SIEMENS

Hardware Installation Manual

SINAMICS

SINAMICS G120 Converters

PM250 Power Module

Edition 04/2021

www.siemens.com/drives

SIEMENS

A5E36265179B-AB

SINAMICS G120
PM250 Power Module

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.

⚠ **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**
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

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 product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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 complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of 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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Changes in this manual

1

Changes with respect to the manual, edition 01/2016

- Dimension drawing for Power Modules FSD, FSE, FSF corrected.
  Mounting the Power Modules (Page 26)
- Degree of protection for output reactors corrected.
  Assignment of converter FSD (18.5 kW and 22 kW) and output reactors corrected.
  Output reactor (Page 72)
- Information on the minimum line impedance added.
  General technical data, PM250 (Page 57)
- Incorrect information about line harmonics removed.
  Electromagnetic compatibility of the inverter (Page 63)
- Incorrect information about maximum conductor cross-section for Power Module FSE corrected.
  Inverter terminals (Page 41)
- Information on overcurrent protective devices added.
  Power-dependent data (Page 58)

Fundamental safety instructions

2

2.1 General safety instructions

⚠ WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.

⚠ WARNING

Risk of electric shock and fire from supply networks with an excessively high impedance

Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.

- In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the converter is connected to the line supply at least meets the minimum requirements for the response of the protective device used.
- You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.

⚠ WARNING

Risk of electric shock and fire from supply networks with an excessively low impedance

Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.

- Ensure that the prospective short-circuit current at the line terminal of the converter does not exceed the breaking capacity (SCCR or Icc) of the protective device used.

⚠ WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠ WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠ WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.

⚠ WARNING

Electric shock due to unconnected cable shield

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

⚠ WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

⚠ WARNING

Electric shock due to residual charges in power components

Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.

- Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.

NOTICE

Damage to equipment due to unsuitable tightening tools.

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Be sure to only use screwdrivers which exactly match the heads of the screws.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

⚠ WARNING

Spread of fire from built-in devices

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠ WARNING

Active implant malfunctions due to electromagnetic fields

Converters generate electromagnetic fields (EMF) in operation. Electromagnetic fields may interfere with active implants, e.g. pacemakers. People with active implants in the immediate vicinity of an converter are at risk.

- As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants.
- Observe the data on EMF emission provided in the product documentation.

⚠ WARNING

Unexpected movement of machines caused by radio devices or mobile phones

Using radio devices or mobile telephones in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices or mobile telephones.
- Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.

NOTICE

Damage to motor insulation due to excessive voltages

When operated on systems with grounded line conductor or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage to ground. If you use motors that have insulation that is not designed for operation with grounded line conductors, you must perform the following measures:

- IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
- TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

⚠ WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

NOTICE

Overheating due to inadmissible mounting position

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.

⚠ WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

⚠ WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

2.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

2.3 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.4 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
https://www.siemens.com/industrialsecurity (https://new.siemens.com/global/en/products/services/cert.html#Subscriptions).

Further information is provided on the Internet:

Industrial Security Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/108862708)

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- On completion of commissioning, check all security-related settings.

2.5 Residual risks of power drive systems

When assessing the machine- or system-related risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer or system installer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly
6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Introduction

3

Description

The Power Module is part of the modular SINAMICS G120 converter family. A converter consists of a Control Unit and a Power Module.

You can operate the Power Module with one of the following Control Units.

- CU230P-2
- CU240B-2
- CU240E-2
- CU250S-2

A characteristic feature of the Power Module is dynamic regenerative braking with energy feedback into the grid.

The Power Module is designed for mains voltages of 380 V to 480 V 3 AC. Depending on the power rating, the Power Modules are supplied in frame sizes FSC to FSF.

The degree of protection is IP20.

- FSC 7.5 kW ... 15 kW
- FSD 18.5 kW ... 30 kW
- FSE 37 kW ... 46 kW
- FSF 55 kW ... 90 kW

The specified power ratings refer to Low Overload operation.

Technical specifications (Page 53)

More information

Note

Commissioning the converter

You must first commission the converter before you can use it. Commissioning is described in the operating instructions of the relevant Control Unit.

Manuals and technical support (Page 83)

Permissible motors

Note

Motors for converter operation

Only use motors that are suitable for operation with converters with a DC link.

For the Power Modules, induction motors are permissible in the range from 25% ... 150% of the converter power without any restrictions.

Installing/mounting

4

4.1 EMC-compliant installation of a machine or system

The converter is designed for operation in industrial environments where strong electromagnetic fields are to be expected.

Reliable and disturbance-free operation is only ensured for EMC-compliant installation.

To achieve this, subdivide the control cabinet and the machine or system into EMC zones:

EMC zones

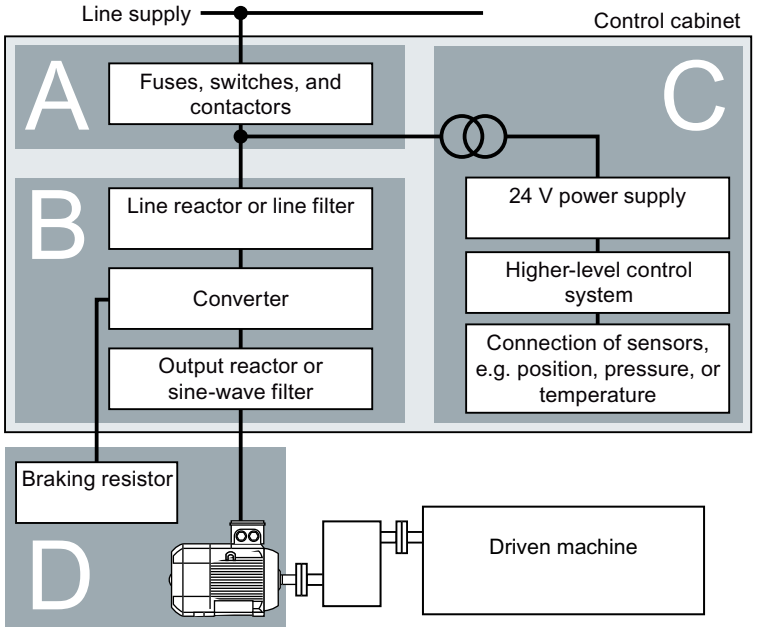


Figure 4-1 Example of the EMC zones of a plant or machine

Inside the control cabinet

- Zone A: Line supply connection
- Zone B: Power electronics
  Devices in Zone B generate energy-rich electromagnetic fields.
- Zone C: Control and sensors
  Devices in Zone C do not generate any energy-rich electromagnetic fields themselves, but their functions can be impaired by electromagnetic fields.

Outside the control cabinet

- Zone D: Motors, braking resistors
  Devices in Zone D generate electromagnetic fields with a significant amount of energy

4.1.1 Control cabinet

- Assign the various devices to zones in the control cabinet.
- Electromagnetically uncouple the zones from each other by means of one of the following actions:
  - Side clearance ≥ 25 cm
  - Separate metal enclosure
  - Large-area partition plates
- Route cables of various zones in separate cable harnesses or cable ducts.
- Install filters or isolation amplifiers at the interfaces of the zones.

Control cabinet assembly

- Connect the door, side panels, top and base plate of the control cabinet with the control cabinet frame using one of the following methods:
  - Electrical contact surface of several cm^2 for each contact location
  - Several screw connections
  - Short, finely stranded, braided copper wires with cross-sections ≥ 95 mm^2 / 000 (3/0) (-2) AWG
- Install a shield support for shielded cables that are routed out of the control cabinet.
- Connect the PE bar and the shield support to the control cabinet frame through a large surface area to establish a good electrical connection.
- Mount the control cabinet components on a bare metal mounting plate.
- Connect the mounting plate to the control cabinet frame and PE bar and shield support through a large surface area to establish a good electrical connection.
- For screw connections onto painted or anodized surfaces, establish a good conductive contact using one of the following methods:
  - Use special (serrated) contact washers that cut through the painted or anodized surface.
  - Remove the insulating coating at the contact locations.

4.1.2 Cables

Cables with a high level of interference and cables with a low level of interference are connected to the converter:

- Cables with a high level of interference:
  - Cable between the line filter and converter
  - Motor cable
  - Cable at the converter DC link connection
  - Cable between the converter and braking resistor
- Cables with a low level of interference:
  - Cable between the line and line filter
  - Signal and data cables

Cable routing inside the cabinet

- Route the power cables with a high level of interference so that there is a minimum clearance of 25 cm to cables with a low level of interference.
  If the minimum clearance of 25 cm is not possible, insert separating metal sheets between the cables with a high level of interference and cables with a low level of interference.
  Connect these separating metal sheets to the mounting plate to establish a good electrical connection.
- Cables with a high level of interference and cables with a low level of interference may only cross over at right angles:
- Keep all of the cables as short as possible.
- Route all of the cables close to the mounting plates or cabinet frames.
- Route signal and data cables - as well as the associated equipotential bonding cables - parallel and close to one another.
- Twist incoming and outgoing unshielded individual conductors.
  Alternatively, you can route incoming and outgoing conductors in parallel, but close to one another.
- Ground any unused conductors of signal and data cables at both ends.
- Signal and data cables must only enter the cabinet from one side, e.g. from below.
- Use shielded cables for the following connections:
  - Cable between the converter and line filter
  - Cable between the converter and output reactor or sine-wave filter

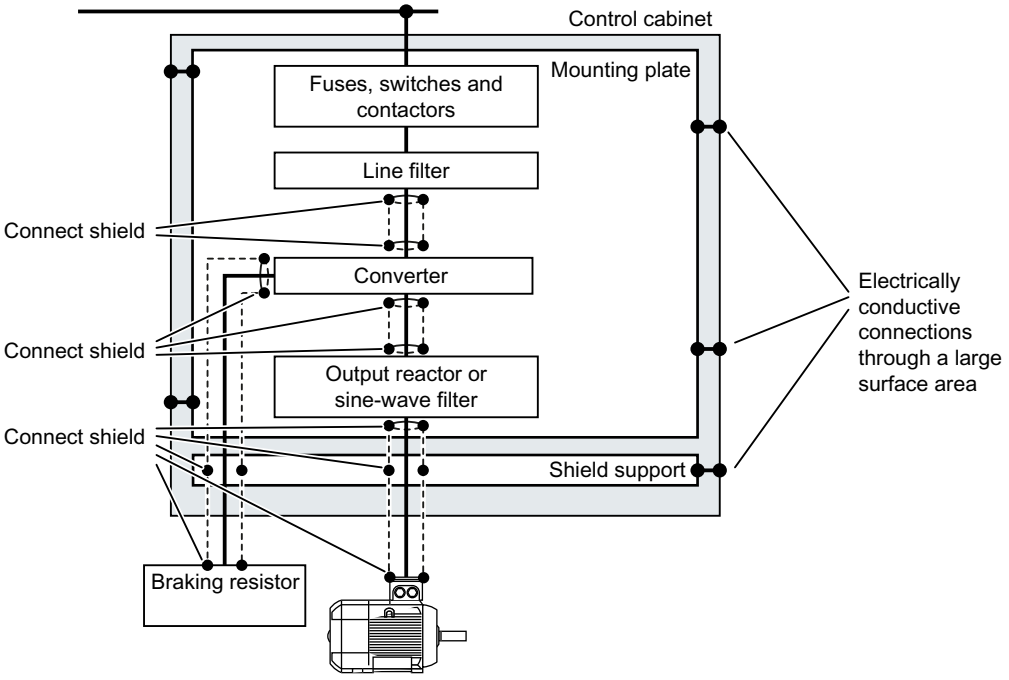


Figure 4-2 Routing converter cables inside and outside a control cabinet

Routing cables outside the control cabinet

- Maintain a minimum clearance of 25 cm between cables with a high level of interference and cables with a low level of interference.
- Use shielded cables for the following connections:
  - Converter motor cable
  - Cable between the converter and braking resistor
  - Signal and data cables
- Connect the motor cable shield to the motor enclosure using a PG gland that establishes a good electrical connection.

Requirements relating to shielded cables

- Use cables with finely-stranded, braided shields.
- Connect the shield to at least one end of the cable.

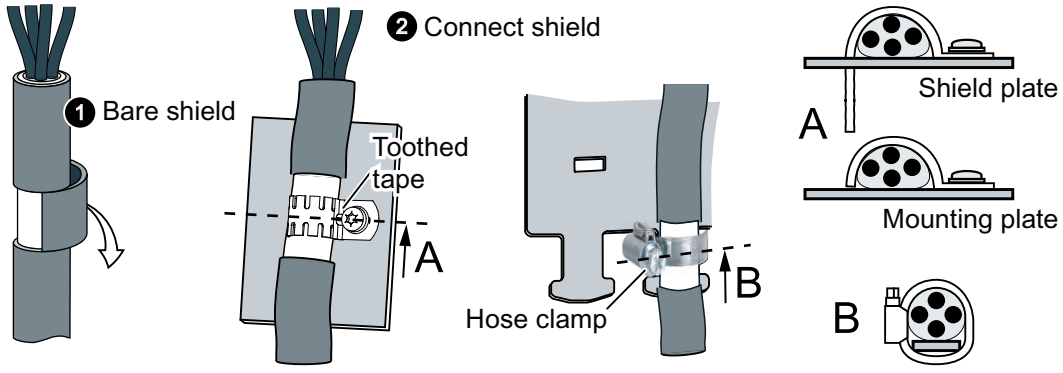


Figure 4-3 Examples for EMC-compliant shield support

- Attach the shield to the shield support directly after the cable enters the cabinet.
- Do not interrupt the shield.
- Only use metallic or metallized plug connectors for shielded data cables.

Measures required for several control cabinets

- Install equipotential bonding for all control cabinets.
- Screw the frames of the control cabinets together at several locations through a large surface area using serrated washers to establish a good electrical connection.
- In plants and systems where the control cabinets are lined up next to one another, and which are installed in two groups back to back, connect the PE bars of the two cabinet groups at as many locations as possible.

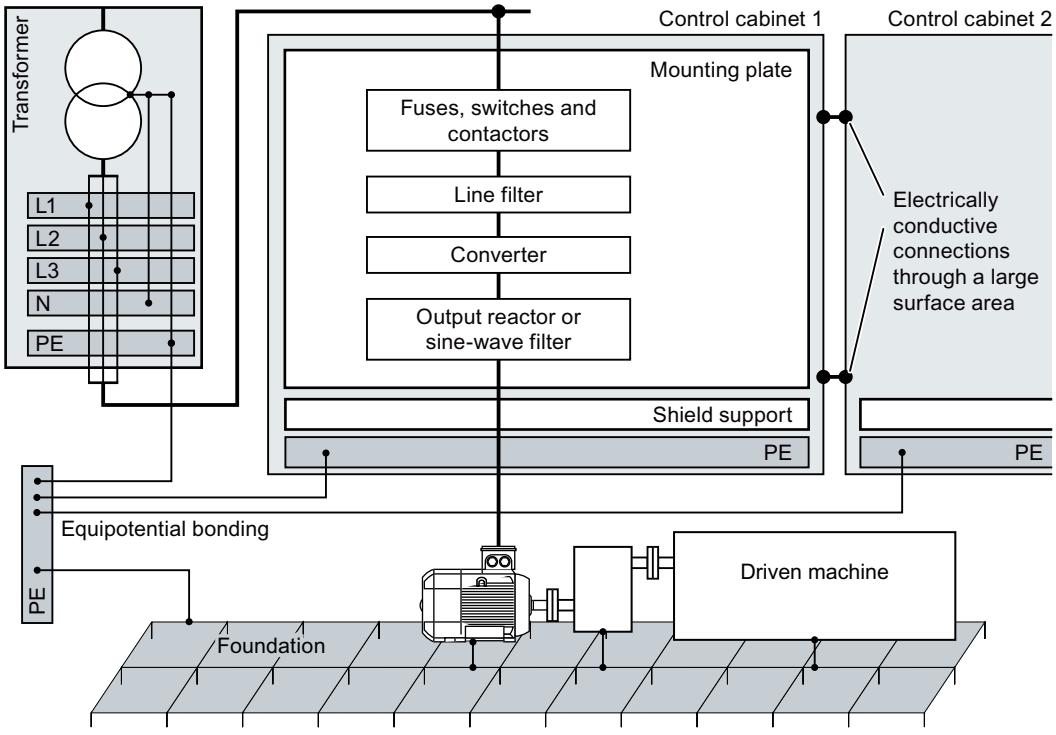


Figure 4-4 Grounding and high-frequency equipotential bonding measures in the control cabinet and in the plant/system

Further information

Additional information about EMC-compliant installation is available in the Internet:

EMC installation guideline (https://support.industry.siemens.com/cs/ww/de/view/60612658/en)

4.1.3 Electromechanical components

Surge voltage protection circuit

- Connect surge voltage protection circuits to the following components:
  - Coils of contactors
  - Relays
  - Solenoid valves
  - Motor holding brakes
- Connect the surge voltage protection circuit directly at the coil.
- Use RC elements or varistors for AC-operated coils and freewheeling diodes or varistors for DC-operated coils.

4.2 Power losses and air cooling requirements

Cooling requirements

To protect the components from overheating, the control cabinet requires a cooling air flow, which depends on the power loss of the individual components.

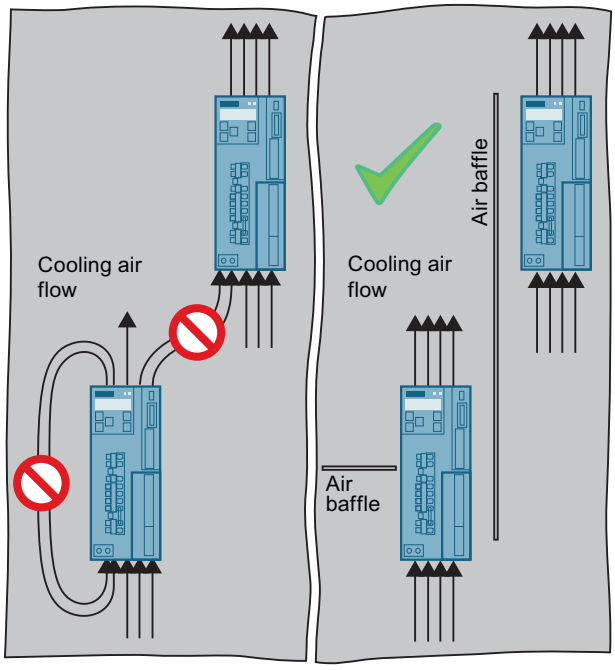
Formula for calculating the cooling airflow:

airflow [l/s] = power loss [W] * 0.86 / ΔT [K]

- Power loss: Total of the power losses of the individual components.
- Δ T: Permissible temperature rise in the control cabinet

Measures in order to ensure that the components are adequately cooled

- Add the power losses of the individual components.
  - Power Module data: "Technical specifications (Page 53)".
  - The Control Unit power loss is less than 0.04 kW.
  - Use the manufacturers data for components, for example reactors or filters
- Calculate the air flow required, using the formula above.
- Ensure that the control cabinet is appropriately ventilated and equipped with suitable air filters.
- Ensure that the components maintain the specified clearances with respect to one another.



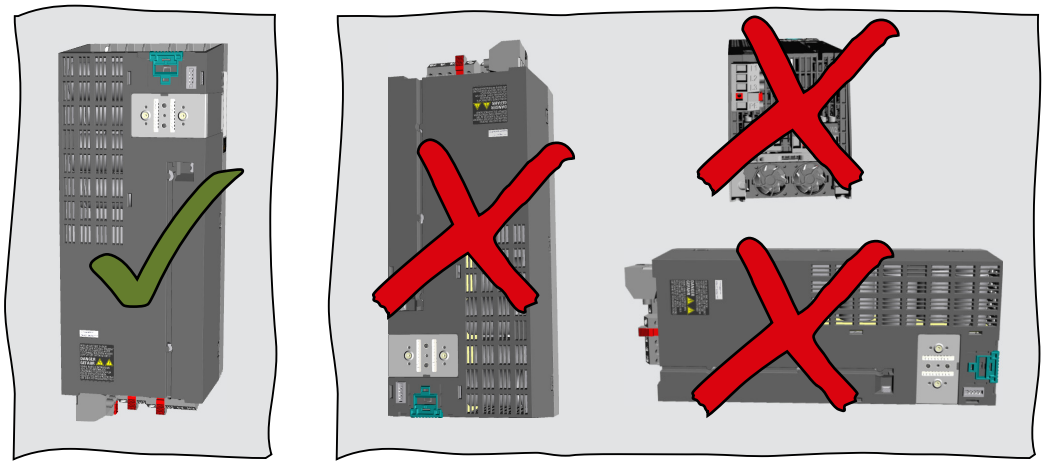
- Ensure that the components are provided with adequate cooling air through the cooling openings.
- Use the appropriate air barriers to prevent cooling air short circuits

4.3 Mounting the Power Modules

Installing

Rules for admissible mounting:

- Only mount the Power Module in a vertical position with the motor connectors at the bottom.



- Maintain the minimum clearances to other components.
- Use the specified installation parts and components.
- Comply with the specified torques.

Protection against the spread of fire

The device may be operated only in closed housings or in control cabinets with protective covers that are closed, and when all of the protective devices are used. The installation of the device in a metal control cabinet or the protection with another equivalent measure must prevent the spread of fire and emissions outside the control cabinet.

Protection against condensation or electrically conductive contamination

Protect the device, e.g. by installing it in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12. Further measures may be necessary for particularly critical operating conditions.

If condensation or conductive pollution can be excluded at the installation site, a lower degree of control cabinet protection may be permitted.

The following dimension drawings and drilling patterns are not to scale.

Frame size FSC

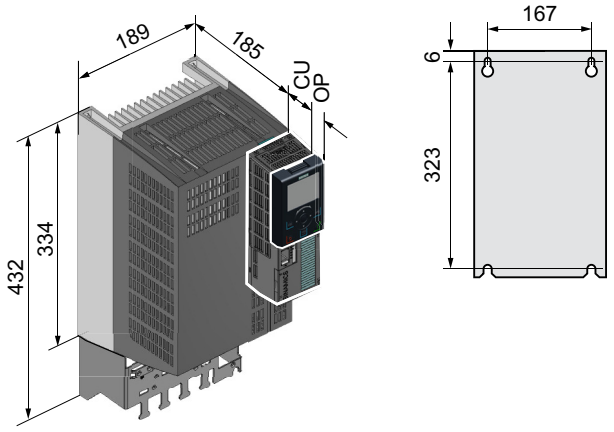


Table 4-1 Dimensions depend on the Control Unit (CU) and Operator Panel (OP)

Frame size	Overall depth in the cabinet [mm]			
	OP inserted?	CU230P-2	CU240B/E-2	CU250S-2
FSC	Without OP	224	206	227
	With OP [1]	235	217	238

[1] With blanking cover or with BOP-2 or IOP-2 Operator Panel

Table 4-2 Cooling air clearances and fixing

Frame size	Cooling air clearances [mm] [1]			Fixing/torque [Nm]
	Top	Bottom	Front	
FSC	125	125	65	4 x M5 / 3

[1] You can mount the Power Modules without any lateral cooling air clearance. For tolerance reasons, we recommend a lateral clearance of approx. 1 mm

Frame sizes FSD ... FSF

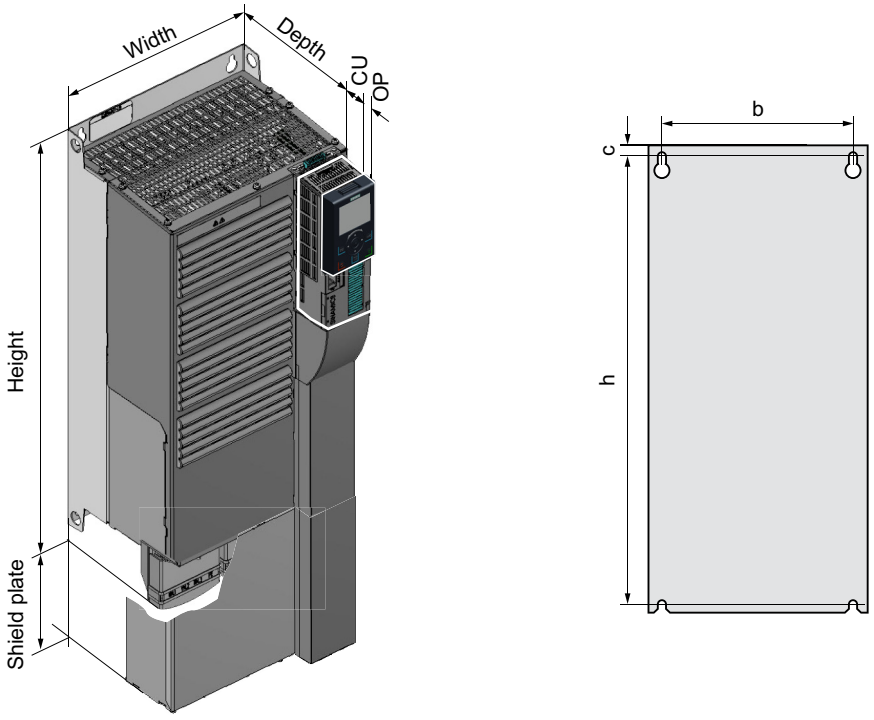


Table 4-3 Dimensions depend on the Control Unit (CU) and Operator Panel (OP)

Frame size	Width [mm]	Height [mm]		Overall depth in the cabinet [mm] [2]			
		without shield plate	with shield plate	OP inserted?	CU230P-2	CU240B/E-2	CU250S-2
FSD without filter	275	419	542	Without OP	263	245	266
				With OP [1]	274	256	277
FSD with filter	275	512	635	Without OP	263	245	266
				With OP [1]	274	256	277
FSE without filter	275	499	622	Without OP	263	245	266
				With OP [1]	274	256	277
FSE with filter	275	635	758	Without OP	263	245	266
				With OP [1]	274	256	277
FSF without filter	350	634	792	Without OP	375	357	378
				With OP [1]	386	368	389
FSF with filter	350	934	1092	Without OP	375	357	378
				With OP [1]	386	368	389

[1] With blanking cover or with BOP-2 or IOP-2 Operator Panel

[2] Power Module depth without Control Unit: FSD, FSE 204 mm, FSF 316 mm

Table 4-4 Drilling dimensions, cooling clearances and fixing

Frame size	Drilling dimensions [mm]			Cooling air clearances [mm] [1]			Fixing/torque [Nm]
	b	h	c	Top	Bottom	Front	
FSD without filter	235	325	11	300	300	65	4 x M6 / 6
FSD with filter	235	419	11	300	300	65	4 x M6 / 6
FSE without filter	235	405	11	300	300	65	4 x M6 / 6
FSE with filter	235	541	11	300	300	65	4 x M6 / 6
FSF without filter	300	598	11	350	350	65	4 x M8 / 13
FSF with filter	300	898	11	350	350	65	4 x M8 / 13

[1] You can mount the Power Modules without any lateral cooling air clearance. For tolerance reasons, we recommend a lateral clearance of approx. 1 mm

4.4 Additional components

Depending on the particular application, additional components may be required for your system. Information about additional components is provided in the following Sections:

 Connection overview (Page 39)

 Optional accessories (Page 69)

Connection

5

Install the converter so that you are compliant with local regulations for erecting and installing low-voltage systems.

Note

Safety devices

Install suitable protective equipment between the line supply and converter.

Technical specifications (Page 53)

Note

Operating displays for converter operation

If, when switching over a function from ON to OFF, an LED or other similar display is not lit or not active; this does not indicate that the device is switched-off or in a no-current condition.

Observe the following product note about protection against indirect contact:

To protect against indirectly touching part of the motor circuit of a converter and to automatically shut down in the case of a fault according to DIN EN 60364-4-41 (VDE 0100-410). (http://support.automation.siemens.com/WW/view/en/103474630)

WARNING

Fire or electric shock due to unsuitable residual-current protective devices

The converter may create a current through the protective conductor. The current through the protective conductor can cause the residual current device (RCD) or residual current monitor (RCM) to incorrectly trip (nuisance trip). In the case of a ground fault, the fault current can contain a DC component, which prevents the RCD or RCM from tripping, with the risk of subsequent fire or electric shock.

- Use the protection and monitoring devices recommended in the documentation.

Protection and monitoring equipment

One of the following measures is suitable in order to ensure touch protection for the inverter:

- Isolated line supply (IT line supply) for frame sizes FSC ... FSF:
  Create an isolated line supply for the inverter using an isolation transformer.
- Residual current device (RCD) or residual current monitoring (RCM) for frame size FSC:
  The equipment must satisfy the following properties and general conditions:
  - super-resistant RCD/RCM type B, with a trip current of 300 mA.
    e.g. a SIQUENCE circuit breaker from Siemens.
  - Only one inverter is supplied from each RCD/RCM
  - The motor cables are shielded and are not longer than 50 m. You can find additional information on the motor cables in Length of motor cable (Page 44)

Note

Fuses and residual current devices and/or monitoring devices

A residual current device (RCD) or residual current monitoring (RCM) does not replace the fuses listed in the Technical data.

5.1 Permissible networks

Note

Line requirement

The machine manufacturer must ensure that in operation the voltage drop between the transformer input terminals and the inverter when operated with its rated values is less than 1%.

The inverter is designed for the following power distribution systems according to IEC 60364-1 (2005).

Restrictions for installation altitudes above 2000 m

Above an installation altitude of 2000 m, the permissible line supplies are restricted.

Restrictions for special ambient conditions (Page 61)

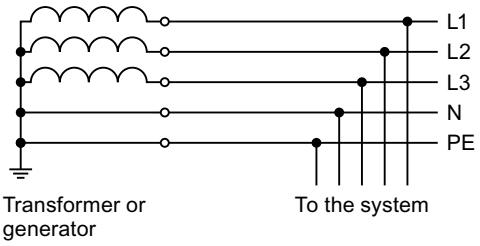
5.1.1 TN line system

A TN system transfers the PE protective conductor to the installed plant or system using a cable.

Generally, in a TN system the neutral point is grounded. There are versions of a TN system with a grounded line conductor, e.g. with grounded L1.

A TN system can transfer the neutral conductor N and the PE protective conductor either separately or combined.

Example: Separate transfer of N and PE, grounded neutral point



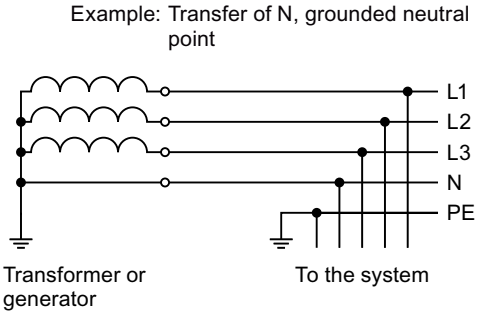
Converter operated on a TN line system

- Converter with integrated or external line filter:
  - Operation on TN line systems with grounded neutral point permissible.
  - Operation on TN line systems with grounded line conductor not permissible.
- Converter without line filter:
  - Operation permissible on all TN line systems.

5.1.2 TT line system

In a TT line system, the transformer grounding and the installation grounding are independent of one another.

There are TT line supplies where the neutral conductor N is either transferred – or not.



Note

Operation in IEC or UL systems

For installations in compliance with IEC, operation on TT line systems is permissible. For installations in compliance with UL, operation on TT line systems is not permissible.

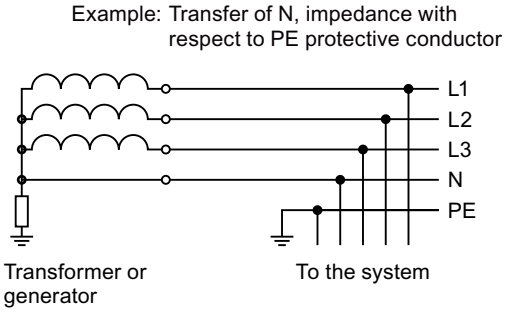
Operating converter on a TT line system

- Converter with integrated or external line filter:
  - Operation on TT line systems with grounded neutral point permissible.
  - Operation on TT line systems without grounded neutral point not permissible.
- Converter without line filter:
  - Operation on all TT line systems permissible.

5.1.3 IT system

In an IT line system, all of the conductors are insulated with respect to the PE protective conductor – or connected to the PE protective conductor through an impedance.

There are IT systems with and without transfer of the neutral conductor N.



Operating the converter on an IT system

- Converter with integrated or external line filter:
  - Operation on IT systems not permissible
- Converter without line filter:
  - Operation on all IT systems permissible

Behavior of the converter when a ground fault occurs

You must install an output reactor if the converter is to remain operational even when a ground fault occurs at the converter output. This output reactor prevents overcurrent tripping or damage to the converter.

5.2 Requirements for the protective conductor

Overview

A high leakage current flows through the protective conductor in converter operation. The protective conductor of the converter must not be interrupted for safe touch protection in converter operation.

This primarily results in requirements for the minimum conductor cross-section of the protective conductor.

No restriction applies to the length of the protective conductor for touch protection. However, short protective conductors are advantageous for EMC-compliant installation.

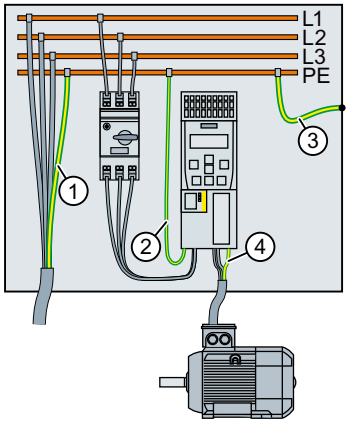
Description

WARNING

Electric shock due to interrupted protective conductor

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

- Comply with the requirements for the protective conductor.



① Protective conductor for line feeder cables
② Protective conductor for converter line feeder cables
③ Protective conductor between PE and the control cabinet
④ Protective conductor for motor feeder cables

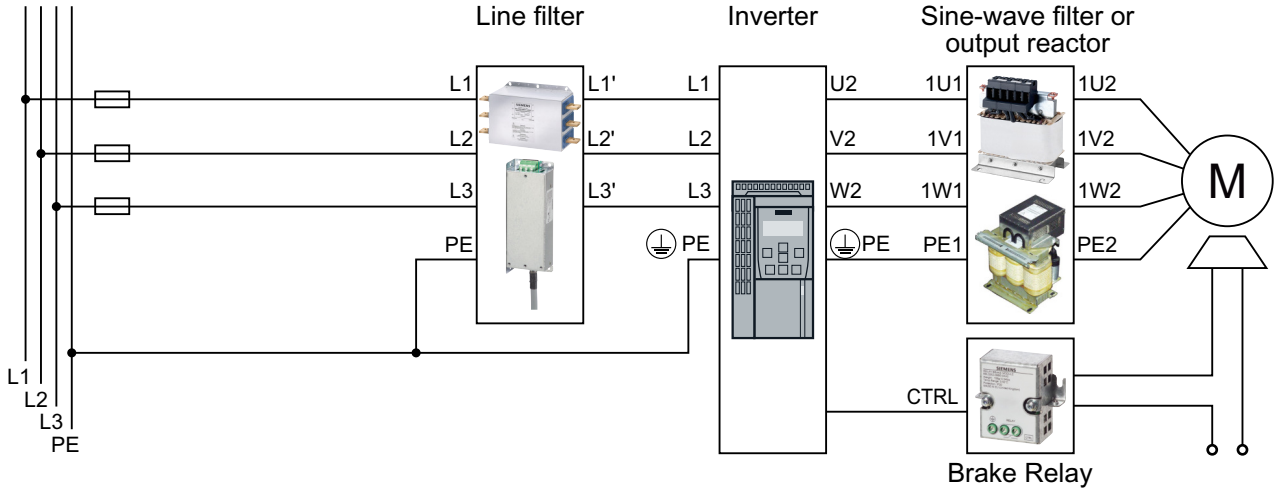
The minimum cross-section of the protective conductor ① ... ④ depends on the cross-section of the line or motor feeder cable:

- Line or motor feeder cable ≤ 16 mm^2
  ⇒ Minimum cross-section of the protective conductor = cross-section of the line or motor feeder cable
- 16 mm^2 < line or motor feeder cable ≤ 35 mm^2
  ⇒ Minimum cross-section of the protective conductor = 16 mm^2
- Line or motor feeder cable > 35 mm^2
  ⇒ Minimum cross-section of the protective conductor = ½ cross-section of the line or motor feeder cable

Additional requirements placed on the protective conductor ① according to IEC 60204-1:

- For permanent connection, the protective conductor must fulfill at least one of the following conditions:
  - The protective conductor is routed so that it is protected against damage along its complete length.
    Cables routed inside switch cabinets or enclosed machine housings are considered to be adequately protected against mechanical damage.
  - As a conductor of a multi-conductor cable, the protective conductor has a cross-section ≥ 2.5 mm^2 Cu.
  - For an individual conductor, the protective conductor has a cross-section ≥ 10 mm^2 Cu.
  - The protective conductor consists of 2 individual conductors with the same cross-section.
- When connecting a multi-core cable using an industrial plug connector according to EN 60309, the protective conductor must have a cross-section of ≥ 2.5 mm^2 Cu.
- Observe the local regulations for protective conductors subject to a high leakage current at the installation site.

5.3 Connection overview



The converters are available with or without integrated line filter (category C2). There are external filters (category C1) for increased EMC requirements for frame size FSC.

Line filter (Page 69)

Converters for systems in the United States / Canada (UL/cUL)

- For configurations in conformance with UL/cUL, use the UL/cUL-approved fuses, Class J or Siemens 3NE1 semiconductor fuses, which are specified in this manual.
  If you use semiconductor fuses as branch protection, then you must install them in the same electrical cabinet as the converter.
  Fuse types and characteristic values:
  Power-dependent data (Page 58)
- Only use copper cables rated for 75 °C.
- The integrated semiconductor short-circuit protection does not provide line protection. On the line side, provide line protection in conformance with NEC or CEC, Part 1 and the local regulations.
- The converter features internal motor overload protection corresponding to UL508C. The protection threshold is 115% of the converter full load current. When commissioning, you can adapt the motor overload protection using parameter p0640.
- The converter is suitable for operation in networks whose short-circuit current at 3 AC 480 V is not higher than 65 kA (symmetrical) if you connect upstream fuses Class J or semiconductor fuses (JFHR2). Semiconductor fuses JFHR2 have not been released for frame size FSC.

Additional requirements for CSA compliance:

Install the converter with an external suppression device with the following properties:

- Surge protection device - Recognized Component XUHT2
- Rated voltage 480 V (phase with respect to ground), 480 V (phase to phase)

- Terminal voltage, V_{PR} = 2000 V
- Suitable for SPD applications, type 1 or type 2

Alternatively, use a surge protection device, article number 5SD7 424-1 from Siemens AG.

5.4 Inverter terminals

Table 5-1 Connection, cross-section and tightening torque for PM250 Power Modules

Converter	Line supply and motor connection	Cross-section and tightening torque		Stripped insulation length
		Metric	Imperial	
FSC	Screw-type terminal	4 ...10 mm^2, 2.3 Nm	12 ... 8 AWG, 20 lbf in	10 mm
FSD	 Cable lug	10 ... 35 mm^2, 6 Nm	7 ... 2 AWG, 53 lbf in	--
FSE		25 ... 50 mm^2, 6 Nm	3 ... 1/0 AWG, 53 lbf in	--
FSF		35 ... 120 mm^2, 13 Nm	2 ... 4/0 AWG, 115 lbf in	--

5.5 Connecting the line supply and motor

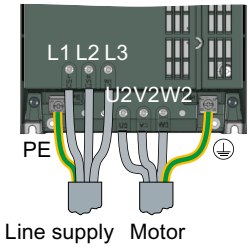
Establishing the line and motor connection, frame size FSA

The terminals are directly accessible.

The terminals are directly accessible.

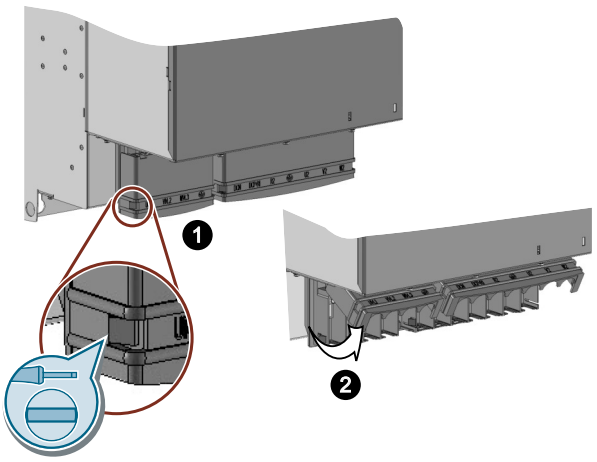
Connect the phases of the line cable to terminals L1, L2, L3 and the protective conductor to PE.

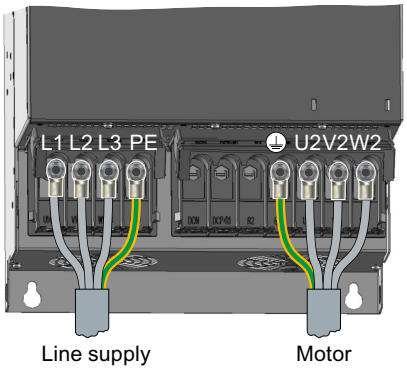
Connect the motor cable phases to terminals U2, V2, W2 and the protective conductor to ⏚.



Connections for frame sizes FSD ... FSF

The line and motor connections have covers to prevent them from being touched.





You must open the cover to connect the line and motor:

1. Release the catches on both sides of the covers using a screwdriver.
2. Swivel the covers upwards.

Close the covers once you have connected the line and motor.

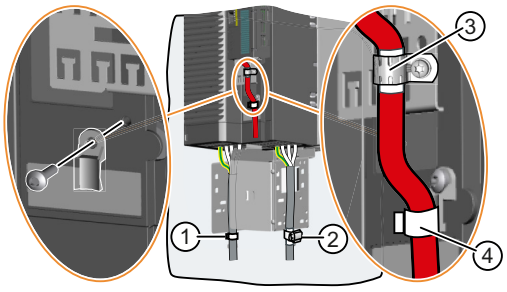
Connect cables at the converter so that they are EMC compliant

Attach the cable tie holders to the Power Module as shown to the left in the diagram before you establish the connections.

Fix the line connecting cable using a cable tie as shown in ①.

Fix the shield of the motor connecting cable using a hose clamp (②).

Connect the shield of the control cable with the shield plate of the Control Unit (③) using a steel band. Also attach the control cable to the Power Module using a cable tie (④).



5.6 Length of motor cable

Always dimension the motor cable so that the ohmic losses are less than 5% of the converter power rating.

The permissible length of the motor cable also depends on the quality of the motor cable and the converter pulse frequency. The values specified below are applicable for high-quality cables, such as CY100 or similar, and for the pulse frequencies set at the factory.

Power-dependent data (Page 58)

If you set other pulse frequencies, then you must ensure that the EMC category is complied with on the line side.

Table 5-2 Permissible motor cable length in m

Converter with integrated filter and shielded cable			Converter without filter, no EMC category	
First environment / second environment, EMC Category C2	Second environment, EMC category C3	No EMC category	Shielded cable	Unshielded cable
25	25	50	50	100

More information on the use of the converters in the first environment:

Electromagnetic compatibility of the inverter (Page 63)

Table 5-3 Permissible length of the motor cable in m with output reactor or sine-wave filter

Frame size	Output reactor		Sine-wave filter	
	Shielded cable	Unshielded cable	Shielded cable	Unshielded cable
FSC	100	150	200	300
FSD ... FSF	200	300	200	300

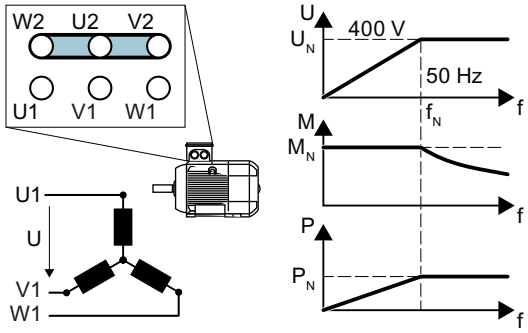
5.7 Connecting the motor to the converter in a star or delta connection

Overview

Standard induction motors up to a rated power of approximately 3 kW are usually connected in star/delta connection (Y/Δ) at 400 V/230 V. For a 400-V line supply, you can connect the motor to the converter either in a star or in a delta connection.

Function description

Operating the motor in a star connection

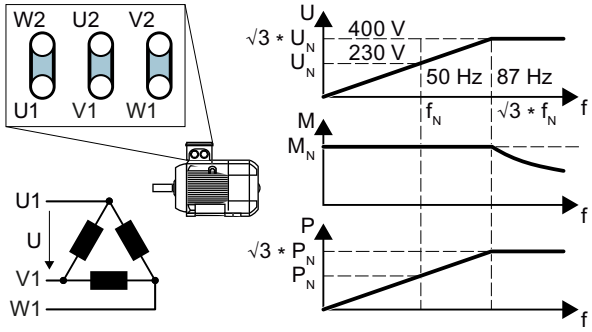


In a star connection, the motor can provide its rated torque M_N in the range 0 ... rated frequency f_N.

Rated voltage U_N = 400 V is available at a rated frequency f_N = 50 Hz.

The motor goes into field weakening above the rated frequency. In field weakening, the available motor torque decreases proportionally with 1/f. In field weakening, the available power remains constant.

Operating the motor in a delta connection with 87 Hz characteristic



In a delta connection, the motor is operated with a voltage and frequency above its rated values. As a consequence, the motor power is increased by a factor $\sqrt{3} \approx 1.73$.

In the range f = 0 ... 87 Hz, the motor can output its rated torque M_N.

The maximum voltage U = 400 V is available at a frequency of f = $\sqrt{3} \times 50$ Hz ≈ 87 Hz.

The motor only goes into field weakening above 87 Hz.

The higher motor power when operated with an 87 Hz characteristic has the following disadvantages:

- The converter must supply approximately 1.73x current. Select a converter based on its rated current - and not its rated power.
- The motor temperature increases more significantly than when operated with f ≤ 50 Hz.
- The motor must have windings that are approved for a voltage > rated voltage U_N.
- As the fan impeller rotates faster, the motor has a higher noise level than operation with f ≤ 50 Hz.

Operation, repair, and maintenance 6

6.1 Operation

Voltage dips and brief power interruptions

For Power Modules, frame sizes FSD ... FSF, voltage dips or power interruptions of up to 3 ms can cause the inverter to be shut down with fault F30003 or F30027.

You can restart the inverter by acknowledging the fault using OFF1 and then entering a new ON command.

Alternatively, activate the automatic restart. You can find details in the Control Unit operating instructions in Chapter "Advanced commissioning".

Overview of the manuals (Page 83).

CAUTION

Burns due to touching hot surfaces

Certain components (e.g. the heat sink or line reactor) can become very hot during operation. The components can remain hot for some time after operation. Touching hot surfaces can cause burns to the skin.

- Do not touch hot components during operation or immediately following operation.

6.2 Repair

⚠ WARNING

Fire or electric shock due to defective components

If an overcurrent protection device is triggered, the converter may be defective. A defective converter can cause a fire or electric shock.

- Have the converter and the overcurrent protection device checked by a specialist.

Repair

⚠ WARNING

Fire or electric shock due to improper repair

Improper repair of the converter may cause malfunctions or result in consequential damage such as fire or electric shock.

- Only commission the following persons to repair the converter:
  - Siemens customer service
  - A repair center that has been authorized by Siemens
  - Specialist personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.
- Only use original spare parts when carrying out repairs.

Recycling and disposal

For environmentally-friendly recycling and disposal of your old device, please contact a company certified for the disposal of waste electrical and electronic equipment, and dispose of the old device as prescribed in the respective country of use.

6.3 Replacing fans

Service life of the fan

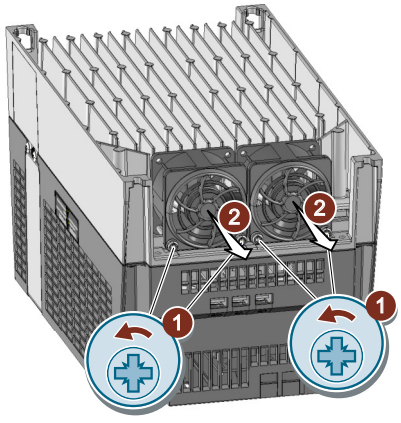
The average service life of the fan is 40,000 hours. In practice, however, the service life may deviate from this value. Especially a dusty environment can block up the fan.

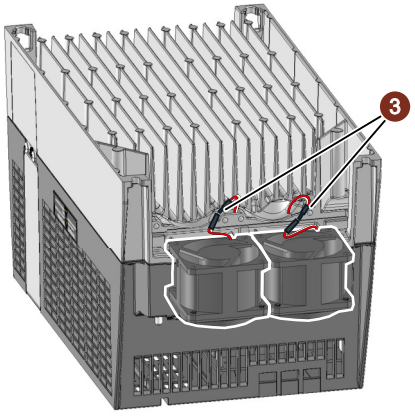
The fan must be replaced in good time to ensure that the converter is ready for operation.

Replacing fans on converters in frame size FSC

1.
2.

Proceed as follows to replace the fans:





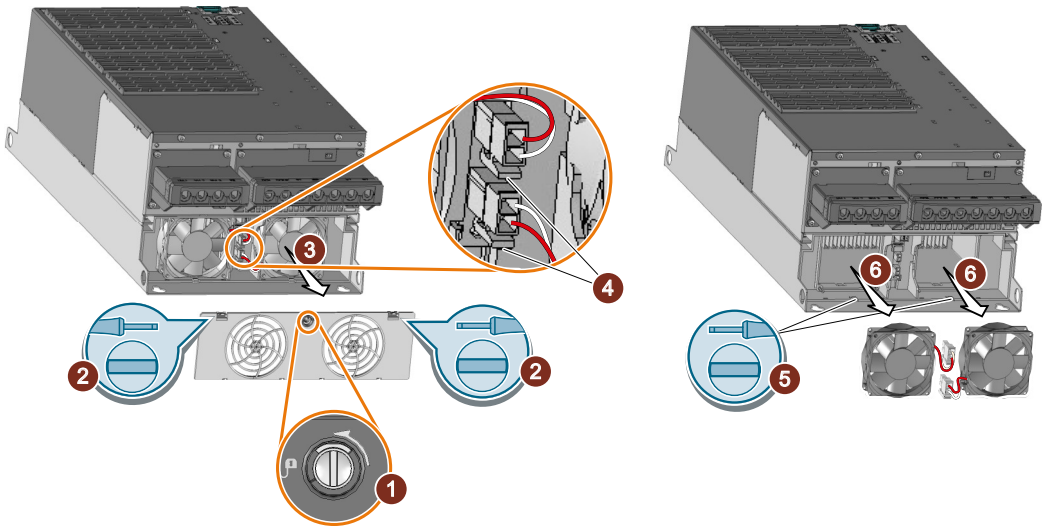
1. Switch off the converter's supply voltage.
2. Wait for 5 minutes until the DC link capacitors have been discharged.
3. Remove the Control Unit from the converter.
4. Disconnect all of the cables from the Power Module.
5. Remove the Power Module.
6. Place the Power Module down on a level surface with the front side facing downwards.
7. Loosen the screws ①.
8. Remove the fan from the device ②.
9. Disconnect the fan plugs ③.
10. Install the new fan in the inverse sequence.

You have replaced the fans.

Replacing fans on converters in frame sizes FSD and FSE

1.
2.

Proceed as follows to replace the fans:

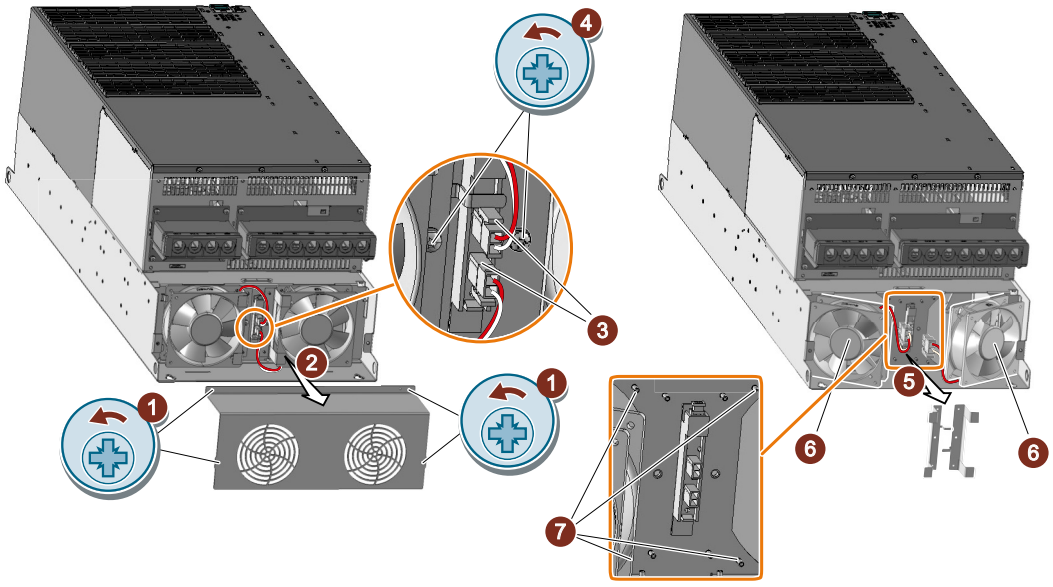


1. Switch off the converter's supply voltage.
2. Wait for 5 minutes until the DC link capacitors have been discharged.
3. Disconnect all of the cables from the Power Module.
4. Release the fan cover ①, ②
5. Remove the fan cover ③
6. Remove the fan connector ④
7. Release the fan catches ⑤
8. Remove the fan from the device ⑥
9. Install the new fan in the inverse sequence.

☐ You have replaced the fans.

Replacing fans on converters in frame size FSF

1.
2. Proceed as follows to replace the fans:



1. Switch off the converter's supply voltage.
2. Wait for 5 minutes until the DC link capacitors have been discharged.
3. Disconnect all of the cables from the Power Module.
4. Release the four screws and remove the fan cover plate ①, ②
5. Remove the fan connector ③
6. Release the screws of the fan mounting bracket ④
7. Remove the fan mounting bracket ⑤
8. Swivel the fan sideways towards the outside and then remove it from the converter ⑥
9. Install the new fan in the inverse sequence.
10. Additionally secure the fan using four M3 nuts on the guide bolts ⑦.

You have replaced the fans.

6.4 Maintenance

The purpose of maintenance is to maintain the specified condition of the Power Module. Regularly remove dirt and pollution, and replace the fan in plenty of time. Replacing fans (Page 49)

Cleaning

Clean the converter with an anti-static brush, a vacuum cleaner and areas that are difficult to access, using dry compressed air (max. 1 bar).

Ventilation

The devices must be installed in a cabinet. Ensure that the cabinet's ventilation slots are not blocked. Check that the fan is functioning correctly.

Cables and screw terminals

Regularly check the cables for damage, and immediately replace any defective parts.

Regularly check that the screw terminals have been correctly tightened. Retighten the screws if necessary.

Note

The actual maintenance intervals depend on the installation and operating conditions.

Siemens offers its customers support in the form of service contracts. For further information, contact your Siemens regional office or sales office via the link below:

Siemens contact database (https://mall.industry.siemens.com/aspa_app?lang=en) .

Technical specifications

7

Power loss of the Power Modules

The power loss values specified are typical values. More information is provided on the Internet:

Power loss data for partial load operation (https://support.industry.siemens.com/cs/ww/en/view/94059311)

7.1 Overload capability of the converter

Overload capability is the property of the converter to temporarily supply a current that is higher than the rated current to accelerate a load. Two typical load cycles are defined to clearly demonstrate the overload capability: "Low Overload" and "High Overload"

Definitions

Base load

Constant load between the accelerating phases of the drive

Low Overload

- **LO base load input current**
  Permissible input current for a "Low Overload" load cycle
- **LO base load output current**
  Permissible output current for a "Low Overload" load cycle
- **LO base load power**
  Rated power based on the LO base load output current

High Overload

- **HO base load input current**
  Permissible input current for a "High Overload" load cycle
- **HO base load output current**
  Permissible output current for a "High Overload" load cycle
- **HO base load power**
  Rated power based on the HO base load output current

If not specified otherwise, the power and current data in the technical data always refer to a load cycle according to Low Overload.

We recommend using the "SIZER" engineering software to select the converter.

You can find additional information about SIZER on the Internet:

Download SIZER (http://support.automation.siemens.com/WW/view/en/10804987/130000)

Load cycles and typical applications:

"Low Overload" load cycle

The "Low Overload" load cycle assumes a uniform base load with low requirements placed on brief accelerating phases. Typical applications when designing according to "Low Overload" include:

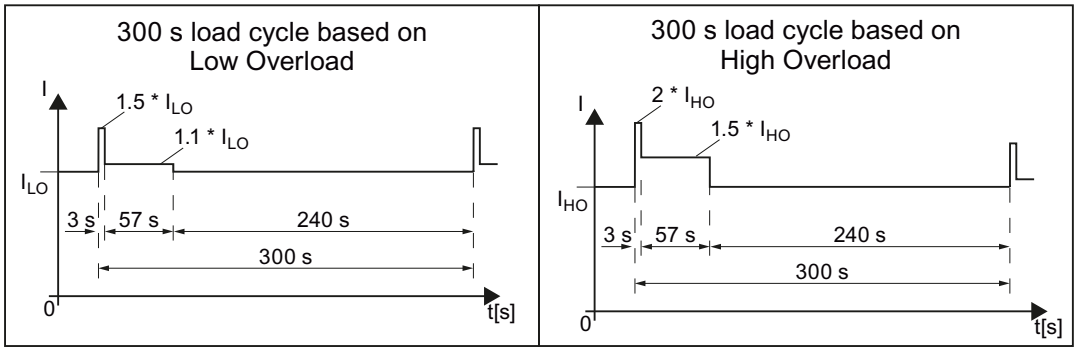
- Pumps, fans and compressors
- Wet or dry blasting technology
- Mills, mixers, kneaders, crushers, agitators
- Basic spindles
- Rotary furnaces
- Extruders

"High Overload" load cycle

The "High Overload" load cycle permits dynamic accelerating phases at a reduced base load. Typical applications when designing according to "High Overload" include:

- Horizontal and vertical conveyor technology (conveyor belts, roller conveyors, chain conveyors)
- Centrifuges
- Escalators/moving stairways
- Lifters/Lowerers
- Elevators
- Gantry cranes
- Cable railways
- Storage and retrieval machines

Typical converter load cycles



7.2 Ambient conditions

Ambient conditions during operation

Property	Version
Ambient conditions for transport in the transport packaging	
Climatic ambient conditions	- 40° C ... + 70° C, according to Class 2K4 to EN 60721-3-2 maximum humidity 95% at 40 °C
Mechanical ambient conditions	FSC: Shock and vibration permissible according to 1M2 to EN 60721-3-2 FSD ... FSF: Shock and vibration permissible according to 2M3 to EN 60721-3-2
Protection against chemical substances	Protected according to Class 2C2 to EN 60721-3-2
Biological ambient conditions	Suitable according to Class 2B1 to EN 60721-3-2
Ambient conditions for long-term storage in the product packaging	
Climatic ambient conditions	- 25 °C ... + 55 °C, according to Class 1K3 to EN 60721-3-1
Protection against chemical substances	Protected according to Class 1C2 to EN 60721-3-1
Biological ambient conditions	Suitable according to class 1B1 to EN 60721-3-1
Ambient conditions in operation	
Installation altitude	Up to 1000 m above sea level without limitations Restrictions for special ambient conditions (Page 61)
Climatic ambient conditions [1]	• Ambient operating temperature [2] – For operation according to Low Overload: 0° C ... +40° C – For operation according to High Overload: 0° C ... +50° C – Restrictions for special ambient conditions (Page 61) • Relative humidity: 5 ... 95%, condensation not permitted • Oil mist, salt mist, ice formation, condensation, dripping water, spraying water, splashing water and water jets are not permitted
Mechanical ambient conditions	• FSC ... FSF: Vibration levels permissible according to Class 3M1 to EN 60721-3-3 • FSC: Shock, permissible according to Class 3M2 to EN 60721-3-3 • FSD ... FSF: Shock permissible according to Class 3M1 to EN 60721-3-3
Protection against chemical substances	Protected according to 3C2 to EN 60721-3-3
Biological ambient conditions	Suitable according to 3C2 to EN 60721-3-3
Pollution	Suitable for environments with degree of pollution 2 according to EN 61800-5-1, condensation not permitted
Cooling	Forced air cooling AF, according to EN 60146
Cooling air	Clean and dry air

[1] Increased ruggedness regarding temperature range and relative humidity; therefore better than 3K3 according to EN 60721-3-3

[2] Observe the permissible ambient temperatures for the Control Unit and possibly the operator panel (IOP-2 or BOP-2).

7.3 General technical data, PM250

Property	Version
Line voltage	380 ... 480 V 3 AC ± 10%
Line impedance	Uk < 1% (RSC > 100), a line reactor is not permitted
Output voltage	3-phase 0 VAC ... input voltage x 0.87 (max.)
Input frequency	50 Hz ... 60 Hz, ± 3 Hz
Output frequency	0 ... 550 Hz, depending on the control mode
Power factor λ	0.9
Inrush current	< LO base load input current
Pulse frequency (factory setting)	4 kHz The pulse frequency can be adjusted up to 16 kHz in 2 kHz steps. The higher the pulse frequency, the lower the available output current. Current derating depending on the pulse frequency (Page 60)
Electromagnetic compatibility	The devices comply with EN 61800-3: 2004 suitable for Category C2 and C3 environments.
Braking methods	• DC braking • Regenerative feedback (energy recovery) max. with rated power based on high overload (HO)
Degree of protection	IP20 chassis units

7.4 Power-dependent data

Note

The values for Low Overload (LO) are identical with those of the rated values.

Table 7-1 PM250, IP20, Frame Size C, 3-ph. AC 380 V ... 480 V

Article No.	**6SL3225-0BE25-5AA1**	**6SL3225-0BE27-5AA1**	**6SL3225-0BE31-1AA1**
LO base load output	7.5 kW	11 kW	15 kW
LO base load input current	18 A	25 A	32 A
LO base load output current	18 A	25 A	32 A
HO base load output	5.5 kW	7.5 kW	11 kW
HO base load input current	13.2 A	19 A	26 A
HO base load output current	13.2 A	19 A	26 A
Fuse	20 A, Class J	32 A, Class J	35 A, Class J
Power loss	0.24 kW	0.30 kW	0.31 kW
Required cooling air flow	38 l/s	38 l/s	38 l/s
Sound pressure level L_{pA} (1 m)	< 60 dB	< 60 dB	< 60 dB
Weight	7.5 kg	7.5 kg	7.5 kg

Table 7-2 PM250, IP20, Frame Size D, 3-ph. AC 380 V ... 480 V

Article No.	**6SL3225-0BE31-5 . A0**	**6SL3225-0BE31-8 . A0**	**6SL3225-0BE32-2 . A0**
LO base load output	18.5 kW	22 kW	30 kW
LO base load input current	36 A	42 A	56 A
LO base load output current	38 A	45 A	60 A
HO base load output	15 kW	18.5 kW	22 kW
HO base load input current	30 A	36 A	42 A
HO base load output current	32 A	38 A	45 A
Fuse according to IEC Fuse according to UL	3NA3820 50 A, Class J 3NE1817-0	3NA3822 63 A, Class J 3NE1818-0	3NA3824 80 A, Class J 3NE1820-0
Power loss	0.44 kW	0.55 kW	0.72 kW
Required cooling air flow	22 l/s	22 l/s	39 l/s
Sound pressure level L_{pA} (1 m)	< 60 dB	< 60 dB	< 61 dB
Weight	15 kg	15 kg	16 kg

Table 7-3 PM250, IP20, Frame Size E, 3-ph. AC 380 V ... 480 V

Article No.	**6SL3225-0BE33-0 . A0**	**6SL3225-0BE33-7 . A0**
LO base load output	37 kW	45 kW
LO base load input current	70 A	84 A
LO base load output current	75 A	90 A
HO base load output	30 kW	37 kW
HO base load input current	56 A	70 A
HO base load output current	60 A	75 A
Fuse according to IEC Fuse according to UL	3NA3830 100 A, Class J 3NE1821-0	3NA3832 125 A, Class J 3NE1822-0
Power loss	1.04 kW	1.2 kW
Required cooling air flow	22 l/s	39 l/s
Sound pressure level L_{pA} (1 m)	< 60 dB	< 62 dB
Weight	21 kg	21 kg

Table 7-4 PM250, IP20, Frame size F, 3-ph. AC 380 V ... 480 V

Article No.	**6SL3225-0BE34-5 . A0**	**6SL3225-0BE35-5 . A0**	**6SL3225-0BE37-5 . A0**
LO base load output	55 kW	75 kW	90 kW
LO base load input current	102 A	135 A	166 A
LO base load output current	110 A	145 A	178 A
HO base load output	45 kW	55 kW	75 kW
HO base load input current	84 A	102 A	135 A
HO base load output current	90 A	110 A	145 A
Fuse according to IEC Fuse according to UL	3NA3836 160 A, Class J 3NE1824-0	3NA3140 200 A, Class J 3NE1825-0	3NA3144 250 A, Class J 3NE1827-0
Power loss	1.5 kW	2.0 kW	2.4 kW
Required cooling air flow	94 l/s	94 l/s	117 l/s
Sound pressure level L_{pA} (1 m)	< 60 dB	< 60 dB	< 65 dB
Weight	51 kg	51 kg	51 kg

You can find information about other permissible overcurrent protection devices on the Internet

Protective devices for PM250 Power Modules (https://support.industry.siemens.com/cs/ww/en/view/109795389)

7.5 Current derating depending on the pulse frequency

Article No. 6SL3225-...	LO base load output	LO baseload output current [A] at a pulse frequency of...						
		4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
-0BE25-5AA0	7.5	18.0	12.5	11.9	10.6	9.20	7.90	6.60
-0BE27-5AA0	11	25.0	18.1	17.1	15.2	13.3	11.4	9.50
-0BE31-1AA0	15	32.0	24.7	23.4	20.8	18.2	15.6	12.8
-0BE31-5 . A0	18.5	38.0	32.3	26.6	22.8	19.0	17.1	15.2
-0BE31-8 . A0	22	45.0	38.3	31.5	27.0	22.5	20.3	18.0
-0BE32-2 . A0	30	60.0	51.0	42.0	36.0	30.0	27.0	24.0
-0BE33-0 . A0	37	75.0	63.8	52.5	45.0	37.5	33.8	30.0
-0BE33-7 . A0	45	90.0	76.5	63.0	54.0	45.0	40.5	36.0
-0BE34-5 . A0	55	110	93.5	77.0	--	--	--	--
-0BE35-5 . A0	75	145	123	102	--	--	--	--
-0BE37-5 . A0	90	178	151	125	--	--	--	--

7.6 Restrictions for special ambient conditions

Maximum current at low speeds

NOTICE
Overheating the converter due to unsuitable load Loading the converter with a high output current and at the same time with a low output frequency can cause the current-conducting components in the converter to overheat. Excessively high temperatures can damage the converter or have a negative impact on the converter service life. • Never operate the converter continuously with an output frequency = 0 Hz. • Only operate the converter in the permissible operating range.

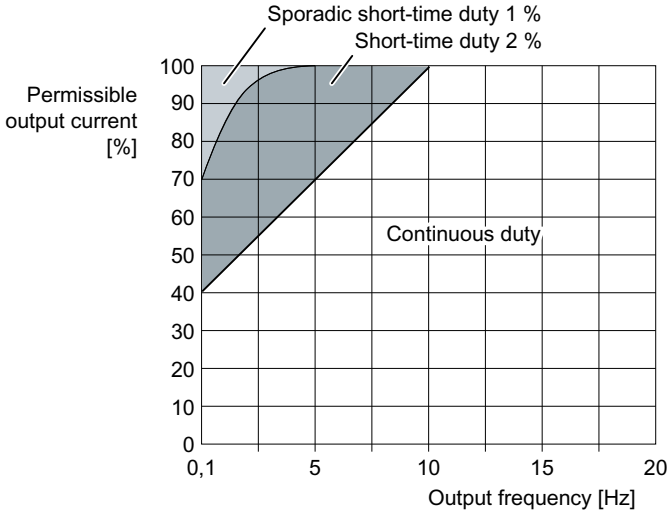
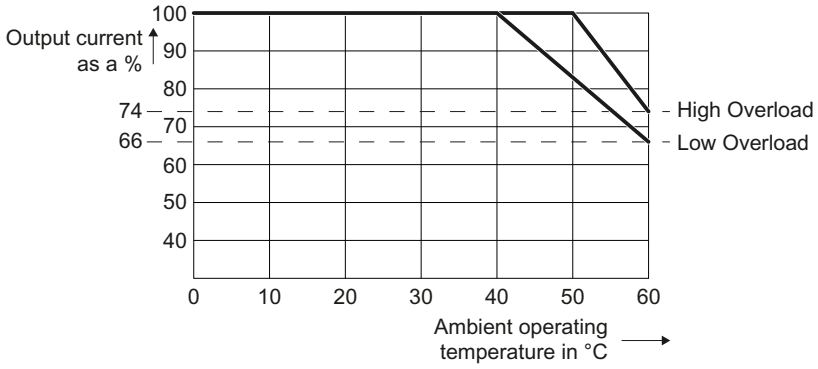


Figure 7-1 Permissible operating range of the converter

- Continuous operation:
  Operating state that is permissible for the complete operating time.
- Short-time duty:
  Operating state that is permissible for less than 2 % of the operating time.
- Sporadic short-time duty:
  Operating state that is permissible for less than 1 % of the operating time.

Current de-rating depending on the ambient operating temperature



The Control Unit and operator panel can restrict the maximum permissible operating ambient temperature of the Power Module.

Current derating as a function of the installation altitude

The permissible converter output current is reduced above an installation altitude of 1000 m.

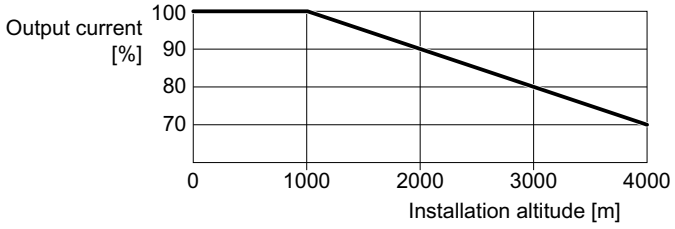


Figure 7-2 Current derating as a function of the installation altitude

Permissible line supplies dependent on the installation altitude

- For installation altitudes ≤ 2000 m above sea level, it is permissible to connect the converter to any of the line supplies that are specified for it.
- For installation altitudes 2000 m ... 4000 m above sea level, the following applies:
  - Connection to a TN line system with grounded neutral point is permissible.
  - TN systems with grounded line conductor are not permitted.
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer.
  - The phase-to-phase voltage does not have to be reduced.

7.7 Electromagnetic compatibility of the inverter

EMC (electromagnetic compatibility) means that the devices function satisfactorily without interfering with other devices and without being disrupted by other devices. EMC applies when the emitted interference (emission level) and the interference immunity are matched with each other.

The product standard IEC/EN 61800-3 describes the EMC requirements placed on "Variable-speed drive systems".

A variable-speed drive system (or Power Drive System PDS) consists of the converter as well as the associated electric motors and encoders including the connecting cables.

The driven machine is not part of the drive system.

Note

PDS as component of machines or systems

When you install PDS into machines or systems, additional measures may be required so that the product standards of these machines or systems is complied with. The machine or system builder is responsible for taking these measures.

Environments and categories

Environments

IEC/EN 61800-3 makes a distinction between the "first environment" and "second environment" - and defines different requirements for these environments.

- **First environment:**
  Residential buildings or locations at which the PDS is directly connected to a public low-voltage supply without intermediate transformer.
- **Second environment:**
  All industrial plant/systems or locations that are connected to the public grid through their own, dedicated transformer.

Categories

IEC/EN 61800-3 makes a distinction between four drive system categories:

- **Category C1:**
  Drive systems for rated voltages < 1000 V for unrestricted use in the "first environment"
- **Category C2:**
  Stationary PDS for rated voltages < 1000 V for operation in the "second environment". Appropriately qualified personnel are required to install the PDS. An appropriately trained and qualified person has the necessary experience for installing and commissioning a PDS, including the associated EMC aspects.
  Additional measures are required for operation in the "first environment".

- **Category C3:**
  PDS for rated voltages < 1000 V - only for operation in the "second environment".
- **Category C4:**
  PDS for IT line supplies for operation in complex systems in the "second environment".
  An EMC plan is required.

7.7.1 Assigning the inverter to EMC categories

The converters have been tested in accordance with the EMC product standard EN 61800-3.

You can find the Declaration of Conformity on the Internet:

Declaration of Conformity (http://support.automation.siemens.com/WW/view/en/58275445)

Requirements for electromagnetic compatibility

To comply with the requirements of EN 61800-3, all drives must be installed in accordance with the manufacturer's instructions and EMC directives.

You can find the EMC Directive on the Internet:

EMC installation guideline (http://support.automation.siemens.com/WW/view/en/60612658)

An appropriately trained specialist must carry out the installation, who has the necessary experience to install and/or commission variable-speed power drives, including the associated EMC issues.

Second environment - category C4

An unfiltered converter corresponds to category C4.

EMC measures in the "second environment", category C4, are implemented on the basis of an EMC plan at the system level.

EMC-compliant installation of a machine or system (Page 19).

Second environment - category C3

Immunity

The inverters comply with the requirements of the standard.

Interference emission for unfiltered inverters

Inverters with integrated filter comply with the requirements of the standard.

Cable-conducted, high-frequency noise emission of an unfiltered inverter

Either install an external filter for the inverter - or install corresponding filters at the system level.

Further information is provided on the Internet:

Compliance with EMC limits with unfiltered devices (https://support.industry.siemens.com/cs/ww/en/view/109750634)

Field-conducted, high-frequency noise emission of an unfiltered inverter

When installed professionally in accordance with EMC guidelines, the inverters fulfill the requirements of the standard.

Second environment - category C2

Immunity

With respect to their immunity, the inverters are suitable for the second environment, Category C2.

Emitted interference

General preconditions in order to maintain the limit values regarding noise emission for the second environment, Category C2:

In order for the inverters to comply with the limit values for category C2 relating to emitted interference, the following conditions must be fulfilled:

- You are using an inverter with an integrated filter
- The motor cable is shorter than 25 m.
- The pulse frequency does not exceed 4 kHz
- The current does not exceed the value of the LO input current Power-dependent data (Page 58)
- You are using a shielded motor connection cable with low capacitance

First environment - category C2

Immunity

With respect to their immunity, the converters are suitable for the first environment, Category C2.

Interference emission

- **Low-frequency, conducted interferences (harmonics)**
  Your line supply defines as to whether the converter can satisfy the requirements of the first environment, Category C2.
  In this regard, contact your network operator.
- **High-frequency conducted interferences**:
  The limit values for the first environment, Category C2, are maintained under the following preconditions:
  - You are using a converter with an integrated filter
  - You are using a shielded motor connection cable with low capacity
  - The current does not exceed the value of the LO input current
  - The pulse frequency does not exceed 4 kHz
  - The motor cable is shorter than 25 m
  - The installation must be carried out by an expert who has the necessary experience for installing and/or commissioning power drives, included the associated EMC aspects.
- **High-frequency emitted interference**
  When installed professionally in accordance with EMC guidelines, the converters fulfill the requirements of the standard in relation to category C2.

7.7.2 EMC limit values in South Korea

이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
For sellers or users, please keep in mind that this device is an A-grade electromagnetic wave device. This device is intended to be used in areas other than home.

The EMC limit values to be observed for Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3 of category C2 or the limit value class A, Group 1 to KN11.

By implementing appropriate additional measures, the limit values according to category C2 or limit value class A, Group 1, are observed.

Additional measures, such as the use of an additional RFI suppression filter (EMC filter), may be necessary.

In addition, measures for EMC-compliant configuration of the plant or system are described in detail in this manual.

You can find additional information about EMC-compliant configuration of the plant or system on the Internet:

EMC installation guideline (http://support.automation.siemens.com/WW/view/en/60612658)

The final statement on compliance with the applicable standard is given by the respective label attached to the individual device.

Spare parts and accessories

8

8.1 Spare parts compatibility

Continuous development within the scope of product maintenance

Converter components are being continuously developed within the scope of product maintenance. Product maintenance includes, for example, measures to increase the ruggedness or hardware changes which become necessary as components are discontinued.

These further developments are "spare parts-compatible" and do not change the article number.

In the scope of such spare parts-compatible ongoing development, plug connector or connection positions are sometimes slightly modified. This does not cause any problems when the components are properly used. Please take this fact into consideration in special installation situations (e.g. allow sufficient reserve regarding the cable length).

8.2 Spare parts

Fan kit

Power Module		Article No. fan kit
Frame size FSC	6SL3225-0BE25-5AA0 (7.5 kW) 6SL3225-0BE27-5AA0 (11 kW) 6SL3225-0BE31-1AA0 (15 kW)	6SL3200-0SF03-0AA0
Frame size FSD	6SL3225-0BE31-5AA0 (18.5 kW) 6SL3225-0BE31-8AA0 (22 kW)	6SL3200-0SF04-0AA0
	6SL3225-0BE32-2AA0 (30 kW)	6SL3200-0SF05-0AA0
Frame size FSE	6SL3225-0BE33-0AA0 (37 kW)	6SL3200-0SF04-0AA0
	6SL3225-0BE33-7AA0 (45 kW)	6SL3200-0SF05-0AA0
Frame size FSF	6SL3225-0BE34-5AA0 (55 kW) 6SL3225-0BE35-5AA0 (75 kW)	6SL3200-0SF06-0AA0
	6SL3225-0BE37-5AA0 (90 kW)	6SL3200-0SF08-0AA0

Cover kit

Power Module	Article No. cover kit
Frame sizes FSD and FSE	6SL3200-0SM11-0AA0
Frame size FSF	6SL3200-0SM12-0AA0

More information

You can find more information on orderable repair and wearing parts or consumables on the Internet:

Spare parts (https://www.automation.siemens.com/sow?sap-language=EN)

8.3 Optional accessories

Which components are available?

- Line filter
- Output reactors
- Sine-wave filter
- Brake Relay and Safe Brake Relay

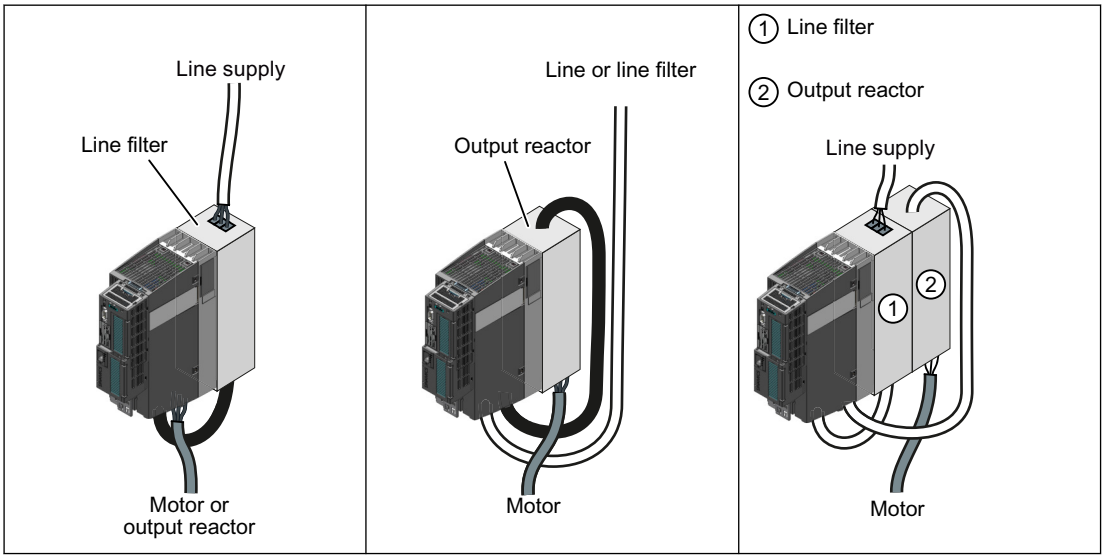
Reactors and filters are designed for Power Modules, frame size FSC as base components.

Reactors and filters as base components (Page 69)

8.3.1 Reactors and filters as base components

Reactors and filters as base components are available for Power Modules, frame size FSC. An overview of the permitted base component combinations is provided below. You can also install base components next to the Power Module.

Permissible combinations of base components



8.3.2 Line filter

With a line filter, the converter can achieve a higher radio interference class.

The line filters integrated in the converter correspond to Category C2 according to EN 61800-3.

External filters are available for Category C2 or C1 according to EN 61800-3. Details are provided in the following tables.

NOTICE
Overloading of the line filter due to use in unsuitable networks The line filter is only suitable for operation on TN or TT networks with a grounded neutral point. The line filter is damaged if operated on all other networks. • For converters equipped with line filter, only connect to TN or TT networks with a grounded neutral point.

Dimensions and drilling patterns

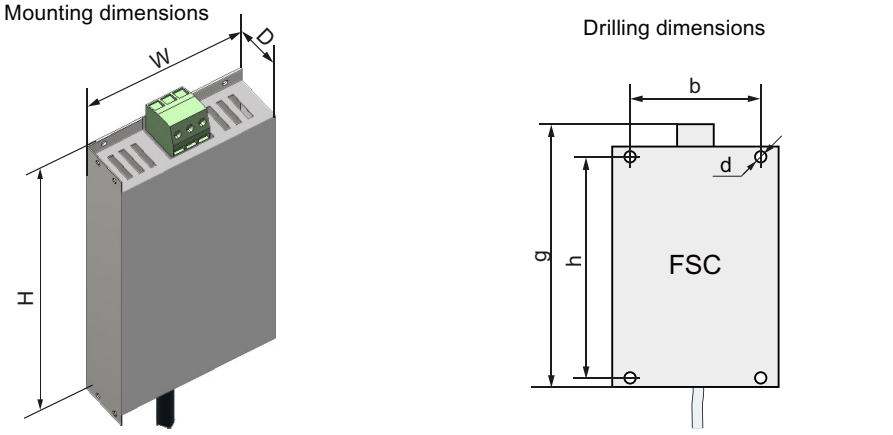


Figure 8-1 FSC dimensions

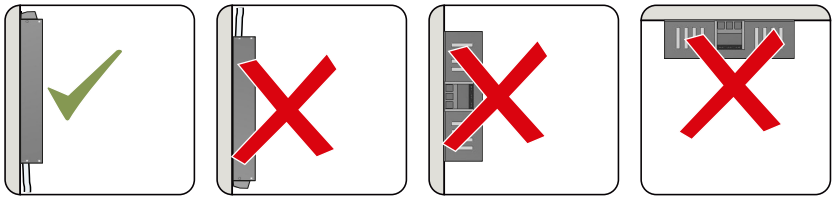


Figure 8-2 Mounting position FSC

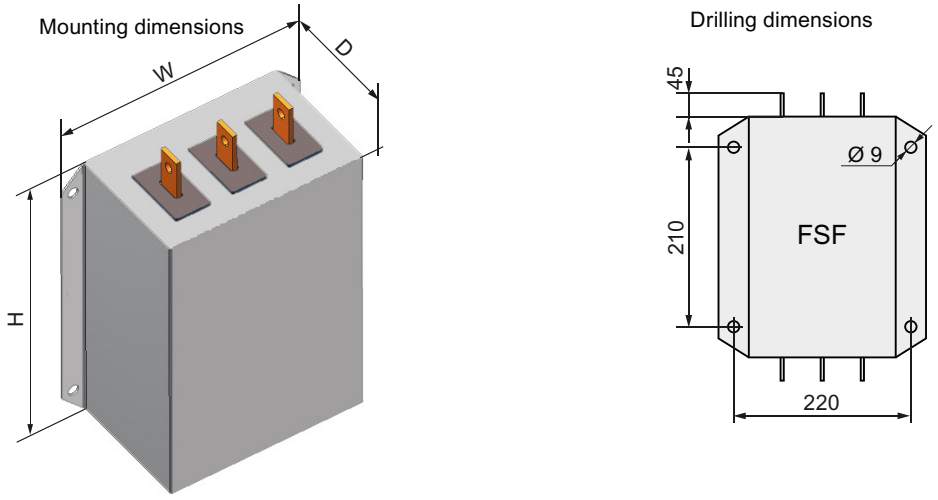


Figure 8-3 FSF dimensions

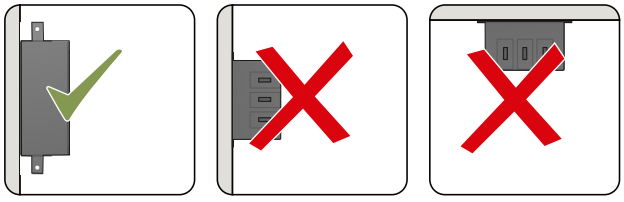


Figure 8-4 Mounting position FSF

Table 8-1 Dimensions and weights

Article No.	Overall dimensions (mm)			Drilling dimensions (mm)			Mounting	Weigh t (kg)
	W	H	D	b	h	g	Screws/torque (Nm)	
6SL3203-0BD23-8SA0	189	362	55	156	232	381	4 x M5 / 3.0	2.3
6SL3203-0BE32-5AA0	240	360	116				4 x M8 / 13	12.4

Technical specifications and assignment tables

Table 8-2 Technical specifications

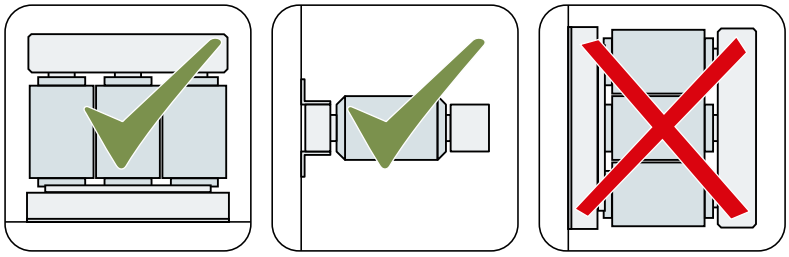
Article No.	Power loss (W) at 50 Hz	Connection (mm^2)		Degree of pro-tection
		Network / PE	Power Module	
6SL3203-0BD23-8SA0	7.5 ... 15	4 mm^2 screw terminals	Integrated, 400 mm	IP20
6SL3203-0BE32-5AA0	60	M8 studs	M8 studs	IP00

Table 8-3 Assignment table

Line filter		Power Module	
Article No.	**Catego-ry**	**Article No.**	**Frame size**
6SL3203-0BD23-8SA0	C1	6SL3225-0BE25-5AA0 6SL3225-0BE27-5AA0 6SL3225-0BE31-1AA0	FSC
6SL3203-0BE32-5AA0	C2	6SL3225-0BE34-5AA0 6SL3225-0BE35-5AA0 6SL3225-0BE37-5AA0	FSF

8.3.3 Output reactor

Mounting position



Clearances to other devices

Keep shaded areas free of any devices and components.

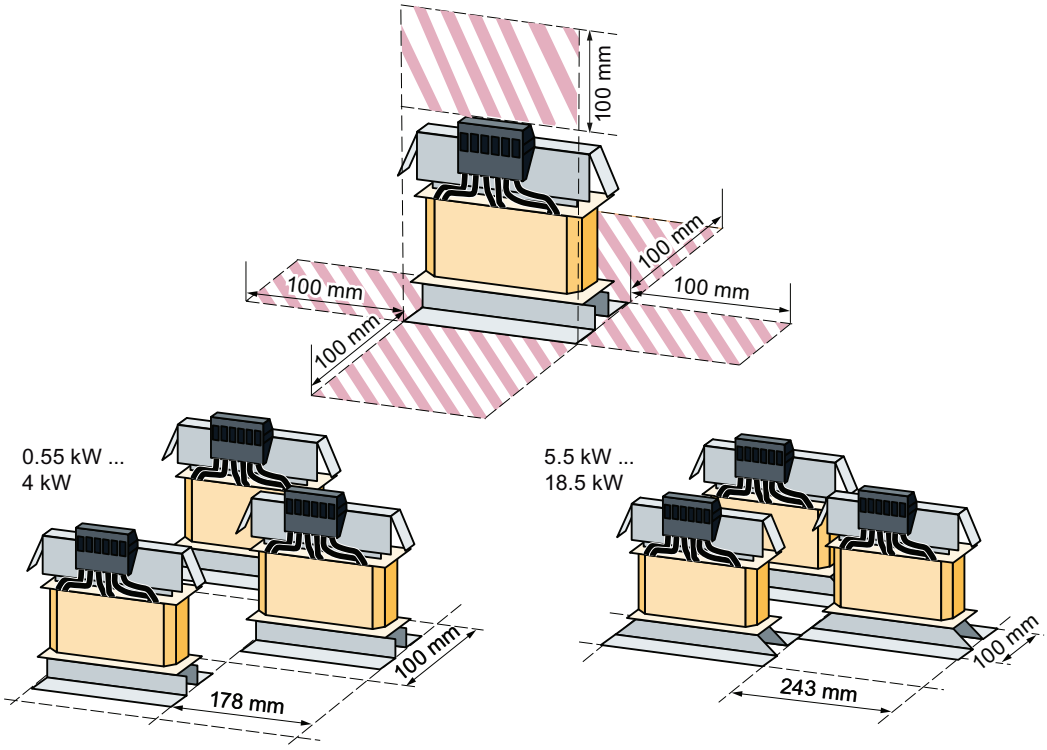


Figure 8-5 Minimum clearances of the output reactor to other devices, space-saving mounting examples

If you use an output reactor, then it is not permissible that the output frequency exceeds 150 Hz. It is not permissible that the pulse frequency is higher than 4 kHz.

Dimensions and drilling patterns

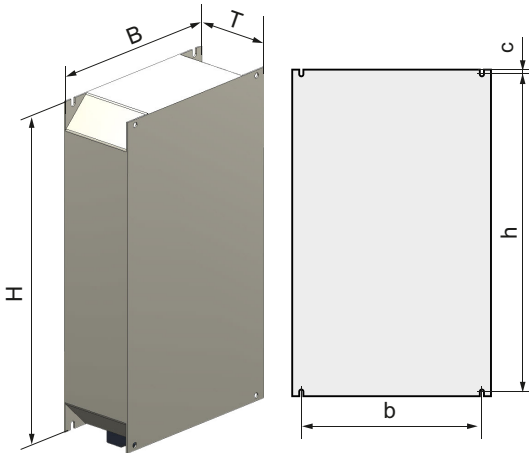


Figure 8-6 Output reactor as base component for frame size FSC

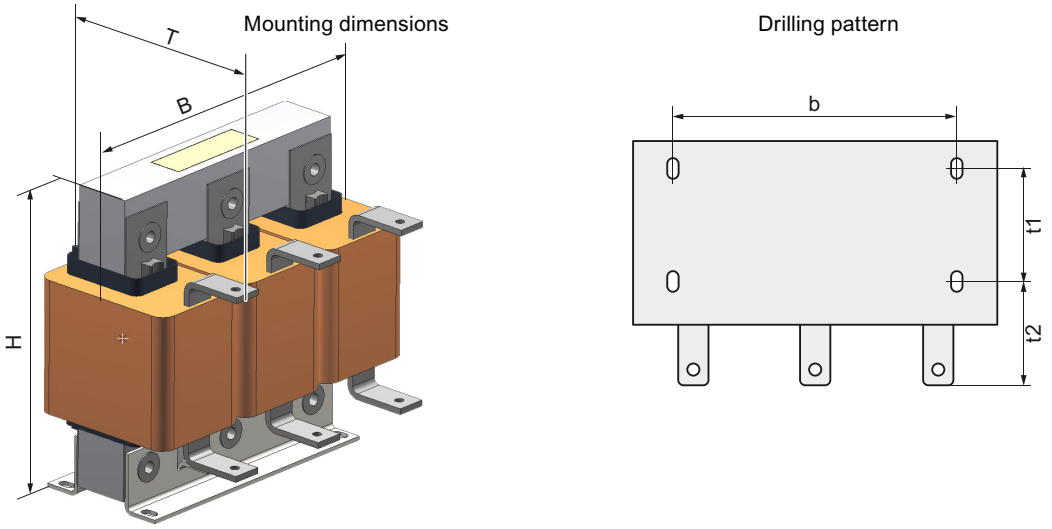


Figure 8-7 Standalone output reactor for frame sizes FSD ... FSF

Table 8-4 Dimensions and weights

Article number	Overall dimensions (mm)			Drilling dimensions (mm)			Tightening screws/torque (Nm)	Weight (kg)
	Reactor that can be mounted under the unit							
	W	**H**	**D**	**b**	**h**	**c**		
6SL3202-0AJ23-2CA0	189	334	80	156	232	5.5	4 x M5 / 3.0	9
	Reactor that cannot be mounted under the unit							
	W	**H**	**D**	**b**	**t1**	**t2**		
6SE6400-3TC05-4DD0	225	210	150	176	69	70.5	4 x M6 / 6.0	11.5
6SE6400-3TC03-8DD0	225	210	179	176	93	75.5	4 x M6 / 6.0	19
6SE6400-3TC05-4DD0	225	210	140	138	264		4 x M6 / 6.0	11.5
6SE6400-3TC08-0ED0	225	210	150	176	69	70.5	4 x M6 / 6.0	12

Article number	Overall dimensions (mm)			Drilling dimensions (mm)			Tightening screws/torque (Nm)	Weight (kg)
6SE6400-3TC07-5ED0	270	248	209	200	102	91.5	4 x M8 / 13	26.5
6SE6400-3TC14-5FD0	350	321	288	264	140	134	4 x M8 / 13	57
6SE6400-3TC15-4FD0	270	248	209	200	102	90	4 x M8 / 13	24
6SE6400-3TC14-5FD0	350	321	288	264	140	134	4 x M8 / 13	57

Technical specifications and assignment tables

Table 8-5 Technical specifications

Article No.	Line supply connection	PE connection	Connection at the Power Module	Degree of protection	Power loss (W)
6SL3202-0AJ23-2CA0	6 mm^2 screw terminals	M5 bolts	Integrated, 350 mm	IP00	60
6SE6400-3TC05-4DD0	M6 cable lug	M6 screw	M6 cable lug	IP00	200
6SE6400-3TC03-8DD0	M6 cable lug	M6 screw	M6 cable lug	IP00	200
6SE6400-3TC05-4DD0	M6 cable lug	M6 screw	M6 cable lug	IP00	200
6SE6400-3TC08-0ED0	M6 cable lug	M6 screw	M6 cable lug	IP00	170
6SE6400-3TC07-5ED0	M6 cable lug	M6 screw	M6 cable lug	IP00	277
6SE6400-3TC14-5FD0	M8 cable lug	M8 screw	M8 cable lug	IP00	469
6SE6400-3TC15-4FD0	M8 cable lug	M6 screw	M8 cable lug	IP00	245
6SE6400-3TC14-5FD0	M8 cable lug	M8 screw	M8 cable lug	IP00	469

Table 8-6 Assignment table

Output reactor	Power Module	
Article No.	Article No.	Frame size
6SL3202-0AJ23-2CA0	6SL3225-0BE25-5AA0 6SL3225-0BE27-5AA0 6SL3225-0BE31-1AA0	FSC
6SE6400-3TC03-8DD0	6SL3225-0BE31-5 . A0	FSD
6SE6400-3TC05-4DD0	6SL3225-0BE31-8 . A0	FSD
6SE6400-3TC05-4DD0	6SL3225-0BE32-2 . A0	FSD
6SE6400-3TC08-0ED0	6SL3225-0BE33-0 . A0	FSE
6SE6400-3TC07-5ED0	6SL3225-0BE33-7 . A0	FSE
6SE6400-3TC14-5FD0	6SL3225-0BE34-5 . A0	FSF
6SE6400-3TC15-4FD0	6SL3225-0BE35-5 . A0	FSF
6SE6400-3TC14-5FD0	6SL3225-0BE37-5 . A0	FSF

8.3.4 Sine-wave filter

The sine-wave filter at the converter output limits the voltage rate of rise and the peak voltages at the motor winding. The maximum permissible length of motor feeder cables is increased to 300 m.

The following applies when using a sine-wave filter:

- Operation is only permissible with pulse frequencies from 4 kHz to 8 kHz.
- The converter power is reduced by 5%.
- The maximum output frequency of the converter is 150 Hz at 380 V to 480 V.
- Operation and commissioning may only be performed with the motor connected, as the sine-wave filter is not no-load proof.
- An output reactor is superfluous.

Dimensions and drilling patterns

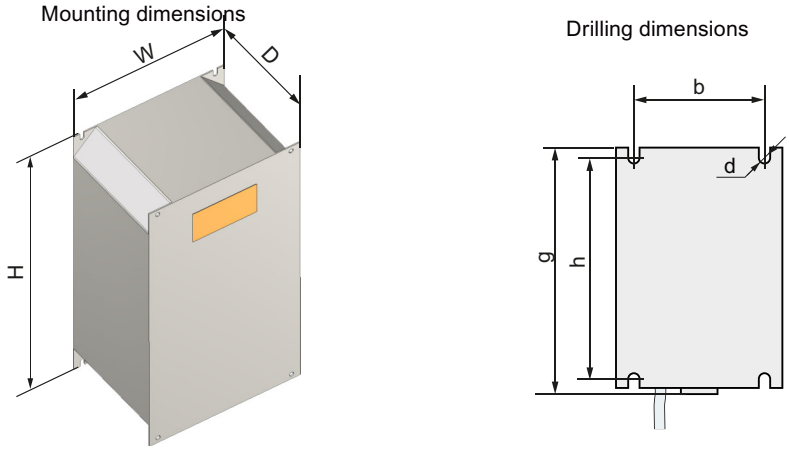


Figure 8-8 Dimensions - footprint filter

Mounting position

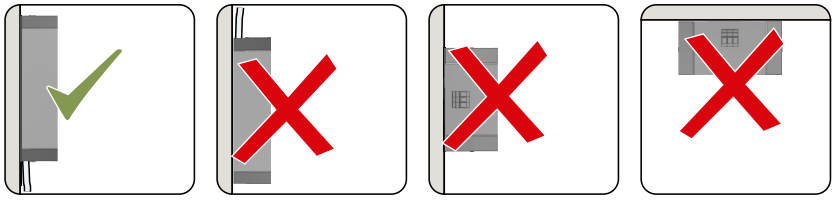


Figure 8-9 Mounting position - footprint filter

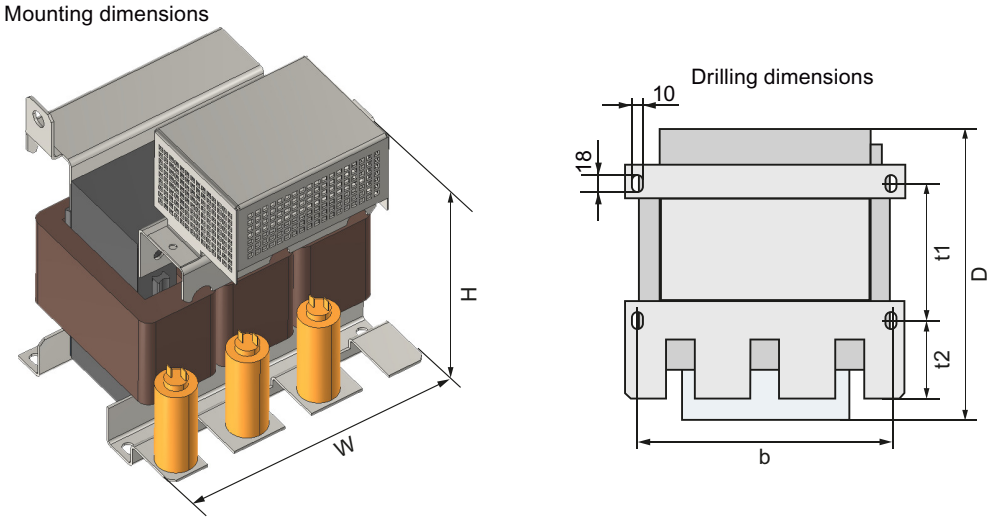


Figure 8-10 Dimensions - standalone filter

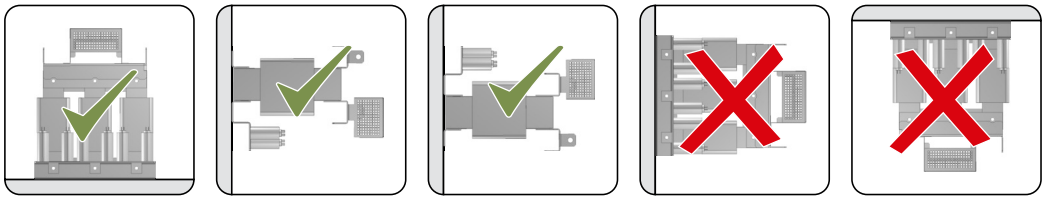


Figure 8-11 Mounting position - standalone filter

Table 8-7 Dimensions and weights

Sine-wave filter	**Overall dimensions (mm)**			**Drilling dimensions (mm)**			**Tightening screws/torque (Nm)**	**Weigh t (kg)**
Footprint filter	**W**	**H**	**D**	**b**	**h**	**g**		
6SL3202-0AE22-0SA0	189	336	140	167	323	351	4 x M5 / 3.0	12
6SL3202-0AE23-3SA0	189	336	140	167	323	351	4 x M5 / 3.0	23
Standalone filter	**W**	**H**	**D**	**b**	**t1**	**t2**		
6SL3202-0AE24-6SA0	250	305	260	230	127	90.5	4 x M8 / 13	24
6SL3202-0AE26-2SA0	250	315	262	230	127	90.5	4 x M8 / 13	34
6SL3202-0AE28-8SA0	275	368	275	250	132	100.5	4 x M8 / 13	45
6SL3202-0AE31-5SA0	350	440	305	320	157	113	4 x M8 / 13	63
6SL3202-0AE31-8SA0	350	468	305	320	157	113	4 x M8 / 13	80

Technical specifications and assignment tables

Table 8-8 Technical specifications

Article No.	Connection (mm^2)		Degree of protection	dU/dt limit [V/ms]	Maximum voltage [V]	Power loss [W] at 50 Hz
	Motor / PE	Power Module				
6SL3202-0AE22-0SA0	10 mm^2 screw terminals	Integrated, 500 mm	IP20	≤ 500	≤ 1078	40
6SL3202-0AE23-3SA0	10 mm^2 screw terminals	Integrated, 500 mm	IP20	≤ 500	≤ 1078	65
6SL3202-0AE24-6SA0	25 ... 50 mm^2 screw terminals	25 ... 50 mm^2 screw terminals	IP00 [1]	≤ 500	≤ 1078	80
6SL3202-0AE26-2SA0	25 ... 50 mm^2 screw terminals	25 ... 50 mm^2 screw terminals	IP00 [1]	≤ 500	≤ 1078	65
6SL3202-0AE28-8SA0	25 ... 95 mm^2 screw terminals	25 ... 95 mm^2 screw terminals	IP00 [1]	≤ 500	≤ 1078	100
6SL3202-0AE31-5SA0	50 ... 150 mm^2 screw terminals	50 ... 150 mm^2 screw terminals	IP00 [1]	≤ 500	≤ 1078	180
6SL3202-0AE31-8SA0	50 ... 150 mm^2 screw terminals	50 ... 150 mm^2 screw terminals	IP00 [1]	≤ 500	≤ 1078	190

[1] With terminal cover IP20

Table 8-9 Assignment table

Sine-wave filter	Power Module	
Article No.	Article No.	Frame size
6SL3202-0AE22-0SA0	6SL3225-0BE25-5AA0	FSC
6SL3202-0AE23-3SA0	6SL3225-0BE27-5AA0 6SL3225-0BE31-1AA0	FSC
6SL3202-0AE24-6SA0	6SL3225-0BE31-5 . A0 6SL3225-0BE31-8 . A0	FSD
6SL3202-0AE26-2SA0	6SL3225-0BE32-2 . A0	FSD
6SL3202-0AE28-8SA0	6SL3225-0BE33-0 . A0 6SL3225-0BE33-7 . A0	FSE
6SL3202-0AE31-5SA0	6SL3225-0BE34-5 . A0 6SL3225-0BE35-5 . A0	FSF
6SL3202-0AE31-8SA0	6SL3225-0BE37-5 . A0	FSF

8.3.5 Connecting a motor holding brake

The converter uses the Brake Relay to control the motor holding brake. Two types of Brake Relay exist:

- The Brake Relay controls the motor holding brake
- The Safe Brake Relay controls a 24 V motor holding brake and monitors the brake control for short-circuit or cable breakage.

Note

Brake Relay and Safe Brake Relay

There are no differences between the Brake Relay and the Safe Brake Relay in terms of installation and connection to the converter.

Connection to the converter

To ensure that you have the correct cable for connecting the Brake Relay irrespective of the converter size, you are supplied with two preassembled cables with different lengths. Connect the appropriate cable to the Brake Module and to the converter as shown below.

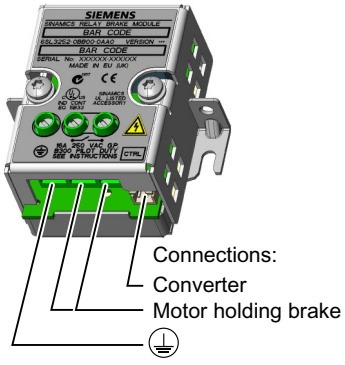
If you are using your own cable, ensure that the cable is insulated and rated for 600 V.

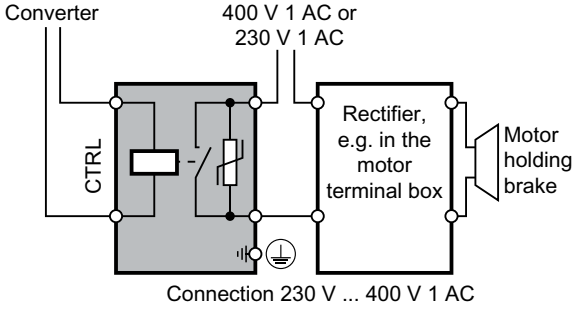
Connecting the motor holding brake via a PELV circuit

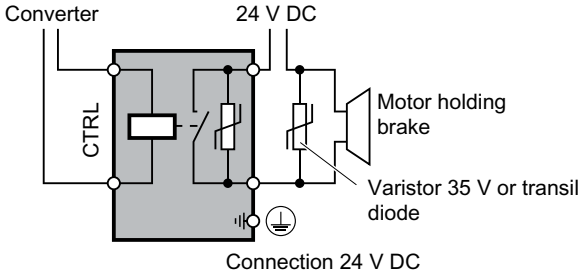
The Brake Relay must be connected to the protective conductor if the motor brake is supplied from a PELV circuit.

8.3.5.1 Mounting and connecting the brake relay

Brake Relay

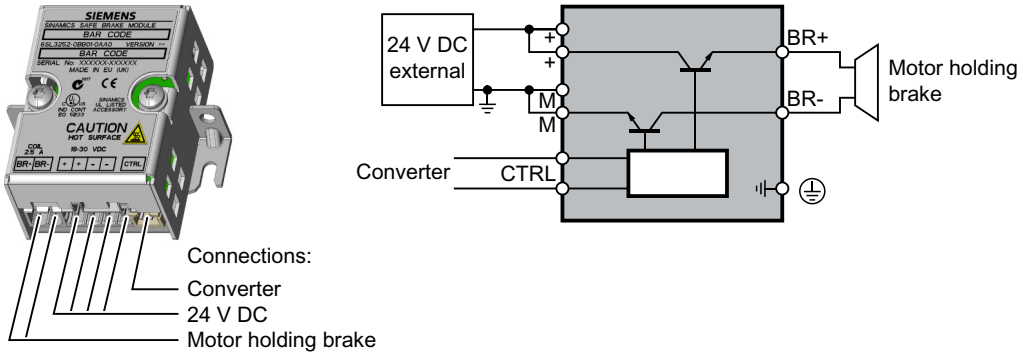






8.3.5.2 Mounting and connecting the Safe Brake Relay

Safe Brake Relay



8.3.5.3 Technical data of the brake relay

	Brake Relay 6SL3252-0BB00-0AA0	Safe Brake Relay 6SL3252-0BB01-0AA0
Input voltage	via the Power Module	20.4 ... 28.8 VDC [1]
Input current	via the Power Module	Max. 2.5 A
Max. connection cross-section:	2.5 mm²	2.5 mm²
Degree of protection	IP20	IP20
Switching capability of the NO contact	1-phase 250 VAC, 16 A 1-phase 30 VDC, 12 A	-
Output voltage	-	24 V
Output current	-	max. 2.5 A

[1] External, controlled power supply required. Recommended voltage: 26 VDC

8.3.5.4 Mounting and connecting the brake relay

Installing the Brake Relay

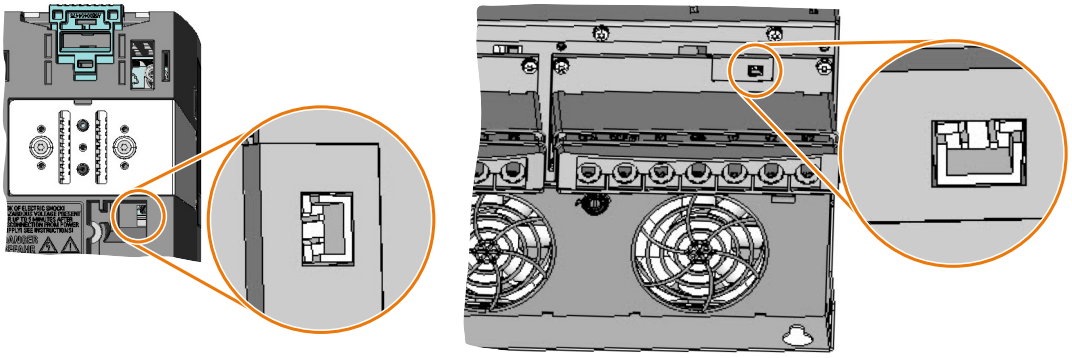
If you use the optional shield plate, install the Brake Relay on the shield plate of the Power Module.

If you do not use the shield plate, install the Brake Relay as close as possible to the Power Module.

Connecting the Brake Relay to the converter

The connector for the brake relay is located at the front of the Power Module for the FSC frame size. These Power Modules have a cable entry for the connecting cable to the Brake Relay.

The connector for the Brake Relay is located at the bottom of the Power Module for the FSD ... FSF frame sizes.



Power Module FSC Power Module FSD ... FSF

Figure 8-12 Connector position for the Brake Relay

8.3.6 Shield connection kit

Description

The shield connection kit is used to connect the shield of the control and motor cable in an EMC-compliant fashion.

The installation instructions for the shield connection kit are available on the Internet:

Shield connection kit for Power Modules (https://support.industry.siemens.com/cs/ww/de/view/23621093/en)

Article numbers of the shield connection kit

- FSC: 6SL3262-1AC00-0DA0
- FSD: 6SL3262-1AD00-0DA0
- FSE: 6SL3262-1AD00-0DA0
- FSF: 6SL3262-1AF00-0DA0

More information

More information is provided on the Internet:

Shield connection kit (https://support.industry.siemens.com/cs/ww/en/view/32052656)

Appendix

9

9.1 Manuals and technical support

9.1.1 Overview of the manuals

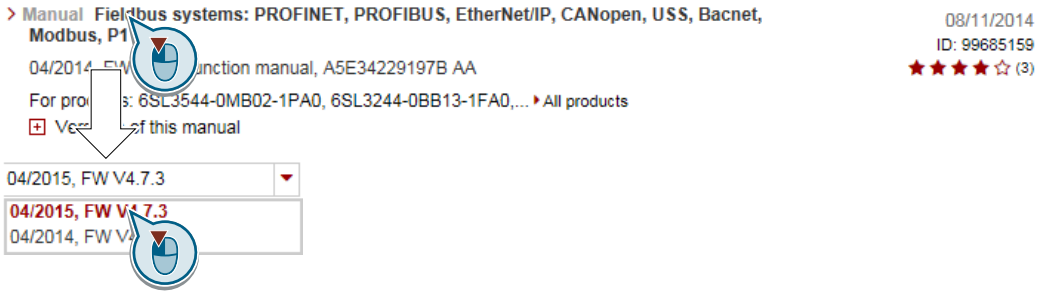
Manuals with additional information that can be downloaded: EMC-compliant control cabinet installation

- PM250 Hardware Installation Manual (https://support.industry.siemens.com/cs/ww/de/view/64875934/en)
  Installing Power Modules, reactors and filters. Technical specifications, maintenance (this manual)
- CU230P-2 operating instructions (https://support.industry.siemens.com/cs/ww/en/view/109782866)
  Installing, commissioning and maintaining the converter. Extended commissioning
- CU240B/E-2 operating instructions (https://support.industry.siemens.com/cs/ww/en/view/109782865)
  Installing, commissioning and maintaining the converter. Extended commissioning
- CU250S-2 operating instructions (https://support.industry.siemens.com/cs/ww/en/view/109782994)
  Installing, commissioning and maintaining the converter. Extended commissioning
- CU230P-2 List Manual (https://support.industry.siemens.com/cs/ww/en/view/109782303)
  Parameter list, alarms and faults. Graphic function diagrams
- CU240B/E-2 List Manual (https://support.industry.siemens.com/cs/ww/en/view/109782301)
  Parameter list, alarms and faults. Graphic function diagrams
- CU250S-2 List Manual (https://support.industry.siemens.com/cs/ww/en/view/109782287)
  Parameter list, alarms and faults. Graphic function diagrams

- EMC installation guideline (http://support.automation.siemens.com/WW/view/en/60612658)
  EMC-compliant control cabinet installation, equipotential bonding and cable routing
- Accessories manual (https://support.industry.siemens.com/cs/ww/en/ps/13225/man)
  Descriptions of how to install converter components, e.g. line reactors and line filters. The printed installation descriptions are supplied together with the components.

Finding the most recent edition of a manual

If there a multiple editions of a manual, select the latest edition:

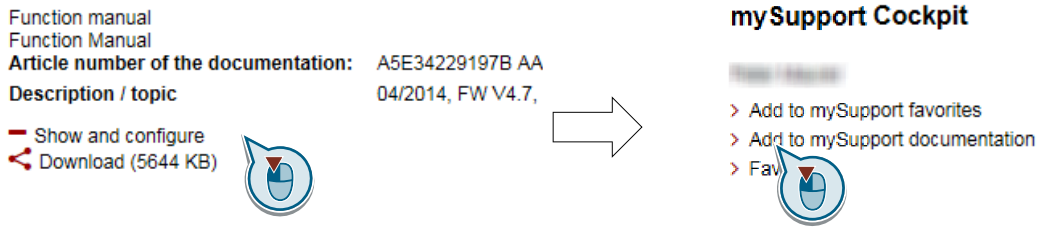


Configuring a manual

Further information about the configurability of manuals is available in the Internet:

MyDocumentationManager (https://www.industry.siemens.com/topics/global/en/planning-efficiency/documentation/Pages/default.aspx).

Select "Display and configure" and add the manual to your "mySupport-documentation":



Not all manuals can be configured.

The configured manual can be exported in RTF, PDF or XML format.

9.1.2 Configuring support

Catalog

Ordering data and technical information for the converters SINAMICS G.

Catalogs for download or online catalog (Industry Mall):

Everything about SINAMICS G120 (www.siemens.en/sinamics-g120)

SIZER

The configuration tool for SINAMICS, MICROMASTER and DYNAVERT T drives, motor starters, as well as SINUMERIK, SIMOTION controllers and SIMATIC technology

SIZER on DVD:

Article number: 6SL3070-0AA00-0AG0

Download SIZER (http://support.automation.siemens.com/WW/view/en/10804987/130000)

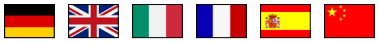
EMC (electromagnetic compatibility) technical overview

Standards and guidelines, EMC-compliant control cabinet design

EMC overview (https://support.industry.siemens.com/cs/ww/en/view/103704610)

EMC Guidelines configuration manual

EMC-compliant control cabinet design, potential equalization and cable routing



EMC installation guideline (http://support.automation.siemens.com/WW/view/en/60612658)

9.1.3 Product Support

Overview

You can find additional information about the product on the Internet:

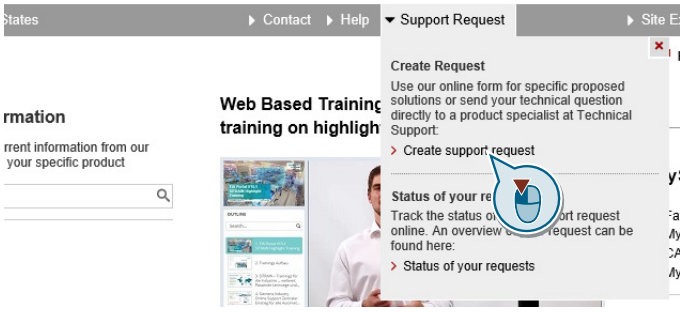
Product support (http://www.siemens.com/automation/service&support)

This URL provides the following:

- Up-to-date product information (product announcements)
- FAQs
- Downloads
- The Newsletter contains the latest information on the products you use.
- The Knowledge Manager (Intelligent Search) helps you find the documents you need.

- Users and specialists from around the world share their experience and knowledge in the Forum.
- You can find your local representative for Automation & Drives via our contact database under "Contact & Partner".
- Information about local service, repair, spare parts and much more can be found under "Services".

If you have any technical questions, use the online form in the "Support Request" menu:



9.2 Directives and standards

Relevant directives and standards

The following directives and standards are relevant for the converters:

European Low-Voltage Directive

The converters fulfill the requirements stipulated in the Low-Voltage Directive 2014/35/EU, if they are covered by the application area of this directive.

European Machinery Directive

The converters fulfill the requirements stipulated in the Machinery Directive 2006/42/EC, if they are covered by the application area of this directive.

However, the use of the converters in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

Directive 2011/65/EU

The converter fulfills the requirements of Directive 2011/65/EU relating to the restriction of the use of certain hazardous substances in electrical and electronic devices (RoHS).

European EMC Directive

The compliance of the converter with the regulations of the Directive 2014/30/EU has been verified through full compliance with IEC/EN 61800-3.

Underwriters Laboratories (North American market)

Converters provided with one of the test symbols displayed fulfill the requirements stipulated for the North American market as a component of drive applications, and are appropriately listed.

EMC requirements for South Korea

The converters with the KC marking on the nameplate satisfy the EMC requirements for South Korea.

Eurasian conformity

The converters comply with the requirements of the Russia/Belarus/Kazakhstan customs union (EAC).

Australia and New Zealand (RCM formerly C-Tick)

The converters showing the test symbols fulfill the EMC requirements for Australia and New Zealand.

Immunity to voltage drop of semiconductor process equipment

The converters comply with the requirements of standard SEMI F47-0706.

China RoHS

The converters comply with the China-RoHs directive. More information is provided on the Internet:

China RoHS (https://support.industry.siemens.com/cs/ww/en/view/109738656)

Directive of the European Union on Waste Electrical and Electronic Equipment (WEEE)

The converter complies with the requirements of Directive 2012/19/EU with regard to the return and recycling of waste electrical and electronic equipment.

Quality systems

Siemens AG employs a Quality Management System that meets the requirements of ISO 9001 and ISO 14001.

Certificates for download

- EC Declaration of Conformity: (https://support.industry.siemens.com/cs/ww/de/view/58275445)
- Certificates for the relevant directives, prototype test certificates, manufacturers declarations and test certificates for functions relating to functional safety ("Safety Integrated"): (http://support.automation.siemens.com/WW/view/en/22339653/134200)
- Certificates for products that were certified by UL: (http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html)
- Certificates for products that were certified by TÜV SÜD: (https://www.tuev-sued.de/industrie_konsumprodukte/zertifikatsdatenbank)

Standards that are not relevant

China Compulsory Certification

The converters do not fall in the area of validity of the China Compulsory Certification (CCC).

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Further information

SINAMICS converters:
www.siemens.com/sinamics

Industry Online Support (Service and Support):
www.siemens.com/online-support

Industry Mall:
www.siemens.com/industrymall

Siemens AG
Digital Industries
Motion Control
Postfach 3180
91050 ERLANGEN
Germany

For further information about SINAMICS G120, scan the QR code.