SINAMICS G120

Power Module PM260

Hardware Installation Manual · 07/2009

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SINAMICS G120 Power Module PM260

Hardware Installation Manual

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Legal information

Warning notice system

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.

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

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

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.

Proper use of Siemens products

Note the following:

/!\WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be adhered to. The information in the relevant documentation must be observed.

Trademarks

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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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Introduction

Available technical documentation

Comprehensive information and support tools are available from the Service and Support internet site

http://support.automation.siemens.com

You find there the following types of documentation:

- Getting Started
- Operating Instructions
- Hardware Installation Manual
- Function Manual
- Parameter Manual
- Product Information

Further internet addresses

You can download the respective documents for your inverter under the following links:

- SINAMICS G110 http://www.siemens.com/sinamics-g110
- SINAMICS G120 http://www.siemens.com/sinamics-g120
- SINAMICS G120D http://www.siemens.com/sinamics-g120d
- SIMATIC ET 200S FC http://www.siemens.com/et200s-fc
- SIMATIC ET 200pro FC http://www.siemens.com/et200pro-fc

Application examples

You find various application examples to the inverters under the following link:

http://support.automation.siemens.com/WW/view/en/20208582/136000

Safety notes

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 inverter, 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 inverter 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, that the voltage drop between the beginning of the load system and the power drive system during operation with rated values does not exceed 4 %.

3.1 Power module PM260

General

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 suitably 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.

As the earth leakage for this product can be greater than 3.5 mA a.c., a fixed earth connection is required and the minimum size of the protective earth conductor shall comply with the local safety regulations for high leakage current equipment.

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

It is strictly prohibited for any mains disconnection to be performed on the motor-side of the system; any disconnection of the mains must be performed on the mains-side of the Inverter.

When connecting the line supply to the Inverter, make sure that the terminal case of the motor is closed.

This equipment is capable of providing internal motor overload protection according to UL508C. Refer to P0610 and P0335, i²t is ON by default.

When changing from the ON to OFF-state of an operation if an LED or other similar display is not lit or active; this does not indicate that the unit is switched-off or powered-down.

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.



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 installations (e.g. EN 50178) as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).

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 this manual within easy reach of the equipment and make it 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

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

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

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.

3.1 Power module PM260

$/! \$ 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.

Mechanical Installation

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).

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

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

When connecting the line supply to the inverter, make sure that the terminal case of the motor is closed.

When changing from the ON to OFF-state of an operation if an LED or other similar display is not lit or active; this does not indicate that the unit is switched-off or powered-down.

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

Operation

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 - and if available the DC 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 power system up to 10,000 symmetrical amperes (rms), for the maximum rated voltage + 10 % when protected by an appropriate standard fuse (refer to the catalogue for the type of fuse).

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!

The line filter conducts a high leakage current via the PE conductor. Due to the high leakage current a permanent PE connection for the line filter is required.

Furthermore, the following measures must be taken in accordance with EN 61800-5-1: Either protective ground conductor cross-sections \geq 10 mm² (8 AWG) Cu or installation of a second protective ground conductor with both having the same cross-section as the line input cable. Safety notes

3.1 Power module PM260

High temperature



Repair

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

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:

- CU without fail-safe functions
 - CU230P-2 HVAC for pump and fan applications with Modbus RTU interface
 - CU230P-2 CAN for pump and fan applications with CANopen interface
 - CU230P-2 DP for pump and fan applications with PROFIBUS DP interface
 - CU240E economic version of the CU240 Control Units (e.g. less terminals, no encoder interface)
 - CU240S standard version of the CU240 Control Units
 - CU240S DP like CU240S plus PROFIBUS DP interface (PROFIdrive Profile V4.1)
 - CU240S PN like CU240S plus PROFINET interface (PROFIdrive Profile V4.1)
- CU with fail-safe functions
 - CU240S DP-F like CU240S DP plus integrated fail-safe functions
 - CU240S PN-F like CU240S PN plus integrated fail-safe functions

The Power Modules differ concerning the supply voltage and the way of realizing the motor braking function:

- PM240 Power Module with resistor braking and dc braking functions, supply voltage 3 AC 400 V
- PM250 Power Module with regenerative braking function, supply voltage 3 AC 400 V
- PM260 Power Module with regenerative braking function, 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.

3.1 Power module PM260

3.1 Power module PM260

Overview

The power modules contain an integrated sine wave output filter for sinusoidal output voltage. They are available with protection level IP20 according to EN 60529, with or without integrated Class A filter in the following frame sizes and power ranges:

- Frame size D, 7,5 kW ... 15 kW
- Frame size F, 22 kW ... 37 kW

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

The PM260 power modules can be used together with G120 standard control units or with G120 fail-safe control units.

The PM260 power modules can be used for three phase asynchronous motors, syncronous motors are not allowed.

Description 3.2 Block diagram

3.2 Block diagram

Block diagram



Figure 3-1 Power Module PM260

Installing/Mounting

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 FSA ... FSF is designed for IP20 protection. It is protected from the ingress of solid foreign objects ≥ 12.5 mm (≥ 0.49 inches)
- The Power Module FSGX is designed for IP20 or IPXXB protection. It is protected from the ingress of solid foreign objects ≥ 12.5 mm (≥ 0.49 inches) respectively from accessing dangerous parts with a finger
- The Power Module is not protected against the ingress of water
- The Power Module 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 Take care to site the inverter away from potential water hazards, for example, do not install the inverter beneath pipes that are subject to condensation. Avoid installing the inverter where excessive humidity and condensation may occur
- 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 earthing and grounding practices for each Power Module and the cabinet follows the guidelines given in this document

The SINAMICS G120 Power Module MUST NOT be mounted horizontally.

4.1 Mechanical Installation

4.1 Mechanical Installation

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).

Installation and cooling

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

- 1. Add the air flow values required for every Power Module (see following table) within the cubicle
- Calculate the airflow required by components as reactor, filter, Control Unit and other electronic devices using the formula
 Air flow (I/s) = (Power loss (Watt) / ΔT) x 0.86
 (ΔT = Allowable temperature rise within the cubicle in °C).

 For the power losses of components see the following table
- 3. Add the airflow values of all components within the cubicle to get the complete air flow required
- 4. No equipment should be installed that could have a negative effect on the flow of cooling air
- 5. Make sure that the cooling vents in the Power Module are positioned correctly to allow the free movement of air



6. Avoid cooling air short circuit using air barriers, if necessary

Figure 4-1 Air barriers for avoiding cooling air short circuits

7. Provide an adequate cubicle with sufficient air vent and suitable air strainer

Distances to other equipment

The power modules can be mounted without any clearance at either side. When mounting one above the other, the specified environmental conditions must not be exceeded. Independent of this, the following distances above and below must be observed:

- Frame Size D: above and below 300 mm (11.81 inches)
- Frame Size F: above and below 350 mm (13.77 inches).

4.1 Mechanical Installation

Dimensions and drill pattern for power modules

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



Figure 4-2 Dimensions and drill pattern for the power modules

Fitting the Control Unit to the Power Module

The Control Unit is snapped onto 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 4-3 Fitting the control unit to the power module

4.2 Electrical Installation

Overview

This section gives information about

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

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.
- The terminals of the Inverter can carry dangerous voltages even if the inverter is inoperative. Wait at least 5 minutes to allow the unit to discharge after switching off the line supply before carrying out any installation work.
- When connecting the line supply to the inverter, make sure that the terminal case of the motor is closed.
- When changing from the ON to OFF-state of an operation if an LED or other similar display is not lit or active; this does not indicate that the unit is switched-off or powered-down.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!"

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.

Overview of 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. The inverter will operate with most supply systems.

Table 4-1 Power distribution systems

TN-S Power System	TN-C-S Power System	TN-C Power System	TT Power System	IT Power System
L1 L2 L3 N PEO = 0 0 0 L1 L2 L3 Exposed Conductive Parts	L1 L2 L3 PE/O N = O O O L1 L2 L3 Exposed Conductive Parts	L1 L2 L3 N PEO OOO L1 L2 L3 Exposed Conductive Parts	L1 L2 L3 N = 000 Exposed Conductive Parts	L1 L2 L3 N L1 L2 L3 N L1 L2 L3 L3 L2 L3 Exposed Conductive Parts
A TN-S power system has separate neutral and protective ground conductors throughout the system.	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.	A TT power system has one point directly grounded, the exposed conductive parts of the installation being connected to a ground, which is electrically independent of the ground of the power system.	An IT power system has no direct connection to ground - instead the exposed parts of the electrical installation are grounded.

Filtered drives can only be used on power systems with grounded starpoint.

Note

For fulfilling the protection class I according to EN 61140 the input and output supply voltages have to be earthed.

Permissible Cable Length

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

Table 4-2 The inverters will operate at full specification with cable lengths as follows

Screened 200 m (656 ft)
 Unscreened 300 m (984 ft)

Frame size	Cable cross se	ection	Tightening t	orques
kW	mm²	AWG	Nm	lbf in
FSD				
7.5:	2,5 16	14 6	1.5	14
11:	4 16	12 6	1.5	14
15:	6 16	10 6	1.5	14
FSF				
22:	10 35	8 2	6	53
30:	16 35	6 2	6	53
37:	25 35	4 2	6	53

Table 4-3 Cable cross section

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

Access to power and motor terminals

Frame size D has has terminal blocks for power and motor connection. The terminal blocks can be removed after releasing 2 fixing screws. Thus a power module can be exchanged easily by removing the terminal blocks from the old one and plugging it onto the new one without new cabling. Once the change has been performed, the fixing screws of the terminal block must be tightened again.



Figure 4-4 Power terminals Frame Size D

Frame sizes F terminals can be accessed by releasing the latches on the left and right side of the terminal covers with a suitable flat-bladed screw driver. The cover then can be turned upwards so that the terminals can be accessed. After connecting the cables the covers must be locked again.



Figure 4-5 Power terminals Frame Size F

4.2.1 Power and motor connections

Power and motor terminal layout

The figures below shows the layout of the power and motor terminals of the PM260 Frame Sizes D and F.



Figure 4-6 Power Connection PM260 FSD



Figure 4-7 Power Connection PM260 FSF

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 90° 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.

<u>/!</u>\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

In order to meet radiated emissions a screen termination kit must be used. Screening without a screen termination kit is only suitable for installation in a metal cabinet.

Should a Screen Termination Kit not be available, the inverter then 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.



5

6

7

8

Figure 4-8 Example of wiring to minimize the effect of EMI

Table 4-4 Legend to the drawing

- 1 Line power input
- 2 Motor cable
- 3 Metal back plate
- 4 Use suitable clips to fix motor and power cable screen securely to metal 9 back plate
- Screened cables
- Screen termination kit
- Cable clamp
- Brake Relay
 - **Terminal blocks**

4.2.2 Motor circuit

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.



Note

690 V / 400 V Standard motors must always be connected in star configuration.

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.



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.

Technical specifications

SINAMICS G120 Power Module

Table 5-1 Performance ratings

Feature	Specification		
Line operating voltage & power ranges	3 AC 660 V 690 V \pm 10% The power modules can be operated with a minimum voltage of 450 V. Ir this case the output voltage will be reduced accordingly.		
	High Overload: 7.5 kW 37 kW (10 hp 50.0 hp)		
	Light Overload: 11 kW 55 kW (15.0 hp 74.0 hp)		
Input frequency	47 Hz 63 Hz		
Output frequency	0 Hz 200 Hz		
Power factor λ	0.9		
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		
Overload capability (LO)	1.1 x Nominal output current (110% overload) for 57 s every 300 s		
	1.4 x Nominal output current (140% overload) for 3 s every 300 s		
Inrush current	Less than rated input current		
Pulse frequency	16 kHz		
Electromagnetic compatibility	Integrated Class A filters for filtered units		
Braking	Regeneration (up to 100% high overload output rating)		
Protection level	IP20		
Temperature range without derating (HO)	0° C +50° C		
Temperature range without derating (LO)	0° C +40° C		
Temperature range with derating	Operational temperature up to 60° C (140° F) is possible with power derating		
Storage temperature	-40 °C +70 °C (-40 °F 158 °F)		
Humidity	< 95% RH - non-condensing		
Operational altitude	Up to 1000 m (3300 ft) above sea level without derating		
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 2006/95/EC and filtered versions also Electromagnetic Compatibility Directive 89/336/EEC		

Power Module PM260 Specifications

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 $V_k = 1\%$.

Table 5- 2 PM260 Frame Sizes D - 3 AC 660 V ... 690 V, ± 10% (500V - 10%)

Order No.	filtered unfiltered	6SL3225- 6SL3225-	0BH27-5AA1 0BH27-5UA1	0BH31-1AA1 0BH31-1UA1	0BH31-5AA1 0BH31-5UA1
Output Rating (HO)		kW	7.5	11.0	15
		hp	10.0	15.0	20.0
Output Powe	er	kVA	14.0	19.8	24.4
Rated Input	Current (LO)	А	13	18	22
HO Output C	Current	А	10	14	19
LO Output C	urrent	А	14	19	23
Fuse		А	20	20	32
Required cooling air flow		l/s	22	22	39
		CFM	47	47	83
Input Cable / Output Cable		mm ²	2.5 16	4 16	6 16
		awg	14 6	12 6	10 6
Weight	filtered	kg	23	23	23
		lb	50.7	50.7	50.7
	unfiltered	kg	21.8	21.8	21.8
		lb	48	48	48
Noise pressu	lre	dB(A)	< 64	< 64	< 64
Order No.	filtered unfiltered	6SL3225- 6SL3225-	0BH32-2AA1 0BH32-2UA1	0BH33-0AA1 0BH33-0UA1	0BH33-7AA1 0BH33-7UA1
---------------------------	------------------------	----------------------	--------------------------	--------------------------	--------------------------
Output Rating (HO)		kW	22.0	30.0	37.0
		hp	30.0	40.0	50.0
Output Power		kVA	34.3	47.3	57.2
Rated Input Current (LO)		Α	34	41	60
HO Output Current		Α	26	35	42
LO Output Current		Α	35	42	62
Fuse		Α	50	50	80
Required cooling air flow		l/s	94	94	117
		CFM	199	199	248
Input Cable /		mm ²	10 35	16 35	25 35
Output Cable	9	awg	8 2	6 2	4 2
Weight	filtered	kg	58	58	58
		lb	128	128	128
	unfiltered	kg	56	56	56
		lb	123	123	123
Noise pressure		dB(A)	< 70	< 70	< 70

Table 5-3 PM260 Frame Sizes F - 3 AC 660 V ... 690 V, ± 10% (500V - 10%)

Operating temperature derating

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

Power Module FSD and FSF

Permissible high overload (HO) output current [%]



Power Module FSD

Permissible low overload (LO) output current [%]



Figure 5-1 Current derating for temperature

Power Module FSF Permissible low overload (LO)



Ambient operating temperature [°C]

Operational altitude derating

The figures below show the derating required according to altitude.





Permissible input voltage [%]



Figure 5-3 Voltage derating for altitude

Dimensional drawings

Power Module PM260

The dimensional drawings for the power modules PM260 are shown in the figures below.







Figure 6-2 Frame size F

Spare parts/Accessories

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.

Brake relay

The Brake Relays is designed to provide the interface between the Power Module and the brake solenoid of a motor. There are two types of the Brake Relay:

- Brake Relay this provides the basic braking control function.
- Safe Brake Relay 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 Relay has been designed to allow a variable voltage to be given to the Safe Brake Relay to allow the system to determine if the brake relay is functioning correctly without actually activating the braking function.

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

Connecting the Brake Relay to the Power Module

Connect one end of the cable form to the Brake Relay.

Two cable form with different lengths are provided with the Brake Relay. Choice the adequate length of the cable depending on the frame size of the Power Module and on the mounting location of the Brake Relay.



Connect the other end of the cable form to the Power Module PM260



Connecting the Brake Relay to the motor brake



Figure 7-1 Brake Relay connection

Connecting the Safe Brake Relay to the motor brake

The Safe Brake Relay can only control motor brakes with 24V power supply.



Figure 7-2 Safe Brake Relay connection

Brake Relay specifications

	Brake Relay	Safe Brake Relay		
Input voltage	connected to the internal power	DC 20.4 28.8 V 1)		
Input current	supply of the Power Module	Max. 2.5 A		
Max. conductor cross-section	2.5 mm²	2.5 mm²		
Degree of protection	IP20	IP20		
Switching capacity of the NO contact	1 AC 440 V, 3.5 A 1 DC 30 V DC, 12 A	-		
Output voltage	-	24 V		
Output current	-	max. 2 A		
1) External controlled power supply is necessary. Recommended voltage: DC 26 V				

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.

Appendix



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.

Interference Resistance

The interference resistance is in accordance with the given values of the standard.

A.2 Definition of the EMC Environment and Categories

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.

A.2 Definition of the EMC Environment and Categories

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.

Model	Remarks				
Category C1 - First Environment					
	The inverters are not intended for use within the Category C1 Environment.				
Category C2 - First Enviro	onment - Professional Use				
Filtered Variants	6SL3225-0BH**-*AA* (integrated class A filter)				
	200 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 En	vironment				
Unfiltered Variants	6SL3225-0BH**-*UA*				
	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

A.3 Standards

European Low Voltage Directive

The SINAMICS G120 product range complies with the requirements of the Low Voltage Directive 2006/95/EC 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



The SINAMICS G120 Power Modules PM260 comply with the appropriate C-tick EMC standard

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

B

List of abbreviations

Abbreviation	State	
AC	Alternating Current	
CE	Communauté Européenne	
CU	Control Unit	
DC	Direct current	
DI	Digital input	
DIP	DIP switch	
DO	Digital output	
ECD	Equivalent circuit diagram	
EEC	European Economic Community	
ELCB	Earth leakage circuit breaker	
EMC	Electromagnetic compatibility	
EMI	Electromagnetic interference	
FSA	Frame size A	
FSB	Frame size B	
FSC	Frame size C	
FSD	Frame size D	
FSE	Frame size E	
FSF	Frame size F	
FSGX	Frame size GX	
GSG	Getting Started Guide	
НО	High Overload (Constant Torque)	
I/O	In-/output	
IGBT	Insulated gate bipolar transistor	
LED	Light emitting diode	
LO	Light Overload (Variable Torque)	
NC	Normally closed	
NEMA	National Electrical Manufacturers Association	
NO	Normally open	
OPI	Operating Instructions	
PELV	Protection by extra low voltage	
PM	Power Module	
PPE	Personal protective equipment	
RCCB	Residual current circuit breaker	
RCD	Residual current device	
RFI	Radio frequency interference	
SELV	Safety extra low voltage	
VT	Variable torque	

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