-0AB2**
Upgrade from V 5.x to V 6.1	**6SW1700-6JD00-1AA4**

Services and documentation

Training

Overview

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SITRAIN highlights

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Our trainers know their topics in practice and possess comprehensive didactic experience. Course developers have a direct wire to product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers enables them to pass on theoretical matter in a plausible manner. But since it has been known that all theory is 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 on state-of-the-art methodically/didactically designed training equipment. You feel absolutely certain when trained in this manner.

Wide variety

With a total of approx. 300 local attendance courses, we train the complete range of A&D products as well as interaction of the products in systems. Telecourses, teach-yourself software and seminars presented on the Web supplement our classical range of courses.

Customized training

We are only a short distance away. You can find us at more than 50 locations in Germany, and worldwide in 62 countries. You wish to have individual training instead of one of our 300 courses? Our solution: we will provide a program tailored exactly to your personal requirements. Training can be carried out in our Training Centers or at your company.

The right mixture: Blended learning

Blended learning is understood to be the combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Additional effect: Lower travel costs and downtimes.

Overview (continued)

Training package for SINAMICS G110/G120

The courses are modular in design and are intended for a variety of target groups as well as individual customer requirements. An overview course enables decision-makers and sales personnel to get to know the SINAMICS drive family as well as its positioning in the existing Siemens drives environment.

SITRAIN offers a compact course to users of SINAMICS G110. Due to the uniform parameterization and commissioning of MICROMASTER 4 and SINAMICS G110, both technologies can be combined in one course.

A training course on the subject of service and commissioning provides the necessary depth of technical knowledge for SINAMICS G120 and SINAMICS G120D.

SINAMICS G120 is also covered by various courses which deal more generally with the SINAMICS drive system.

All modules 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.

More information on course contents, dates and prices is available on the Internet at:

http://www.siemens.com/sitrain

Title	Target group					Duration	Course code
	Decision-makers, sales personnel	Project managers, project assistants	Programmers	Commissioning engineers, configurators, service personnel	Maintenance personnel		
SINAMICS system overview	✓					2 days	DR-SN-UEB
MICROMASTER MM4/ SINAMICS G110 compact course		✓		✓	✓	1 day	SD-WSMM4
SINAMICS G120 commissioning and service	✓			✓	✓	2 days	DR-G120-EXP
SINAMICS communication			✓	✓		5 days	DR-SN-COM

SINAMICS G110 training case

Overview

The modular SIDEMO case system for micro-systems also includes a training case for SINAMICS G110 which is designed for mobile use for sales and servicing.

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-USV.

For this reason, a conversion guide is enclosed with the training case that enables the user to replace the inverter with a USS version (not included in the scope of supply).

The training systems are fitted in dark blue transport cases (400 x 300 x 210 mm; gross weight: 12 kg). The transport cases can be stacked.

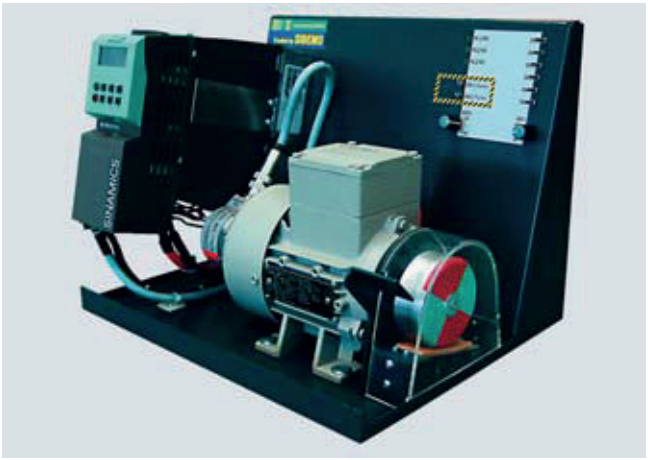
Further information is available on the Internet at http://www.siemens.com/sidemo

Selection and Ordering Data

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

SINAMICS G120 training case

Application



A training case is available for on-site training and demonstration of the SINAMICS G120 system. It can demonstrate and increase understanding of a wide range of SINAMICS G120 functions. The case uses the CU240S DP-F or CU240S PN-F as a Control Unit with which the PROFIBUS or PROFINET interface and safety functions can be demonstrated.

Design

- CU240S DP-F Control Unit or CU240S PN-F Control Unit
- PM240 Power Module frame size FSA, 0.37 kW (0.5 hp)
- Basic Operator Panel (BOP)
- Asynchronous motor 1LA
- Encoder
- Load equipment
- Simulator panel
- Power cable
- Storage and carrying case

Technical specifications

	SINAMICS G120 training case
Input voltage	230 V 1 AC
Degree of protection to DIN VDE 0470 Part 1, EN 60529, IEC 529	IP00
Ambient temperature, perm.	
• Storage and transport	–20 … +60 °C
• Operation	5 … 40 °C
Dimensions	
• Width	540 mm
• Height	500 mm
• Depth	400 mm
Weight, approx.	10 kg

Selection and Ordering Data

	Order No.
SINAMICS G120 training case	
• with CU 240S DP-F and Tanos box	**6ZB2480-0CD00**
• with CU 240S DP-F and Peli box	**6ZB2480-0CE00**
• with CU 240S PN-F and Tanos box	**6ZB2480-0CF00**
Line adapter 110 V/230 V	**6AG1064-1AA02-0AA0**

Documentation SINAMICS G110

Overview

The following manuals are available for the inverter chassis units SINAMICS G110:

	Manuals		
	Operating instructions	Parameter list	Getting started guide
Controlled Power Modules			
CPM110	de, en, fr, it, es	de, en, fr, it, es	multilingual

Manuals are available in the following form:

Paper documentation

The scope of supply for each Controlled Power Module comprises a Getting started guide in hard copy form. Additionally, the Operating instructions and the Parameter list can be ordered in hard copy form.

Online version on the Internet as download

The documentation is also available on the Internet under

http://www.siemens.com/sinamics-g110

Selection and Ordering Data

Type of documentation	Language	Order No.
SINAMICS G110 Operating instructions (Paper version)	German	**6SL3298-0AA11-0AP0**
	English	**6SL3298-0AA11-0BP0**
	French	**6SL3298-0AA11-0DP0**
	Italian	**6SL3298-0AA11-0CP0**
	Spanish	**6SL3298-0AA11-0EP0**
SINAMICS G110 Parameter list (Paper version)	German	**6SL3298-0BA11-0AP0**
	English	**6SL3298-0BA11-0BP0**
	French	**6SL3298-0BA11-0DP0**
	Italian	**6SL3298-0BA11-0CP0**
	Spanish	**6SL3298-0BA11-0EP0**

Documentation SINAMICS G120

Overview

SINAMICS G120 is a modular inverter system that comprises different function units – these are primarily the Control Unit and the Power Module. The documentation is also organized in a modular structure. The following manuals are available:

	Manuals			
	Installation guide	Operating instructions	List manual	Getting started
Control Units				
CU240S	–	de, en	de, en [1]	de, en, fr, it, es
CU240E	–	de, en	de, en [1]	de, en, fr, it, es
Power Modules				
PM240	de, en	–	– [2]	multilingual
PM250	de, en	–	– [2]	multilingual
PM260	de, en	–	– [2]	multilingual

Manuals are available in the following form:

Multi-language package on CD-ROM

A multi-language package on CD-ROM is supplied with every Control Unit which comprises all manuals in the available language for SINAMICS G120.

Paper documentation

The scope of supply for each Power Module and Control Unit comprises a Getting started guide in hard copy form.

Online version on Internet as download

The documentation is also available on the Internet under

http://www.siemens.com/sinamics-g120

[1] A joint List manual is available for the CU240S and CU240E Control Units.

[2] The parameter settings for the Power Modules are included in the List manual for the Control Units.

Documentation SINAMICS G120D

Overview

SINAMICS G120D is a modular, distributed inverter system that comprises different function units – these are primarily the Control Unit and the Power Module. The documentation is also organized in a modular structure. The following manuals are available:

	Manuals			
	Installation guide	Operating instructions	List manuals	Getting started
Control Units				
CU240D	–	de, en	de, en	de, en, fr, it, es [1]
Power Modules				
PM250D	– [2]	–	– [3]	de, en, fr, it, es [1]

Manuals are available in the following form:

Multi-language package on CD-ROM

A multi-language package on CD-ROM is supplied with every Control Unit which comprises all manuals in the available languages for SINAMICS G120D.

Paper documentation

The scope of supply for each Power Module and each Control Unit comprises a Getting Started guide in hard copy form.

Online version on Internet as download

The documentation is also available on the Internet under

http://www.siemens.com/sinamics-g120d

More information

Language	Manual in language
de	German
en	English
fr	French
it	Italian
es	Spanish
multilingual	de, en, fr, it, es

Installation manual

The Installation manual describes the actions that have to be carried out once with or on the product in order to use the product in the desired place in the desired way. The Installation manual contains all relevant information for setting up, assembling and wiring as well as the required dimension drawings and circuit diagrams.

Usage phases: Installation and commissioning phase

Operating instructions

Operating instructions are a comprehensive collection of all information necessary for the normal and safe operation of products, process cells and complete plants (EN 62079).

Usage phases: Planning and configuration phase, implementation phase, setup and commissioning phase, application phase, maintenance and service phase.

List manual/Parameter list

The List manual or Parameter list describes all parameters, function charts and faults/warning for the product/system as well as their meanings and setting options. It contains parameter data and fault/warning descriptions with functional correlations.

Usage phases: Commissioning of components that have already been connected, configuration of system functions and fault cause/diagnostics.

Getting started/Getting started guide

The Getting started or Getting started guide provides information about getting started for the first-time user as well as references to additional information. It contains information about basic steps to be taken during commissioning. Descriptions of more advanced procedures can be found in the other documentation.

Usage phases: Commissioning of components that have already been connected.

[1] A joint Getting started for the CU240D Control Units and PM250D Power Modules is available.

[2] The installation instructions for the PM250D Power Module are included in the Getting started guide.

[3] The parameter settings for the Power Modules are included in the List manual for the Control Units.

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 output		SINAMICS G120 Power Module PM240		Replacement fan
kW	hp	Type 6SL3224-...	Frame size and number of fans	Order No.
380 … 480 V 3 AC				
0.37	0.50	0BE13-7UA0	FSA, 1 fan	**6SL3200-0SF01-0AA0** (includes 1 replacement fan)
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, 2 fans [1]	
3.0	4	0BE23-0 . A0		
4.0	5	0BE24-0 . A0		
7.5	10	0BE25-5 . A0	FSC, 2 fans [1]	**6SL3200-0SF03-0AA0** (includes 1 replacement fan)
11.0	15	0BE27-5 . A0		
15.0	20	0BE31-1 . A0		
18.5	25	0BE31-5 . A0	FSD, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
22	30	0BE31-8 . A0		
30	40	0BE32-2 . A0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
37	50	0BE33-0 . A0	FSE, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
45	60	0BE33-7 . A0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
55	75	0BE34-5 . A0	FSF, 2 fans	**6SL3200-0SF06-0AA0** (includes 2 replacement fans)
75	100	0BE35-5 . A0		
90	125	0BE37-5 . A0		**6SL3200-0SF07-0AA0** (includes 2 replacement fans)
110	150	0BE38-8UA0		**6SL3200-0SF08-0AA0** (includes 2 replacement fans)
132	200	0BE41-1UA0		

[1] 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.

Replacement fans for SINAMICS G120

Selection and Ordering Data (continued)

Rated output		SINAMICS G120 Power Module PM250		Replacement fan
kW	hp	Type 6SL3225-...	Frame size and number of fans	Order No.
380 … 480 V 3 AC				
7.5	10	0BE25-5AA0	FSC, 2 fans [1]	**6SL3200-0SF03-0AA0** (includes 1 replacement fan)
11.0	15	0BE27-5AA0		
15.0	20	0BE31-1AA0		
18.5	25	0BE31-5AA0	FSD, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
22	30	0BE31-8AA0		
30	40	0BE32-2AA0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
37	50	0BE33-0AA0	FSE, 2 fans	**6SL3200-0SF04-0AA0** (includes 2 replacement fans)
45	60	0BE33-7AA0		**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
55	75	0BE34-5AA0	FSF, 2 fans	**6SL3200-0SF06-0AA0** (includes 2 replacement fans)
75	100	0BE35-5AA0		
90	125	0BE37-5AA0		**6SL3200-0SF08-0AA0** (includes 2 replacement fans)

Rated output		SINAMICS G120 Power Module PM260		Replacement fan
kW	hp	Type 6SL3225-...	Frame size and number of fans	Order No.
660 … 690 V 3 AC				
11.0	15	0BH27-5 . A0	FSD, 2 fans	**6SL3200-0SF05-0AA0** (includes 2 replacement fans)
15.0	20	0BH31-1 . A0		
18.5	25	0BH31-5 . A0		
30	40	0BH32-2 . A0	FSF, 2 fans	**6SL3200-0SF07-0AA0** (includes 2 replacement fans)
37	50	0BH33-0 . A0		
55	75	0BH33-7 . A0		

Replacement fans for SINAMICS G120D

Selection and Ordering Data

Rated output		SINAMICS G120D Power Module PM250D		Replacement fan
kW	hp	Type 6SL3525-...	Frame size	Order No.
380 … 480 V 3 AC				
4.0	5.0	0PE24-0AA0	FSC	**6SL3500-0SF01-0AA0** (preinstalled unit with hood, fan and bolts)
5.5	7.5	0PE25-5AA0		
7.5	10	0PE27-5AA0		

[1] 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.

Overview

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E-Mail: adsupport@siemens.com

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Fax: +1 423 262 2200
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(0.14 €/min from the German fixed network)

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To enhance productivity and save costs in your project we offer high-quality services in optimization and upgrading. [1)]

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

[1)] For country-specific telephone numbers go to our Internet site at: http://www.siemens.com/automation/service&support

Notes

Appendix

Appendix

Frequency inverters for SIMATIC ET 200 distributed I/O

Frequency inverters are available for the SIMATIC ET 200 distributed I/O that are fully system-integrated modules. Inverters are available for the finely modular SIMATIC ET 200S FC system to the IP20 degree of protection as well as for the cabinet-free SIMATIC ET 200pro FC system to the IP65 degree of protection. With a broad range of possibilities, the frequency inverters expand the functional scope of the modular modules that are available in both systems (e.g. inputs and outputs, technology modules, direct and soft starters). With suitable interface modules, connection to PROFIBUS and PROFINET is possible via the ET 200 system bus as well as integration of PLC functionality into the system. Fail-safe frequency inverter functions can be activated locally or via PROFIsafe.

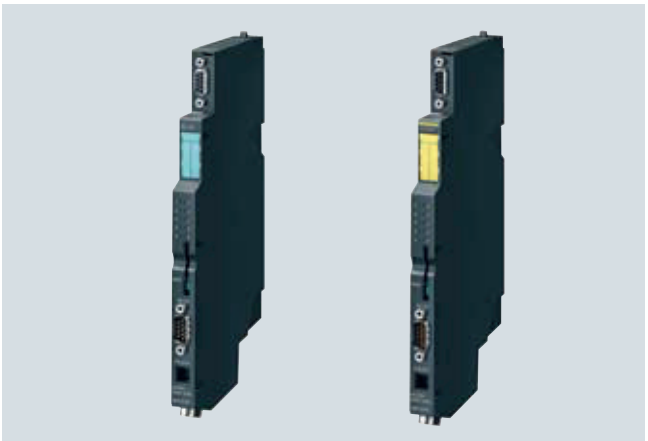
An overview of the features of the SIMATIC ET 200S FC frequency inverter series is given in the table below. The complete product spectrum including ordering data, technical data and explanations can be found in Catalog IK PI "Industrial Communication for Automation und Drives" and on the Internet at

http://www.siemens.com/et200s-fc

and

http://www.siemens.com/et200pro-fc

	SIMATIC ET 200S FC
Main features	• Complete embedding of a frequency inverter into a distributed I/O system to IP20 degree of protection • Easy assembly and low susceptibility to errors thanks to self-assembling energy and communications bus • Space-saving assembly thanks to compact dimensions and common protection • Fast, tool-free replacement of the frequency inverter for a servicing requirement (hot swapping) • Frequency control (V/f), vector control with and without encoders • Line-commutated regenerative feedback by power electronics of the latest generation • Modular structure with Control Unit (closed-loop control module) and Power Module (power section) • Frequency inverter variant with integrated, autonomous, fail-safe functions without the need for complex external wiring
Rated outputs	0.75 kW (1.0 hp) 2.2 kW (3.0 hp) 4.0 kW (5.0 hp)
Input voltage	380 … 480 V 3 AC +10 % -10 %
Overall width	Control Unit + Power Module up to 0.75 kW (1.0 hp): 80 mm, otherwise 145 mm
Mains frequency	47 ... 63 Hz
Overload capability	• Overload current 1.5 x rated output current (i.e. 150 % overload) over 60 s, cycle time 300 s • Overload current 2 x rated output current (i.e. 200 % overload) over 3 s, cycle time 300 s
Output frequency	0 ... 650 Hz
Pulse frequency	8 kHz (standard) 2 ... 16 kHz (in steps of 2 kHz)
Frequency bands that can be skipped	1, programmable
Efficiency	≥ 96 %
Interfaces	• Connection to PROFIBUS via IM151 interface module • Connection to PROFINET via IM151-3PN interface module • Integration of PLC functionality through IM151 CPU and IM151-7 F CPU interface modules • RS232 interface with USS protocol for commissioning on the PC with the STARTER commissioning software • Slot for an optional Micro Memory Card for uploading or downloading parameter settings • PTC/KTY84 interface for motor monitoring • Speed sensor interface (Sub-D connector) for unipolar HTL incremental encoder • Activation of the integrated safety functions over PROFIsafe (using the PM-D F PROFIsafe Power Module) or terminals (using the Safety Local Power Module PM-D F X1)
Standards conformance	UL, cUL, CE and c-tick, Low-Voltage Directive 73/23/EEC, EMC Directive 89/336/EEC
Functional safety	Closed-loop control module with Integral safety functions to Category 3 of EN 954-1 and SIL2 of IEC 61508: • Safe Torque Off • Safely Limited Speed • Safe Stop 1 The safety functions "Safely Limited Speed" and "Safe Stop 1" are certified for encoderless asynchronous motors. These safety functions are not approved for pull-through loads as in the case of lifting gear and winders.
Degree of protection	IP20



SIMATIC ET 200S FC
Control Units

SIMATIC ET 200S FC
Power Modules

	SIMATIC ET 200pro FC
Main features	• Complete embedding of a frequency inverter into a distributed I/O system to IP65 degree of protection • Easy assembly and low susceptibility to errors thanks to self-assembling energy and communications bus • Fast replacement of the frequency inverter during servicing without interruption of the bus communication to other modules within the SIMATIC ET 200pro FC • Frequency control (*V/f*), vector control without encoders • Line-commutated regenerative feedback by power electronics of the latest generation • Frequency inverter variant with integrated, autonomous, fail-safe functions without the need for complex external wiring
Rated outputs	1.1 kW (1.5 hp) (at 0 ... 55 °C ambient temperature) 1.5 kW (2.0 hp) (at 0 ... 45 °C ambient temperature)
Input voltage	380 ... 480 V 3 AC +10 % -10 %
Overall width	155 mm
Mains frequency	47 ... 63 Hz
Overload capability	• Overload current 1.5 × rated output current (i.e. 150 % overload) over 60 s, cycle time 300 s • Overload current 2 × rated output current (i.e. 200 % overload) over 3 s, cycle time 300 s
Output frequency	0 ... 650 Hz
Pulse frequency	4 kHz (standard) 2 ... 16 kHz (in steps of 2 kHz)
Frequency bands that can be skipped	1, programmable
Efficiency	≥ 96 %
Interfaces	• Connection to PROFIBUS via IM154-1 and IM154-2 interface modules • Available soon: connection to PROFINET over IM154-4PN interface modules and connection to IM154-8 CPU interface modules • Optical interface with USS protocol for fiber-optic RS232 connecting cable • Control signal for 180 V DC electromagnetic motor brake • Slot for an optional memory card (MMC) for uploading or downloading parameter settings • PTC/KTY84 interface for motor temperature monitoring • Activation of the integrated safety functions through the Safety Local Isolator Module F RSM or through F-Switch PROFIsafe
Standards conformance	UL, cUL, CE, Low-Voltage Directive 73/23/EEC, EMC Directive 89/336/EEC
Functional safety	Variant with Integral safety functions to Category 3 of EN 954-1 and SIL2 of IEC 61508: • Safe Torque Off • Safely Limited Speed • Safe Stop 1 The safety functions “Safely Limited Speed” and “Safe Stop 1” are certified for encoderless asynchronous motors. These safety functions are not approved for pull-through loads as in the case of lifting gear and winders.
Degree of protection	IP65

SIMATIC ET 200pro FC
Standard frequency inverter

SIMATIC ET 200pro FC Fail-safe
Frequency inverter with integrated safety functions

Appendix

Frequency converters MICROMASTER 410/420/430/440

MICROMASTER converters from Siemens perfectly complement the motors. The table shows an overview of the features of these converters. For the full range of products complete with ordering data, technical details and explanations, see Catalog DA 51.2.

For up-to-date information on MICROMASTER 420/430/440 frequency converters, visit the Internet at http://www.siemens.com/micromaster

	MICROMASTER 410	MICROMASTER 420	MICROMASTER 430	MICROMASTER 440
Main characteristics	**"The low-price solution"** for variable speeds with three- phase motors on single-phase networks, e.g. with pumps, fans, billboards, barriers, gate drives and automatic machines. **Discontinued model** [1]	**"The universal converter"** for three-phase networks and optional fieldbus interfacing, e.g. for conveyor belts, material transport, pumps, fans and machine tools	**"The specialist for pumps and fans"** with optimized OP (manual/automatic changeover), adapted software functionality and optimized output utilization	**"The all-rounder"** with advanced vector control (with and without encoder feedback) for versatile applications in sectors such as conveyor systems, textiles, lifts, lifting gear and machine construction
Output range	0.12 ... 0.75 kW (0.16 ... 1.0 hp)	0.12 ... 11 kW (0.16 ... 15 hp)	7.5 ... 250 kW (10 ... 350 hp)	0.12 ... 250 kW (0.16 ... 300 hp)
Voltage ranges	100 ... 120 V 1 AC 200 ... 240 V 1 AC	200 ... 240 V 1 AC 200 ... 240 V 3 AC 380 ... 480 V 3 AC	380 ... 480 V 3 AC	200 ... 240 V 1 AC 200 ... 240 V 3 AC 380 ... 480 V 3 AC 500 ... 600 V 3 AC
Closed-loop Control	• *V/f* characteristic • Multipoint characteristic (parameterizable *V/f* characteristic) • FCC (Flux Current Control)	• *V/f* characteristic • Multipoint characteristic (parameterizable *V/f* characteristic) • FCC (Flux Current Control)	• *V/f* characteristic • Multipoint characteristic (parameterizable *V/f* characteristic) • FCC (Flux Current Control)	• *V/f* characteristic • Multipoint characteristic (parameterizable *V/f* characteristic) • FCC (Flux Current Control) • Vector control
Process control		Internal PI controller	Internal PID controller	Internal PID controller (autotuning)
Inputs	3 digital inputs 1 analog input	3 digital inputs 1 analog input	6 digital inputs 2 analog inputs 1 PTC/KTY input	6 digital inputs 2 analog inputs 1 PTC/KTY input
Outputs	1 relay output	1 analog output 1 relay output	2 analog outputs 3 relay outputs	2 analog outputs 3 relay outputs
Interfacing to automation system	The PLC partner for LOGO! and SIMATIC S7-200	The ideal partner for your automation tasks, whether with SIMATIC S7-200, SIMATIC S7-300/400 (TIA) or SIMOTION	The ideal partner for your automation tasks, whether with SIMATIC S7-200, SIMATIC S7-300/400 (TIA) or SIMOTION	The ideal partner for your automation tasks, whether with SIMATIC S7-200, SIMATIC S7-300/400 (TIA) or SIMOTION
Additional features	• Natural ventilation (no fan unit) • Position of connections as with conventional switching elements (e.g. contactors) • Variant with flat heat sink	• BICO technology • Compound braking for controlled rapid braking	• Energy-saving mode • Load torque monitoring (detects dry run of pumps) • Motor staging • Bypass mode • BICO technology	• 3 selectable drive data records • Integrated brake chopper (up to 75 kW) • Torque control • BICO technology

Examples of MICROMASTER 410/420/430/440

[1] Only available as spare part.

Distributed drive solution - Converters
MICROMASTER 411/COMBIMASTER 411

The MICROMASTER 411/COMBIMASTER 411 converters and geared motors from Siemens are available as a distributed drives solution. The table shows an overview of the features of this product. The complete product spectrum with ordering data, technical details and descriptions can be found in Catalog DA 51.3 MICROMASTER 411/COMBIMASTER 411.

For up-to-date information on MICROMASTER 411 and COMBIMASTER 411 visit the Internet at http://www.siemens.com/combimaster

	MICROMASTER 411	COMBIMASTER 411
Main characteristics	"The distributed converter" for a wide drive range, for simple individual applications for pumps and fans through to multiple drives for conveyor systems in net-worked control systems.	
Output range	0.37 ... 3 kW (0.5 ... 4.0 hp)	
Voltage ranges	380 ... 480 V 3 AC	
Case/frame sizes	CSB CSC	71 ... 100 90/100
Types of construction		IMB3 IMB5 IMV1 (without protective cover) IMV1 (with protective cover) IMB14 (with standard flange) IMB14 (with special flange) IMB35
Degree of protection	IP65	IP55
Further technical characteristics	• *V/f* characteristic • Multipoint characteristic (parameterizable *V/f* characteristic) • FCC (Flux Current Control) • Internal PI controller • 3 digital inputs • 1 analog input • 1 relay output • Compound braking for controlled rapid braking • ECOFAST variants with plug connector for power supply, communication interfaces and motor connections to support quick and problem-free replacement. The ECOFAST variants are totally compatible with the ECOFAST technology systems.	

Examples of MICROMASTER 411

Examples of COMBIMASTER 411

Appendix

Low-voltage motors
IEC squirrel-cage motors

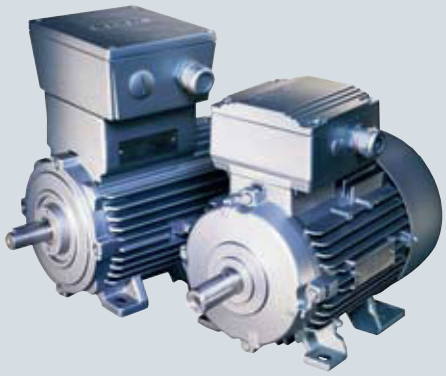
With an output range from 0.06 kW to 1250 kW, low-voltage motors are available for the widest range of requirements and applications that are harmonized and coordinated with the MICROMASTER and SINAMICS frequency inverters. In addition to energy-saving motors and explosion-proof motors, there are also sector and customer-specific motors such as smoke extraction motors. The table shows an overview of the technical features of these motors. You will find the available product range with ordering data, technical data and detailed explanations in Catalog D 81.1 “Low-Voltage Motors - IEC Squirrel-Cage Motors - Frame Sizes 56 to 450” and on the Internet under: http://www.siemens.com/motors

	IEC Squirrel-Cage Motors		
Versions	**Energy-saving motors**		
	Aluminum housing	**Gray cast housing**	**Temp.-time classes F200/F300/F400**
Rated power	0.06 ... 45 kW	0.75 ... 1250 kW	0.37 ... 200 kW
Frame sizes	56 M ... 225	100 L ... 450	80 M ... 315 L
Type of construction	All common types of construction	All common types of construction	All common types of construction
Speed	750 ... 3000 rpm	750 ... 3000 rpm	1000 ... 3000 rpm
Rated torque	0.3 ... 292 Nm	9.9 ... 10300 Nm	2.5 ... 1546 Nm
Rated voltages	All commonly used voltages	All commonly used voltages	230 VΔ/400 VY, 500 VΔ, 400 VΔ/690 VY, 500 VY
Designation	EFF1, EFF2	EFF1, EFF2	EFF1, EFF2
Degree of protection	IP55	IP55	IP55
Housing	Aluminum	Gray iron	Aluminum, Gray iron
Cooling type	Surface-cooled	Surface-cooled	Surface-cooled
Temperature class	155 (F) utilized to 130 (B) / 155 (F)	155 (F) utilized to 130 (B) / 155 (F)	155 (F) utilized to 130 (B)
Approvals	CE, CCC, UL, CSA	CE, CCC, UL, CSA	CE
Approvals for marine propulsion drives	Below deck use: BV, DNV, GL, LR	Below deck use: BV, DNV, GL, LR	No
Explosion protection (incl. temp. class)	Ex nA II T3 (Zone 2), Dust-Ex (Zone 21, 22)	Ex nA II T3 (Zone 2), Dust-Ex (Zone 21, 22)	No

Examples, energy-saving motors

Example, smoke extraction motors

	IEC Squirrel-Cage Motors			
Versions	**Explosion-proof motors**			
	Type of protection "e"	**Type of protection "d"**	**Type of protection "n"**	**Dust explosion protection**
Rated power	0.12 ... 165 kW	0.25 ... 950 kW	0.09 ... 1000 kW	0.06 ... 1000 kW
Frame sizes	63 M ... 315 L	71 M ... 450	63 M ... 450	Zone 21: 56 M ... 315 L Zone 22: 56 M ... 450
Type of construction	All common types of construction	All common types of construction	All common types of construction	All common types of construction
Speed	1000 ... 3000 rpm	750 ... 3000 rpm	750 ... 3000 rpm	750 ... 3000 rpm
Rated torque	0.61 ... 1300 Nm	1 ... 8579 Nm	1 ... 8090 Nm	0.3 ... 8090 Nm
Rated voltages	All commonly used voltages	All commonly used voltages	All commonly used voltages	All commonly used voltages
Designation	See Catalog D 81.1	See Catalog D 81.1	Analog energy-saving motors EFF1/EFF2	Analog energy-saving motors EFF1/EFF2
Degree of protection	IP55, IP56 (non-heavy-sea), IP65	IP55, IP56 (non-heavy-sea)	IP55, IP56 (non-heavy-sea), IP65	Zone 21: IP65 Zone 22: IP55
Housing	FS 63 ... 160 L Aluminum FS 100 L ... 315 L Gray iron	FS 71 M ... 315 L Gray iron FS 355 ... 450 Steel	FS 63 M ... 160 L Aluminum FS 100 L ... 450 Gray iron	FS 63 M ... 225 M Aluminum FS 100 L ... 450 Gray iron
Cooling type	Surface-cooled	Surface-cooled	Surface-cooled	Surface-cooled
Temperature class	155 (F) utilized to 130 (B) / 155 (F)	155 (F) utilized to 130 (B) (line operation); 155 (F) utilized to 155 (F) (frequency inverter operation)	155 (F) utilized to 130 (B)	155 (F) utilized to 130 (B)
Approvals	CE, CCC, GOST, ATEX	CE, CCC, GOST, ATEX, NEPSI	CE, CCC, GOST, ATEX, NEPSI	CE, CCC, GOST, ATEX
Approvals for marine propulsion drives	Below deck use: BV, DNV, GL, LR	Below deck use: BV, DNV, GL, LR	Below deck use: BV, DNV, GL, LR	Below deck use: BV, DNV, GL, LR
Explosion protection (incl. temp. class)	II 2G Ex e II T1-T3	II 2G Ex de IIC T1-T4	II 3G Ex nA II T3	Zone 21: II 2D Ex tD A21 IP65 T125 °C Zone 22: II 3D Ex tD A22 IP55 T125 °C



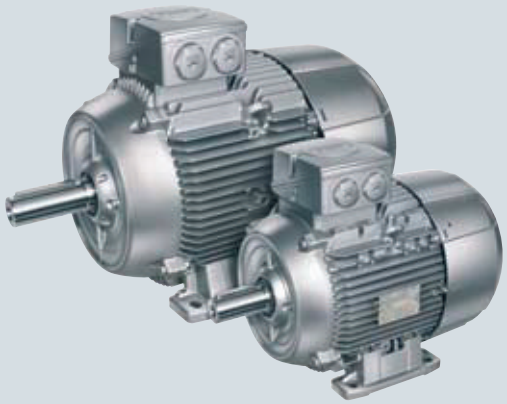
Examples, explosion-proof motors

Appendix

Low-voltage motors
IEC squirrel-cage motors – new generation 1LE1

Increasing energy costs have resulted in greater emphasis on the power consumption of drive systems. It is extremely important to utilize the full potential for minimization here to secure competitiveness today and in the future. This is the reason that already today, Siemens is developing a new generation of low-voltage motors. Innovative copper rotors create the best requisites for motors with high efficiencies. The new motors for EFF1 (High Efficiency) offer considerable energy savings and protect our environment. The table shows an overview of the technical features of these motors. The presently available product range with ordering data, technical data and detailed explanations are provided in the new Catalog News D 81.1 N "Low-Voltage Motors - IEC Squirrel-Cage Motors - New Generation 1LE1 - Frame Size 100 to 160" and on the Internet under:
http://www.siemens.com/motors

	IEC Squirrel-Cage Motors - new generation 1LE1
Versions	**Self-cooled energy-saving motors with:** • Improved efficiency (EFF2) • High efficiency (EFF1)
	Self-cooled motors with increased output and: • Improved efficiency (EFF2) • High efficiency (EFF1)
	Forced-air-cooled motors without external fan and fan cover with: • Improved efficiency (EFF2) • High efficiency (EFF1)
Rated power	0.75 ... 22 kW
Frame sizes	100 L … 160 L
Type of construction	**Without flange:** IM B3, IM B6, IM B7, IM B8, IM V5 without protective cover, IM V6, IM V5 with protective cover **With flange:** IM B5, IM V1 without protective cover, IM V1 with protective cover, IM V3, IM B35 **With standard flange:** IM B14, IM V19, IM V18 without protective cover, IM V18 with protective cover, IM B34
Speed	750 ... 3000 rpm
Rated torque	9.9 ... 150 Nm
Rated voltages	All commonly used voltages
Designation	EU/CEMEP efficiency classification: EFF1: 2-, 4-pole, EFF2: 2-, 4-pole US Energy Policy Act EPACT: 2-, 4-, 6-pole (available soon)
Degree of protection	IP55 as standard
Housing	Aluminum
Cooling type	**Self-cooled:** Frame size 100 L ... 160 L (IC 411), **Forced-air cooled:** Frame size 100 L ... 160 L (IC 416)
Temperature class	Temperature class 155 (F), utilized to temperature class 130 (B)
Approvals	CE



Examples, IEC squirrel-cage motors - new generation 1LE1, aluminum housing

In addition to the products offered in the catalog, our range of motors also includes “Customized motors”.

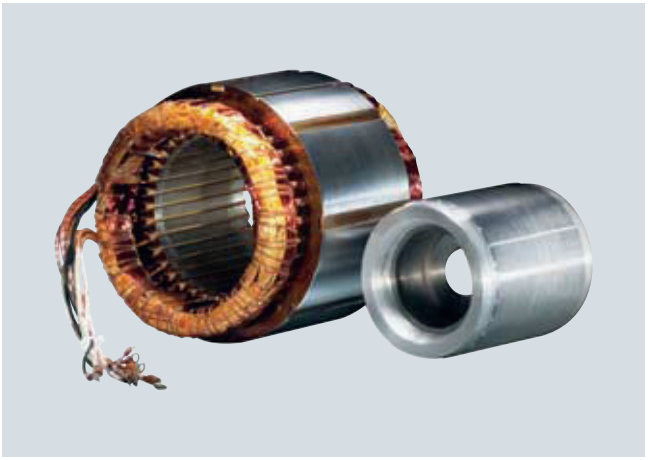
We can develop individual drive solutions for your special requirements, provide samples and supply them in accordance with your logistical requirements.

Our worldwide network of Siemens offices as well as our regional offices in Germany are, of course, at your disposal for advice (see “Siemens Contacts Worldwide”).

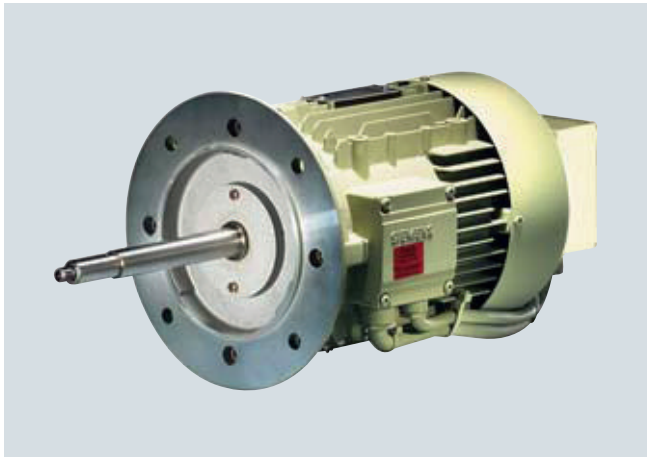
Please inquire for details.

We have listed below some of the “Customized solutions” already realised:

- High-speed motors for textile machines and compressors
- Motors with increased power density
- Liquid-cooled motors
- Synchronous generators for standby supply systems
- Motors for wood processing plants
- Built-in motors for refrigerating motors/compressors (freezer proof)
- Rolling motors for harsh conditions (e.g. roller drives)
- Pump motors with special shafts/special materials
- Single-phase motors for industrial applications
- Lifting gear motors



Built-in motor for refrigeration



Pump motor with special shaft/special materials

Roller motor for harsh conditions

Lifting gear motor

Appendix

Low-voltage motors
NEMA motors

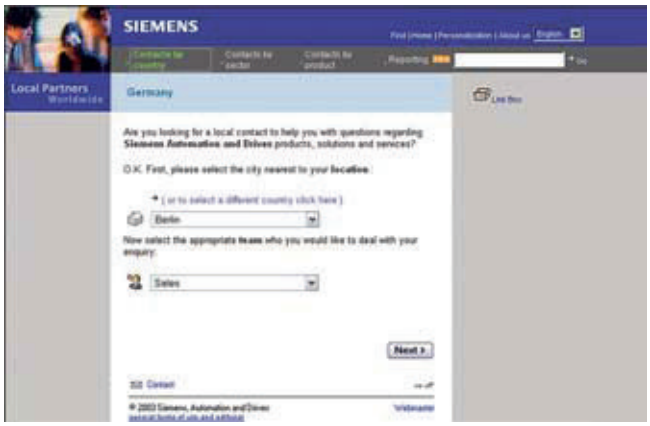
For compliance with the local specifications of the NAFTA markets (USA, Canada and Mexico), we manufacture low-voltage motors acc. to the NEMA standard for a wide range of different application areas. This includes motors designed in accordance with the US act, EPACT (specified minimum efficiency levels), as well as motors with NEMA premium efficiency levels: Our NEMA motor series provide the highest operating reliability and maximum service life. Designed and manufactured for rugged operation, our NEMA motors conquer even the harshest industrial conditions strictly in accordance with the ISO 9001 international quality standard; with maximum performance, reliability and efficiency.
You will find the complete product spectrum with ordering data, technical specifications and information in Catalog D 81.2 U.S./Canada on the Internet at
http://www.sea.siemens.com/motors

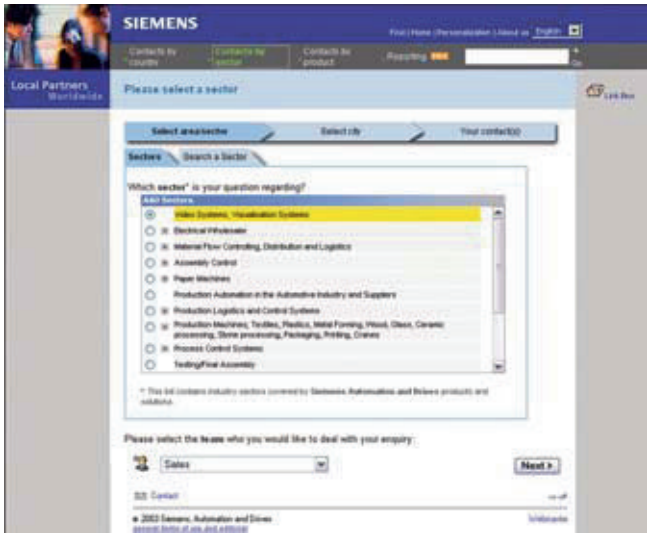
	NEMA motors (NEMA = National Electrical Manufacturers Association)
Frame size	NEMA frame size 56 ... 449
Output range	0.25 HP ... 500 HP
Number of poles	2/4/6/8
Voltages	230/460/575 V 3 AC
Frequency	60 Hz, 50 Hz on request
Type of construction	Foot-mounted, D flange, C flange, P flange
Housing	Cast-iron, aluminum or steel depending on the version
Cooling method	Surface-cooling or internal ventilation depending on the version
Temperature class	F used acc. to B
Type spectrum	**General purpose motors** • Legally specified minimum efficiency levels or NEMA premium efficiency levels • Standard motors for general industrial use • Aluminum or cast-iron case depending on the version
	Severe duty motors • Legally specified minimum efficiency levels or NEMA premium efficiency levels • Cast-iron case • Motors for use under extremely difficult environmental conditions
	Severe duty IEEE841 motors • Efficiency levels required by IEEE that exceed the EPACT act • Motors with increased requirements for use in the petrochemical industry (according to IEEE841) • Cast-iron case
	Explosion-proof motors • Efficiency levels better than or equal to EPACT • Multi label according to Division 1, Class I, Group D and Class II, Groups F&G • Single label according to Division 1, Class I, Groups C&D

Example of NEMA motor, Severe Duty SD100, cast-iron case

Example of NEMA motor, General Purpose GP10A, aluminum case

Siemens Contacts Worldwide





At

http://www.siemens.com/automation/partner

you can find details of Siemens contact partners worldwide responsible for particular technologies.

You can obtain in most cases a contact partner for

- Technical Support,
- Spare parts/repairs,
- Service,
- Training,
- Sales or
- Consultation/engineering.

You start by selecting a

- Country,
- Product or
- Sector.

By further specifying the remaining criteria you will find exactly the right contact partner with his/her respective expertise.

Information and Ordering on the Internet and on CD-ROM

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A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

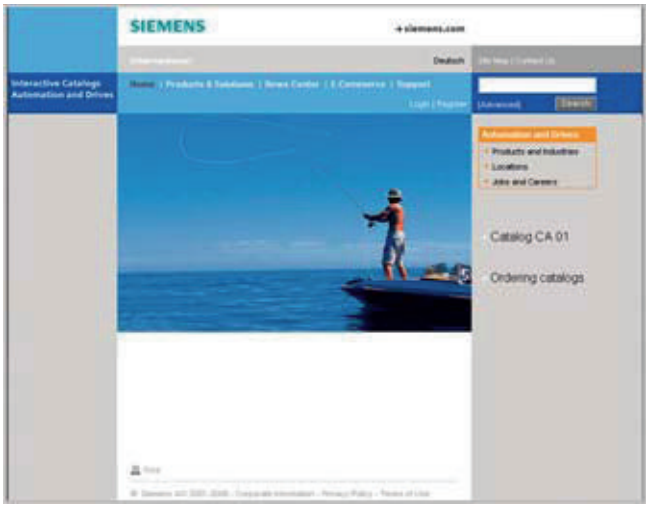
Siemens Industry Automation and Drive Technologies has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

http://www.siemens.com/automation

you will find everything you need to know about products, systems and services.

Product Selection Using the Offline Mall



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Numerous functions are available to support you.

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Subject index

Appendix

Subject index

Order number index

Conditions of sale and delivery
Export regulations

Terms and Conditions of Sale and Delivery

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following terms. 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 terms apply exclusively for orders placed with Siemens AG.

For customers with a seat or registered office in Germany

The "General Terms of Payment" as well as the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry" shall apply.

For software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office in Germany" shall apply.

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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.

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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.

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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 and the text of the Comprehensive Terms and Conditions of Sale and Delivery are available free of charge from your local Siemens business office under the following Order Nos.:

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  (for customers based in Germany)
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  (for customers based outside Germany)

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Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

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A&D/VuL_ohne MZ/En 05.09.06

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Further information can be obtained from our branch offices listed in the appendix or at www.siemens.com/automation/partner

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