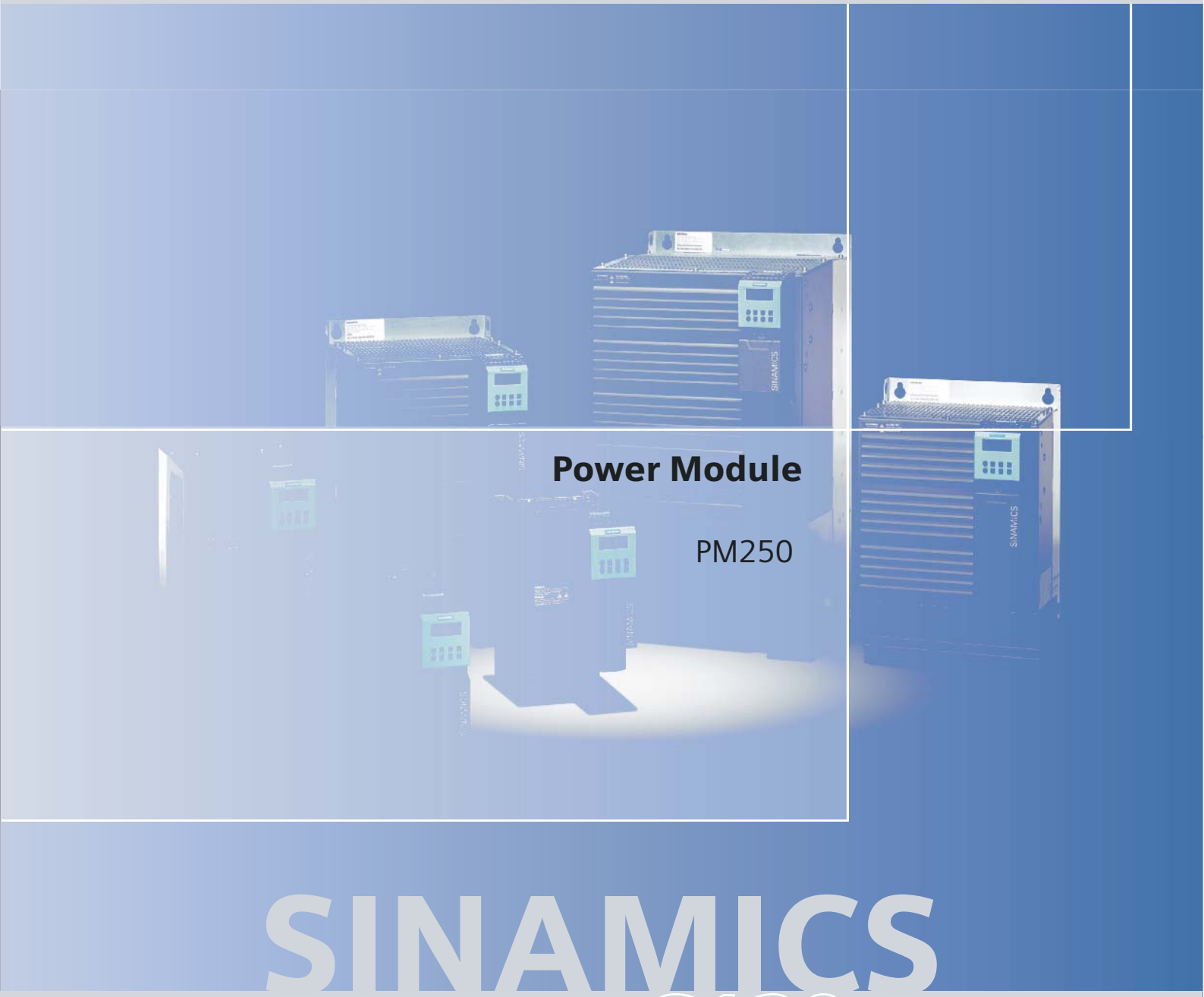
Hardware Installation Manual · Edition 11/2006



Power Module

PM250

SINAMICS

G120

SIEMENS

SIEMENS

SINAMICS

SINAMICS G120
Power Modules PM250

Hardware Installation Manual

Edition 11/2006

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Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.

Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.

Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Order No.: A5E01003502AB
℗ 11/2006

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1 Introduction

1.1 Documents for the SINAMICS G120

Available documentation

The following document types are available for the SINAMICS G120 inverters:

- Brochure
- Catalog
- Getting started Guide
- Operating Instructions
- Hardware Installation Manual
- Compact Operating Instructions (for the Control Units)
- Parameter List.

The documents can be downloaded from the Internet via the following link:
http://www.siemens.de/sinamics-g120

Furthermore you will find in the internet:

- Detailed technical information under:
  http://support.automation.siemens.com/WW/view/de/22339653/133000
- Application examples under:
  http://support.automation.siemens.com/WW/view/de/20208582/136000

Description of the documents

Brochure

The brochure is advertising literature designed to introduce the product to the marketplace. It contains a basic outline of the product with a brief overview of the technical capabilities of the product.

Catalog

The catalog presents information that allows the customer to select an appropriate inverter including all available options. It contains detailed technical specifications, ordering and pricing information to allow the customer to order the appropriate items for their application or plant.

Getting started Guide

The Getting started Guide presents warnings, dimension drawings and a brief set up information for the customer.

Operating Instructions

The Operating Instructions gives information for the Control Unit regarding the features of the product. It gives detailed information on commissioning, control modes, system parameters, troubleshooting, technical specifications and the available options from the product.

Hardware Installation Manual

The Hardware Installation Manual gives information for the Power Modules regarding the features of the product. It gives detailed information on installation, technical specifications, dimension drawings and the available options from the product.

Compact Operating Instructions

The Compact Operating Instructions gives a brief description of the installation, commissioning and control modes as well as an overview of troubleshooting, technical specifications and the available options from the product.

Parameter List

The Parameter List contains a detailed description of all the parameters that can be modified and adapted for specific applications. The Parameter List also contains a series of function diagrams to diagramatically portray the nature and interoperability of the system parameters.

Safety notes

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Safety Instructions

The following Warnings, Cautions and Notes are provided for your safety and as a means of preventing damage to the product or components in the connected machines. This section lists Warnings, Cautions and Notes, which apply generally when handling the SINAMICS G120 product, classified as General, Transport and Storage, Commissioning, Operation, Repair and Dismantling and Disposal.

Specific Warnings, Cautions and Notes that apply to particular activities are listed at the beginning of the relevant sections in this manual and are repeated or supplemented at critical points throughout these sections.

Please read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your SINAMICS G120 product and the equipment to which it is connected.

Common Instructions

It has to be ensured by the machine manufacturer, that the line-side overcurrent protection equipment interrupts within 5 s (immovable equipment and modules in immovable equipment) in the case of minimum fault current (current on complete insulation failure to accessible conductive parts that are not live during operation and maximum current loop resistance).

It has to be ensured by the machine manufacturer, tat the voltage drop between the beginning of the load system and the power drive system during operation with rated values does not exceed 4 %.

General

Warning

This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with the Warnings or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.

Protection in case of direct contact by means of SELV / PELV is only permissible in areas with equipotential bonding and in dry indoor rooms. If these conditions are not fulfilled, other protective measures against electric shock must be applied e.g. protective insulation.

Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.

Static discharges on surfaces or interfaces that are not generally accessible (e.g. terminal or connector pins) can cause malfunctions or defects. Therefore, when working with inverters or inverter components, ESD protective measures should be observed.

Take particular notice of the general and regional installation and safety regulations regarding work on dangerous voltage installation (e.g. EN 50178) as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).

Caution

Children and the general public must be prevented from accessing or approaching the equipment!

This equipment may only be used for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

Notice

Keep these operating instructions within easy reach of the equipment and make them available to all users.

Whenever measuring or testing has to be performed on live equipment, the regulations of Safety Code BGV A2 must be observed, in particular § 8 "Permissible Deviations when Working on Live Parts". Suitable electronic tools should be used.

Before installing and commissioning, please read these safety instructions and warnings carefully and all the warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and replace missing or damaged labels.

Transport and storage

Warning

Correct transport, storage as well as careful operation and maintenance are essential for the proper and safe operation of the equipment.

Caution

Protect the equipment against physical shocks and vibration during transport and storage. It is important that the equipment is protected from water (rainfall) and excessive temperatures.

Commissioning

Warning

Working on the equipment by unqualified personnel or failure to comply with warnings can result in severe personal injury or serious damage to material. Only suitably qualified personnel trained in the setup, installation, commissioning and operation of the product should carry out work on the equipment.

Caution

Cable connection

The control cables must be laid separately from the power cables. Carry out the connections as shown in the installation section in this manual, to prevent inductive and capacitive interference from affecting the correct function of the system.

Power and motor connections

Warning

The inverter must always be grounded.

Isolate the line supply before making or changing connections to the unit.

Ensure that the inverter is configured for the correct supply voltage. The inverter must not be connected to a higher voltage supply.

Caution

After connecting the power and motor cables to the proper terminals, make sure that all covers have been returned to the closed position and are snapped shut, before supplying power to the inverter!

Notice

Ensure that the appropriate circuit-breakers/fuses with the specified current rating are connected between the power supply and the inverter.

Mechanical installation

Warning

To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in this manual.

Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installation (e.g. EN 61800-5-1) as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).

The line input and motor terminals can carry dangerous voltages even if the inverter is inoperative. Wait 5 minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.

Electrical installation

Warning

Power and motor connections

The inverter must be grounded from the supply side and the motor side. If it is not grounded correctly, extremely dangerous conditions may arise which could prove potentially fatal.

Isolate the mains electrical supply before making or changing connections to the unit.

Ensure that the inverter is configured for the correct supply voltage – it must not be connected to a higher voltage supply.

Operation

Warning

The inverter operates at high voltages. When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.

The power supply and motor terminals can carry dangerous voltages even if the inverter is inoperative. Wait five minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.

Emergency Stop facilities according to EN 60204, IEC 204 (VDE 0113) must remain operative in all operating modes of the control equipment. Any disengagement of the Emergency Stop facility must not lead to an uncontrolled or an undefined restart of the equipment.

Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (that is, potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).

Certain parameter settings may cause the inverter to restart automatically after an input power failure, for example, the automatic restart function.

Motor parameters must be accurately configured for motor overload protection to operate correctly.

This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 480 V + 10 % when protected by an H, J or K type fuse, a circuit breaker or self-protected combination motor controller.

The power modules are components with a high leakage current!

Use of mobile radio device (e.g. telephones, walky-talkies) with a transmission power > 1 W in the immediate vicinity of the devices (< 1.5 m) can interfere with the functioning of the equipment!

Repair

Warning

Repairs on equipment may only be carried out by Siemens Service, by repair centers authorized by Siemens or by authorized personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.

Any defective parts or components must be replaced using parts contained in the relevant spare parts list.

Disconnect the power supply before opening the equipment for access.

Dismantling and disposal

Caution

The packaging of the inverter is re-usable. Retain the packaging for future use.

Easy-to-release screw and snap connectors allow you to break the unit down into its component parts. You can recycle these component parts, dispose of them in accordance with local requirements or return them to the manufacturer.

Description

3

3.1 System Overview of SINAMICS G120 - overview

The SINAMICS G120 range

The SINAMICS G120 inverter has been designed for the accurate and efficient control of the speed and torque for three-phase motors. The SINAMICS G120 system comprises two basic modules, the Control Unit (CU) and the Power Module (PM).

The Control Units are divided into the following:

- Standard CUs (CUs without fail-safe functions)
  - CU240S
  - CU240S DP like CU 240S plus PROFIBUS DP interface
- CUs with fail-safe functions
  - CU240S DP-F like CU240S DP plus integrated fail-safe functions

The Power Modules are divided as follows:

- PM240 Power module with dc braking functions, supply voltage 3 AC 400 V
- PM250 Power module with regenerative mode, supply voltage 3 AC 400 V
- PM260 Power module with regenerative mode, supply voltage 3 AC 690 V

Control Units and Power modules are allowed to be combined in any possible configuration.

See the respective manual for specific functions and features.

3.2 Power Modules PM250

Overview

The power modules are available with protection level IP 20 according to EN 60529, with integrated Class A filter in the following frame sizes and power ranges:

- Frame size C, 5,5 kW … 11 kW
- Frame size D, 15 kW … 22 kW
- Frame size E, 30 kW … 37 kW
- Frame size F, 45 kW … 75 kW

The power modules have regenerative capability, where the regeneration limit is the nominal power (high overload) of the power module.

The PM250 power modules can be used together with G120 standard Control Units or with G120 fail-safe control units.

3.3 Accessories for the PM250, 400 V

Description of accessories or spare parts

A description how to use the individual options or spare parts is part of the option package itself.

Ordering information and a brief functional description is given in the SINAMICS G120 catalog.

Power Module PM250 accessories

- NEMA 1 kit
- Screen termination kit
- Brake relay and safe brake relay
- Output reactors

Power Module spare parts

- Fan.

3.4 Block diagram

Block diagram

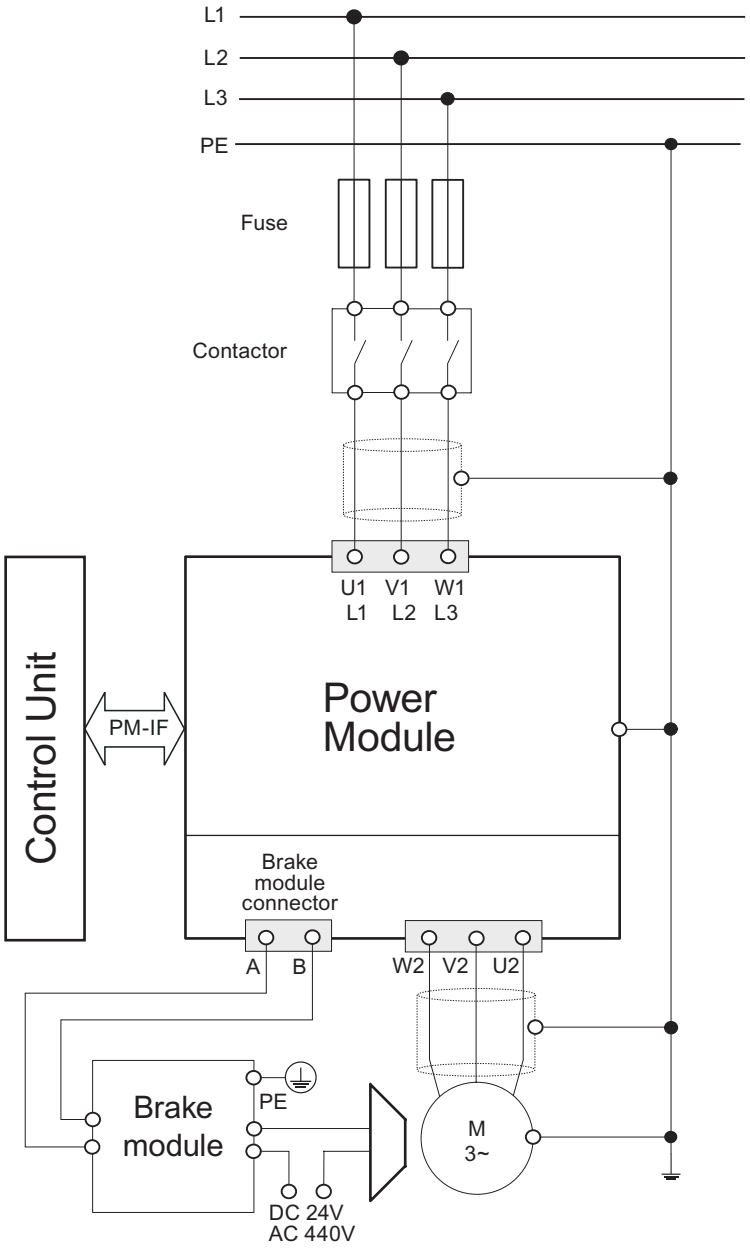


Figure 3-1 Power module

Installing/Mounting

4

General rules for the environmental protection of the power modules

To ensure that the power module is installed in the correct environmental conditions, please ensure that you adhere to the following guidelines:

- The power module is designed for IP20 protection, this means:
  - It is protected from the ingress of solid foreign objects ≥ 12.5 mm (≥ 0.49 inches).
  - It is not protected against the ingress of water.
  - It is designed to be installed in an electrical cabinet.
- Keep the power module free from dust and dirt.
- Keep the power module away from water, solvents and chemicals.
- Keep the power module within the maximum and minimum operating temperatures.
- Ensure that the correct level of ventilation and air flow is provided.
- Ensure that good earthing/grounding practices are followed for each power module and the cabinet.

4.1 Mechanical Installation

Overview

This section contains information about

- distances to other equipment,
- drill patterns,
- dimensions and tightening torques
- environmental conditions

Warning

To ensure the safe operation of the equipment, it must be installed and commissioned by qualified personnel in full compliance with the warnings laid down in this manual.

Take particular note of the general and regional installation and safety regulations regarding work on dangerous voltage installation (e.g. EN 61800-5-1) as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).

The terminals of the power module can carry dangerous voltages even if the inverter is inoperative. Wait 5 minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.

Distances to other equipment

The power modules FSD to FSF can be mounted without any clearance at either side; power modules FSC need a side by side spacing of 50 mm (1.97 inches).

When mounting the power modules one above the other, the specified environmental conditions must not be exceeded. Independent of this, these minimum distances above and below the power modules must be observed:

- FSC: above and below 125 mm (4.92 inches)
- FSD: above and below 300 mm (11.81 inches)
- FSE: above and below 300 mm (11.81 inches)
- FSF: above and below 350 mm (13.77 inches).

4.1.1 Dimensions and drill patterns 400 V

Dimensions

To allow the preliminary installation work to be undertaken, dimensions and drill patterns for the power modules are shown below.

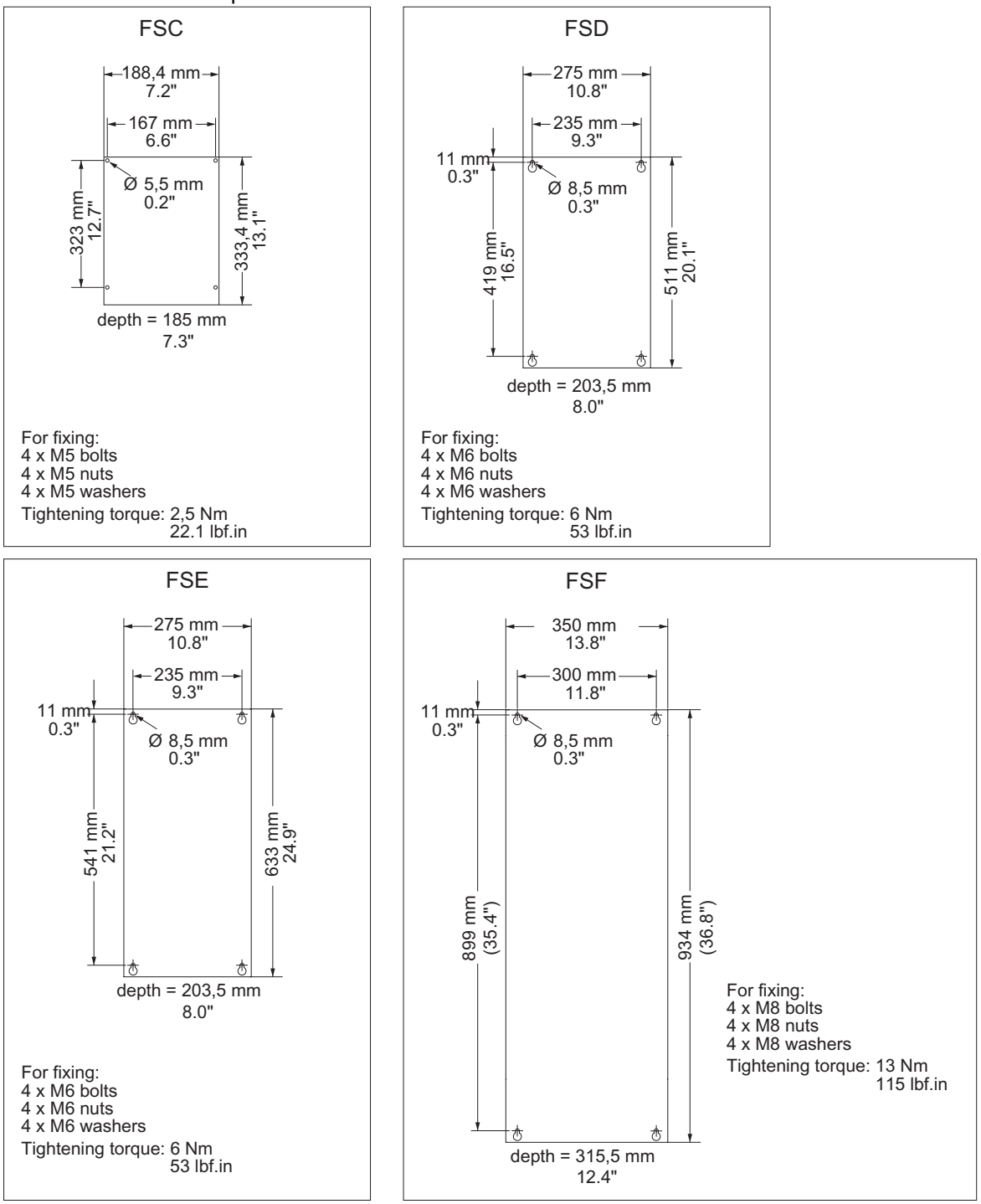


Figure 4-1 Dimensions and drill patterns for the power modules

4.2 Electrical Installation

Overview

This section gives information about

- power distribution systems,
- connecting the motor,
- screening methods
- motor connection star/delta

Warning

Power and motor connections

- The inverter must be grounded from the supply side and the motor side. If the inverter is not grounded correctly, extremely dangerous conditions may arise which could prove potentially fatal.
- Isolate the mains electrical supply before making or changing connections to the unit.
- Input chokes must not be used.
- RSCE of the power supply must be at least 100.
- Ensure that the inverter is configured for the correct supply voltage – the inverter must not be connected to a higher voltage supply.
- If a residual-current device is used on the supply side of this electronic equipment for protection in case of direct or indirect contact, only Type B is permitted! Otherwise a different protective measure must be employed, such as separation of the electronic equipment from the environment by double or reinforced insulation, or from the supply by a transformer!"

Caution

The control cables must be laid separately from the power cables. The connection must be carried out as shown in the installation section in this manual, to prevent inductive and capacitive interference from affecting the correct function of the system.

Note

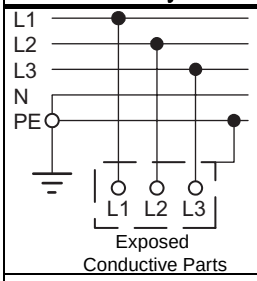
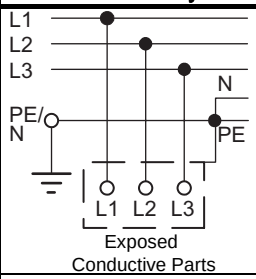
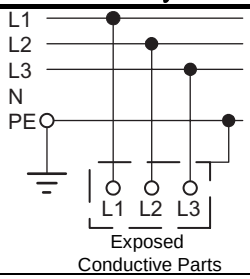
Ensure that the appropriate circuit-breakers/fuses with the specified current rating (see technical data) are connected between the power supply and the inverter.

4.2.1 Power distribution systems

Power Distribution Systems

The power distribution systems described below, as defined in EN 60950, have been considered in the design of the inverter. In the next figures three phase systems are outlined. The three phase inverter must be connected to L1, L2 and L3. PE must always be connected.

Table 4-1 Power distribution systems

TN-S Power System	TN-C-S Power System	TN-C Power System
		
A TN-S power system has separate neutral and protective ground conductors throughout the system. It is the standard distribution system in the UK	In a TN-C-S power system, the neutral and protective functions are combined in a single part of the system.	In a TN-C power system, the neutral and protective functions are combined in a single conductor throughout the system.

4.2.2 Permissible Cable Length (PM250, 400 V)

Motor cables

The use of unshielded motor cables is possible. However to meet C2 EMI class, shielded cables with appropriate EMI installation are required.

The inverters will operate at full specification with cable lengths as follows:

- 100 m (328 ft) with unscreened cables
- 25 m (82 ft) with screened cables

Table 4-2 Using output chokes as specified in the catalog, the following cable length are possible:

- 100 m with screened cables at a supply voltage from 400 V … 480 V
- 150 m FSC with screened cables at a supply voltage from 380 V … 400 V
  FSC with unscreened cables at a supply voltage from 400 V … 480 V
- 200 m FSD … FSF with screened cables at a supply voltage from 380 V … 400 V
  FSD … FSF with screened cables at a supply voltage from 400 V … 480 V
- 225 m FSC with unscreened cables at a supply voltage from 380 V … 400 V
- 300 m FSD … FSF with unscreened cables at a supply voltage from 380 V … 400 V
  FSD … FSF with unscreened cables at a supply voltage from 400 V … 480 V

Table 4-3 Cable cross section

FSC

• 5,5 kW:	4 mm^2 … 10 mm^2	12 AWG … 8 AWG
• 7,5 kW:	4 mm^2 … 10 mm^2	12 AWG … 8 AWG
• 11 kW:	6 mm^2 … 10 mm^2	10 AWG … 8 AWG

Tightening Torques: 2.25 Nm / 19.9 lbf.in

FSD

• 15 kW	10 mm^2 … 35 mm^2	7 AWG … 2 AWG
• 18,5 kW:	10 mm^2 … 35 mm^2	7 AWG … 2 AWG
• 22 kW:	16 mm^2 … 35 mm^2	5 AWG … 2 AWG

Tightening Torques: 6 Nm / 53 lbf.in

FSE

• 30 kW:	25 mm^2 … 35 mm^2	3 AWG … 2 AWG
• 37 kW:	25 mm^2 … 35 mm^2	3 AWG … 2 AWG

Tightening Torques: 6 Nm / 53 lbf.in

FSF

• 45 kW	35 mm^2 … 150 mm^2	2 AWG … -5 AWG
• 55 kW:	70 mm^2 … 150 mm^2	-2 AWG … -5 AWG
• 75 kW:	95 mm^2 … 150 mm^2	-3 AWG … -5 AWG

Tightening Torques: 13 Nm / 115 lbf.in

Caution

The cable cross section for earhting must be the same as the motor cables but at least 10 mm^2 (Cu) or 16 mm^2 (Al).

4.2.3 Access to power and motor terminals (PM250)

Access to power and motor terminals

The terminals for Frame size C can be accessed directly, without removing any cover.

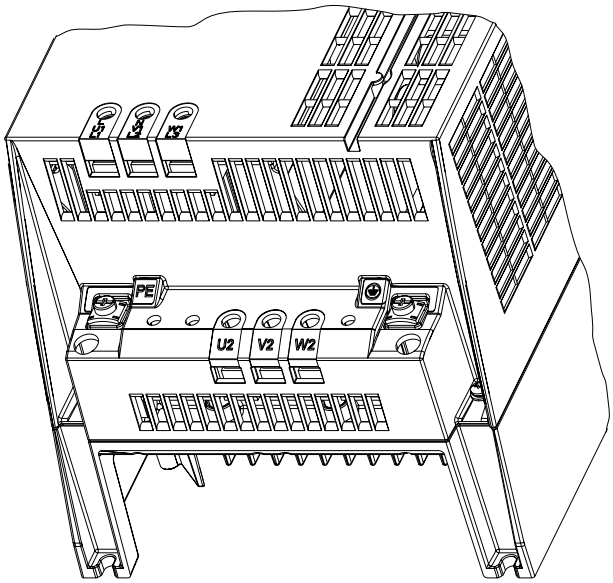


Figure 4-2 Access to power and motor terminals on FSC

Frame size F terminals covers are accessed by releasing the latch on the side of the terminal covers with a suitable flat-bladed screwdriver. The cover can then be pushed upwards and locked into position, as shown in the figure below.

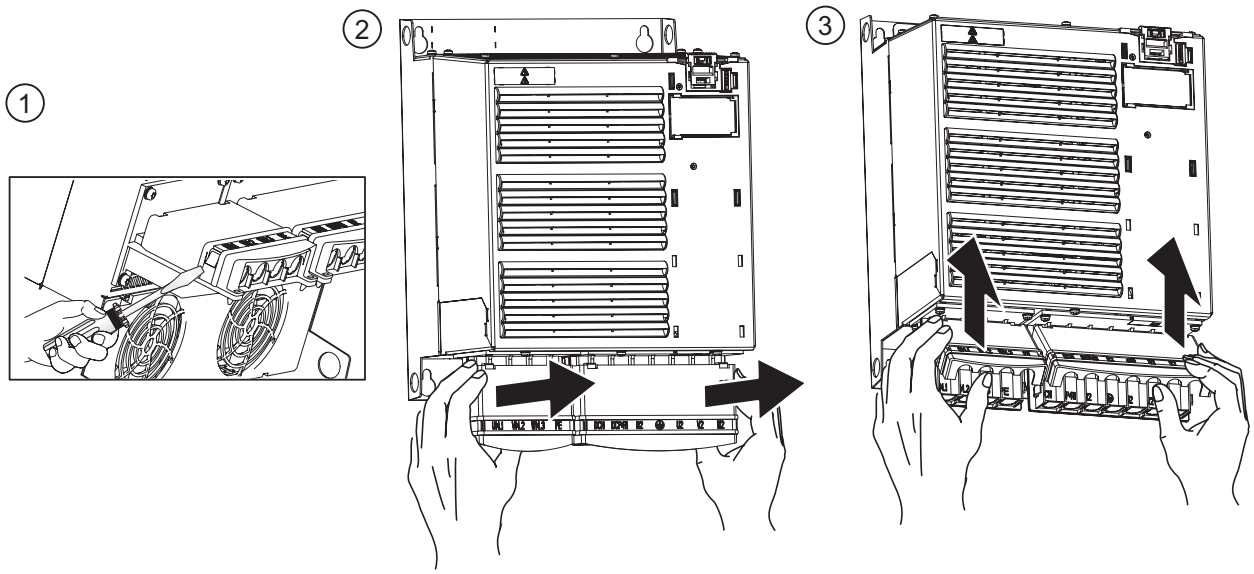


Figure 4-3 Access to power and motor terminals on FSD, FSE and FSF

Power and motor terminal layout

The figures below show the layout of the power and motor terminals of the PM250 Frame Sizes C… F.

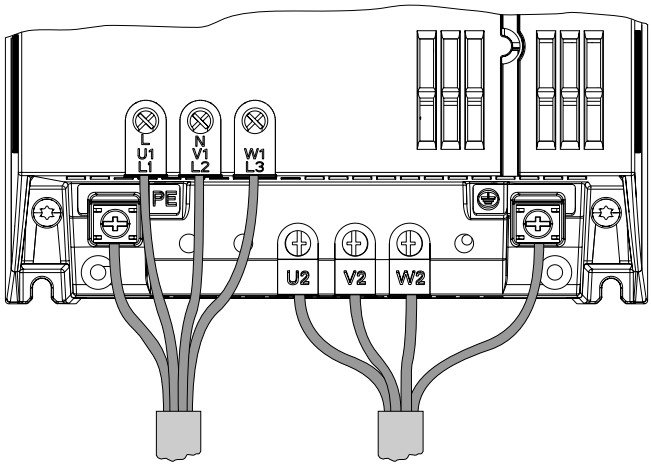


Figure 4-4 PM250 Power and motor terminals FSC

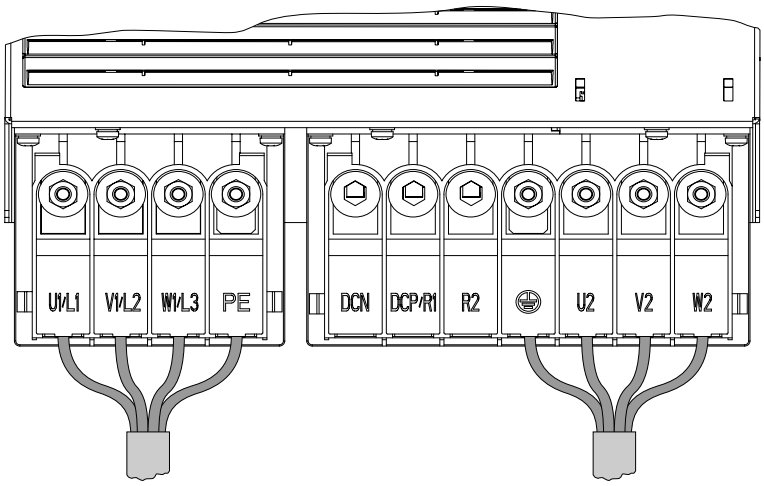


Figure 4-5 PM250 Power and motor terminals FSD … FSF

Operation with Residual Current Devices (RCD)

If an RCD (also referred to as an ELCB or a RCCB) is fitted, the Power Module will operate without nuisance tripping provided that:

- A type B RCD is used.
- The trip limit of the RCD is 300 mA.
- The neutral of the supply is grounded.
- Only one power module is supplied from each RCD.
- The output cables are less than 50 m (164 ft) screened or 100 m (328 ft) unscreened.

Avoiding Electromagnetic Interference (EMI)

The inverters are designed to operate in an industrial environment where a high level of EMI can be expected. Most installations do not give problems. However, it is good engineering practice to conform to the following guidelines - this will reduce the likelyhood of problems during operation.

Actions to take

- Ensure that all equipment in the cubicle is well grounded using short, thick grounding cable connected to a common star point or busbar.
- Make sure that any control equipment (such as a PLC) connected to the inverter is connected to the same ground or star point as the inverter using a short thick link.
- Connect the return ground from the motors directly to the ground connection (PE) on the associated inverter.
- Flat conductors are preferred as they have lower impedance at higher frequencies.
- Terminate the ends of the cable neatly, ensuring that unscreened wires are as short as possible.
- Separate the control cables from the power cables as much as possible, using separate trunking, if the cables cross they should cross at 90º to each other.
- Whenever possible, use screened leads for the connections to the control circuitry.
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay.
- Use screened or armored cables for the motor connections and ground the screen at both ends using the cable clamps.

Warning

Safety regulations must not be compromised when installing inverters!

Screening methods

For all frame sizes the Screen Termination Kit is supplied as an optional extra. It allows easy and efficient connection of the necessary screening. For further details on the Screen Termination Kit, please refer to the SINAMICS G120 catalog.

Screening without a Screen Termination Kit

Should a Screen Termination Kit not be available, then the inverter can be screened using the methodology shown in the figure below. This diagram shows both methodologies of screening.

Note

The EMI illustration below is not to scale.

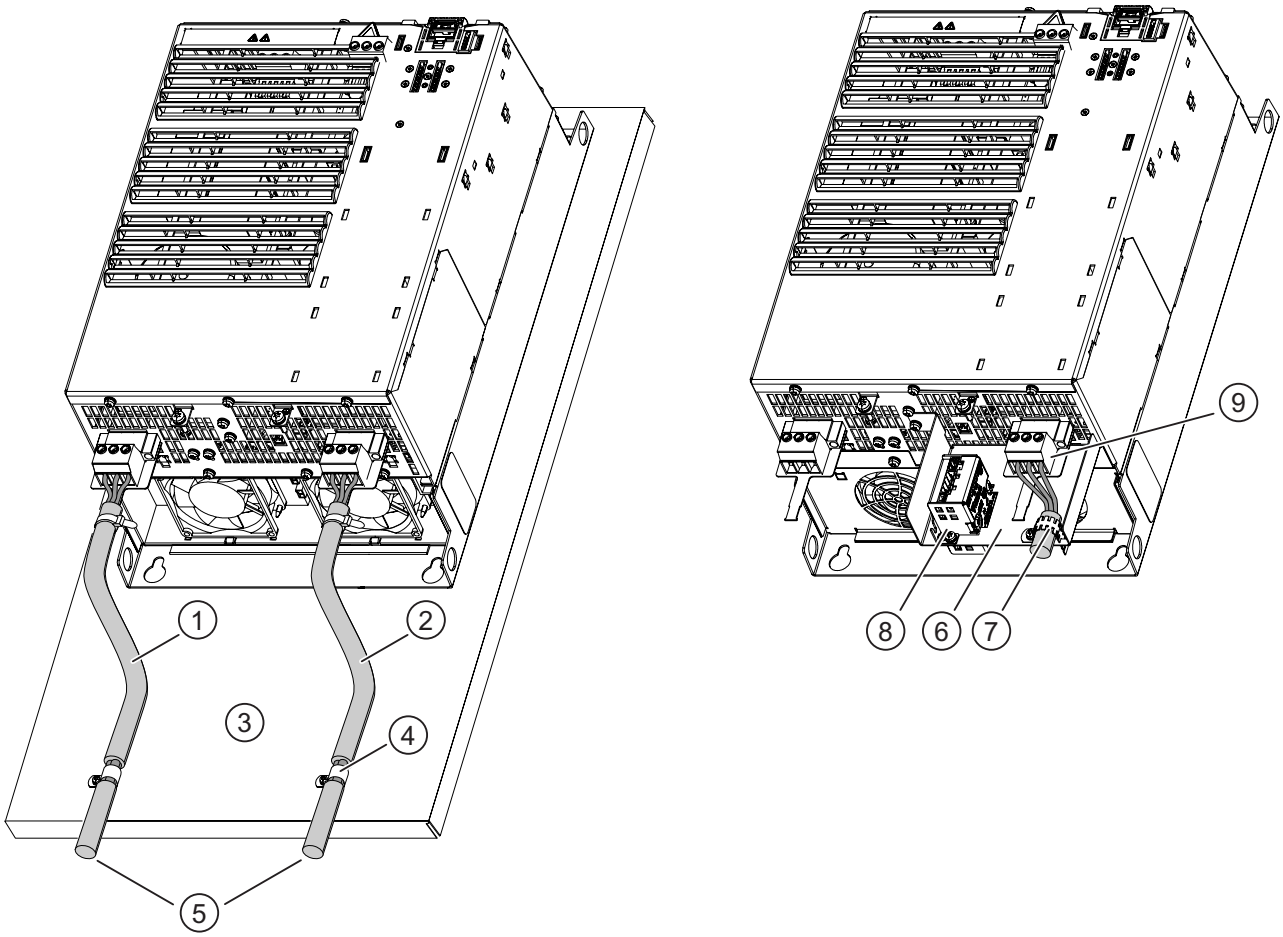


Figure 4-6 Example of wiring to minimize the effect of EMI

Table 4-4 Legend to the drawing

1	Mains power input	5	Screened cables
2	Motor cable	6	Screen termination kit
3	Metal back plate	7	Cable clamp
4	Use suitable clips to fix motor and power cable screen securely to metal back plate	8	Brake Module
		9	Terminal blocks

Motor Circuit

In order to ensure a straightforward, successful commissioning, it is important that the circuit connection in the motor terminal box matches the rated motor voltage entered in P0304 or the rated motor current P0305.

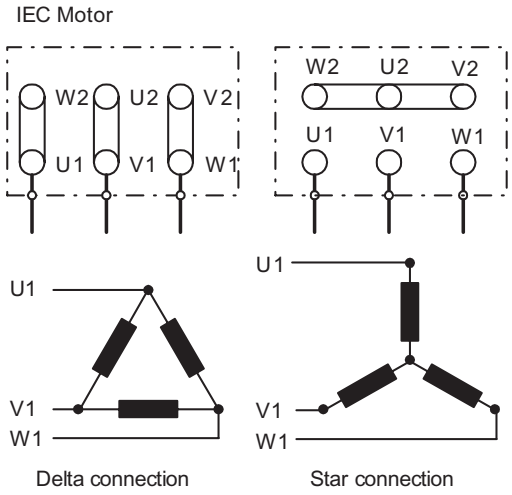


Figure 4-7 Motor connection - IEC motors

Table 4-5 Motor connection NEMA motors - star connection

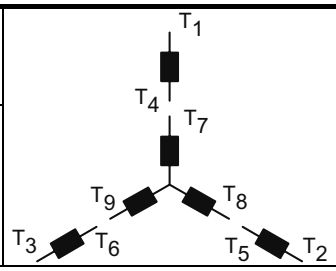
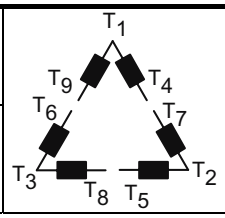
Supply voltage	U	V	W	Connected together	Type	
230 V	T_1 - T_7	T_2 - T_8	T_3 - T_9	T_4 - T_5 - T_6	YY	
400V	T_1	T_2	T_3	T_1 - T_7, T_2 - T_8, T_3 - T_9	Y	

Table 4-6 Motor connection NEMA motors - delta connection

Supply voltage	U	V	W	Connected together	Type	
230 V	T_1-T6-T_7	T_2-T4-T_8	T_3-T5-T_9	-	Δ Δ	
400V	T_1	T_2	T_3	T_4 - T_7, T_5 - T_8, T_6 - T_9	Δ	

The following must be noted when entering the rating plate data or the ECD data:

- The outer conductor voltage/phase-to-phase voltage (voltage U12 between outer conductors L1, L2) and the outer conductor current (phase current) I1 are always specified on the rating plate.
- The rated motor voltage and the rated motor current must always be entered according to the motor circuit configuration (either delta/star circuit configuration).
- If rated motor data that are available are not consistent with the motor circuit configuration, then an appropriate conversion should be made which is then entered.
- If equivalent circuit diagram data is available, then these should be entered according to the motor circuit configuration. If there is no consistency between the motor circuit configuration and equivalent circuit diagram data, then the equivalent circuit diagram data should be converted and entered corresponding to the data on the rating plate.

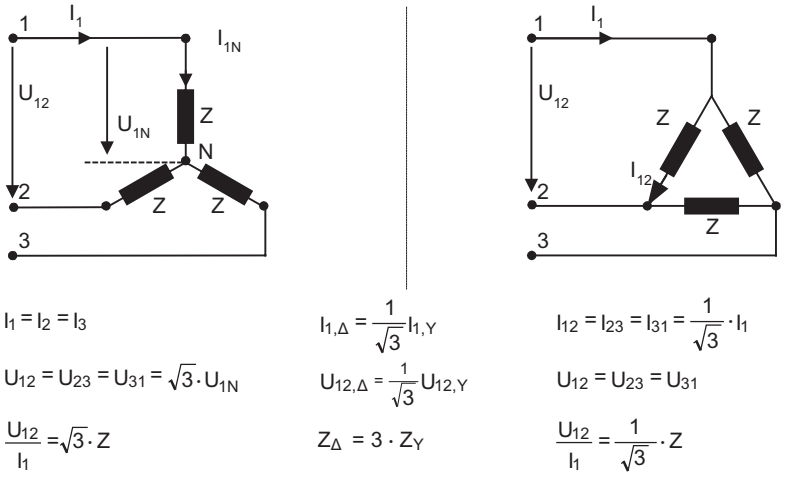


Figure 4-8 Star/Delta configuration

Note

The precise equivalent circuit diagram data is of extreme importance regarding the stability of the closed-loop vector control and for the voltage boost applied to the V/f characteristic. Equivalent circuit diagram data can only be estimated from the rating plate data; this is the reason that equivalent circuit diagram data is either determined

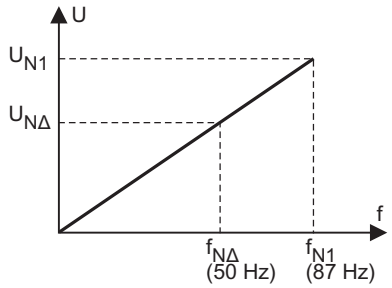
- using the motor data identification, or
- is entered from a motor data sheet that may be available.

87 Hz characteristic

When a motor with a delta circuit configuration (e.g. $V_{N\Delta}$, motor = 230 V) is fed from a frequency inverter, where the rated voltage corresponds to the star circuit configuration (e.g. 400 V frequency inverter), then it is important to proceed as follows and observe the following:

- The motor must have the appropriate voltage.
- Above the rated motor frequency, the iron losses in the motor increase over-proportionally. This is the reason that above this frequency, the thermal motor torque should be reduced.
- For the quick commissioning, the rating plate data for the delta circuit configuration should be entered or must be appropriately converted.
- The inverter must be designed for the higher current (delta circuit configuration).
- The 87 Hz characteristic is independent of the control type and can therefore be used both for V/f control as well as for closed-loop vector control.
- When using the 87 Hz characteristic, the mechanical motor limits must be taken into account.

For the 87 Hz characteristic, the ratio between the voltage and frequency (V/f characteristic) remain constant. This is the reason that the following relationships apply:



$$P_{N1} = \frac{U_{N1}}{U_{N\Delta}} \cdot P_{N\Delta}$$

$$f_{N1} = \frac{U_{N1}}{U_{N\Delta}} \cdot f_{N\Delta}$$

$$n_{N1} = \frac{60\left[\frac{s}{min}\right]}{p} \cdot (f_{N1} - f_{N\Delta}) + n_{\Delta}$$

P = power
f = frequency
n = speed
p = pole pair No.

Figure 4-9 V/f characteristic

Table 4-7 Example 1LA7060-4AB10

		Delta circuit configuration	87 Hz characteristic	Star circuit configuration
P0304	Rated motor voltage	230 V	400 V	400 V
P0305	Rated motor current	0.73 A	0.73 A	0.42 A
P0307	Rated motor power	120 W	207 W	120 W
P0308	cos φ	0.75	0.75	0.75
P0310	Rated motor frequency	50 Hz	87 Hz	50 Hz
P0311	Rated motor speed	1350 RPM	2460 RPM	1350 RPM
P0314	Motor pole pairs	2	2	2

Contrary to the OP, the STARTER commissioning (start-up) program offers a mask-orientated quick commissioning. On the other hand, the OP offers, in conjunction with the inverter, parameter-orientated quick commissioning.

Fitting the Control Unit to the Power Module

The Control Unit is snapped on to the Power Module as shown in the figure below. To disconnect the CU push the release button on top of the PM.

The process of fitting the Control Unit to the Power Module is the same technique independent from the type of G120 control unit or G120 power module.

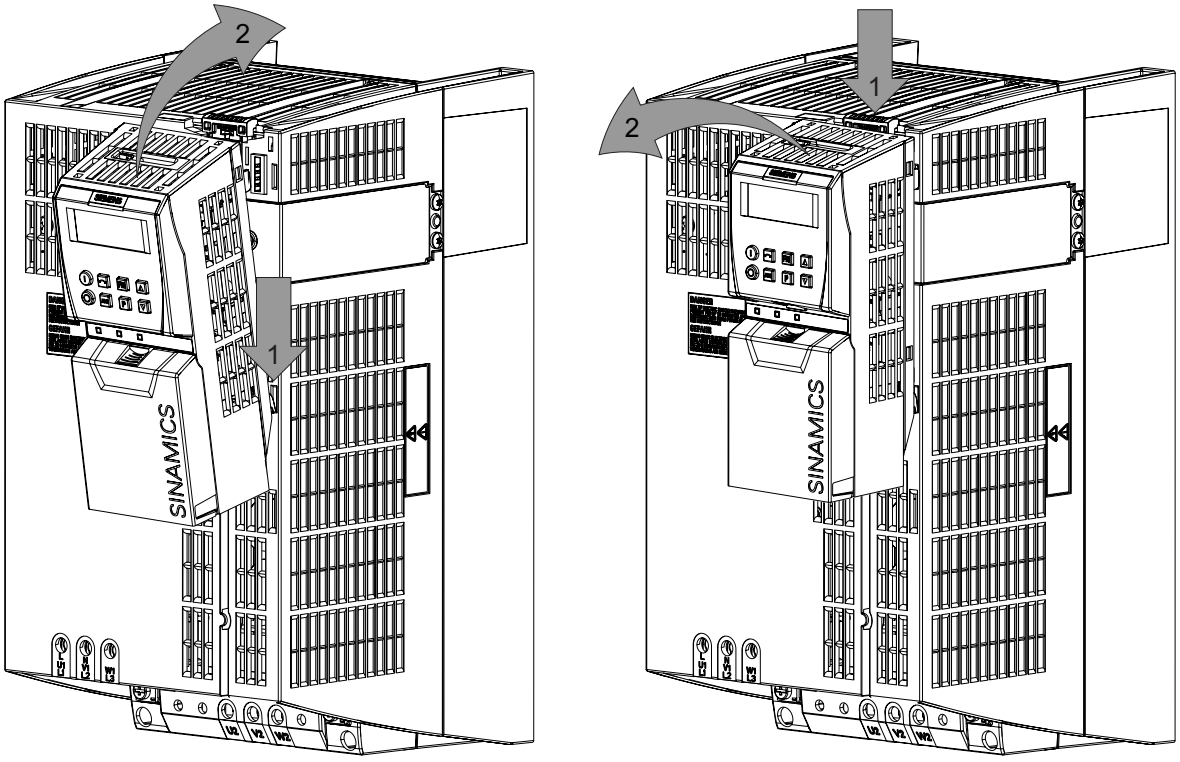


Figure 4-10 Fitting the control unit to the power module

24 V power supply

Normally the CU is supplied with 24 V from Power Module. But it is also possible to use an external DC 24 V supply (20.4 V … 28.8 V, 0.5 A). It must be connected to the Control Unit terminals 31 (+ 24 V In) and 32 (0 V In). Some reasons for using an external 24 V power supply are:

- The PROFIBUS DP interface is required to communicate with the Control Unit when the Power Module mains power is not present
- Supply for 24 V encoder

Caution

Care must be taken to ensure that the 24 V DC power is connected correctly or damage to the Control Unit may occur.

Max. cable length on 24 V DC supply and I/O cables connected to CU must not exceed 10 m. Use of unscreened cables is possible however we recommend to use screened cables.

Note

If the CU is externally powered with 24 V DC but the power module is disconected from the mains supply, the faults F0001 … F0028 are not generated.

Operation (hardware) 5

Overview

This section describes the possibilities to exchange inverter comonents, power modules or control units, and the necesarry actions, depending on the swap type.

The following swaps are allowed:

- CU swap (neither PM nor CU powered)
- PM swap (neither PM nor CU powered)
- PM swap (CU externally powered)

Note

A swap is indicated by a F395. A downlaod fault during swap will be indicated by F0061 or F0063.

If F0061 or F0063 occurs during startup it cannot be cleard except via a power cycle.

5.1 Swap behavior

CU swap, PM swap (whether PM nor CU powered)

Constraints: MMC with valid Parameter set plugged

- Swap after power on detected, Parameter MMC -> RAM/EEPROM, inverter runs into F0395
- Confirmation for standard CU or acceptance test in case of fail-safe CU required

constraints: no MMC

- Swap after power on detected, Parameter EEPROM -> RAM, inverter runs into F0395
- Commissioning recommended - otherwise inverter runs with parameter settings from EEPROM
- Confirmation for standard CU or acceptance test in case of fail-safe CU required

PM swap (CU externally powered)

Constraints: MMC with valid Parameter set plugged

- Swap detected, Parameter MMC -> RAM/EEPROM, inverter runs into F0395
- Confirmation for standard CU or acceptance test in case of fail-safe CU required

Constraints: no MMC

- Swap detected, Parameter EEPROM -> RAM, inverter runs into F0395
- If the parameters, already held in the EEPROM are ok there is no commissioning necesarry.
- Confirmation for standard CU or acceptance test in case of fail-safe CU required

Note

After a PM swap without MMC the parameter settings only stored in RAM will be lost

Successful swap

After a successful swap, F0395 will be displayed.

- In case of a standard CU a confirmation is necessary.
- In the case of CUs with fail-safe functions, an acceptance test must be performed.

Confirmation

On standard CUs the current parameter set needs to be checked and confirmed by clearing F0395. It can be cleared via:

- Digital input or PLC signal (depends on the settings of P0700)
- setting P7844 = 0.
- Via the FN button on the OP

Warning

The user is responsible for ensuring that the parameters held in the CU are the correct parameters for their application.

Acceptance test

On CUs with fail-safe functions it is necessary to do an acceptance test (refer to the "Fail-safe functions" section in this manual). To clear F0395 on CUs with fail-safe functions the following procedure has to be followed:

- P0010 = 30
- P9761 = safety password
- P7844 = 0
- Carry out acceptance test

Swap fault

A swap fault is indicated if the automatic download fails. In this case, the CU will return to the parameter set previously held in the EEPROM and F0395 as well as one of F0061, F0062 and F0063 will be generated.

First F0395 must be cleared via:

- Digital input or PLC signal (depends on the settings of P0700)
- setting P7844 = 0.
- Via the FN button on the OP

In the next step F0061 / F0062 or F0063 has to be cleared via power cycle.

Note

F0395 cannot be cleared via power cycle. F0061, F0062 and F0063 can only be cleared via power cycle.

In case of a swap fault check, whether the MMC is defective or a parameter set clone00.bin is available or the parameter set is valid.

A valid parameter set means, it is not from a different type (eg. CU20S DP and CU240S or failsafe and standard CUs)

Rules regarding swap and hot swap

There are a number of scenarios where a swap or hot swap can take place, each with their own unique set of conditions that must be observed.

Danger

Do not attempt to hot swap a power module (PM)

Before attempting to swap a PM it must be fully powered-down. Any attempt to swap-out a PM when power is still applied could result in death of personnel and severe damage to property and equipment.

Warning

Swap restrictions

Before performing a swap take care of the following:

- It is the responsibility of the user to ensure that only CUs of the same type are swapped
- It is the responsibility of the user to ensure that the MMC contains the correct parameter set
- It is the responsibility of the user to ensure that only PMs of the same type and power rating are swapped.
- It is the responsibility of the user to ensure that the application is in a safe state before any swap of equipment is performed.

Swapping a CU

The following procedure is given as a guide to perform a swap of a CU.

Caution

Data set compatibility

To ensure complete data set compatibility, it is recommended to perform an upload of the parameter set from the CU to a new MMC prior to swapping the CU.

Before performing a CU swap take care of the following:

1. The PM is powered-down and disconnected.
2. Wait 5 minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.
3. Remove the two-part terminals that are actually wired on the CU.
4. Remove the MMC.
5. Remove the CU from the PM.

Before switching on Power supply to the inverter take care of the following:

1. Fit the new CU to the PM.
2. Reconnect the two-part terminals to the CU.
3. Insert the MMC into the MMC-slot of the CU.

Swapping the PM

Caution

To ensure complete data set compatibility, make sure that all parameters are stored in the EEPROM of the Control Unit (see P0014 or P0971) prior to swapping the PM).

Before performing a PM swap take care of the following:

1. The PM is powered-down and disconnected.
2. Wait 5 minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.

Before switching on Power supply take care of the following:

1. The new PM is properly installed and connected.
2. The CU is fitted back on the PM.

5.2 Regeneration

Description

The power modules, described in this manual, are able to continously feed back regenerative power to mains supply network.

The regenerative power capability depends on the motor speed and on current or voltage limiting parameters. The maximum regenerative power is limited to 100 % of the nominal power (high overload) of the power module.

Regeneration in case of V/f control

The regenerative power can be limited via P0640. If the regenerative power exceeds the limit for more than 5 s the inverter will trip with F0028.

Regeneration in case of vector control

The regenerative power can be limited via P1531. If the regenerative power exceeds the limit the drive will not be able to hold its setpoint.

The following graph shows the limiting parameters.

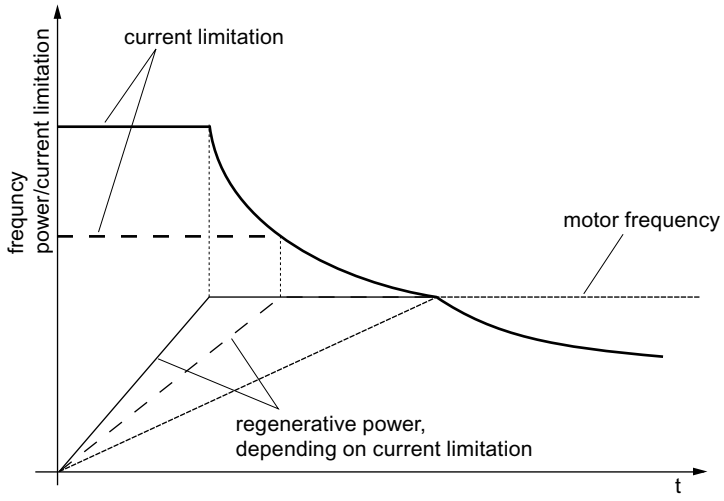


Figure 5-1 Regenerative capability

Technical data

6

6.1 Performance Ratings (PM250)

SINAMICS G120 Power Module

Table 6-1 Performance ratings

Feature	Specification
Line operating voltage & power ranges	3 AC 380 V … 480 ± 10 %
	High Overload: 5.5 kW … 75 kW (7.4 hp … 100 hp)
	Light Overload: 7.5 kW … 90 kW (10 hp … 121 hp)
Input frequency	47 Hz … 63 Hz
Output frequency	0 Hz … 200 Hz
cos φ	0.95
Inverter efficiency	95 % … 97 %
Overload capability (HO)	1.5 x Nominal output current (150 % overload) for 57 s every 300 s
	2 x Nominal output current (200 % overload) for 3 s every 300 s, 20,000 cycles
Overload capability (LO)	1.1 x Nominal output current (110 % overload) for 57 s every 300 s
	1.5 x Nominal output current (150 % overload) for 3 s every 300 s, 70,000 cycles
Inrush current	Less than rated input current
Pulse frequency	4 kHz (factory setting) adjustable in 2 kHz-steps from • 4 kHz … 16 kHz for FSC to FSE • 4 kHz … 8 kHz for FSF
Electromagnetic compatibility	Integrated Class A filters
Braking	Regeneration (up to 100 % output rating)
Protection level	IP20 according to EN 60529
Storage temperature	-40 °C … +70 °C (-40 °F … 158 °F)
Protection features	Undervoltage, Overvoltage, Overload, Ground faults, Short circuit, Stall prevention, Motor blocking protection, Motor overtemperature, Power Module overtemperature, Parameter interlock
Standards	CE, C-tick
CE marked	Conformity with EC Low Voltage Directive 73/23/EEC and filtered versions also Electromagnetic Compatibility Directive 89/336/EEC

Power Module PM250 Specifications

Caution

High Overload (HO) and Light Overload (LO) input currents

The input current depends on the motor load and the line impedance. The given values apply for a load representing the rated power (based on high overload current) for a line impedance of Vk = 1 %.

Notice

UL Fuses

In order that the system is in compliance with UL, UL-certified fuses must be used with the appropriate rated current.

Table 6-2 PM250 Frame Sizes C, 3 AC 380 V … 480 V, ± 10 % (with built-in Class A Filter)

Order No.	6SL3225 -	0BE25-5AA0	0BE27-5AA0	0BE31-1AA0
Output Rating (HO)	[kW]	5.5	7.5	11.0
	[hp]	7.5	10.0	15.0
Output Power	[kVA]	10.1	14.0	19.8
Rated Input Current	[A]	15.5	23.1	32.6
HO Output Current	[A]	13.2	18.4	26.0
LO Output Current	[A]	19.0	26.0	32.0
Fuse	[A]	20	32	35
Required cooling air flow	l/s	38	38	38
Input Cable / Output Cable	[mm^2]	2.5 … 10	4 … 10	6 … 10
	[awg]	14 … 8	12 … 8	10 … 8
Weight	[kg]	7.0	7.0	7.0
	[lbs]	15.4	15.4	15.4

Table 6-3 PM250 Frame Sizes D, 3 AC 380 V … 480 V, ±10 % (with built-in Class A Filter)

Order No.	6SL3225 -	0BE31-5AA0	0BE31-8AA0	0BE32-2AA0
Output Rating (HO)	[kW]	15.0	18.5	22.0
	[hp]	20.0	25.0	30.0
Output Power	[kVA]	24.4	29.0	34.3
Rated Input Current	[A]	30.0	35.0	42.0
HO Output Current	[A]	32.0	38.0	45.0
LO Input Current	[A]	37.2	54.7	74.8
LO Output Current	[A]	45.2	45.0	60.0
Fuse	[A]	50	63	80
Required cooling air flow	l/s	22	22	39
Input Cable / Output Cable	[mm^2]	10 … 35	10 … 35	16 … 35
	[awg]	7 … 2	7 … 2	5 … 2
Weight	[kg]	16.0	16.0	16.0
	[lbs]	37.0	37.0	37.0

Table 6-4 PM250 Frame Sizes E, 3 AC 380 V … 480 V, ±10 % (with built-in Class A Filter)

Order No.	6SL3225 -	0BE33-0AA0	0BE33-7AA0
Output Rating (HO)	[kW]	30.0	37.0
	[hp]	40.0	50.0
Output Power	[kVA]	47.3	57.2
Rated Input Current	[A]	56.0	70.0
HO Output Current	[A]	60.0	75.0
LO Input Current	[A]	91.0	111.0
LO Output Current	[A]	75.0	90.0
Fuse	[A]	100	125
Required cooling air flow	l/s	22	39
Input Cable Min.	[mm^2]	25 … 35	25 … 35
	[awg]	3 … 2	3 … 2
Weight	[kg]	23.0	23.0
	[lbs]	48.0	48.0

Table 6-5 PM250 Frame Sizes F, 3 AC 380 V … 480 V, ±10 % (with built-in Class A Filter)

Order No.	6SL3225 -	0BE34-5AA0	0BE35-5AA0	0BE37-5AA0
Output Rating (HO)	[kW]	45.0	55.0	75
	[hp]	60.0	75.0	100.0
Output Power	[kVA]	68.6	83.8	110.5
Rated Input Current	[A]	84.0	103.0	135.0
HO Output Current	[A]	--	110.0	145.0
LO Input Current	[A]	143.0	190.0	223.0
LO Output Current	[A]	110.0	145.0	178.0
Fuse	[A]	160	200	250
Required cooling air flow	l/s	94	94	117
Input Cable Min.	[mm^2]	35 … 150	70 … 150	95 … 150
	[awg]	2 … - 5	- 2 … - 5	- 3 … - 5
Weight	[kg]	52.0	52.0	52.0
	[lbs]	165.0	165.0	165.0

Relationship between pulse frequency and current reduction

Table 6-6 Current reduction depending on pulse frequency

Mains voltage	Nominal Power (HO)	Nominal Current	Output current at pulse frequency of					
		4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
	kW	A	A	A	A	A	A	A
3 AC 400 V	5.5	13.2	12.5	11.9	10.6	9.2	7.9	6.6
	7.5	19.0	18.1	17.1	15.2	13.3	11.4	9.5
	11.0	26.0	24.7	23.4	20.8	18.2	15.6	13.0
	15.0	38.0	32.0	27.0	23.0	19.0	17.0	15.0
	18.5	45.0	38.0	32.0	27.0	23.0	20.0	18.0
	22.0	60.0	51.0	42.0	36.0	30.0	27.0	24.0
	30.0	75.0	64.0	53.0	45.0	38.0	34.0	30.0
	37.0	90.0	77.0	63.0	--	--	--	--
	45.0	110.0	94.0	77.0	--	--	--	--
	55.0	145.0	123.0	102	--	--	--	--
	75.0	178	151	125	--	--	--	--

Temperature

The operating temperature range is shown diagramatically in the figure below:

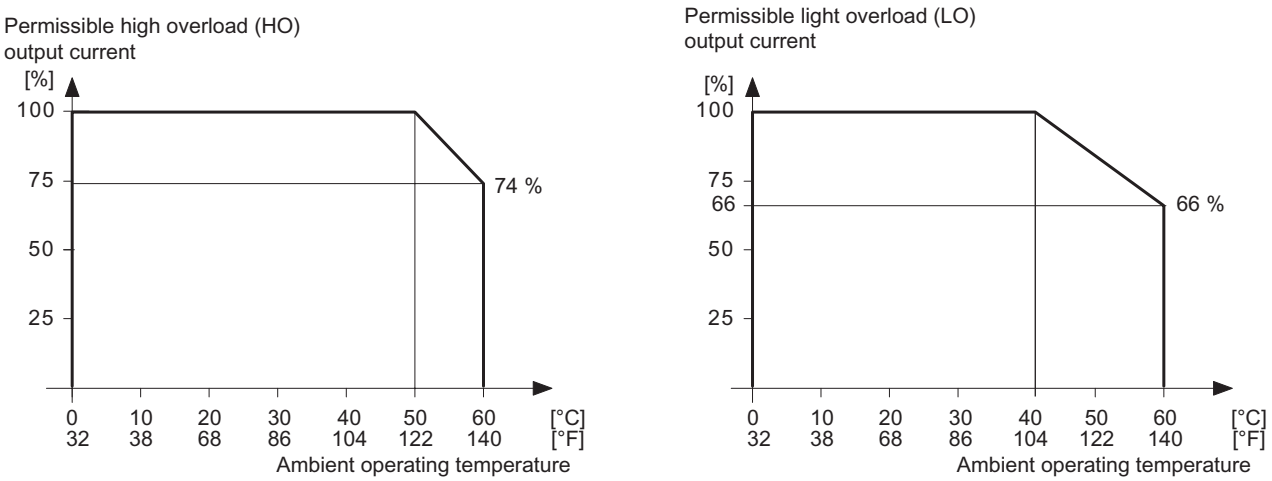


Figure 6-1 Power derating for temperature

Humidity range

Relative air humidity for the SINAMICS G120 is ≤ 95 % non-condensing.

In areas of high relative humidity, measures should be taken to ensure that condensation does not form within or around the SINAMICS G120. Anti-condensation heaters are commonly used to prevent the formation of condensation.

Altitude

If the SINAMICS G120 is to be installed at an altitude > 1000 m (> 3280 ft) derating will be required. The figures below show the derating required according to altitude.

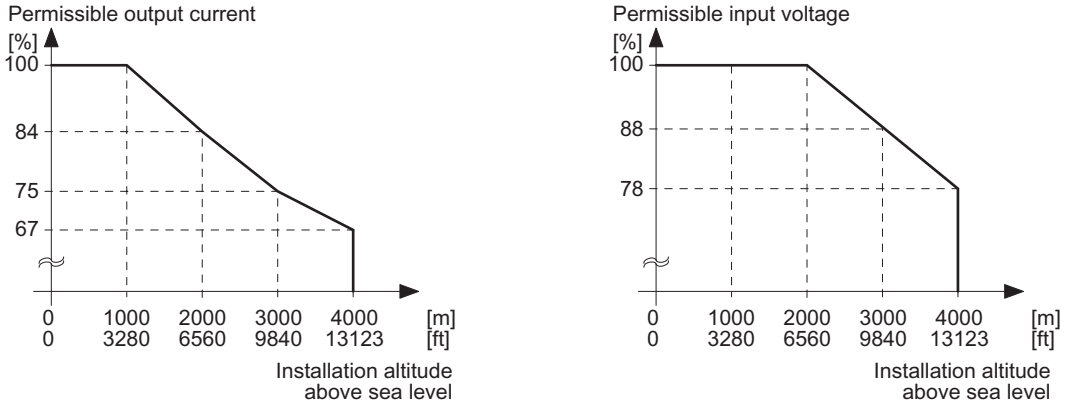


Figure 6-2 Derating for altitude

Shock and vibration

Do not drop the SINAMICS G120 or expose to sudden shock. Do not install the SINAMICS G120 in an area where it is likely to be exposed to constant vibration.

Electromagnetic radiation

Do not install the SINAMICS G120 near sources of electromagnetic radiation.

Atmospheric pollution

Do not install the SINAMICS G120 in an environment which contains atmospheric pollutants such as dust and/or corrosive gases.

Water

Take care to site the SINAMICS G120 away from potential water hazards, for example, do not install the SINAMICS G120 beneath pipes that are subject to condensation. Avoid installing the SINAMICS G120 where excessive humidity and condensation may occur.

Installation and cooling

Caution

The SINAMICS G120 Power Module MUST NOT be mounted horizontally.

When mounting SINAMICS G120 Power Modules one above the other, the specified environmental conditions and clearance must not be exceeded (see Dimension Drawings)

No equipment that could have a negative effect on the flow of cooling air should be installed in this area. Make sure that the cooling vents in the SINAMICS G120 Power Module are positioned correctly to allow the free movement of air.

Make sure that there is an adequate airflow through the cubicle as follows:

1. Using the formula below, calculate the airflow required:
   Airflow (m^3/hr) = (Dissipated Watts / ΔT) x 3.1
2. If necessary, install cubicle cooling fans.

Note

Dissipation (Watts) = 3 % to 5 % of the SINAMICS G120 Power Module rating.

ΔT = Allowable temperature rise within the cubicle in °C.

3.1 = Specific heat of air at sea level.

Dimensional drawings

7

Power Module PM250 Dimensional Drawings

The dimensional drawings for the power modules are shown in the figures below.

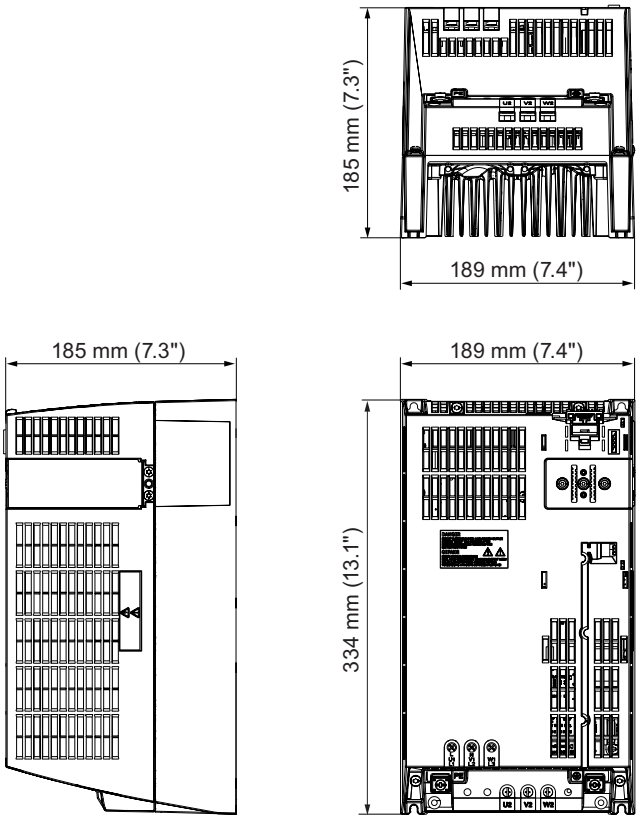


Figure 7-1 Dimensional drawing PM250 FSC, 400V

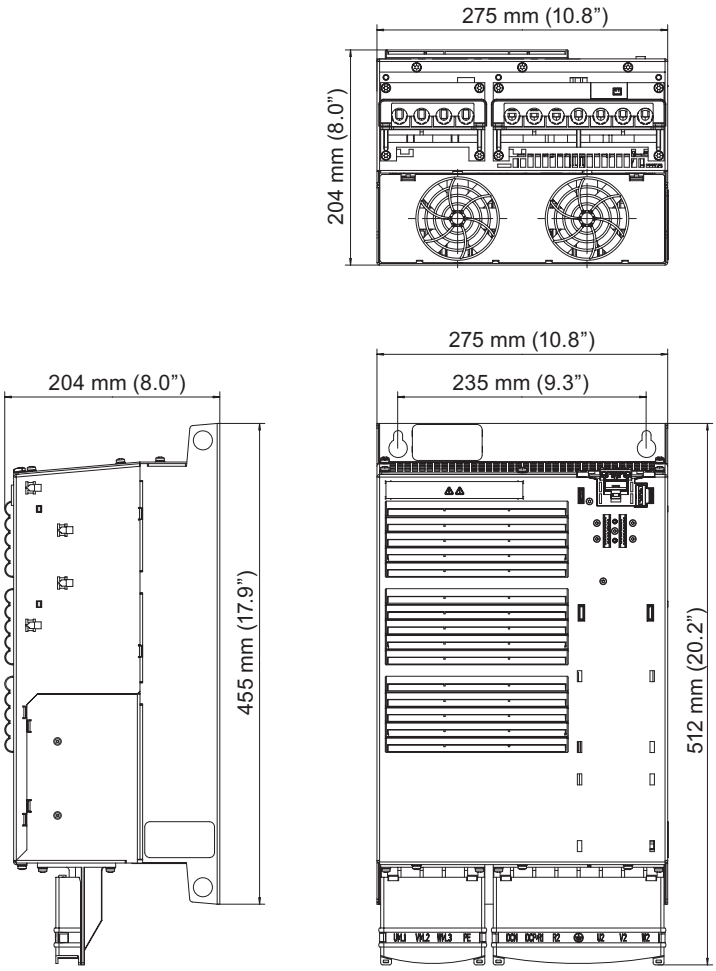


Figure 7-2 Dimensional drawing PM250 FSD, 400V (filtered)

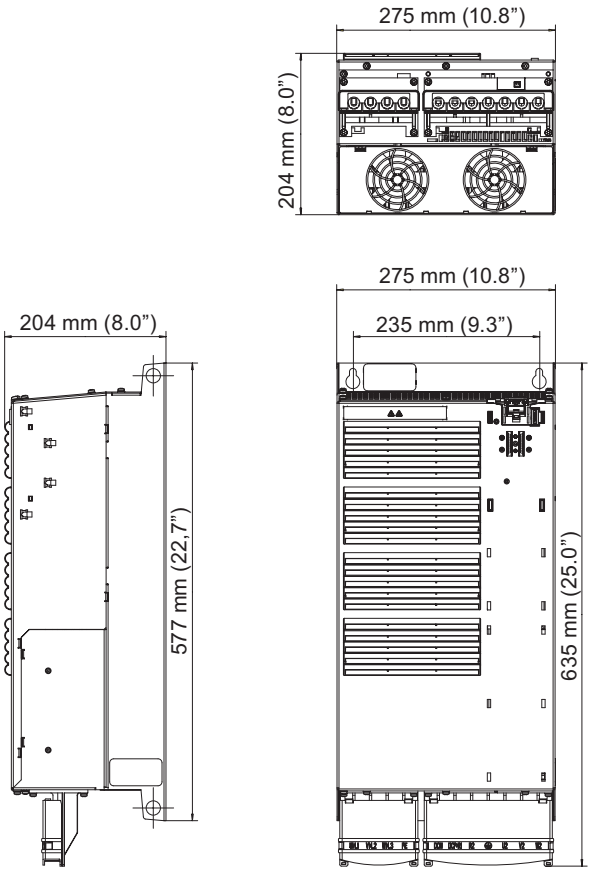


Figure 7-3 Dimensional drawing PM250 FSE, 400V (filtered)

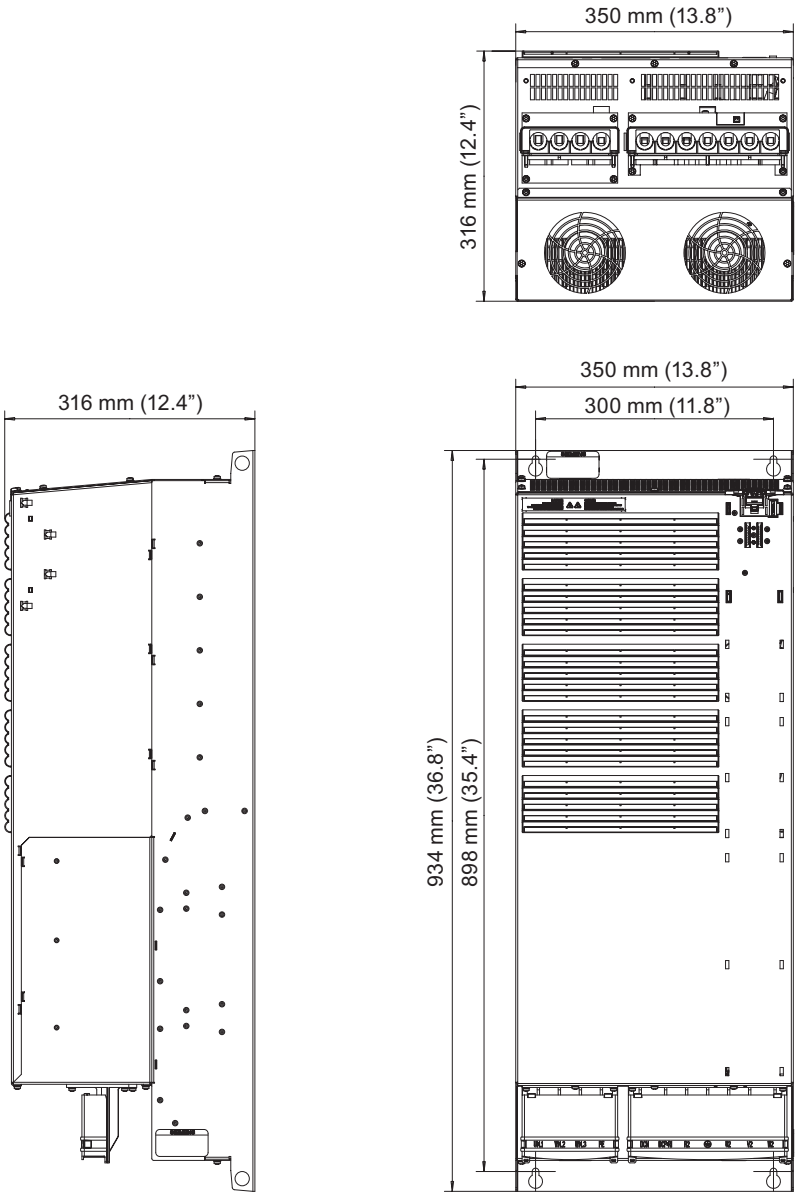


Figure 7-4 Dimensional drawing PM250 FSF, 400V (filtered)

Spare parts/Accessories

8

NEMA 1 kit

The NEMA 1 kit has been designed to provide some protection against limited amounts of falling dirt in an indoor environment. The level of protection does not protect against falling liquids.

The NEMA 1 kit only provides protection for the inverter itself and does not protect any of the footprint options or the DIN rail kit.

The kit provides protection for both the power module and the control unit including easy access to the MMC on the control unit.

The NEMA 1 kit consists of the following components:

- Top cover (to protect the top of the inverter).
- Metal glanding box (to allow the correct termination of control cables).
- Gland box cover (to ensure that the control cables can not be touched accidentally).

Screen termination kit

The screen termination kit has been designed to allow the termination of control, mains and power cables to ensure the correct electrical grounding to the inverter.

For FSC and larger the screen termination kits provides for the termination of at least 4 screened cables.

Brake modules

The brake modules are designed to provide the interface between the Control Module/Power Module and the brake solenoid of a motor. There are two versions:

- Brake module – this provides the basic braking control function.
- Safe brake module – this provides for the braking control function within a safety integrated system. To adhere to the requirements of a safety integrated system, the safe brake module has been designed to allow a variable voltage to be given to the safe brake module to allow the system to determine if the brake module is functioning correctly without actually activating the braking function.

The brake modules can be panel mounted, wall mounted or mounted on the screen termination plates and gland kits.

Output choke

Output chokes can be used to reduce the capacitive compensation currents and dV/dt in the case of motor cables greater than 50 m [164 ft] (shielded) or less than 100 m [328 ft] unshielded.

8.1 Cooling Fan

Replacing a Cooling Fan

The power modules have been designed to allow the cooling fans to be replaced. The procedure how to replace a fan is described in the following. Furthermore an illustrated description is part of the fan package.

1. Power-down the inverter.
2. Remove the Control Unit from the inverter.
3. Disconnect all the cables from the Power Module.
4. Remove the fan cover.
5. Release the fan cable connectors.
6. Slide the cooling fan out from the inverter.
7. Fit the new cooling fan into the fan housing area (make sure that the arrow on the fan is pointing upwards) .
8. Re-attach the fan cable connector(s).
9. Replace the fan cover.
10. Reconnect all the cables to the Power Module.
11. Reattach the Control Unit.
12. Check that the installation is correct and safely installed.
13. Apply power the system.
14. Check that the cooling fan(s) are running correctly.

8.2 Brake Control Relays

Overview

There are two types of brake control relays:

- Brake Module (Relay Brake Module)
- Safe Brake Module (Safe Brake Module)

The Safe Brake Module and the Brake Module are different variants of the same device (for details see option description "Brake Module Instructions".

Connections of Brake Module and Safe Brake Relay:

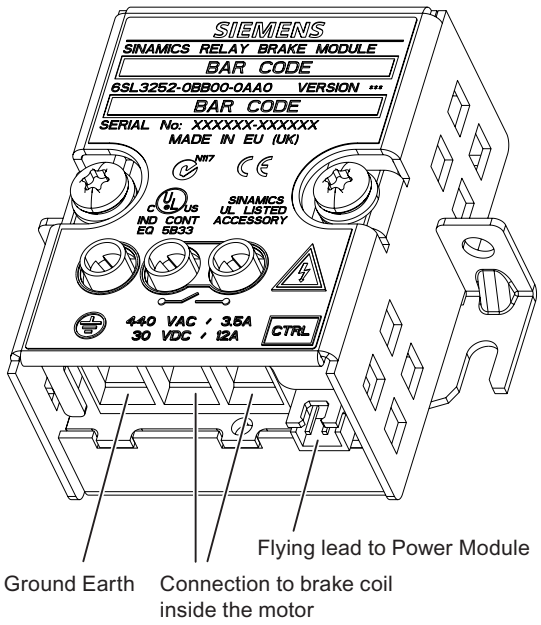


Figure 8-1 Brake Relay

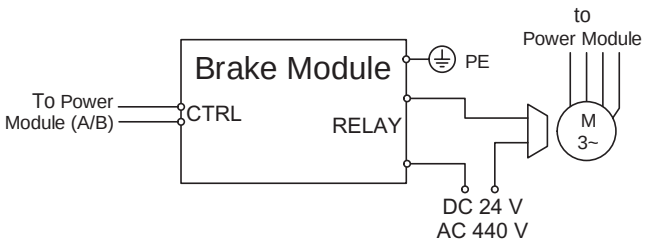


Figure 8-2 Wiring of Brake Relay

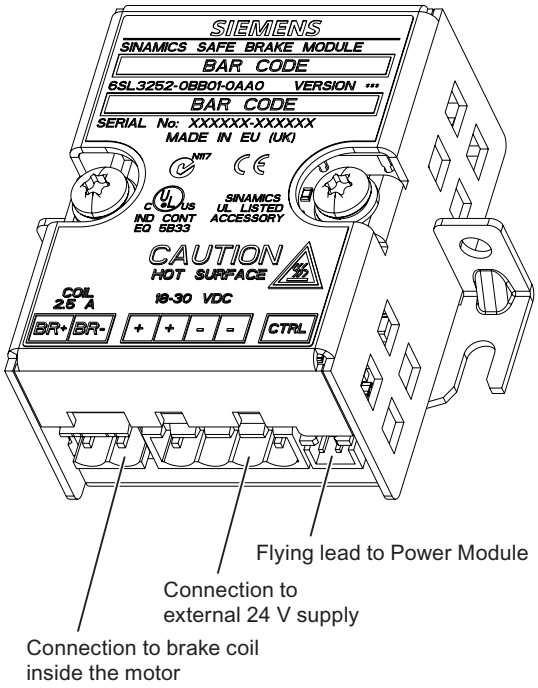


Figure 8-3 Safe Brake Module

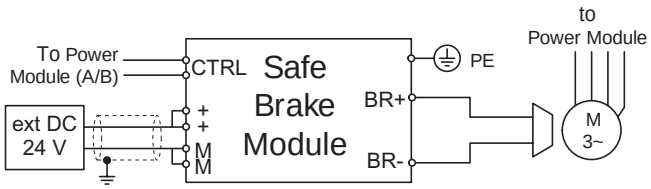


Figure 8-4 Wiring of Safe Brake Module

With the Safe Brake Module 24 V motor brakes up to a current consumption of 2 A can be operated. Necessary is an external controlled power supply for 2.5 A and an output voltage which can be adjusted at a voltage of 26 V, e.g. SITOP modular. The higher voltage is required to compensate the voltage drop across the cables to the coil of the brake.

Note

On fail-safe reasons it is not allowed to take the 24 V supply of the Control Unit.
The power supply for the Safe Brake Module must be a separate additional power supply.

During power ON for the drive it is necessary to supply the Safe Brake Module first, so that the Control Unit is able to check its function, otherwise the fault F1601 will occur.

The Safe Brake Module is designed to react to a stepped voltage input, which allows the braking mechanism to be tested. The Brake Module does not have this functionality.

Note

During forced dynamisation all connections of the Safe Brake Module are checked but in operation the connection between Safe Brake Module and brake coil is not monitored.

Triggering the Brake Control with Standard Control Units

The motor brake function can be activated or deactivated via P1215. It controls a brake relay, connected to the power module. This Brake Module controls an electro-mechanical brake, which is always closed when powered down.

P1215 = 0
(motor brake not active - factory setting), that means, if a brake is available, it will be closed to prevent the motor against unintended moves, e.g. after a parameter download.

P1215 = 1
(motor brake active) the brake will be controlled via terminals A and B on the power module.

Triggering the Brake Control with Contol Units with fail-safe functions

Prerequisite: P1215 = 1

Warning

The brake can be triggered via both, a Brake Module and a Safe Brake Relay.
Triggering via a Brake Module is not fail-safe!

For a fail-safe triggering of a Safe Brake Module the following parameters must be set: P9602 = P9802 = 1 (factory setting is 0). If P9602 ≠ P9802 a fault will be generated.

In case of P9602 = P9802 = 1 a test signal regarding the signal to the Safe Brake Control is generated and monitored.

This test signal does not interfere with the normal function of the mechanical brake. If the mechanical brake is fitted and the test fails, a fault condition will be indicated by the inverter.

If the Safe Brake Control is deactivated by setting P9602 = P9802 = 0 the Safe Brake Module will still work as intendet but will not be monitored in a safe way.

Appendix

A

A.1 Electromagnetic Compatibility

Electromagnetic compatibility

All manufacturers/assemblers of electrical apparatus which "performs a complete intrinsic function and is placed on the market as a single unit intended for the end user" must comply with the EMC directive EC/89/336.

There are three routes for the manufacturer/assembler to demonstrate compliance:

Self-certification

This is a manufacturer's declaration that the European standards applicable to the electrical environment for which the apparatus is intended have been met. Only standards that have been officially published in the Official Journal of the European Community can be cited in the manufacturer's declaration.

Technical construction file

A technical construction file can be prepared for the apparatus describing its EMC characteristics. This file must be approved by a ‘Competent Body’ appointed by the appropriate European government organization. This approach allows the use of standards that are still in preparation.

EMC Standards

The SINAMICS G120 drives have been tested in accordance with the EMC Product Standard EN 61800-3:2004.

A.2 Definition of the EMC Environment and Categories

Classification of EMC performance

The EMC environment and categories are defined within the EMC Product Standard EN 61800-3, as follows:

First Environment

An environment that includes domestic premises and establishments that are connected directly to a public low-voltage power supply network without the use of an intermediate transformer.

Note

For example: houses, apartments, commercial premises or offices in a residential building.

Second Environment

An environment that includes industrial premises and establishments that are not connected directly to a public low-voltage power supply network.

Note

For example: industrial and technical areas of buildings fed from a dedicated transformer.

Category C1

Power Drive System (PDS) of rated voltage less than 1000 V intended for use in the First (Domestic) Environment.

Category C2

Power Drive System (PDS) of rated voltage less than 1000 V, which is neither a plug in device nor a movable device, and when used in the First (Domestic) Environment, is only intended to be installed and commissioned by a professional.

Note

A professional is a person or an organization having necessary skills in installing and/or commissioning a Power Drive System (PDS), including their EMC aspects.

Category C3

Power Drive System (PDS) of rated voltage less than 1000 V intended for use in the Second (Industrial) Environment and not intended for use within the First (Domestic) Environment.

Table A-1 Compliance Table

Model	Remarks
Category C1 - First Environment	
--	The inverters are not intended for use within the Category C1 Environment.
Category C2 - First Environment - Professional Use	
Filtered Variants	6SL3225-0BE**-*AA0 (integrated class A filter)
	25 m screened cable type CY
	When used in the First (Domestic) Environment this product may cause radio interference in which case mitigation measures may be required. Units installed within the Cateogry C2 (Domestic) Environment require supply authority acceptance for connection to the puplic low-voltage power supply network. Please contact your local supply network provider.
Category C3 - Second Environment	
Unfiltered Variants	----
	The use of unfiltered drives within an industrial installation is only possible if it forms part of a system which includes additional power-line filtering at the "system level" or, alternatively, the use of filtered variants.

Note

All drives should be installed and commissioned in accordance with the manufacturer's guidelines and in accordance with good EMC practices.

For further information refer to SIEMENS application note "EMC Design Guidelines".

A.3 Standards

European Low Voltage Directive

The SINAMICS G120 product range complies with the requirements of the Low Voltage Directive 73/23/EEC as amended by Directive 98/68/EEC. The units are certified for complaince with the following standards:

EN 61800-5-1 — Semiconductor inverters –General requirements and line commutated inverters

EN 60204-1 — Safety of machinery –Electrical equipment of machines

European Machinery Directive

The SINAMICS G120 inverter series does not fall under the scope of the Machinery Directive. However, the products have been fully evaluated for compliance with the essential Health & Safety requirements of the directive when used in a typical machine application. A Declaration of Incorporation is available on request.

European EMC Directive

When installed according to the recommendations described in this manual, the SINAMICS G120 fulfils all requirements of the EMC Directive as defined by the EMC Product Standard for Power Drive Systems EN 61800-3

Underwriters Laboratories

UL and CUL LISTED POWER CONVERSION EQUIPMENT for use in a pollution degree 2 environment.

Note: UL certification is presently in progress.

ISO 9001

Siemens plc operates a quality management system, which complies with the requirements of ISO 9001.

Certificates can be downloaded from the internet under the following link:
http://support.automation.siemens.com/WW/view/de/22339653/134200

List of abbreviations

B

B.1 Abbreviations

Abbreviations used with the SINAMICS G120 Products

Table B-1 Abbreviations used with the SINAMICS G120 Products

Abbreviations	State
A	
AC	Alternating Current
A/D	Analog digital converter
ADR	Address
AFM	Additional frequency modification
AG	Automation Unit
AI	Analog input
AK	Request Identifier
AO	Analog output
AOP	Advanced operation panel
ASIC	Application-specific integrated circuit
ASP	Analog setpoint
ASVM	Asymmetric space vector modulation
B	
BCC	Block check character
BCD	Binary-coded decimal code
BI	Binector input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit
BICO	Binector/connector
BO	Binector output
C	
C	Commissioning
CB	Communication board
CCW	Counter-clockwise
CDS	Command data set
CI	Connector input
CM	Configuration management
CMD	Command

Abbreviations	State
CO	Connector output
CO/BO	Connector output/Binector output
COM	Common (terminal is connected to NO or NC)
CT	Commissioning, ready to run
CU	Control Unit
CUT	Commissioning, run, ready to run
CW	Clockwise
D	
D/A	Digital analog converter
DC	Direct current
DDS	Drive data set
DI	Digital input
DIP	DIP switch
DO	Digital output
DP	Distributed I/Os
DP-V1	Acyclic data transfer (extended PROFIBUS function)
DS	Drive state
E	
ECD	Equivalent circuit diagram
EEC	European Economic Community
EEPROM	Electrical erasable programmable read-only memory
ELCB	Earth leakage circuit breaker
EMC	Electromagnetic compatibility
EMF	Electromagnetic force
ES	Engineering System
FAQ	Frequently asked question
F	
FB	Function block
FFB	Freely Assignable Function block
FCC	Flux current control
FCL	Fast current limiting
FF	Fixed frequency
FFB	Free function block
FOC	Field orientated control
FREQ	Frequency
FSA	Frame size A
FSB	Frame size B
FSC	Frame size C
FSD	Frame size D
FSE	Frame size E
FSF	Frame size F

Abbreviations	State
G	
GSD	Device Data File (Geräte Stamm Datei)
GSG	Getting Started Guide
GUI ID	Global unique identifier
H	
HIW	Main actual value
HMI	Human machine interface
HO	High Overload (Constant Torque)
HSW	Main setpoint
HTL	High-voltage transistor logic
I	
I/O	In-/output
IBN	Commissioning
IGBT	Insulated gate bipolar transistor
IND	Sub-index
J	
JOG	JOG
K	
KIB	Kinetic buffering
L	
LCD	Liquid crystal display
LED	Light emitting diode
LGE	Length
LO	Light Overload (Variable Torque)
LWL	Fiber Optic conductor
LSTO	Latched Safe Torque Off
M	
MHB	Motor holding brake
MLP	Multi-Language Pack
MOP	Motor operated potentiometer
N	
NC	Normally closed
NEMA	National Electrical Manufacturers Association
NO	Normally open
O	
OLM	Optical Link Module
OLP	Optical Link Plug
OM	Object Manager
OP	Operator Panel
OPI	Operating Instructions
PA	
PID	Proportional, integral, derivative controller

Abbreviations	State
PKE	Parameter ID
PKW	Parameter ID value area (Parameterkennung Wert)
PLC	Programmable logic control
PM	Power module
PM-IF	Power module interface
PNU	Parameter Number
PNO	PROFIBUS Nutzerorganisation
PPO	Parameter process data object
PTC	Positive temperature coefficient
PWE	Parameter value
PWM	Pulse-width modulation
Pxxxx	Write parameter
PZD	Process data area (Prozeßdaten)
Q	
QC	Quick commissioning
R	
RAM	Random-access memory
RCCB	Residual current circuit breaker
RCD	Residual current device
RFG	Ramp-function generator
RFI	Radio frequency interference
ROM	Read-only memory
RPM	Revolutions per minute
rxxxx	read-only parameters of analogue signals
S	
SBC	Safe Break Control
SLVC	Sensorless vector control
SLS	Safe-Limited Speed
SOL	Serial option link
SS1	Safe Stop 1
STO	Safe Torque Off
STW	Control word
STX	Start of text
SVM	Space vector modulation
T	
TTL	Transistor-transistor logic
U	
USS	Universal serial interface
V	
V/f	Voltage/frequency
VC	Vector control
VT	Variable torque

Abbreviations	State
W	
WEA	Automatic restart
Z	
ZSW	Status word
ZUSW	Additional setpoint

Index

R

S

T

U

W

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