SINAMICS S120

Chassis power units

Equipment Manual · 10/2008

SINAMICS

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SINAMICS

S120
Chassis power units

Manual

(GH3), 10/2008
6SL3097-2AE00-0BP3

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

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

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

Siemens AG
Industry Sector
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GERMANY

Ordernumber: 6SL3097-2AE00-0BP3
℗ 01/2009

Preface

SINAMICS documentation

The SINAMICS documentation is organized in two parts:

- General documentation / catalogs
- Manufacturer / service documentation

This documentation is part of the manufacturer/service documentation for SINAMICS. All of the documents are available individually.

At http://www.siemens.com/motioncontrol/docu information is available on the following topics:

- Order documentation
  Here you can find an up-to-date overview of publications
- Download documentation
  Links to more information for downloading files from Service & Support
- Documentation online
  Information on DoconCD and direct access to the publications in DoconWeb.
- Assemble documentation individually on the basis of Siemens content with the My Documentation Manager (MDM), see http://www.siemens.com/mdm
  The My Documentation Manager offers you a range of features for creating your own machine documentation.
- Training and FAQs
  Information on the range of training courses and FAQs (frequently asked questions) are available via the page navigation.

Standard scope

The scope of the functionality described in this document can differ from the scope of the functionality of the drive system that is actually supplied. Other functions not described in this documentation might be able to be executed in the drive system. This does not, however, represent an obligation to supply such functions with a new controller or when servicing. The machinery construction OEM documents supplements or changes that he makes (the machinery construction OEM).

Further, for the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation or maintenance.

Audience

This documentation is aimed at machine manufacturers, plant engineers, commissioning engineers, and service personnel who use SINAMICS.

Objective

This manual describes the hardware components of the SINAMICS S system. It provides information about installation, electrical connection, and cabinet design.

Technical support

If you have any questions, please contact our hotline:

	European and African time zone
Telephone	+49 180 5050 - 222
Fax	+49 180 5050 - 223
€0.14/min. from German landlines, mobile phone prices may differ	
Internet	http://www.siemens.de/automation/support-request

	America time zone
Telephone	+1 423 262 2522
Fax	+1 423 262 2200
E-mail	mailto:techsupport.sea@siemens.com

	Asia and Australia time zone
Telephone	+86 1064 757 575
Fax	+86 1064 747 474
E-mail	mailto:support.asia.automation@siemens.com

Note

You will find telephone numbers for other countries for technical support on the Internet:
http://www.automation.siemens.com/partner

Spare parts

You will find spare parts on the Internet at:
http://support.automation.siemens.com/WW/view/en/16612315.

Internet address for SINAMICS

http://www.siemens.com/sinamics

EC Declarations of Conformity

The EC Declaration of Conformity for the EMC Directive can be found/obtained:

- on the Internet:
  http://support.automation.siemens.com
  under the Product/Order No. 15257461
- from the relevant regional office of the I DT MC Business Unit of Siemens AG.

The EC Declaration of Conformity for the Low Voltage Directive can be found/obtained

- on the Internet:
  http://support.automation.siemens.com
  under the Product/Order No. 22383669

ESD information

⚠ CAUTION

Electrostatic sensitive devices (ESD) are single components, integrated circuits or devices that can be damaged by electrostatic fields or electrostatic discharges.

Regulations for handling ESD components:

- During the handling of electronic components, pay attention to the grounding of the person, workplace and packaging!
- Personnel in ESD areas with conductive flooring may only handle electronic components if:
  - They are grounded with an ESD wrist band
  - They are wearing ESD shoes or ESD shoe grounding straps
- Electronic components should be touched only when this is unavoidable. They must only be handled on the front panel or, in the case of printed circuit boards, at the edge.
- Electronic components must not be brought into contact with plastics or clothing made of artificial fibers.
- Electronic components may only be placed on conducting surfaces (table with ESD coating, conducting ESD foamed material, ESD packing bag, ESD transport container).
- Electronic components may not be placed near display units, monitors or televisions (minimum distance from the screen > 10 cm).
- Measurements must only be taken on boards when the measuring instrument is grounded (via protective conductors, for example) or the measuring probe is briefly discharged before measurements are taken with an isolated measuring device (for example, touching a bare metal housing).

Safety information

DANGER

Commissioning must not start until you have ensured that the machine in which the components described here are to be installed complies with Directive 98/37/EC.

SINAMICS S equipment must only be commissioned by suitably qualified personnel.

The personnel must take into account the information provided in the technical customer documentation for the product, and be familiar with and follow the specified danger and warning notices.

When electrical equipment and motors are operated, the electrical circuits automatically conduct a dangerous voltage.

When the machine or system is operated, hazardous axis movements can occur.

All work on the electrical system must be carried out when the system has been disconnected from the power supply and is in a no-voltage condition.

DANGER

Five safety rules

When carrying out any kind of work on electrical devices, the "five safety rules" must always be observed:

1. Disconnect the system.
2. Protect against reconnection.
3. Make sure that the equipment is de-energized.
4. Ground and short-circuit.
5. Cover or enclose adjacent components that are still live.

WARNING

Correct and safe operation of SINAMICS S units assumes correct transportation in the transport packaging, correct long-term storage in the transport packaging, setup and installation, as well as careful operation and maintenance.

The details in the catalogs and proposals also apply to the design of special equipment versions.

In addition to the danger and warning information provided in the technical customer documentation, the applicable national, local, and plant-specific regulations and requirements must be taken into account.

According to EN 61800-5-1 and UL 508, only safely isolated protective extra-low voltages on the electronic modules may be connected to any of the terminals on the electronic modules.

Note

When operated in dry operating areas, SINAMICS equipment with AC motors conforms to Low-Voltage Directive 2006/95/EC.

Note

In the configuration specified in the corresponding EC Declaration of Conformity regarding EMC requirements and when the EMC installation guideline (order no. 6FC5297-0AD30-0*P2) is observed, SINAMICS devices conform to EMC Directive 89/336/EEC and 2004/108/EC.
(*A: German; *B: English)

NOTICE
For a UL-approved system use 60/75°C copper conductors only.

CAUTION
Operating the equipment in the immediate vicinity (< 1.5 m) of mobile telephones with a transmitter power of > 1 W may lead to incorrect operation.

Residual risks of power drive systems

When carrying out a risk assessment of the machine/plant in accordance with the EU Machinery Directive, the machine manufacturer/plant operator must consider the following residual risks associated with the control and drive components of a power drive system (PDS).

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example:
   - Hardware defects and/or software errors in the sensors, controllers, actuators, and connection technology
   - Response times of the controller and drive
   - Operating and/or ambient conditions not within the scope of the specification
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - External influences / damage
2. Exceptional temperatures as well as emissions of light, noise, particles, or gas caused by, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions not within the scope of the specification
   - External influences / damage
3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions not within the scope of 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.

For more information about residual risks of the Power Drive System components, see the relevant chapters in the technical user documentation.

⚠ WARNING

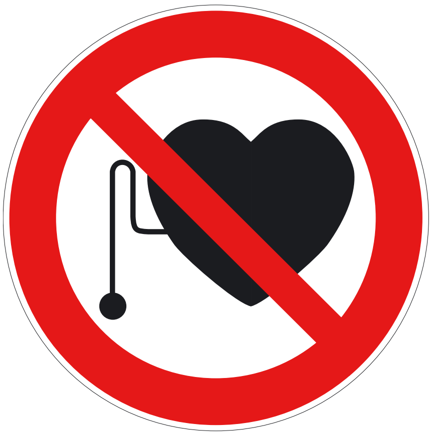
Electromagnetic fields "electro smog"

Electromagnetic fields are generated by the operation of electrical power engineering installations such as transformers, converters or motors.

Electromagnetic fields can interfere with electronic devices, which could cause them to malfunction. For example, the operation of heart pacemakers can be impaired, potentially leading to damage to a person's health or even death. It is therefore forbidden for persons with heart pacemakers to enter these areas.

The plant operator is responsible for taking appropriate measures (labels and hazard warnings) to adequately protect operating personnel and others against any possible risk.

- Observe the relevant nationally applicable health and safety regulations. In Germany, "electromagnetic fields" are subject to regulations BGV B11 and BGR B11 stipulated by the German statutory industrial accident insurance institution.
- Display adequate hazard warning notices.



- Place barriers around hazardous areas.
- Take measures, e.g. using shields, to reduce electromagnetic fields at their source.
- Make sure that personnel are wearing the appropriate protective gear.

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System overview

1

1.1 The SINAMICS range of drives

Field of application

SINAMICS is the new range of converters from Siemens designed for industrial mechanical and plant engineering applications. SINAMICS offers solutions for all drive tasks:

- Simple pump and fan applications in the process industry
- Complex individual drives in centrifuges, presses, extruders, elevators, as well as conveyor and transport systems.
- Drive line-ups in textile, plastic film, and paper machines, as well as in rolling mill plants
- Highly dynamic servo drives for machine tools, as well as packaging and printing machines.

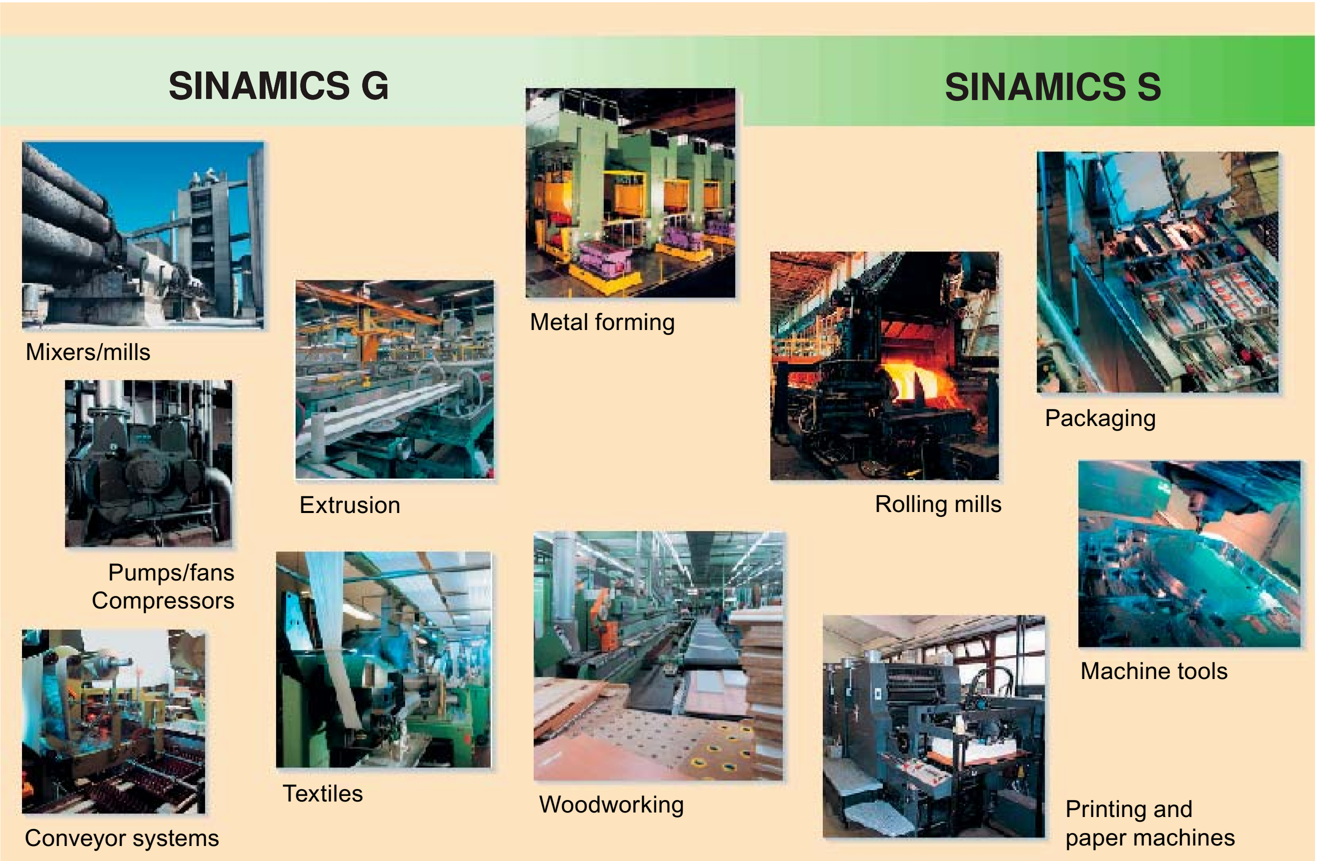

Figure 1-1 SINAMICS applications

Variants

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

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

Platform concept and Totally Integrated Automation

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

SINAMICS is part of the Siemens "Totally Integrated Automation" concept. Integrated SINAMICS systems covering configuration, data storage, and communication at automation level ensure low-maintenance solutions with the SIMATIC, SIMOTION, and SINUMERIK control systems.

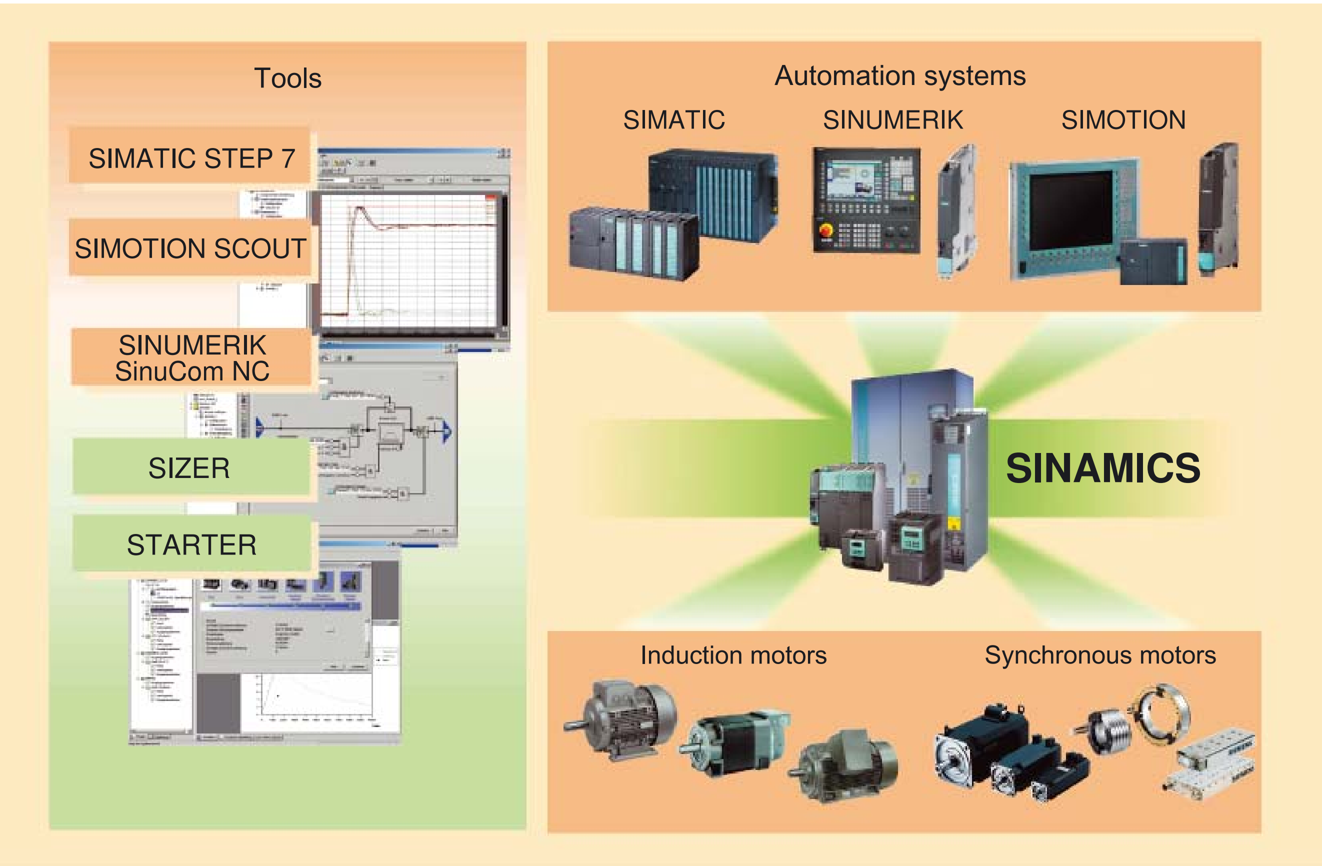

Figure 1-2 SINAMICS as part of the Siemens modular automation system

Quality according to DIN EN ISO 9001

SINAMICS is able to meet the highest requirements in terms of quality. Comprehensive quality assurance measures in all development and production processes ensure a consistently high level of quality.

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

Universal applications

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

1.2 SINAMICS S120 drive system

Modular system for sophisticated drive tasks

SINAMICS S120 solves demanding drive tasks for a wide range of industrial applications and is, therefore, designed as a modular system. Users can choose from many different harmonized components and functions to create a solution that best meets their requirements. SIZER, a high-performance engineering tool, makes it easier to choose and determine the optimum drive configuration. SINAMICS S120 is enhanced by a wide range of motors. Whether synchronous or induction, all motor types are supported by SINAMICS S120.

Particularly suitable for multi-axis applications

Coordinated drives that carry out drive tasks together are used in many mechanical and plant engineering applications, including running gears in gantry cranes, stretching systems in the textile industry, or paper machines and rolling mills. These require drives with a connected DC link, which allows cost-saving energy balancing between braking and driving axes.

SINAMICS S120 features Line Modules (infeed modules) and Motor Modules (inverter modules) covering a wide power range which, having been designed for seamless integration, pave the way for compact multi-axis drive configurations.

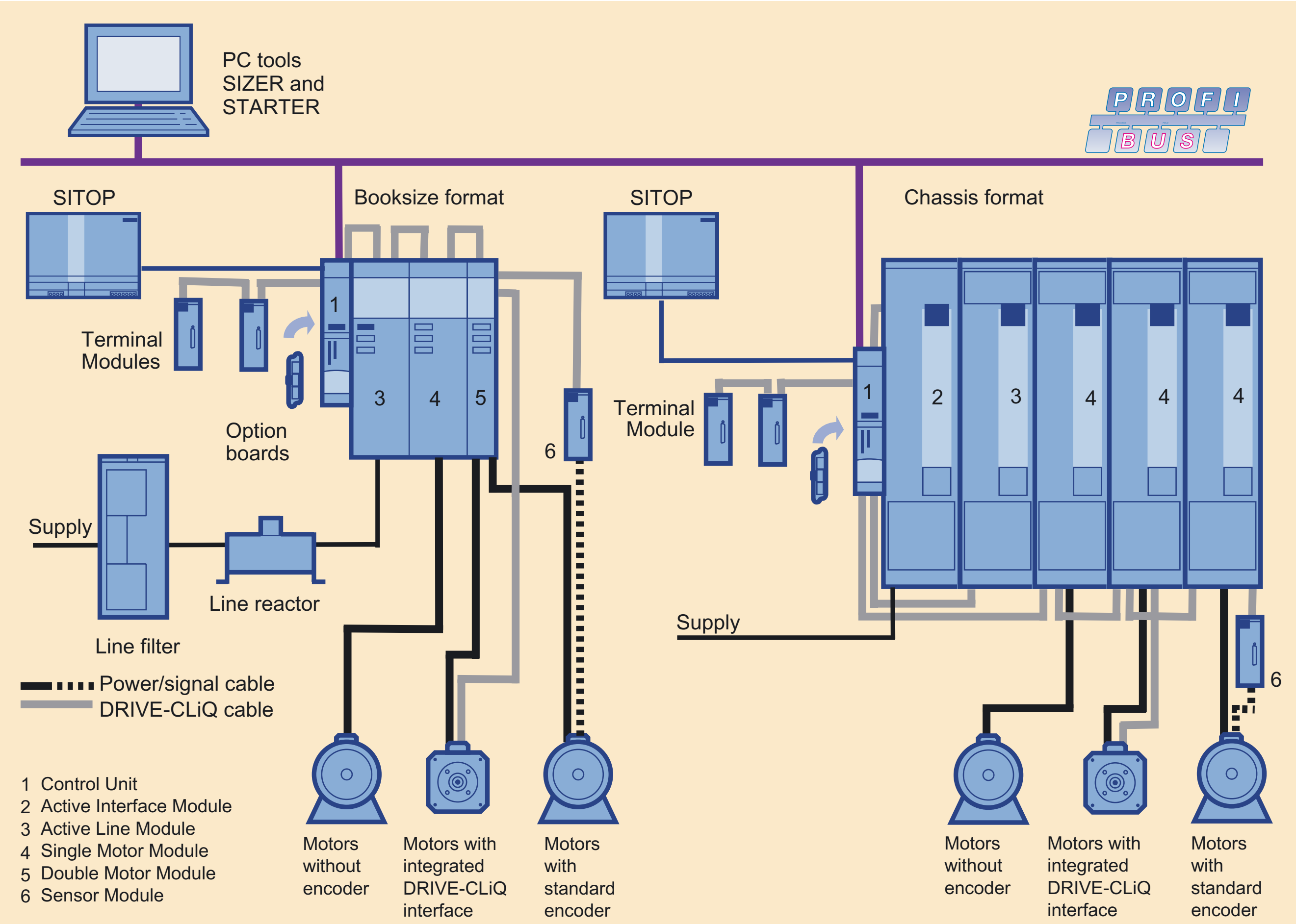

Figure 1-3 SINAMICS S120 system overview

New system architecture with a central Control Unit

Electronically coordinated individual drives work together to perform your drive tasks. Higher-level controllers operate the drives to achieve the required coordinated movement. This requires cyclic data exchange between the control and all the drives. This exchange usually took place via a field bus, which required a great deal of time and effort for installation and configuration. SINAMICS S120 takes a different approach. A central Control Unit controls the drive for all connected axes and also establishes the technological links between the drives and/or axes. Since all the required data is stored in the central Control Unit, it does not need to be transferred. Inter-axis connections can be established within a Control Unit and easily configured in the STARTER commissioning tool using a mouse.

The SINAMICS S120 Control Unit solves basic technological tasks autonomously. For complex numerical or motion-control tasks, high-performance SIMOTION D modules are used instead.

DRIVE-CLiQ – the digital interface between all components

All SINAMICS S120 components, including the motors and encoders, are interconnected by a shared serial interface called DRIVE-CLiQ. The standardized cables and connectors reduce the variety of different parts and cut storage costs.

Converter boards (Sensor Modules) for converting standard encoder signals to DRIVE-CLiQ are available for third-party motors or retrofit applications.

Electronic rating plates in all components

All SINAMICS S120 components with a DRIVE-CLiQ interface have an electronic rating plate. This electronic rating plate contains all the relevant technical data about that particular component. For motors, for example, these data include the parameters of the electric equivalent circuit diagram and characteristic values for the built-in motor encoder. The Control Unit records these data automatically via DRIVE-CLiQ so that they do not need to be entered during commissioning or when the equipment is replaced.

In addition to the technical data, the rating plate includes logistical data (manufacturer ID, order number, and globally unique ID). Since these data can be called up electronically on site or remotely, all the components used in a machine can always be individually identified, which helps simplify servicing.

SINAMICS S120 components

The SINAMICS S120 components are primarily used for multi-axis drive tasks.

The following power components are available:

- **Line-side power components**, such as fuses, contactors, line reactors and line filters for switching the power supply and complying with EMC regulations.
- **Line Modules**, which supply power centrally to the DC link.
- **DC link components**, which are used optionally to stabilize the DC link voltage.
- **Motor Modules**, which act as inverters, receive power from the DC link, and supply the connected motors.
- **Motor-side components**, such as sine-wave filters, motor reactors, and dv/dt filters for reducing the voltage loads on the motor windings.

To carry out the required functions, SINAMICS S120 is equipped with:

- A **Control Unit** that carries out all drive and technological functions across all axes.
- **Additional system components** that enhance functionality and offer different interfaces for encoders and process signals.

SINAMICS S120 components were developed for installation in cabinets. They have the following features and characteristics:

- Easy to handle, simple installation and wiring
- Practical connection system, cable routing in accordance with EMC requirements
- Standardized design, seamless integration
- Internal air cooling (other cooling methods available on request).

1.3 Technical specifications

Technical specifications

Unless specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS S120 drive system.

Table 1- 1 General technical specifications

Electrical data	
Line connection voltage	• 3-ph. 380 V AC -10% (-15% < 1 min) to 3-ph. 480 V AC +10% • 3-ph. 500 V AC -10% (-15% < 1 min) to 3-ph. 690 V AC +10%
Line frequency	47 Hz to 63 Hz
Output voltage	0 to line connection voltage, depending on the type of infeed. With an Active Line Module, it is also possible to achieve a higher output voltage.
Output frequency	0 Hz to 300 Hz
Electronic power supply	24 V DC (20.4 V - 28.8 V)
Short-circuit current rating SCCR in accordance with UL508C (up to 600 V)	• 1.1 kW – 447 kW: 65 kA • 448 kW – 671 kW: 84 kA • 672 kW – 1193 kW: 170 kA • >1194 kW: 200 kA
DC link precharging frequency	Maximum of one precharge every 3 minutes
Interference suppression	
• Standard • With line filter	• Category C3 (environment 2) to EN 61800-3 • Category C2 (environment 1) to EN 61800-3
Overvoltage category	Class III to EN 60664-1
Mechanical data	
Vibratory load • Transport [1)] • Operation	 • EN 60721-3-2, class 2M2 • Test values in accordance with EN 60068-2-6 test Fc: – 10 to 58 Hz with constant deflection = 0.075 mm – 58 to 150 Hz with constant acceleration = 9.81 m/s^2 (1 g)
Shock stressing • Transport [1)] • Operation	 • EN 60721-3-2, class 2M2 • Test values in accordance with EN 60068-2-27 test Ea: 98 m/s^2 (10 g) / 20 ms
Ambient conditions	
Degree of protection	IP00 or IP20 to EN 60529
Protection class	Class I (with protective conductor system) and class III (PELV) to EN 61800-5-1
Shock protection	DIN VDE 0100 Part 100 and BGV A 3 when used properly
Permissible ambient and coolant temperature (air) during operation for line-side components, Line Modules and Motor Modules	0 °C to +40 °C without derating, >40 °C to +55 °C (see derating characteristics)

Permissible ambient and coolant temperature (air) during operation for DC link and motor-side power components	0 °C to +55 °C up to 2000 m above sea level
Cooling method according to EN 60146-1-1:1993	• Active Interface Modules, Basic Line Modules, Smart Line Modules, Active Line Modules, Motor Modules: **AF** – A: Air cooling – F: Forced cooling, drive unit inside the device • Line reactors, sine-wave filters, motor reactors, dv/dt filters with Voltage Peak Limiter: **AN** – A: Air cooling – N : Natural cooling (convection)
Cooling method	Internal air cooling, power units with increased air cooling by built-in fans
Climatic ambient conditions	
• Storage[1] • Transport [1] • Operation	• Class 1K3 to EN 60721-3-1Temperature: -40 °C to +70 °C • Class 2K4 to EN 60721-3-2, Temperature -40 °C to +70 °C Max. air humidity 95 % at +40 °C • Class 3K3 to EN 60721-3-3, Condensation, splashwater and ice formation are not permitted (EN 60204, Part 1)
Environmental class/harmful chemical substances	
• Storage[1] • Transport [1] • Operation	• Class 1C2 to EN 60721-3-1 • Class 2C2 to EN 60721-3-2 • Class 3C2 to EN 60721-3-3
Organic/biological influences	
• Storage[1] • Transport [1] • Operation	• Class 1B1 according to EN 60721-3-1 • Class 2B1 according to EN 60721-3-2 • Class 3B1 according to EN 60721-3-3
Degree of pollution	2 to EN 61800-5-1 The devices may be operated only in environments with degree of pollution 2 and without condensation. On control cabinets with forced air cooling, foreign particles must be filtered out of the inflow air through filter mats. To prevent condensation, the devices can be warmed constantly by heaters.
The Safety-Integrated safety function: The components must be protected against conductive contamination (e.g. by installing them in a cabinet with degree of protection IP54B to EN 60529). Provided that conducted interference can be prevented at the installation site, the degree of protection for the cabinet can be decreased accordingly.	
Installation altitude	• > 2000 m above sea level without derating • > 2000 ... 4000 m above sea level, see derating characteristics
Certificates	
Conformity	CE (Low Voltage and EMC Directives)
Standards	EN 61800-5-1, EN 60204-1, EN 61800-3, EN 60146-1-1
Approvals (only up to 600 V 3 AC)	cULus (File Nos.: E192450 and E214113)

[1] In transport packaging

1.4 Derating factors

1.4.1 Derating factors as a function of installation altitude and ambient temperature

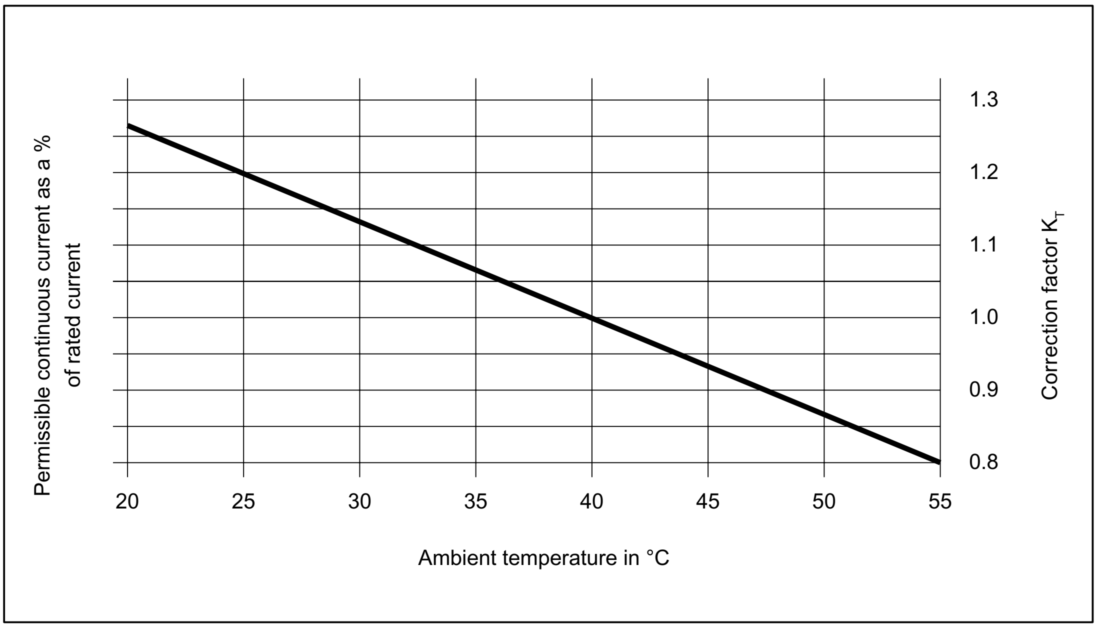

Figure 1-4 Current correction factor K_T as a function of the cooling air temperature

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Note

A current correction factor of K_T > 1 can be applied only to compensate a current correction factor of K_I (see diagram below). The output current cannot be increased.

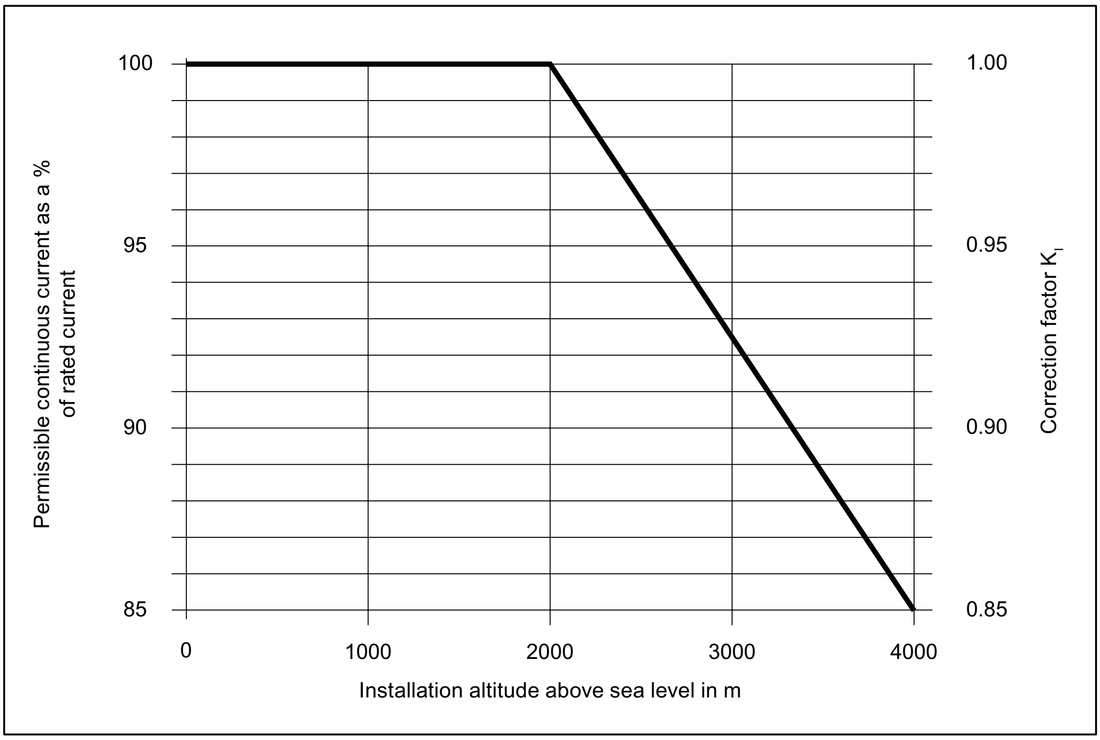

Figure 1-5 Current correction factor K_T as a function of the installation altitude

At installation altitudes above 2000 m (6562 ft), the line voltage must not exceed certain limits to ensure that surge voltages can be insulated in accordance with EN 60664-1 for surge voltage category III. If the line voltage is higher than this limit at installation altitudes > 2000 m (6562 ft), measures must be taken to reduce transient category III surge voltages to category II values, e.g. equipment must be supplied via an isolating transformer.

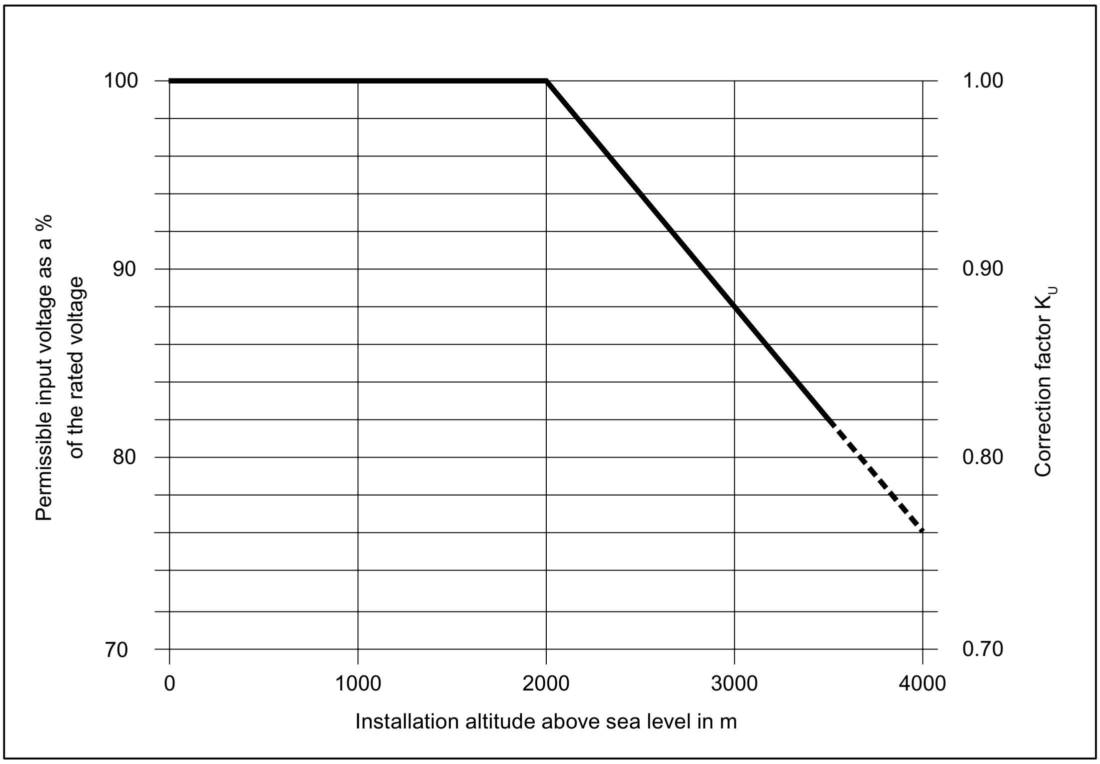

Figure 1-6 Voltage correction factor K_T as a function of the installation altitude

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Note

The dashed line represents a theoretical characteristic of the correction factor. The devices have an undervoltage threshold, which leads to shutdown when the voltage drops below it. Consequently, the input voltage range that is actually usable has a lower limit.

1.4.2 Correction factors for increased ambient temperatures and installation altitudes

If the Line Modules and Motor Modules are operated at ambient temperatures of > 40 °C and installation altitudes of > 2000 m, both derating characteristics must be taken into account for the permissible output power/output current.

A voltage reduction K_U must also be taken into account at installation altitudes of > 2000 m in accordance with IEC 60664-1. Due to their narrow voltage range, modules with a voltage range between 500 V and 690 V 3 AC can only be used at altitudes of up to max. 3500 m above sea level.

Example 1

A drive system comprising Line and Motor Modules is to be operated at an altitude of 2500 m at a maximum ambient temperature of 30 °C.

Since the ambient temperature is below 40 °C, a compensation calculation (installation altitude/ambient temperature) can be carried out.

Reason:

If the Modules are operated at installation altitudes between 2000 m and 4000 m, the air density and thus also the cooling capacity of the forced-cooled devices decreases. However, as the ambient temperatures at the site of installation are often lower, a compensation factor can be calculated for the units in this case. The reduction in current can be balanced by correction factor K_T. If the result of multiplying correction factor K_T by correction factor K_I is greater than 1, the rated current can be used in the calculation. If the multiplication result is <1, the rated current must be multiplied by this value to yield the maximum permissible continuous current.

The following formula is used:

$I \leq I_N \times K_I \times K_T$, $I \leq I_N$ (I = permissible continuous current, I_N = rated current)

Installation altitude: 2500 m; max. ambient temperature: 30 °C

- Correction factor $K_I = 0.965$
- Correction factor $K_T = 1.133$
- Correction factor $K_U = 0.94$

$I \leq I_N \times K_I \times K_T$

$I \leq I_N \times 0.965 \times 1.133$

$I \leq I_N \times 1.094$

however $I \leq I_N$

Result:

- Since the result yields a factor of > 1, the current does not have to be reduced
- However, IEC 60664-1 stipulates that voltage derating is required at installation altitudes > 2000 m (6562 ft).
- Devices in the voltage range 380 V – 480 V 3 AC can be operated with a maximum voltage of 0.94 x 480 V = 451 V.
- Devices in the voltage range 500 V – 690 V 3 AC can be operated with a maximum voltage of 0.94 x 690 V = 648 V.

Example 2

When a drive line-up is configured, a Motor Module with the order number 6SL3320-1TE32-1AA0 is selected. The drive line-up is to be operated at an altitude of 3000 m where ambient temperatures could reach 35 °C as a result of the installation conditions.

The following formula is used:

$I \leq I_N \times K_I \times K_T$, $I \leq I_N$ (I = permissible continuous current, I_N = rated current)

Installation altitude: 3000 m; max. ambient temperature: 35 °C, output voltage of the Motor Modules 380 V to 480 V, 110 kW / 210 A

- Correction factor $K_I = 0.925$
- Correction factor $K_T = 1.066$
- Correction factor $K_U = 0.88$

$I \leq I_N \times K_I \times K_T$

$I \leq I_N \times 0.925 \times 1.066$

$I \leq I_N \times 0.987$

Result:

- Since the result yields a factor of < 1, the current must be reduced
  210 A x 0.987 = 207 A
- However, IEC 60664-1 stipulates that voltage derating is required at altitiudes > 2000 m.

  The selected Motor Module for the voltage range 380 V – 480 V 3 AC can be operated with a max. voltage of 0.88 x 480 V = 422 V. This means that no restrictions apply for operation of a 400 V induction motor in this case. Due to the installation altitude, however, derating must be taken into account for the induction motor.
- Due to the voltage derating, however, the Motor Module must be operated only with 400 V output voltage.

1.5 Basic structure of a drive system with SINAMICS S120

1.5.1 Structure of a drive system with SINAMICS S120 and regulated infeed

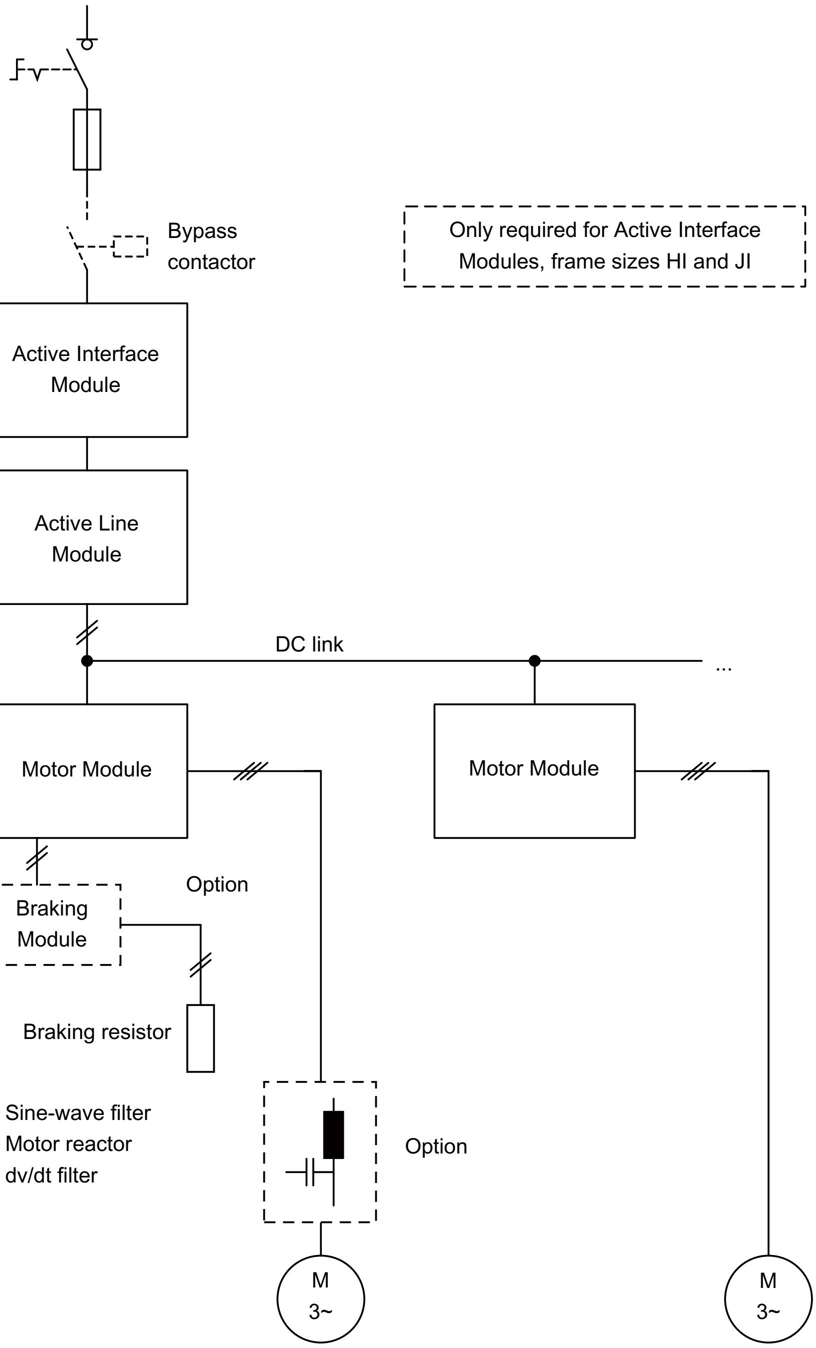

Figure 1-7 Basic structure of a drive system with SINAMICS S120 and regulated infeed

1.5.2 Structure of a drive system with SINAMICS S120 and unregulated infeed/regenerative feedback

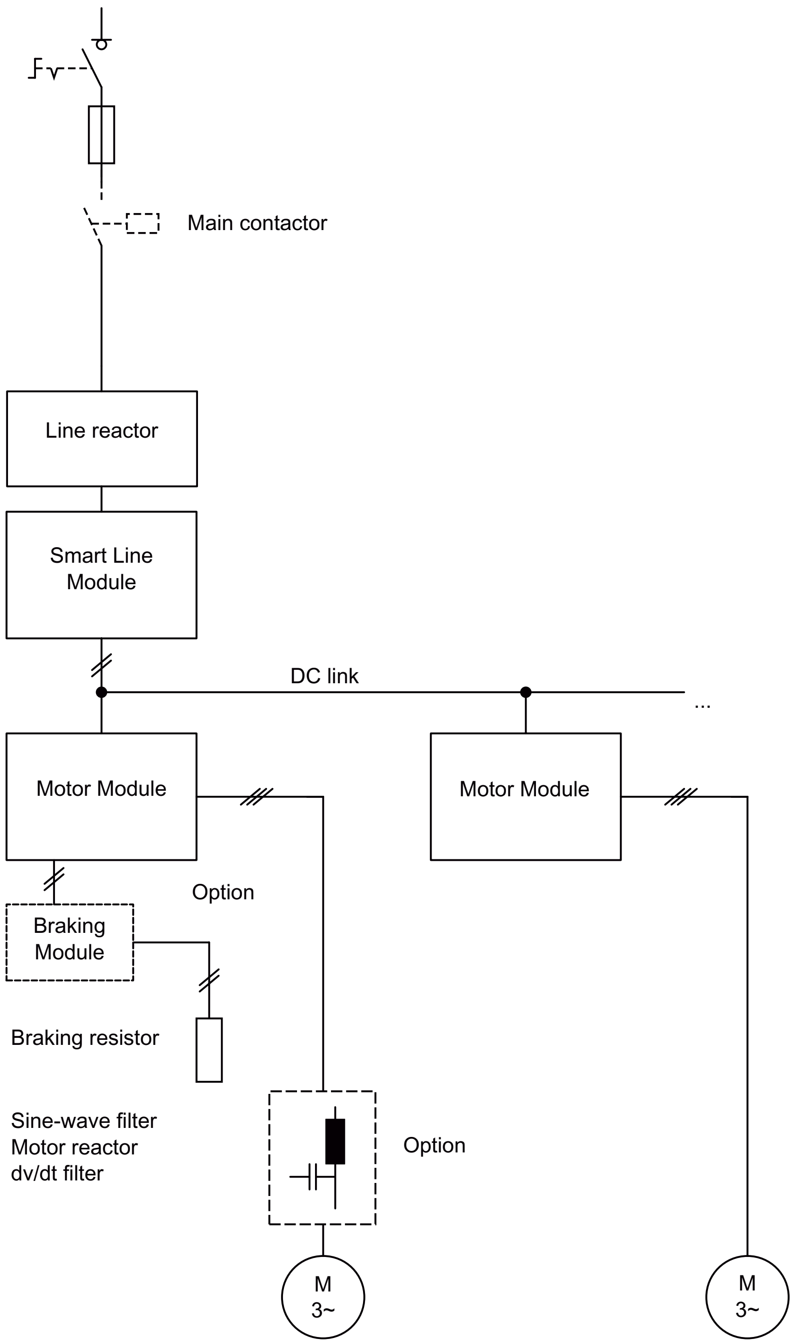

Figure 1-8 Basic structure of a drive system with SINAMICS S120 and unregulated infeed/regenerative feedback

1.5.3 Structure of a drive system with SINAMICS S120 and unregulated infeed

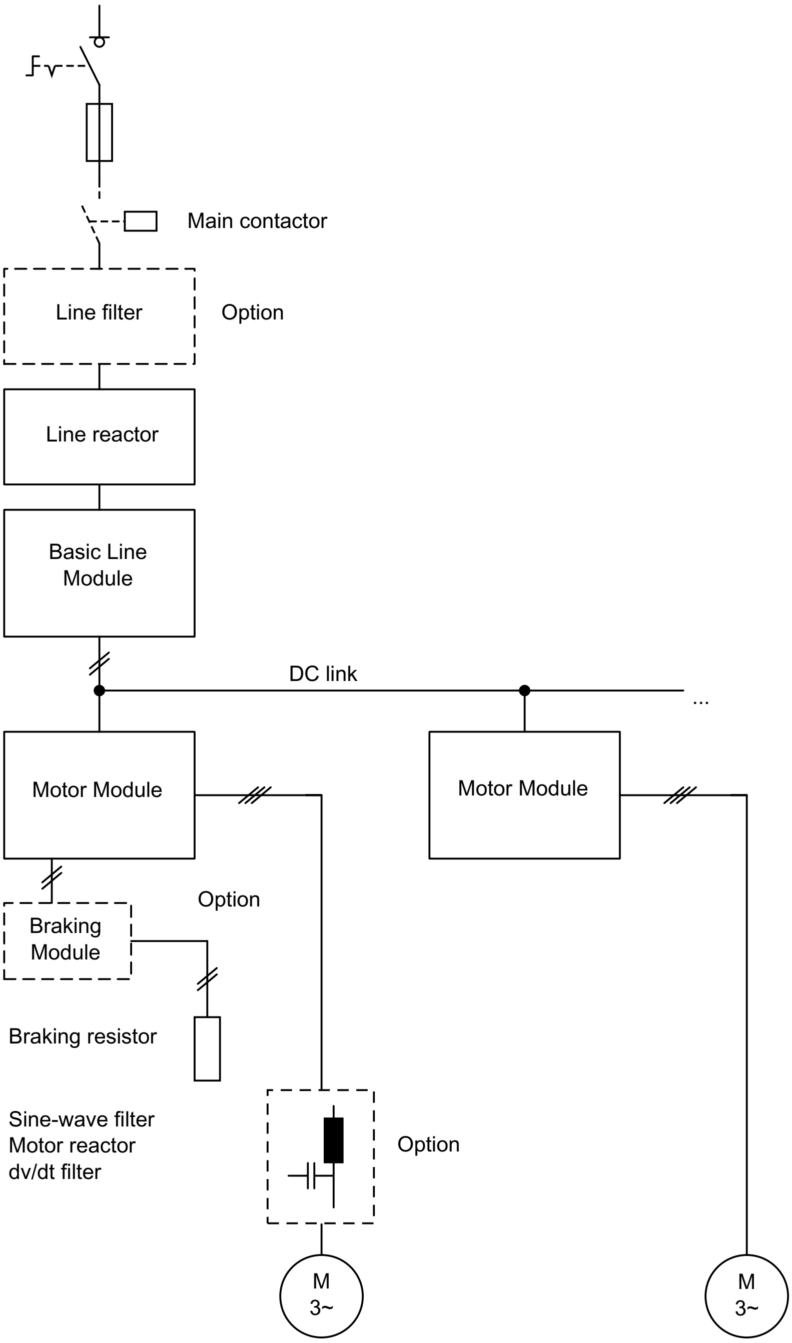

Figure 1-9 Basic structure of a drive system with SINAMICS S120 and unregulated infeed

2 Line-side power components

2.1 General

Line-side power components are used to protect the connected components against transient or continuous overvoltages and ensure that prescribed limit values are adhered to.

2.2 Line filters for Basic Line Modules

2.2.1 Description

In conjunction with line reactors and a systematic plant configuration, line filters limit the conducted interference emitted by the power modules at the installation location to permissible values for industry.

2.2.2 Safety information

CAUTION

Line filters are only suitable for direct connection to TN systems.

DANGER

The cooling clearances of 100 mm above and below the components must be observed. This prevents thermal overloading of the filter.

CAUTION

The connections must not be interchanged:

- Incoming line cable to LINE/NETZ L1, L2, L3
- Outgoing cable to the reactor to LOAD/LAST L1', L2', L3'

Non-observance may damage the line filter.

CAUTION

The line filters listed conduct a high leakage current via the PE conductor. A permanent PE connection for the line filter or control cabinet is required due to the high leakage current of the line filters.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

Note

If a high-voltage test is conducted with alternating voltage, the line filter must be disconnected to obtain an accurate measurement result.

If a high-voltage test is carried out with direct voltage, the noise suppression capacitor must also be disconnected (for the Basic Line Module).

CAUTION
Using line filters not approved by SIEMENS for SINAMICS can lead to line-side harmonics that can interfere with or damage other loads powered from the network.

2.2.3 Dimension drawing

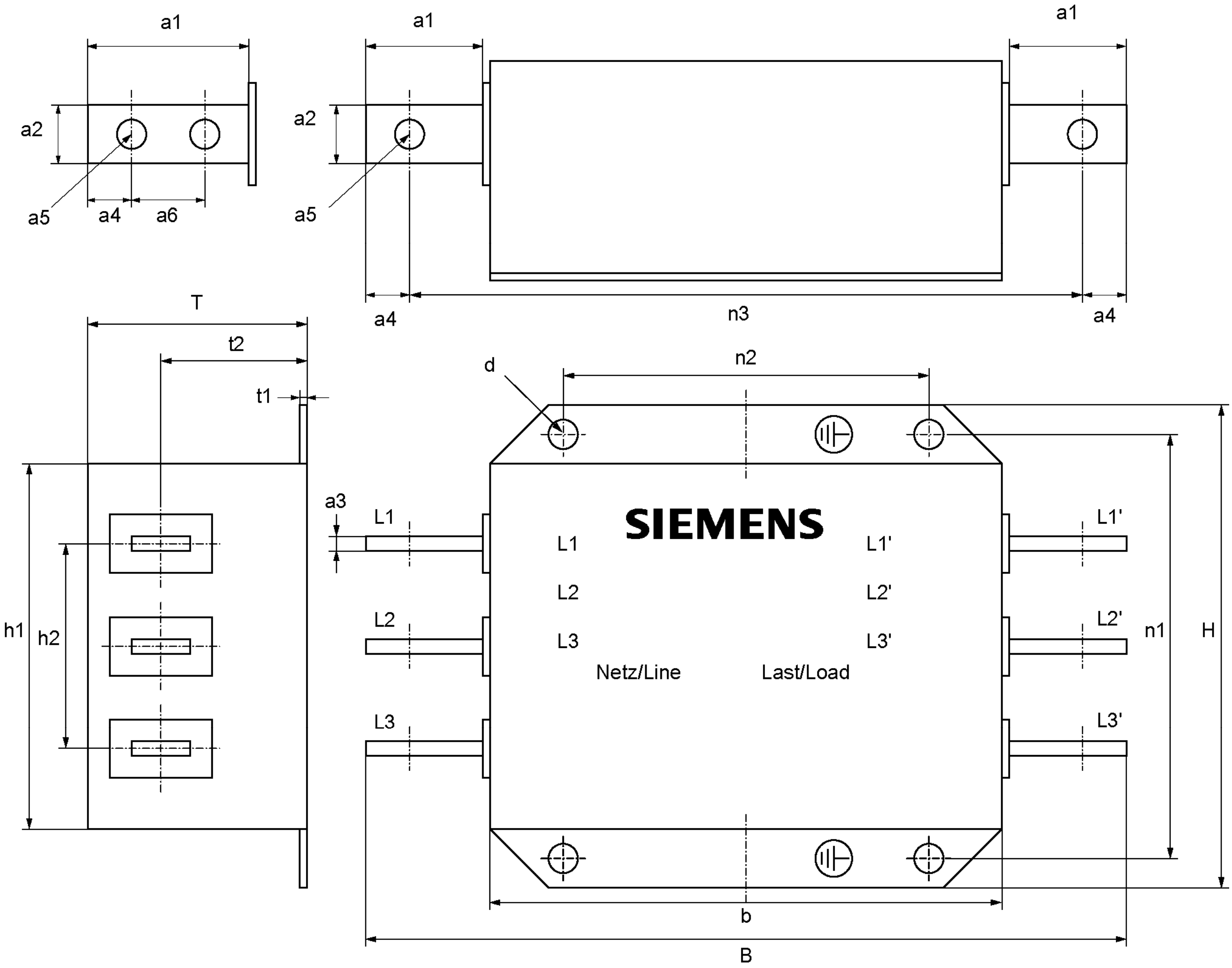

Figure 2-1 Dimension drawing of line filters for Basic Line Modules

Table 2- 1 Dimensions of line filters for Basic Line Modules (all data in mm)

6SL3000-	0BE34-4AA0 0BG34-4AA0	0BE36-0AA0 0BG36-0AA0	0BE41-2AA0 0BG41-2AA0	0BE41-6AA0
B	360	400	425	505
H	240	265	265	265
T	116	140	145	145
a1	40	40	50	90
a2	25	25	50	50
a3	5	8	10	15
a4	15	15	20	20
a5	11	11	14	14
a6	–	–	–	40
b	270	310	315	315
h1	200	215	215	215
h2	100	120	142	142
t1	2	3	2.5	2.5
t2	78.2	90	91	91
n1 [1)]	220	240	240	240
n2 [1)]	210	250	255	255
n3	330	370	385	465
d	9	12	12	12

1) Lengths n1 and n2 correspond to the distance between holes

2.2.4 Technical specifications

Table 2- 2 Technical specifications of line filters for Basic Line Modules, 380 V – 480 V 3 AC

Order number	6SL3000-	0BE34-4AA0	0BE36-0AA0	0BE41-2AA0	0BE41-2AA0	0BE41-6AA0
Suitable for Basic Line Module	6SL3330-	1TE34-2AA0	1TE35-3AA0	1TE38-2AA0	1TE41-2AA0	1TE41-5AA0
Rated power of the Basic Line Module	kW	200	250	400	560	710
Rated voltage	V	3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 %				
Rated current	A	440	600	1200	1200	1600
Power loss	kW	0.049	0.055	0.137	0.137	0.182
Line/load connection L1, L2, L3, L1', L2', L3'		M10 connection lugs	M10 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs
PE connection		M8	M10	M10	M10	M10
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 400 265 140	 425 265 145	 425 265 145	 505 265 145
Weight	kg	12.3	19.0	25.8	25.8	28.8

Table 2- 3 Technical specifications of line filters for Basic Line Modules, 500 V – 690 V 3 AC

Order number	6SL3000-	0BG34-4AA0	0BG34-4AA0	0BG36-0AA0	0BG41-2AA0	0BG41-2AA0
Suitable for Basic Line Module	6SL3330-	1TH33-3AA0	1TH34-3AA0	1TH36-8AA0	1TH41-1AA0	1TH41-4AA0
Rated power of the Basic Line Module	kW	250	355	560	900	1100
Rated voltage	V	3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 %				
Rated current	A	440	440	600	1200	1200
Power loss	kW	0.049	0.049	0.055	0.137	0.137
Line/load connection L1, L2, L3, L1', L2', L3'		M10 connection lugs	M10 connection lugs	M10 connection lugs	M12 connection lugs	M12 connection lugs
PE connection		M8	M8	M10	M10	M10
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 360 240 116	 400 265 140	 425 265 145	 425 265 145
Weight	kg	12.3	12.3	19.0	25.2	25.2

2.3 Line reactors for Basic Line Modules

2.3.1 Description

Line reactors limit low-frequency line harmonics and reduce the load on the semiconductors in the Basic Line Modules. A line reactor must be used in connection with a line filter or if several Basic Line Modules are operated in parallel.

If a Basic Line Module is operated singly and no line filter is used, and with an effective line impedance uk > 3 %, the line reactor is not necessary.

2.3.2 Safety information

CAUTION
The 100 mm cooling clearances above and to the side of the components must be observed.

Note

The connecting cables to the Line Module must be kept as short as possible (max. 5 m).

CAUTION

When using line reactors that have not been approved by SIEMENS for SINAMICS, the following can occur:

- The Basic Line Modules may become damaged/faulty.
- Line harmonics may interfere with or damage other loads connected to the same line supply.

⚠ CAUTION
The surface temperature of the line reactors can exceed 80 °C.

2.3.3 Dimension drawing

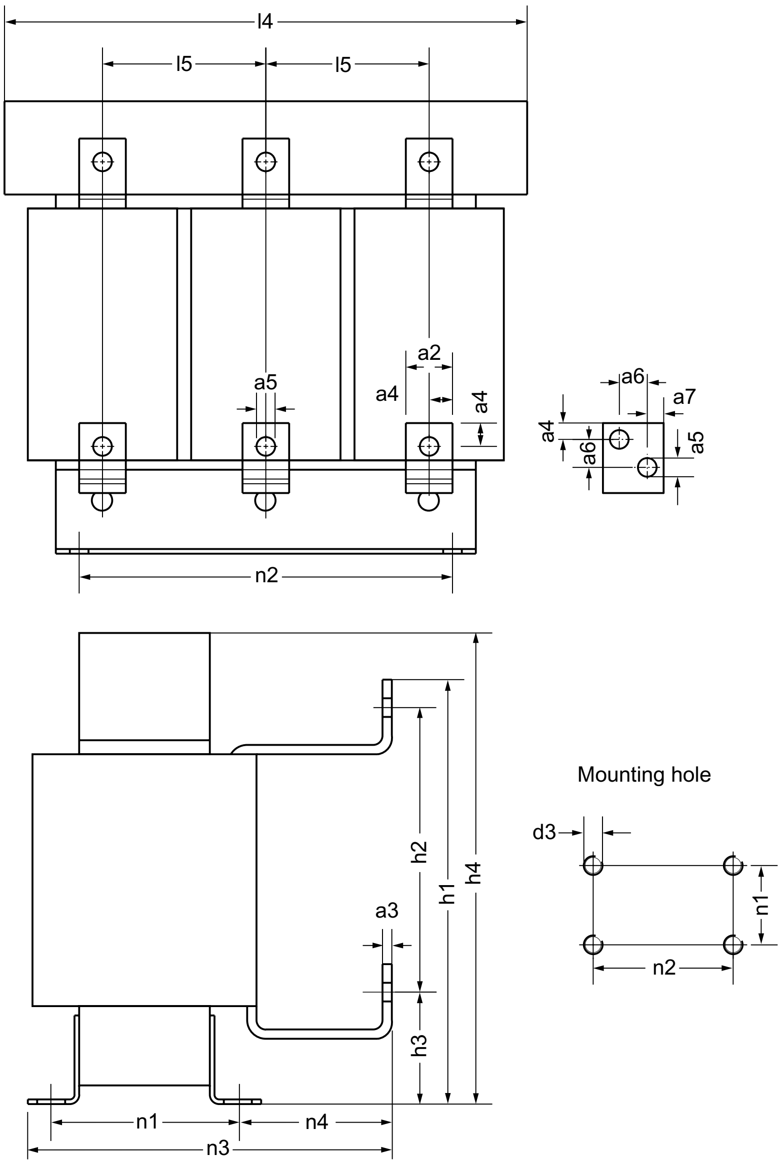

Figure 2-2 Dimension drawing of line reactors for Basic Line Modules

Table 2- 4 Dimensions of line reactors for Basic Line Modules, 380 V – 480 V 3 AC (all values in mm)

6SL3000-	0CE35-1AA0	0CE37-7AA0	0CE41-0AA0	0CE41-5AA0
a2	30	30	50	60
a3	6	6	8	12
a4	15	15	25	25
a5	14	14	14	14
a6	-	-	-	26
a7	-	-	-	17
l4	300	300	350	460
l5	100	100	120	152.5
h1	-	-	397	-
h2	180	180	252	278
h3	60	60	120	120
h4	269	269	321	435
n1 1)	118	118	138	155
n2 1)	224	224	264	356
n3	212.5	212.5	211.5	235
n4	81	81	60	60
d3	M8	M8	M8	M12

1) Lengths n1 and n2 correspond to the distance between holes

Table 2- 5 Dimensions of line reactors for Basic Line Modules, 500 V – 690 V 3 AC (all values in mm)

6SL3000-	0CH32-7AA0	0CH34-8AA0	0CH36-0AA0	0CH41-2AA0
a2	25	30	30	60
a3	5	6	6	12
a4	12.5	15	15	25
a5	11	14	14	14
a6	-	-	-	26
a7	-	-	-	17
l4	270	350	350	460
l5	88	120	120	152.5
h1	-	-	-	-
h2	150	198	198	278
h3	60	75	75	120
h4	248	321	321	435
n1 1)	101	138	138	155
n2 1)	200	264	264	356
n3	200	232.5	232.5	235
n4	84.5	81	81	60.5
d3	M8	M8	M8	M12

1) Lengths n1 and n2 correspond to the distance between holes

2.3.4 Technical specifications

Table 2- 6 Technical specifications of line reactors for Basic Line Modules, 380 V – 480 V 3 AC

Order number	6SL3000-	0CE35-1AA0	0CE35-1AA0	0CE37-7AA0	0CE41-0AA0	0CE41-5AA0
Suitable for Basic Line Module	6SL3330-	1TE34-2AA0	1TE35-3AA0	1TE38-2AA0	1TE41-2AA0	1TE41-5AA0
Rated power of the Basic Line Module	kW	200	250	400	560	710
Rated voltage	V	3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 %				
I_{thmax}	A	508	508	773	1022	1458
Power loss	kW	0.365	0.365	0.351	0.498	0.776
Line/load connection		M12 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 269 212.5	 300 269 212.5	 300 269 212.5	 350 397 211.5	 460 435 235
Weight	kg	38	38	51.3	69.6	118

Table 2- 7 Technical specifications of line reactors for Basic Line Modules, 500 V – 690 V 3 AC

Order number	6SL3000-	0CH32-7AA0	0CH34-8AA0	0CH36-0AA0	0CH41-2AA0	0CH41-2AA0
Suitable for Basic Line Module	6SL3330-	1TH33-0AA0	1TH34-3AA0	1TH36-8AA0	1TH41-1AA0	1TH41-4AA0
Rated power of the Basic Line Module	kW	250	355	560	900	1100
Rated voltage	V	3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 %				
I_{thmax}	A	270	482	597	1167	1167
Power loss	kW	0.277	0.478	0.485	0.783	0.783
Line/load connection		M10 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 270 248 200	 350 321 232.5	 350 321 232.5	 460 435 235	 460 435 235
Weight	kg	27.9	55.6	63.8	147	147

2.4 Line reactors for Smart Line Modules

2.4.1 Description

Line reactors limit low-frequency line harmonics and reduce the load on the semiconductors in the Smart Line Modules. For this reason, line reactors must always be provided when Smart Line Modules are used.

2.4.2 Safety information

CAUTION
The 100 mm cooling clearances above and to the side of the components must be observed.

Note

The connecting cables to the Line Module must be kept as short as possible (max. 5 m).

CAUTION

When using line reactors that have not been approved by SIEMENS for SINAMICS, the following can occur:

- The Smart Line Modules may become damaged/faulty.
- Line harmonics may interfere with or damage other loads connected to the same line supply.

⚠ CAUTION
The surface temperature of the line reactors can exceed 80 °C.

2.4.3 Dimension drawing

Line reactor 6SL3000-0EE36-2AA0

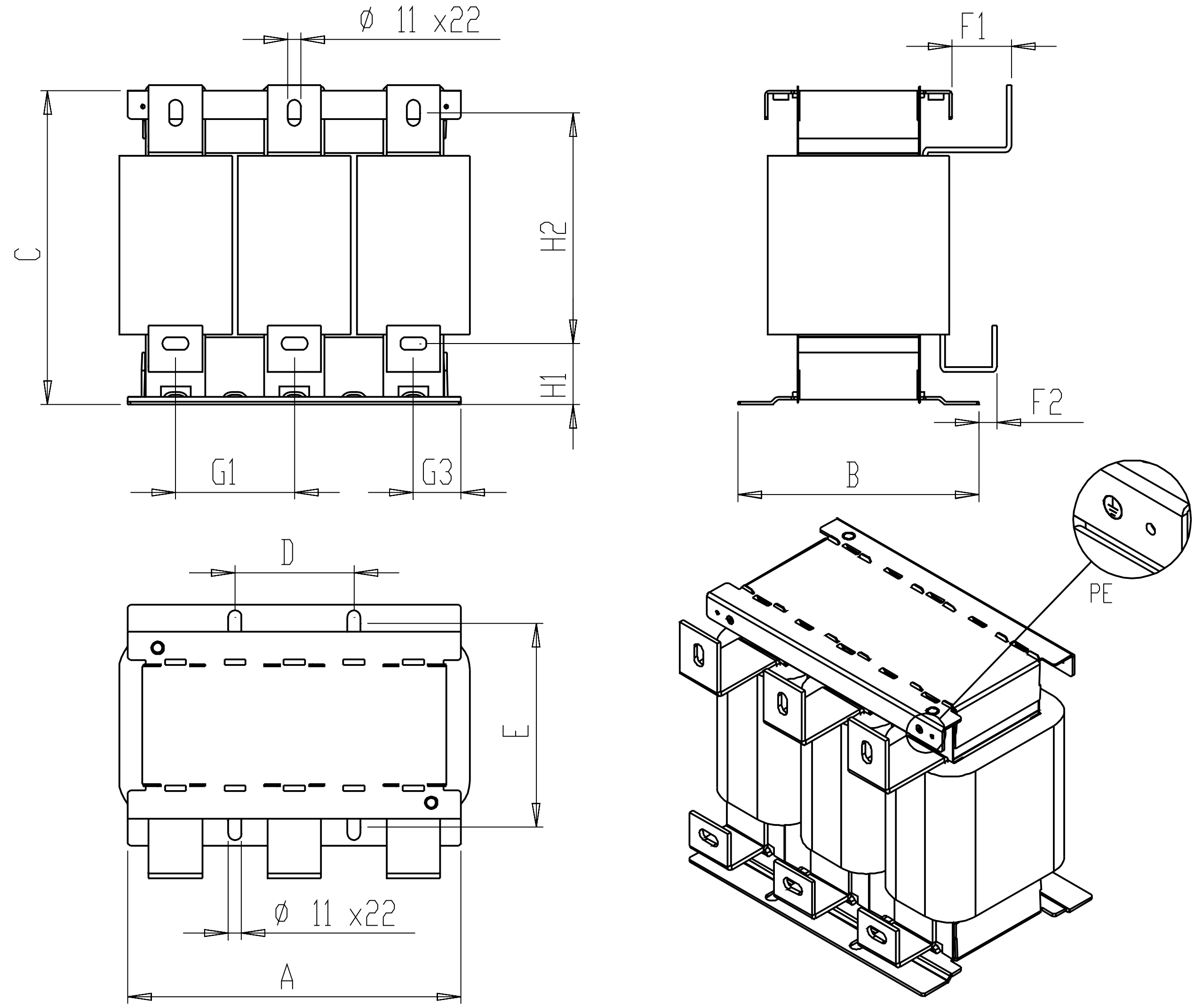

Figure 2-3 Dimension drawing of line reactor 6SL3000-0EE36-2AA0

Table 2- 8 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
280	203	264	100	171	50	15	100
G2	G3	H1	H2	H3			
–	40	51	194	–			

[1)] Lengths D and E correspond to the distance between holes

Line reactor 6SL3000-0EE38-8AA0

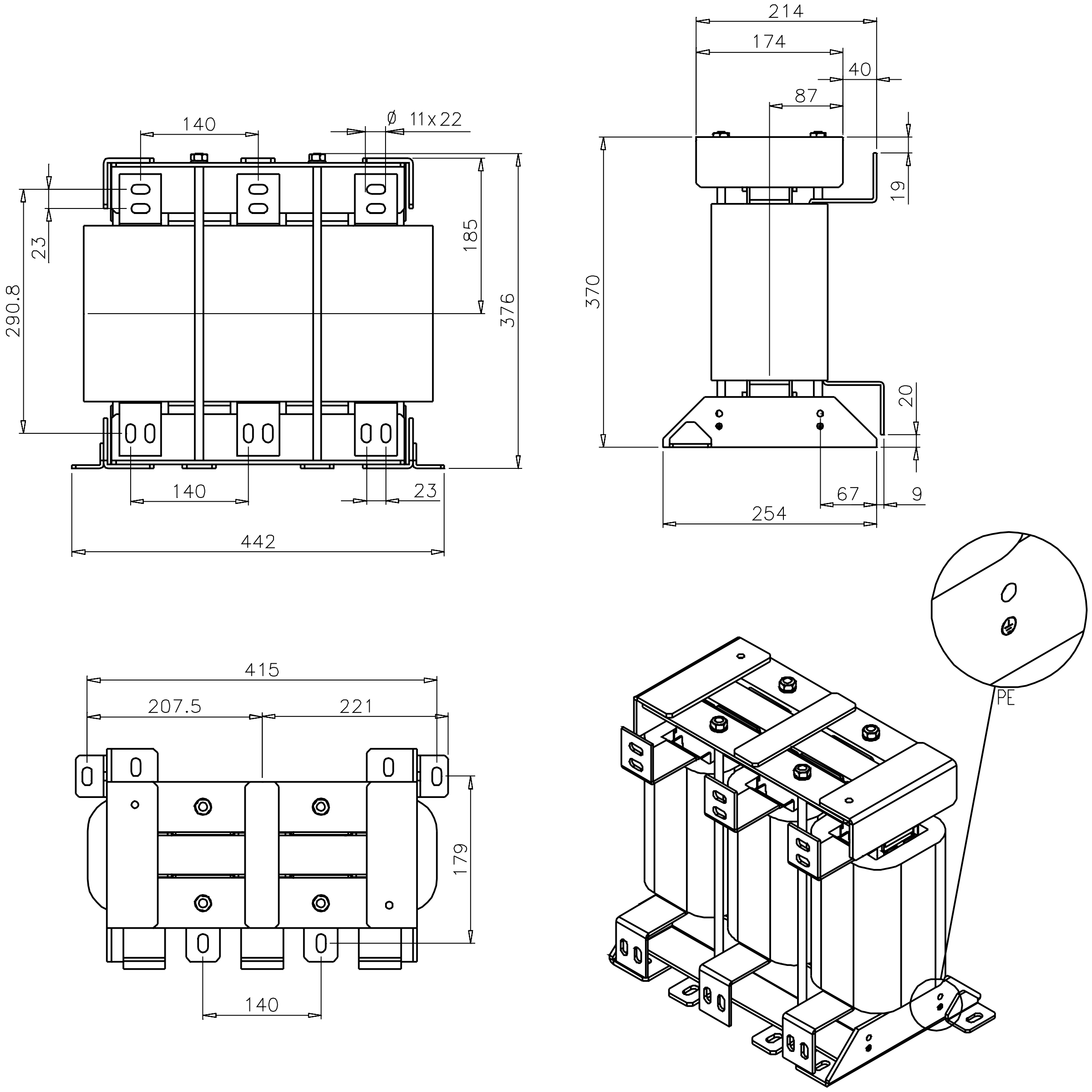

Figure 2-4 Dimension drawing of line reactor 6SL3000-0EE38-8AA0, all dimensions in mm

Line reactor 6SL3000-0EE41-4AA0

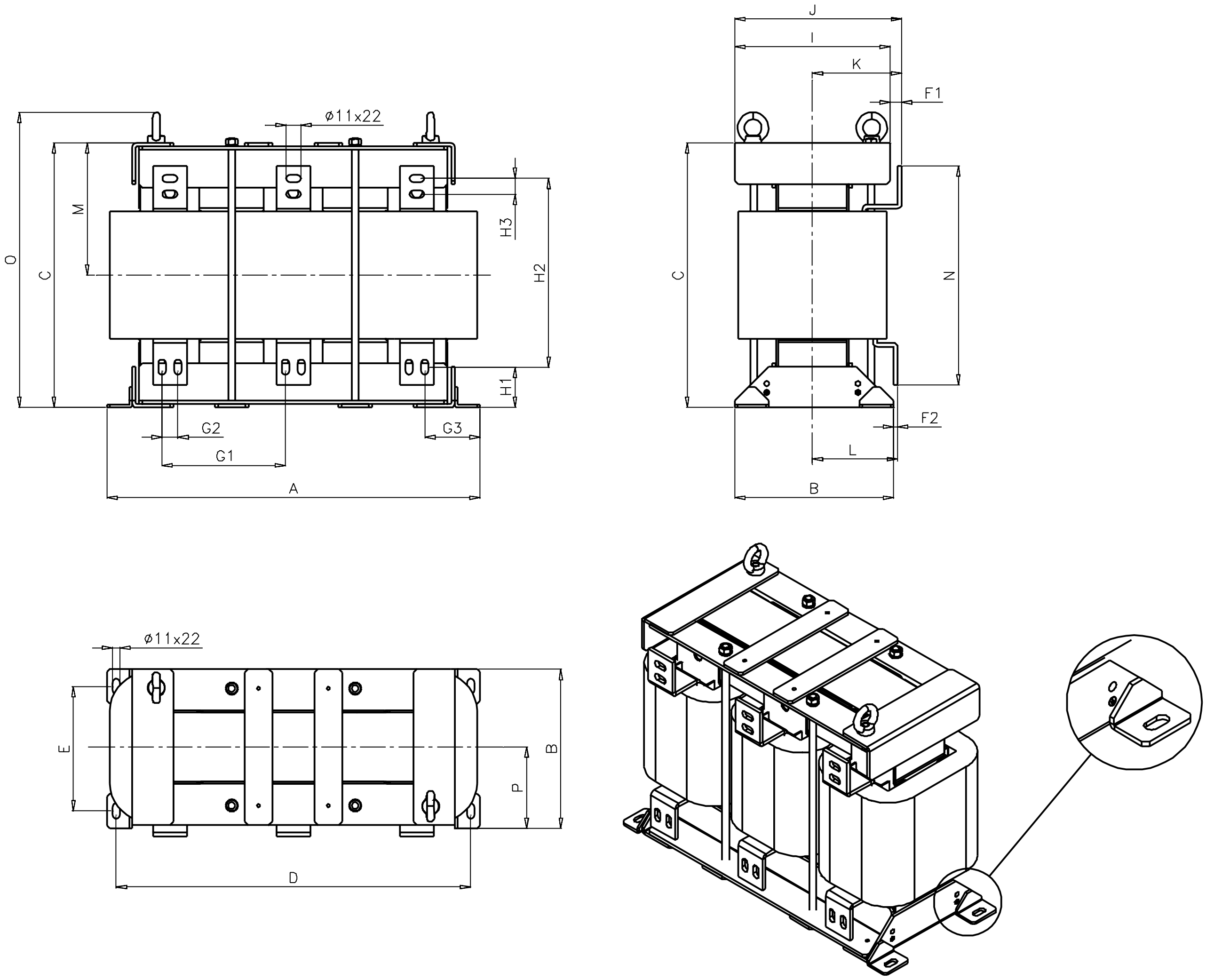

Figure 2-5 Dimension drawing of line reactor 6SL3000-0EE41-4AA0

Table 2- 9 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
544	232	386	517	182	17	6	180
G2	G3	H1	H2	H3	I	J	K
23	80.5	59	276	23	227	244	130.5
L	M	N	O	P			
122	193	320	431	116			

1) Lengths D and E correspond to the distance between holes

Note

The crane lifting eyes can be removed after installation.

Line reactor 6SL3000-0EH34-7AA0

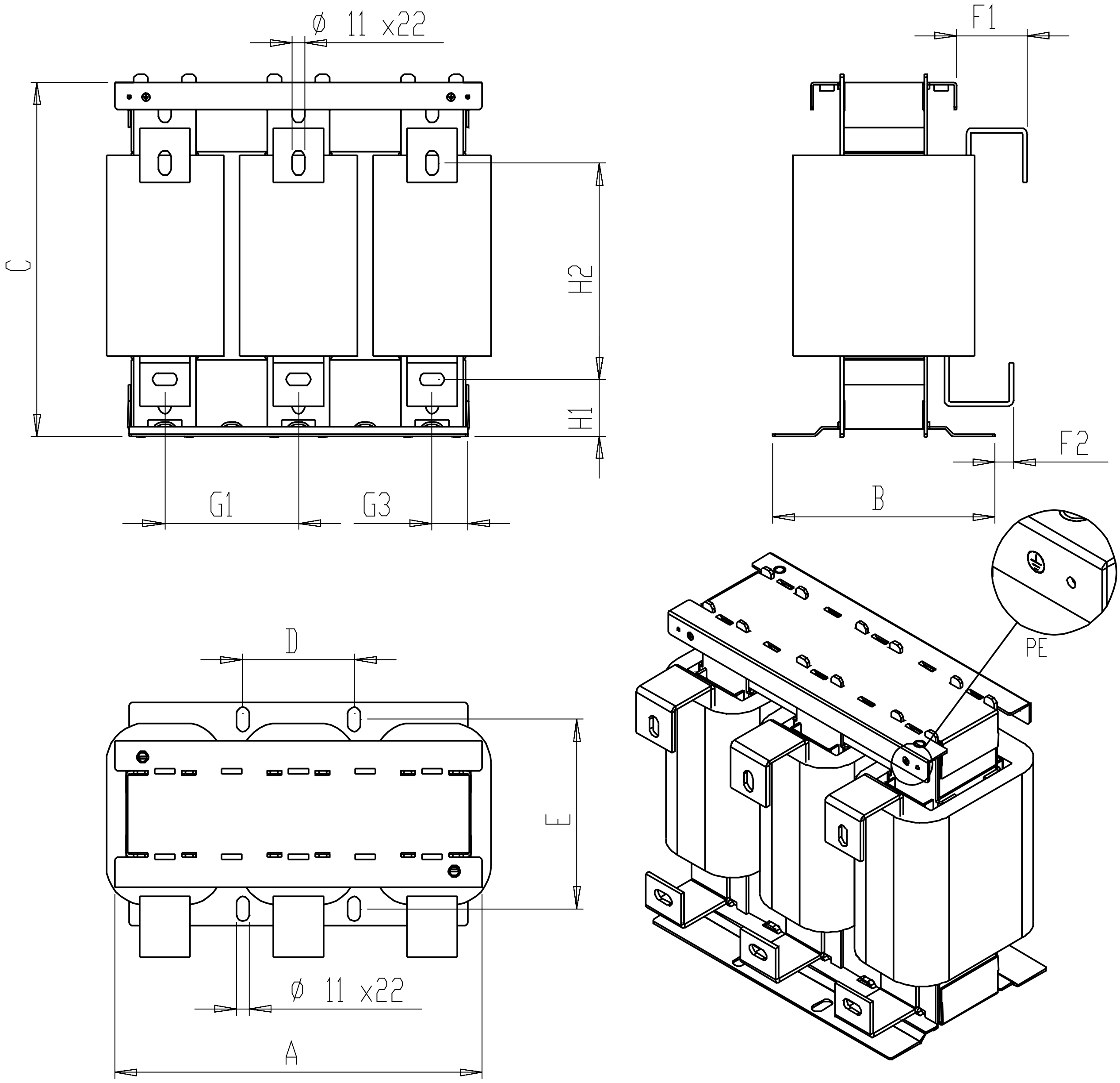

Figure 2-6 Dimension drawing of line reactor 6SL3000-0EH34-7AA0

Table 2- 10 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
330	200	318	100	170	63	16.5	120
G2	G3	H1	H2	H3			
–	32	51	194	–			

1) Lengths D and E correspond to the distance between holes

Line reactor 6SL3000-0EH37-6AA0

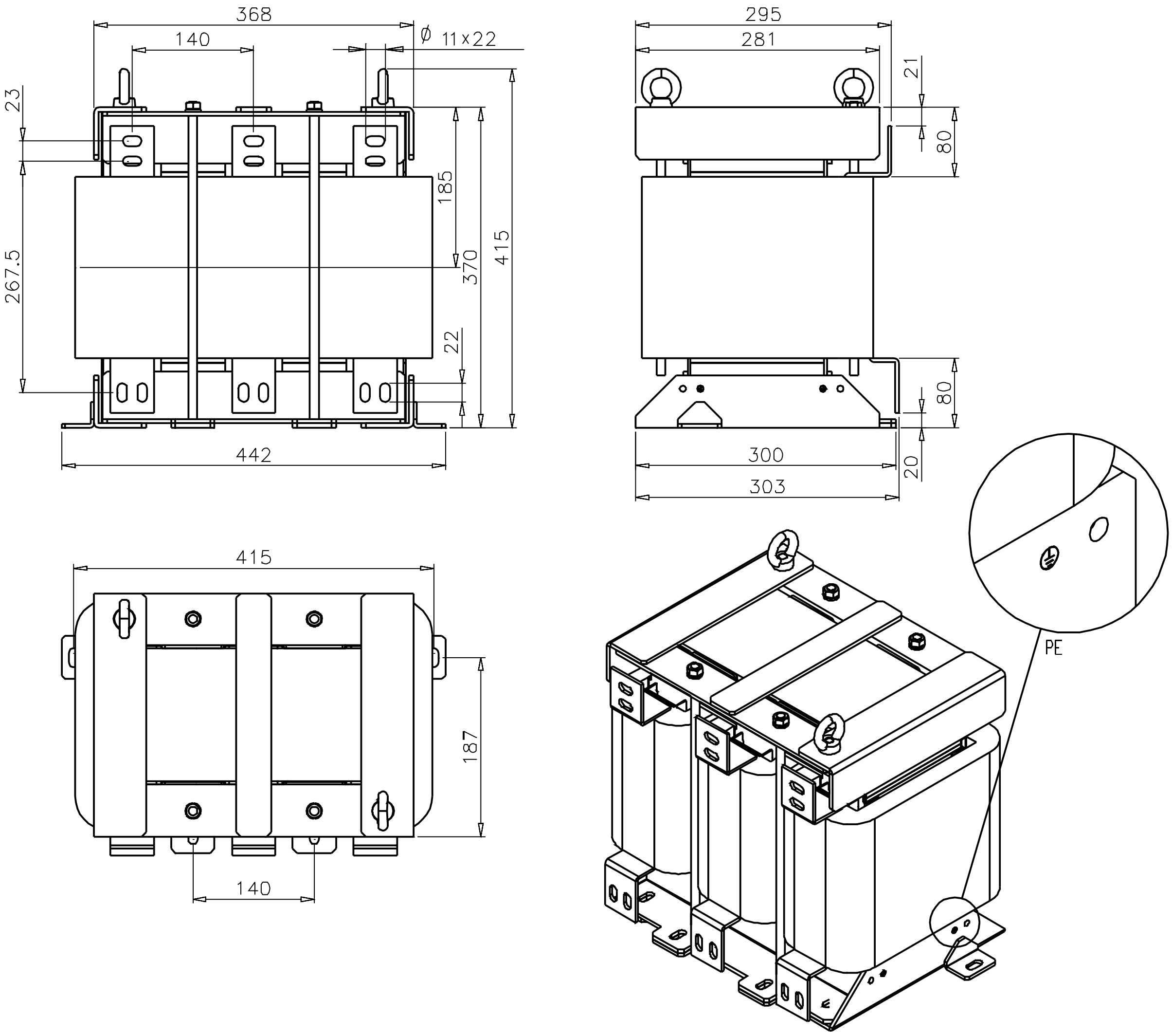

Figure 2-7 Dimension drawing of line reactor 6SL3000-0EE37-6AA0, all dimensions in mm

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Note

The crane lifting eyes can be removed after installation.

Line reactor 6SL3000-0EE41-4AA0

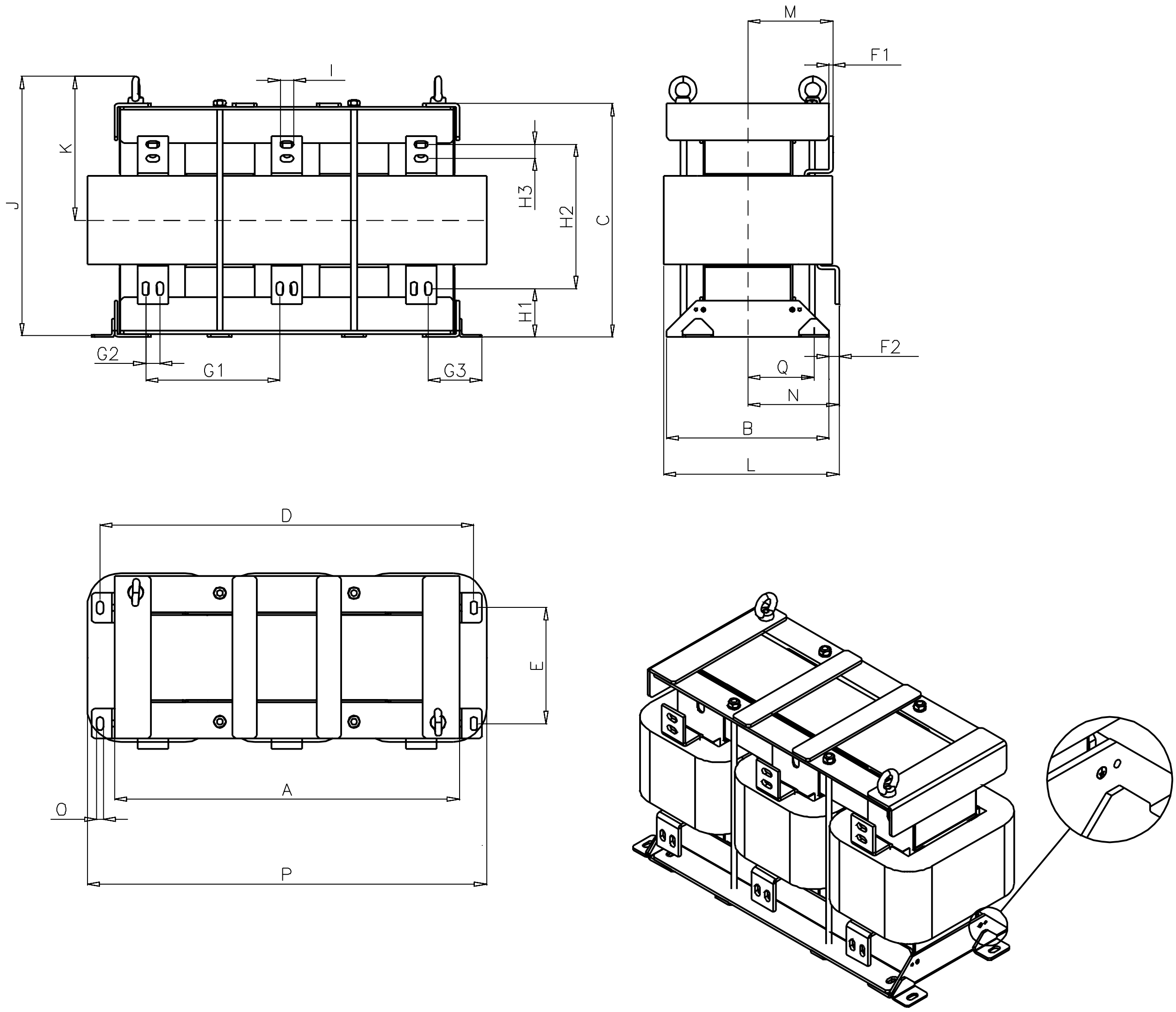


Figure 2-8 Dimension drawing of line reactor 6SL3000-0EH41-4AA0

Table 2- 11 Dimensions (all dimensions in mm)

A	B	C	D[1]	E[1]	F1	F2	G1
566	267	383	613	190	6	16	220
G2	G3	H1	H2	H3	I	J	K
23	88.5	79.5	236.5	23	22	426	213
L	M	N	O	P	Q		
288	139.5	149.5	11	655	108.5		

[1)] Lengths D and E correspond to the distance between holes

---

Note

The crane lifting eyes can be removed after installation.

2.4.4 Technical specifications

Table 2- 12 Technical specifications of line reactors for Smart Line Modules, 380 V – 480 V 3 AC

Order number	6SL3000-	0EE36-2AA0	0EE36-2AA0	0EE38-8AA0	0EE41-4AA0	0EE41-4AA0
Suitable for Smart Line Module	6SL3330-	6TE35-5AA0	6TE37-3AA0	6TE41-1AA0	6TE41-3AA0	6TE41-7AA0
Rated power of the Smart Line Module	kW	250	355	500	630	800
Rated voltage	V	3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 %				
I_{thmax}	A	676.5	676.5	973.5	1573	1573
Power loss 50/60 Hz	kW	0.500/0.560	0.500/0.560	0.725/0.810	0.925/1.080	0.925/1.080
Line/load connection		M12 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs	M12 connection lugs
PE connection		M6, 4x	M6, 4x	M8, 4x	M8, 4x	M8, 4x
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 268 230	 300 268 230	 442 376 263	 544 431 244	 544 431 244
Weight	kg	57	57	85.5	220	220

Table 2- 13 Technical specifications of line reactors for Smart Line Modules, 500 V – 690 V 3 AC

Order number	6SL3000-	0EH34-7AA0	0EH37-6AA0	0EH41-4AA0	0EH41-4AA0	
Suitable for Smart Line Module	6SL3330-	6TG35-5AA0	6TG38-8AA0	6TG41-2AA0	6TG41-7AA0	
Rated power of the Smart Line Module	kW	450	710	1000	1400	
Rated voltage	V	3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 %				
I_{thmax}	A	511.5	836	1573	1573	
Power loss 50/60 Hz	kW	0.720/0.820	0.840/0.950	1.680/1.850	1.680/1.850	
Line/load connection		M10 connection lugs	M10 connection lugs	M10 connection lugs	M10 connection lugs	
PE connection		M6, 4x	M8, 4x	M8, 4x	M8, 4x	
Degree of protection		IP00	IP00	IP00	IP00	
Dimensions Width Height Depth	 mm mm mm	 360 325 229	 442 370 303	 655 383 288	 655 383 288	
Weight	kg	58	145	239	239	

2.5 Active Interface Modules

2.5.1 Description

Active Interface Modules are used in conjunction with the Active Line Modules in chassis format. The Active Interface Modules contain a Clean Power Filter with basic RI suppression, the pre-charging circuit for the Active Line Module, the line voltage sensing circuit and monitoring sensors.

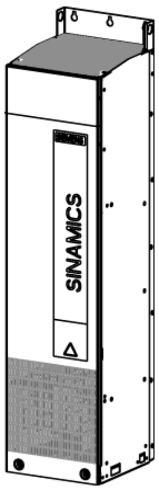
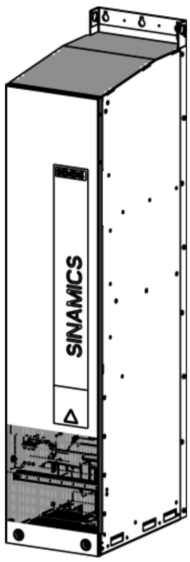
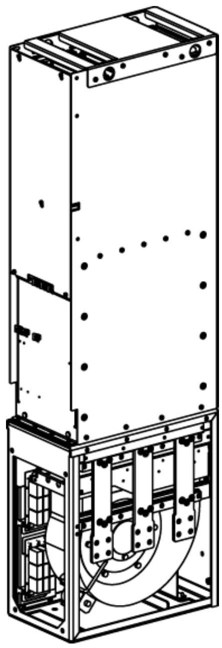
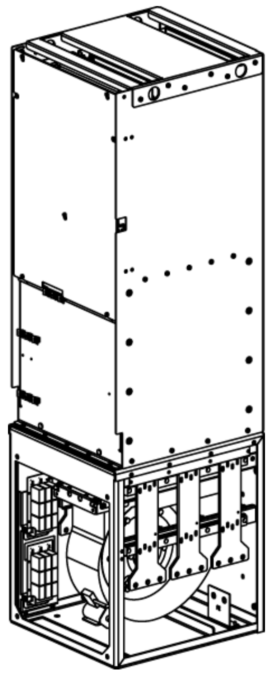
The bypass contactor is an integral component in frame sizes FI and GI, which ensures a highly compact design. The bypass contactor must be provided separately for frame sizes HI and JI.

The vast majority of line harmonics are suppressed by the Clean Power Filter.

The Active Interface Module contains:

- Clean Power Filter
- Line reactor
- Pre-charging circuit
- Bypass contactor (frame sizes FI/GI)
- Voltage Sensing Module (VSM)
- Fan

Table 2- 14 Active Interface Module

			
Frame size FI	Frame size GI	Frame size HI	Frame size JI

2.5.2 Safety information

⚠ CAUTION
The DC link discharge time hazard warning must be affixed to the component in the relevant local language.

NOTICE
The cooling clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

⚠ DANGER
Active Interface Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Active Interface Modules, they or the relevant control cabinet must be permanently connected to PE. According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

2.5.3 Interface description

2.5.3.1 Overview

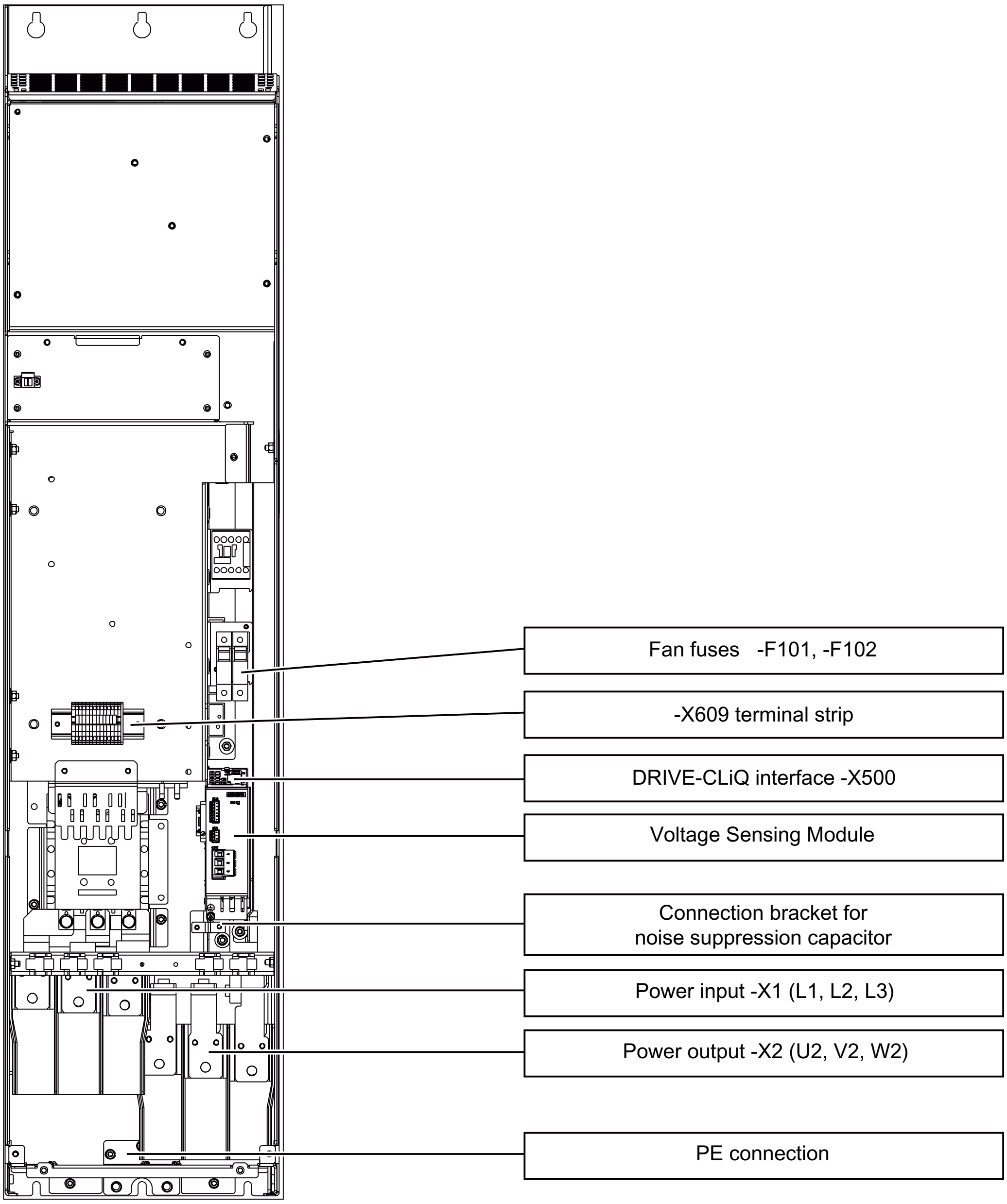


Figure 2-9 Interface overview in the Active Interface Module, frame size FI

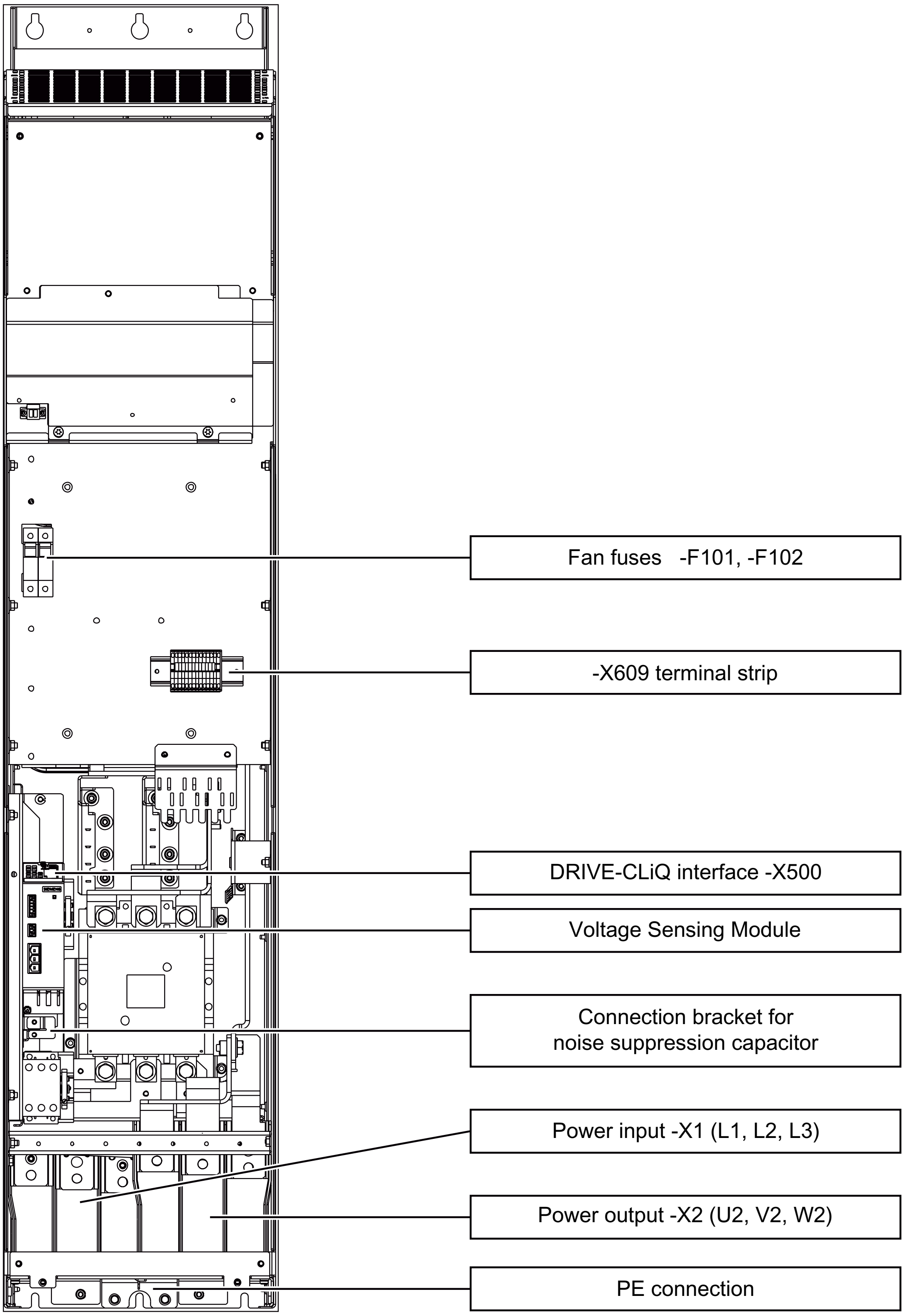


Figure 2-10 Interface overview in the Active Interface Module, frame size GI

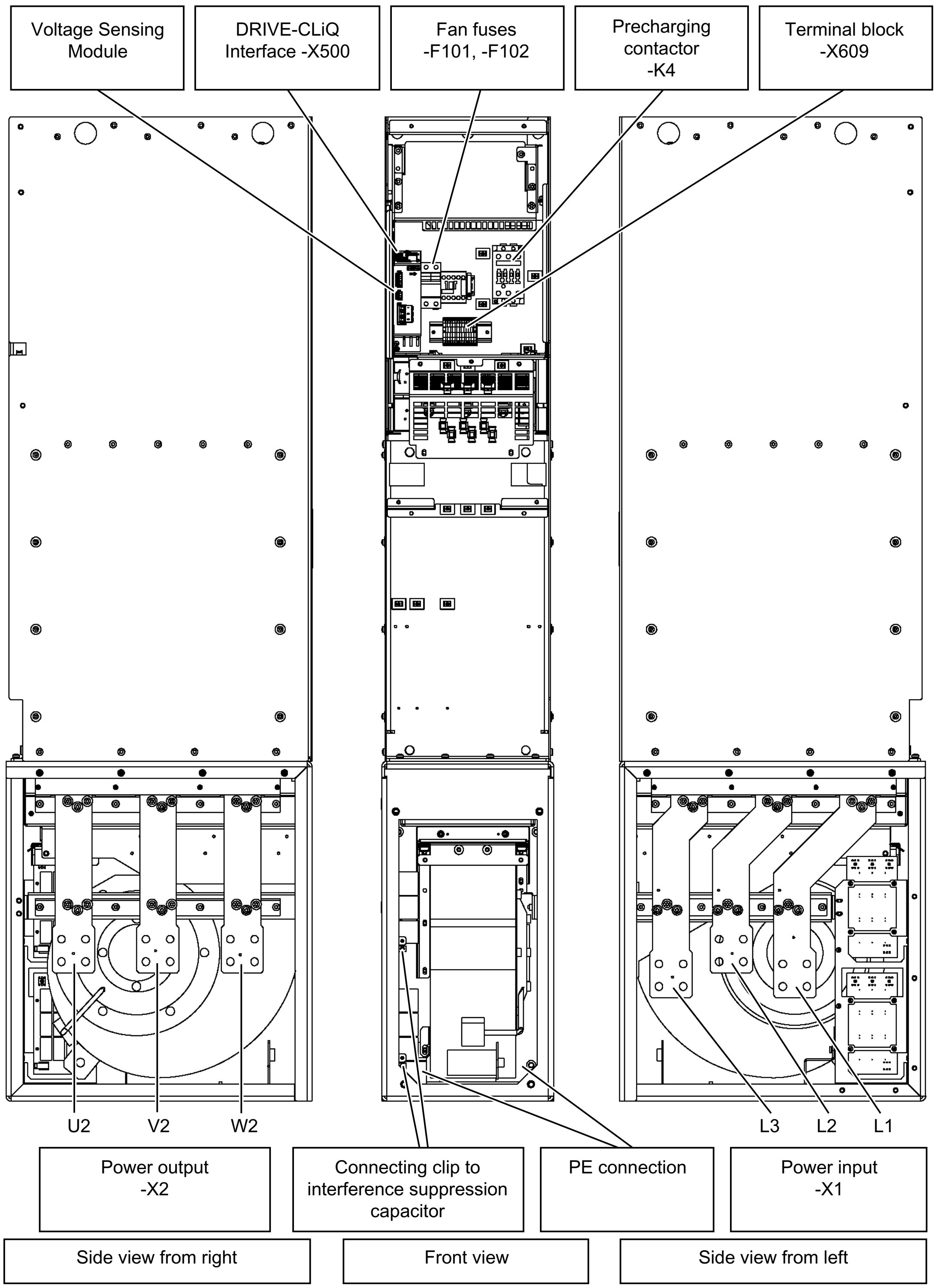


Figure 2-11 Interface overview in the Active Interface Module, frame size HI

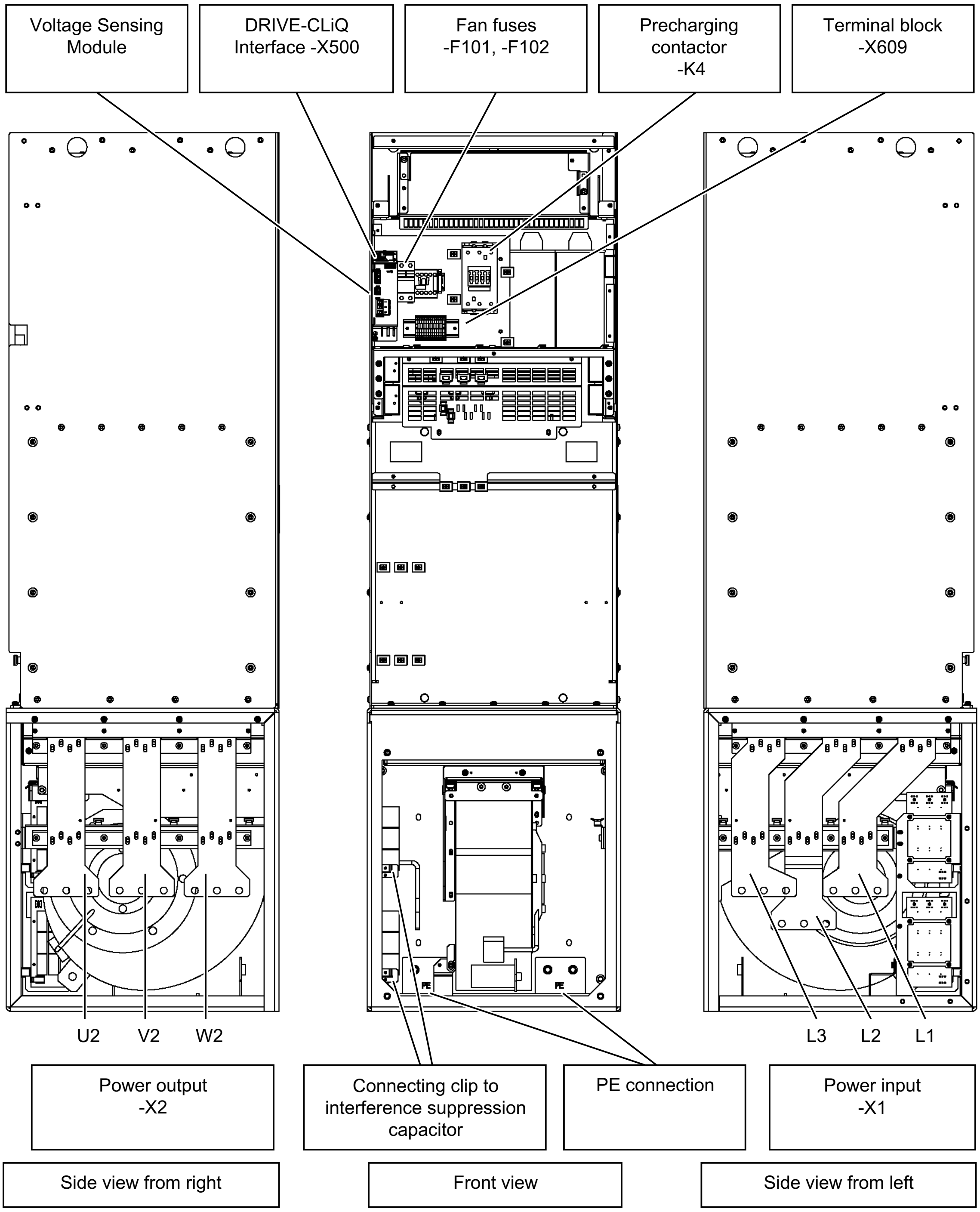
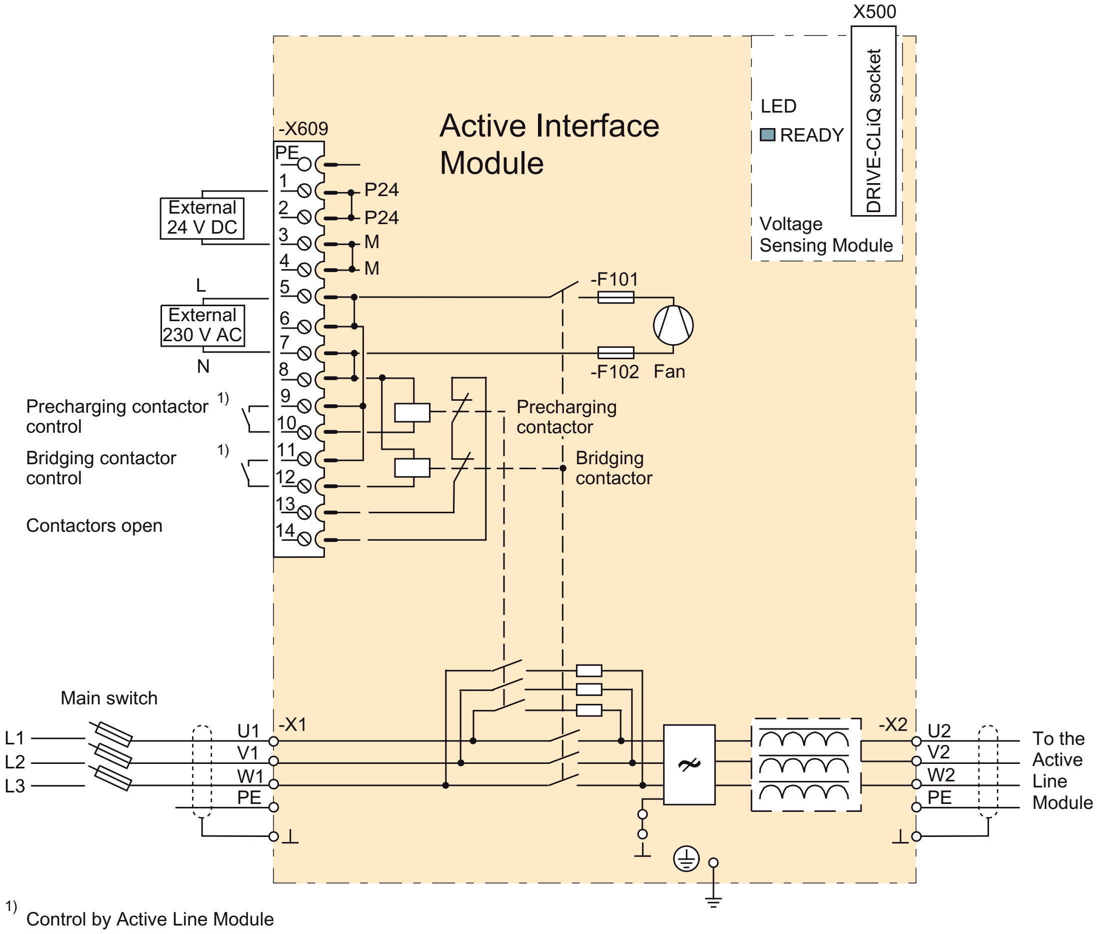


Figure 2-12 Interface overview in the Active Interface Module, frame size JI

2.5.3.2 Connection example



1) Control by Active Line Module

Figure 2-13 Connection example Active Interface Module, frame sizes FI / GI

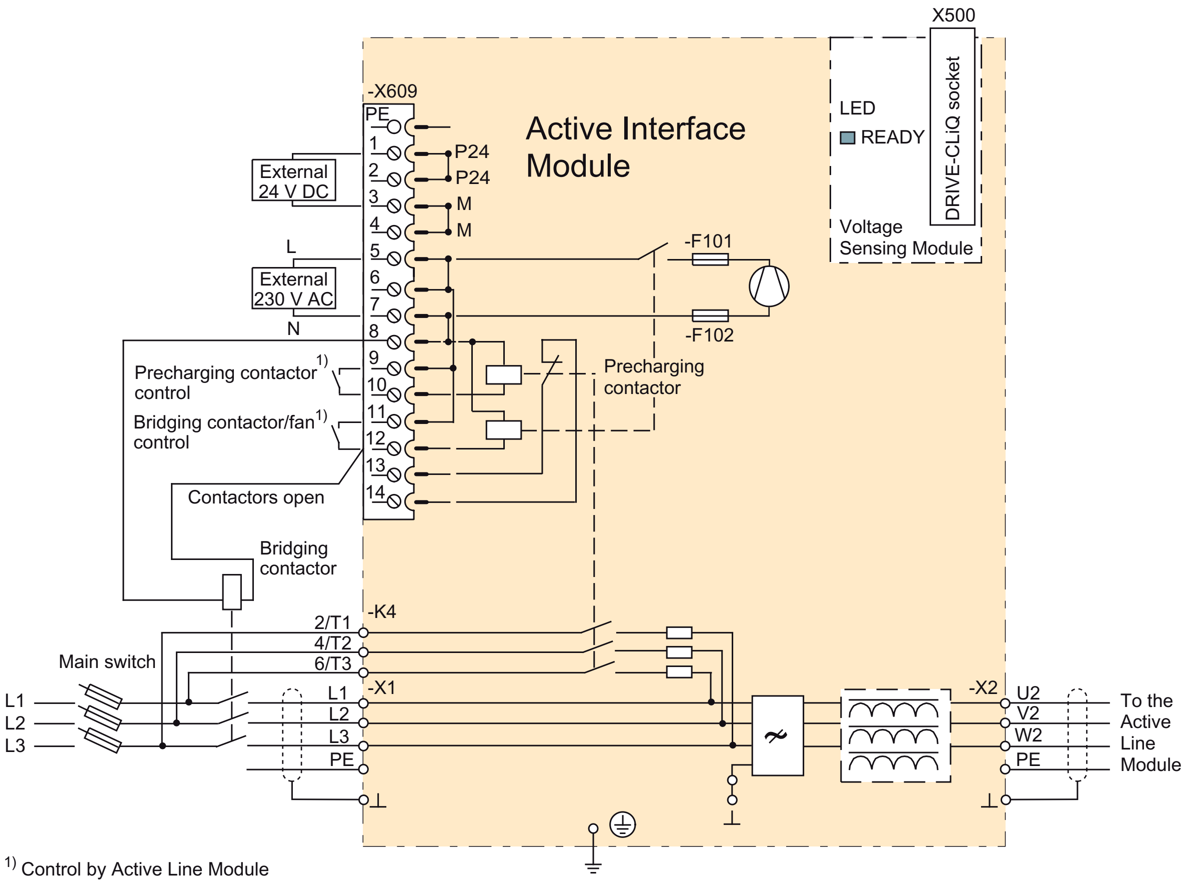


Figure 2-14 Connection example Active Interface Module, frame sizes HI / JI

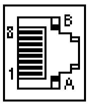
2.5.3.3 X1, X2 line/load connection

Table 2- 15 Connections for the Active Interface Module

Terminals	Designations
X1: L1, L2, L3 X2: U2, V2, W2	Voltage: • 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 % • 3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 % Frequency: 47 Hz to 63 Hz Connecting thread: • Frame sizes FI / GI: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HI / JI: M12 / 50 Nm for ring cable lugs to DIN 46234
K4: 2/T1, 4/T2, 6/T3 (for frame sizes HI / JI only)	Connection for pre-charging circuit directly on precharging contactor: • Frame size HI: 2 x 16 mm² max. (3RT1034) • Frame size JI: 2 x 35mm² max. (3RT1044)
PE connection	Connecting thread: • Frame sizes FI / GI: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HI / JI: M12 / 50 Nm for ring cable lugs to DIN 46234

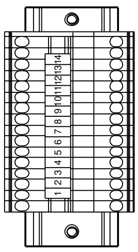
2.5.3.4 DRIVE-CLiQ interface X500

Table 2- 16 DRIVE-CLiQ interface X500

	PIN	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order no.: Y-ConAS-13			

2.5.3.5 X609 terminal strip

Table 2- 17 X609 terminal strip

	Terminal	Designation	Technical specifications	
	1	P24	Voltage: 24 V DC (20.4 V – 28.5 V) Power consumption: max. 0.25 A	
	2	P24		
	3	M		
	4	M		
	5	L	Voltage: 230 V AC (195.5 V – 264.5 V) Power consumption: max. 10 A Fan operating currents, see "Technical specifications"	
	6	L		
	7	N		
	8	N		
	9	Precharging contactor–A1	Voltage: 230 V AC (195.5 V – 264.5 V) Power consumption: max. 4 A	To Active Line Module, X9:5
	10	Precharging contactor–A2		To Active Line Module, X9:6
	11	Bridging contactor–A1	Voltage: 230 V AC (195.5 V – 264.5 V) Power consumption: max. 6 A	To Active Line Module, X9:3
	12	Bridging contactor–A2		To Active Line Module, X9:4
	13	Contactor feedback 1 *	Voltage: 230VAC (195.5V – 264.5V) Max. permissible current: 6 A	
	14	Contactor feedback 2 *		
Max. connectable cross-section 1.5 mm^2				

* Series connection NO contact of precharging contactor and bridging contactor (only for frame size FI, GI)

CAUTION
Active Interface Modules of frame sizes HI and JI require a signal on terminal X609:11 and 12 to control the fans. If this signal is not present during operation, the fans do not rotate and the module is shut down on overtemperature.

2.5.3.6 Meaning of the LED on the Voltage Sensing Module (VSM) in the Active Interface Module

Table 2- 18 Description of the LED on the Voltage Sensing Module (VSM) in the Active Interface Module

LED	Color	State	Description
RDY	---	Off	The electronics power supply is missing or out of tolerance
	Green	Continuously lit	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	Continuously lit	DRIVE-CLiQ communication is being established.
	Red	Continuously lit	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
	Green / red	Flashing 0.5 Hz	Firmware is being downloaded.
		Flashing 2 Hz	Firmware download is complete. Waiting for POWER ON
	Green / orange or Red / orange	Flashing 2 Hz	Component recognition via LED is activated (p0144) Note: The two options depend on the LED status when module recognition is activated via p0144 = 1.

2.5.4 Dimension drawing

Dimension drawing, frame size FI

The mandatory cooling clearances are indicated by the dotted line.

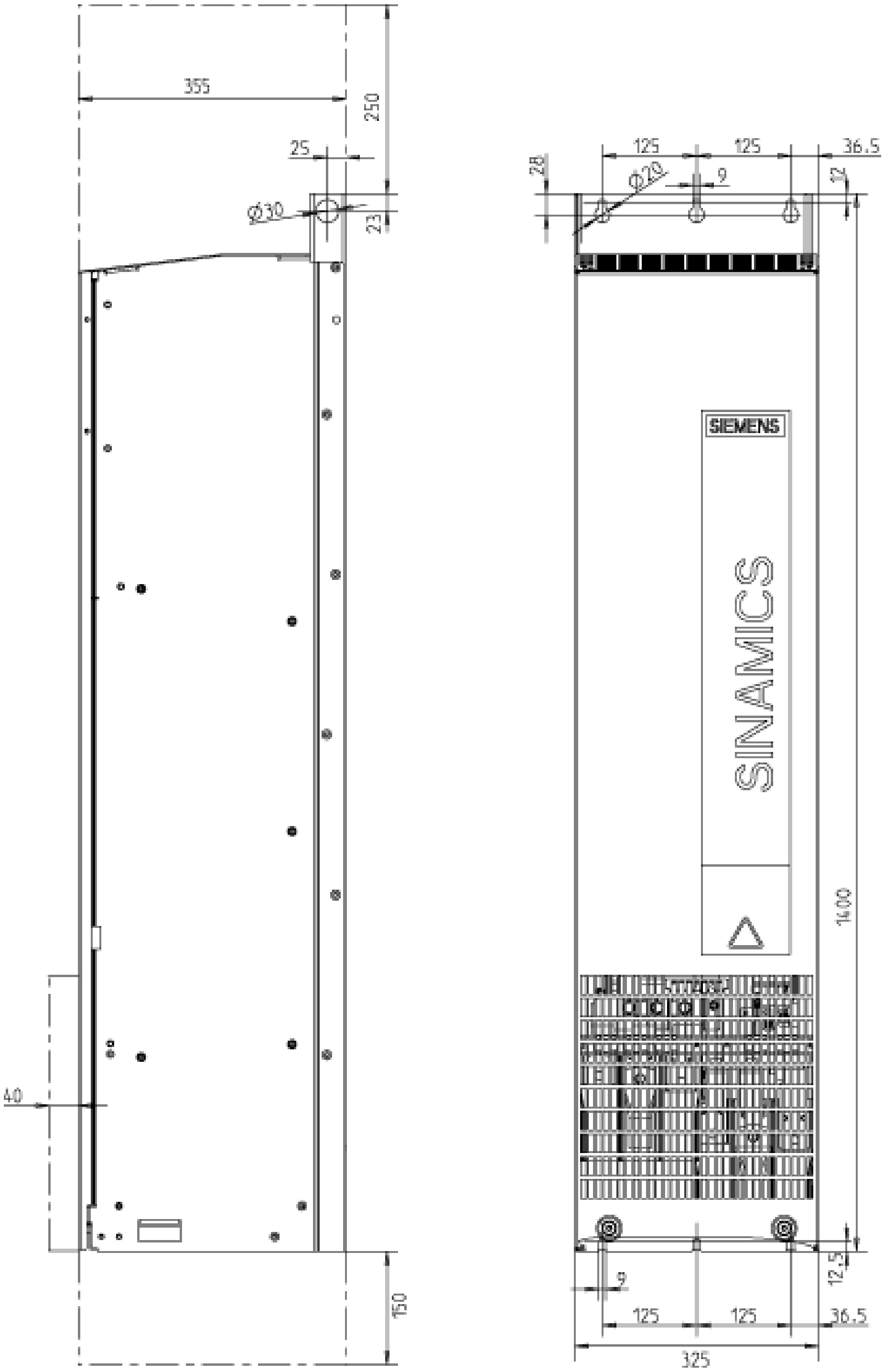


Figure 2-15 Dimension drawing for Active Interface Module, frame size FI Side view, front view

Dimension drawing, frame size GI

The mandatory cooling clearances are indicated by the dotted line.

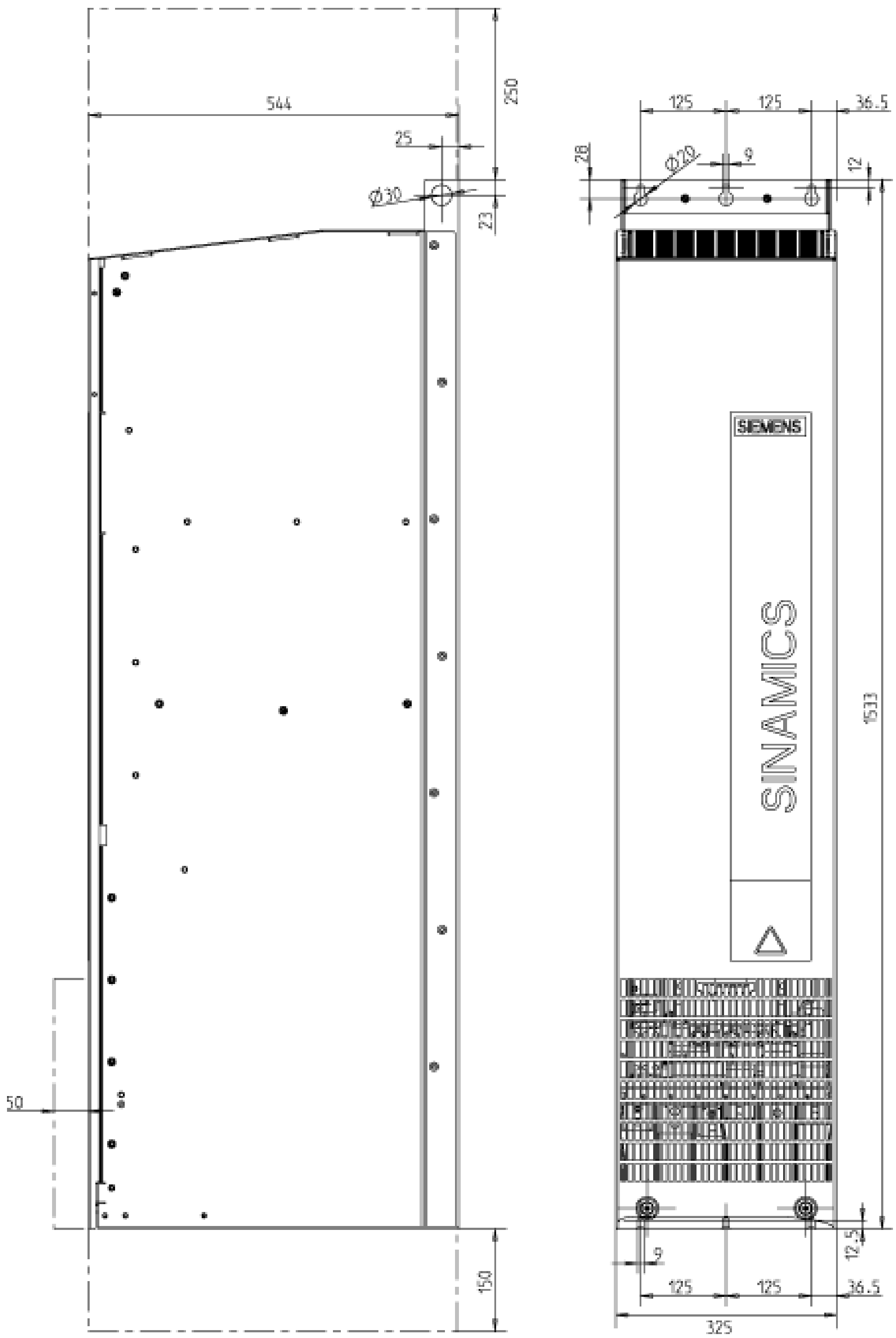


Figure 2-16 Dimension drawing for Active Interface Module, frame size GI Side view, front view

Dimension drawing, frame size HI

The mandatory cooling clearances are indicated by the dotted line.

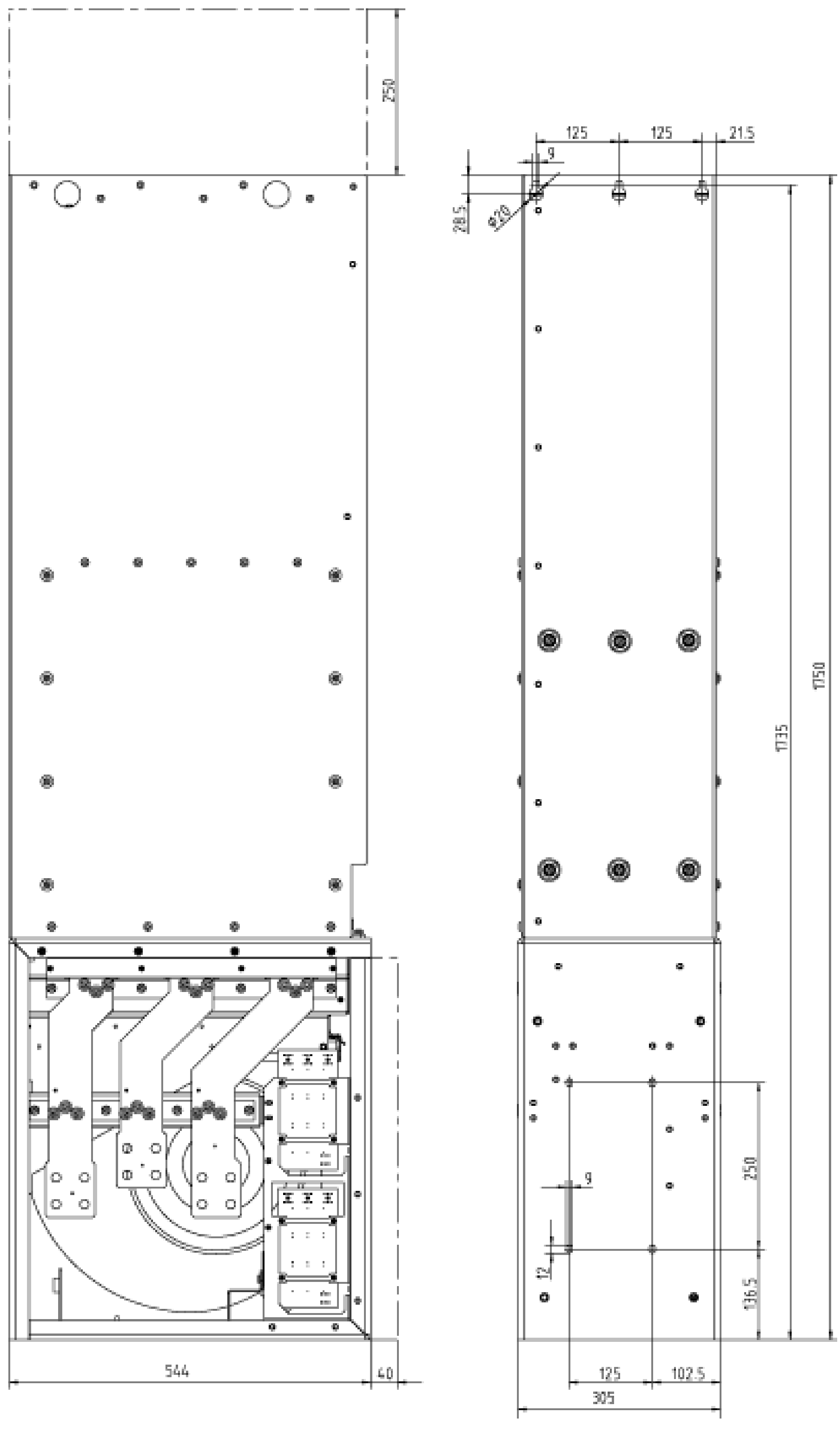


Figure 2-17 Dimension drawing for Active Interface Module, frame size HI Side view, rear view

Dimension drawing, frame size JI

The mandatory cooling clearances are indicated by the dotted line.

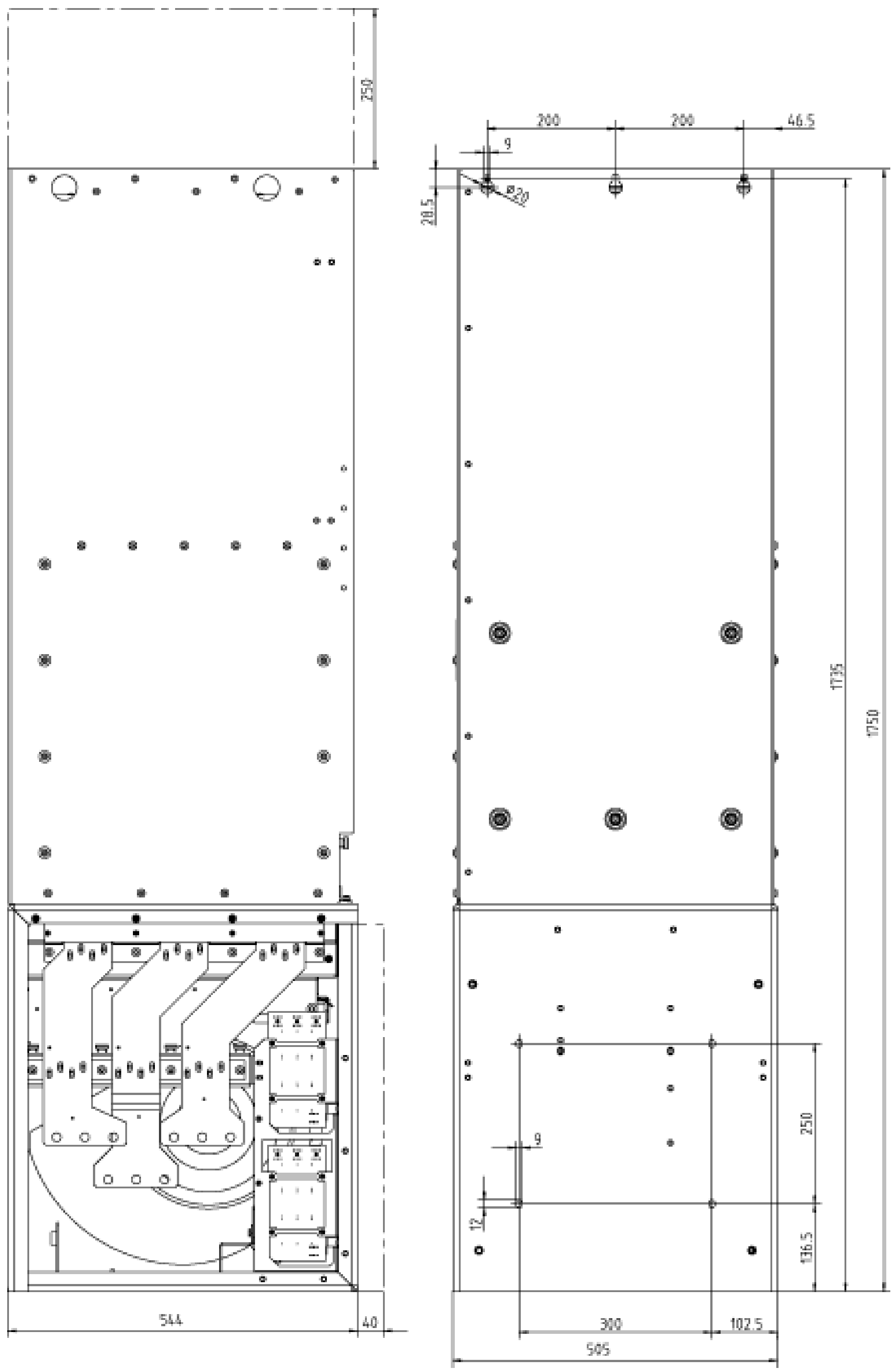


Figure 2-18 Dimension drawing for Active Interface Module, frame size JI Side view, rear view

2.5.5 Electrical connection

The Active Interface Module is electrically connected in accordance with the connection examples shown in section "Interface description".

Operating an Active Interface Module on an isolated-neutral network (IT system)

When the device is operated on an isolated-neutral network (IT system), the connection bracket to the noise suppression capacitor must be removed (e.g.: see "1" in figure below).

The interface overview in the section "Interface description" shows the position of the connection bracket on the different frame sizes.

With devices of frame sizes HI and JI, two connection brackets must be removed.

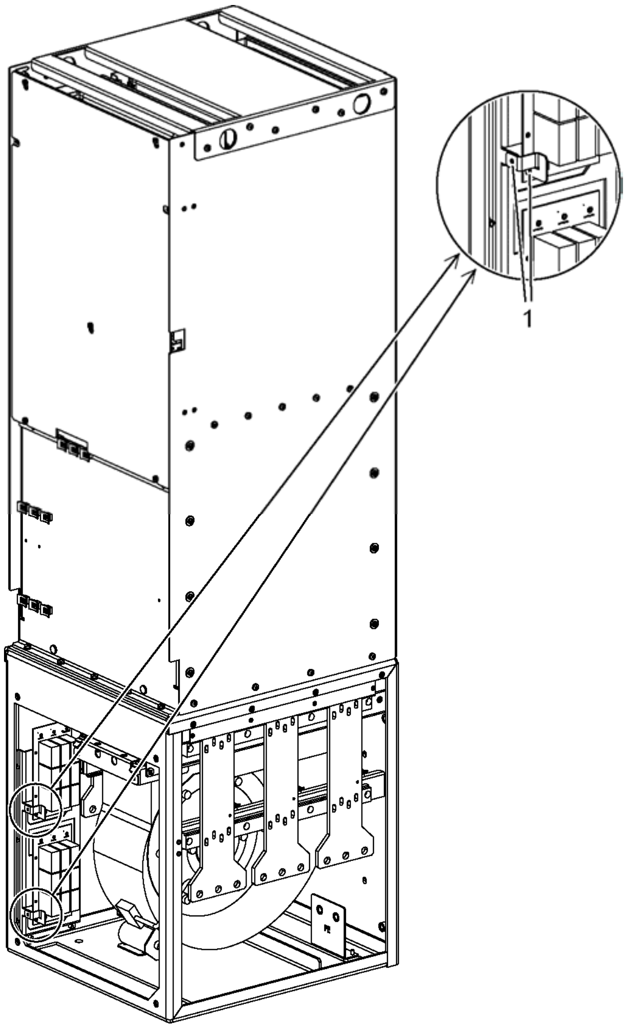


Figure 2-19 Removing the connection bracket to the noise suppression capacitor (example: frame size JI)

⚠ WARNING
Failing to remove the connection bracket for the noise suppression capacitor on a non-grounded system/IT system can cause significant damage to the unit.

2.5.6 Technical specifications

Table 2- 19 Technical specifications for Active Interface Modules, 380 V – 480 V 3 AC, part 1

Order number	6SL3300–	7TE32–6AA0	7TE32–6AA0	7TE33–8AA0	7TE35–0AA0
Suitable for Active Line Module Rated power of Active Line Module	6SL3330- kW	7TE32-1AA0 132	7TE32-6AA0 160	7TE33-8AA0 235	7TE35-0AA0 300
Rated current	A	210	260	380	490
Supply voltages - Line voltage - Line frequency - Electronics power supply - Fan supply voltage	 V_{ACrms} Hz V_{DC} V_{AC}	 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 230 (195.5 - 264.5)			
DC link capacitance of the drive line-up, max.	 µF	 41600	 41600	 76800	 76800
Power requirements - Electronics power consumption (24 V DC) - Max. fan power consumption, 230 V 2 AC, 50/60 Hz, max.	 A A	 0.17 0.45 / 0.6	 0.17 0.45 / 0.6	 0.17 0.9 / 1.2	 0.17 0.9 / 1.2
Power consumption bridging contactor (230 V AC) - Making current - Holding current	 A A	 1.25 0.6	 1.25 0.6	 2.5 1.2	 2.5 1.2
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
Power loss	kW	2.1	2.2	3.0	3.9
Cooling air requirement	m^3/s	0.24	0.24	0.47	0.47
Sound pressure level L_{pA} (1 m) at 50/60 Hz [1)]	 dB(A)	 74 / 76	 75 / 77	 76 / 78	 76 / 78
Line/load connection L1, L2, L3 / U2, V2, W2		Flat connector for screw M10	 M10	 M10	 M10
PE connection		M10 screw	M10 screw	M10 screw	M10 screw
Line/load connection - Line connection (L1, L2, L3) - Load connection (U2, V2, W2) - PE connection	 mm² mm² mm²	 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 325 1400 355	 325 1400 355	 325 1533 544	 325 1533 544
Frame size		FI	FI	GI	GI
Weight	kg	135	135	190	190

[1)] Sound pressure level of Active Interface Module and Active Line Module

Table 2- 20 Technical specifications for Active Interface Modules, 380 V – 480 V 3 AC, part 2

Order number	6SL3300–	7TE38–4AA0	7TE38–4AA0	7TE41–4AA0	7TE41–4AA0
Suitable for Active Line Module Rated power of Active Line Module	6SL3330- kW	7TE36-1AA0 380	7TE38-4AA0 500	7TE41-0AA0 630	7TE41-4AA0 900
Rated current	A	604	840	985	1405
Supply voltages - Line voltage - Line frequency - Electronics power supply - Fan supply voltage	 V_{ACrms} Hz V_{DC} V_{AC}	 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 230 (195.5 - 264.5)			
DC link capacitance of the drive line-up, max.	 µF	 134400	 134400	 230400	 230400
Power requirements - Electronics power consumption (24 V DC) - Max. fan power consumption, 230 V 2 AC, 50/60 Hz, max.	 A A	 0.17 3.6 / 4.6	 0.17 3.6 / 4.6	 0.17 3.8 / 4.9	 0.17 3.8 / 4.9
Bridging contactor	A	3RT1476- 6AP36	3WL1110- 2BB34-4AN2-Z Z=C22	3WL1112- 2BB34-4AN2-Z Z=C22	3WL1116- 2BB34-4AN2-Z Z=C22
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
Power loss	kW	5.5	6.1	7.5	8.5
Cooling air requirement	m^3/s	0.40	0.40	0.40	0.40
Sound pressure level L_{pA} (1 m) at 50/60 Hz [1]	 dB(A)	 78 / 80	 78 / 80	 78 / 80	 78 / 80
Line/load connection L1, L2, L3 / U2, V2, W2		Flat connector for screw M12	 M12	 M12	 M12
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
Line/load connection - Line connection (L1, L2, L3) - Load connection (U2, V2, W2) - PE connection	 mm² mm² mm²	 4 x 240 4 x 240 2 x 240	 4 x 240 4 x 240 2 x 240	 6 x 240 6 x 240 4 x 240	 6 x 240 6 x 240 4 x 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 305 1750 544	 305 1750 544	 505 1750 544	 505 1750 544
Frame size		HI	HI	JI	JI
Weight	kg	390	390	620	620

[1] Sound pressure level of Active Interface Module and Active Line Module

Table 2- 21 Technical specifications for Active Interface Modules, 500 V–690 V 3 AC

Order number	6SL3300–	7TG35–8AA0	7TG37–4AA0	7TG41–3AA0	7TG41–3AA0
Suitable for Active Line Module Rated power of Active Line Module	6SL3330- kW	7TG35-8AA0 560	7TG37-4AA0 800	7TG41-0AA0 1100	7TG41-3AA0 1400
Rated current	A	575	735	1025	1270
Supply voltages - Line voltage - Line frequency - Electronics power supply - Fan supply voltage	 V_{ACrms} Hz V_{DC} V_{AC}	 3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 230 (195.5 - 264.5)			
DC link capacitance of the drive line-up, max.	 µF	 59200	 153600	 153600	 153600
Power requirements - Electronics power consumption (24 V DC) - Max. fan power consumption, 230 V 2 AC	 A A	 0.17 4.6	 0.17 4.6	 0.17 4.9	 0.17 4.9
Bridging contactor	A	3RT1476-6AP36	3RT1476-6AP36 (3 x)	3WL1212-4BB34-4AN2-Z Z=C22	3WL1216-4BB34-4AN2-Z Z=C22
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
Power loss	kW	6.8	9.0	9.6	9.6
Cooling air requirement	m^3/s	0.40	0.40	0.40	0.40
Sound pressure level L_{pA} (1 m) at 50/60 Hz [1)]	 dB(A)	 78 / 80	 78 / 80	 78 / 80	 78 / 80
Line/load connection L1, L2, L3 / U2, V2, W2		Flat connector for screw M12	 M12	 M12	 M12
PE connection		M12 screw	M12 screw	M12 screw	M12 screw
Line/load connection - Line connection (L1, L2, L3) - Load connection (U2, V2, W2) - PE connection	 mm² mm² mm²	 4 x 240 4 x 240 2 x 240	 6 x 240 6 x 240 4 x 240	 6 x 240 6 x 240 4 x 240	 6 x 240 6 x 240 4 x 240
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 305 1750 544	 505 1750 544	 505 1750 544	 505 1750 544
Frame size		HI	JI	JI	JI
Weight	kg	390	620	620	620

1) Sound pressure level of Active Interface Module and Active Line Module

3 Line Modules

3.1 Introduction

The drive line-up is connected to the power supply network via the Line Modules.

Line Infeeds generate a DC voltage from the connected line voltage that is used to power the connected Motor Modules.

The Line and Interface Modules are suitable for direct operation on TN, IT and TT systems.

General characteristics of the Line Modules

- Supply voltage:
  - 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 %
  - 3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 %
- Line frequency: 47 to 63 Hz
- Suitable for TN, TT, and IT supply systems
- Operating status and error status via LEDs

3.2 Basic Line Modules

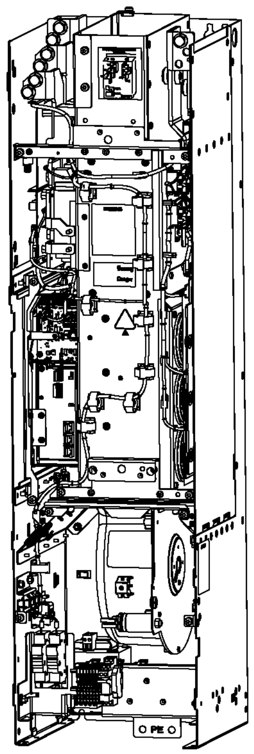
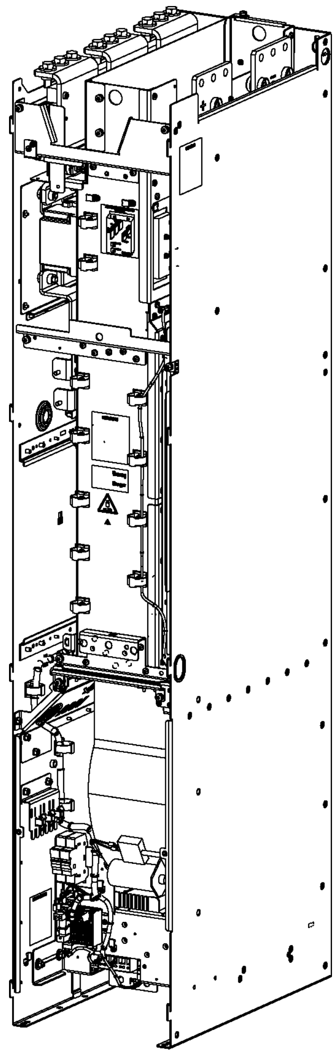
3.2.1 Description

Basic Line Modules are used for the power infeed into the DC link.

They are suitable for applications in which no regenerative energy is produced, or in which the energy exchange takes place between the motor- and the generator-driven axes in the DC link.

The DC link voltage is greater than the rms value of the line rated voltage by a factor of 1.35 (under partial load) or 1.32 (under full load).

Table 3- 1 Overview of Basic Line Modules

	
Frame size FB	Frame size GB

Components of the Basic infeed

A Basic Infeed comprises a Basic Line Module and an external line connection, which comprises a line filter and a line reactor.

Operating principle

One or more Motor Modules can be connected to the power supply network via the Basic Line Module. The Basic Line Module provides the DC link voltage for the Motor Modules.

The Basic Line Module is suitable for direct operation both on TN and on IT and TT systems.

3.2.2 Safety information

WARNING

A hazardous voltage will be present in the component for a further 5 minutes after all voltage supplies have been disconnected. Work cannot be carried out until this time has elapsed.

Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC link terminals DCP and DCN.

CAUTION

The DC link discharge time hazard warning must be affixed to the component in the relevant local language.

NOTICE

The cooling clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

DANGER

Basic Line Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Basic Line Modules, they or the relevant control cabinet must be permanently connected to PE.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

3.2.3 Interface description

3.2.3.1 Overview

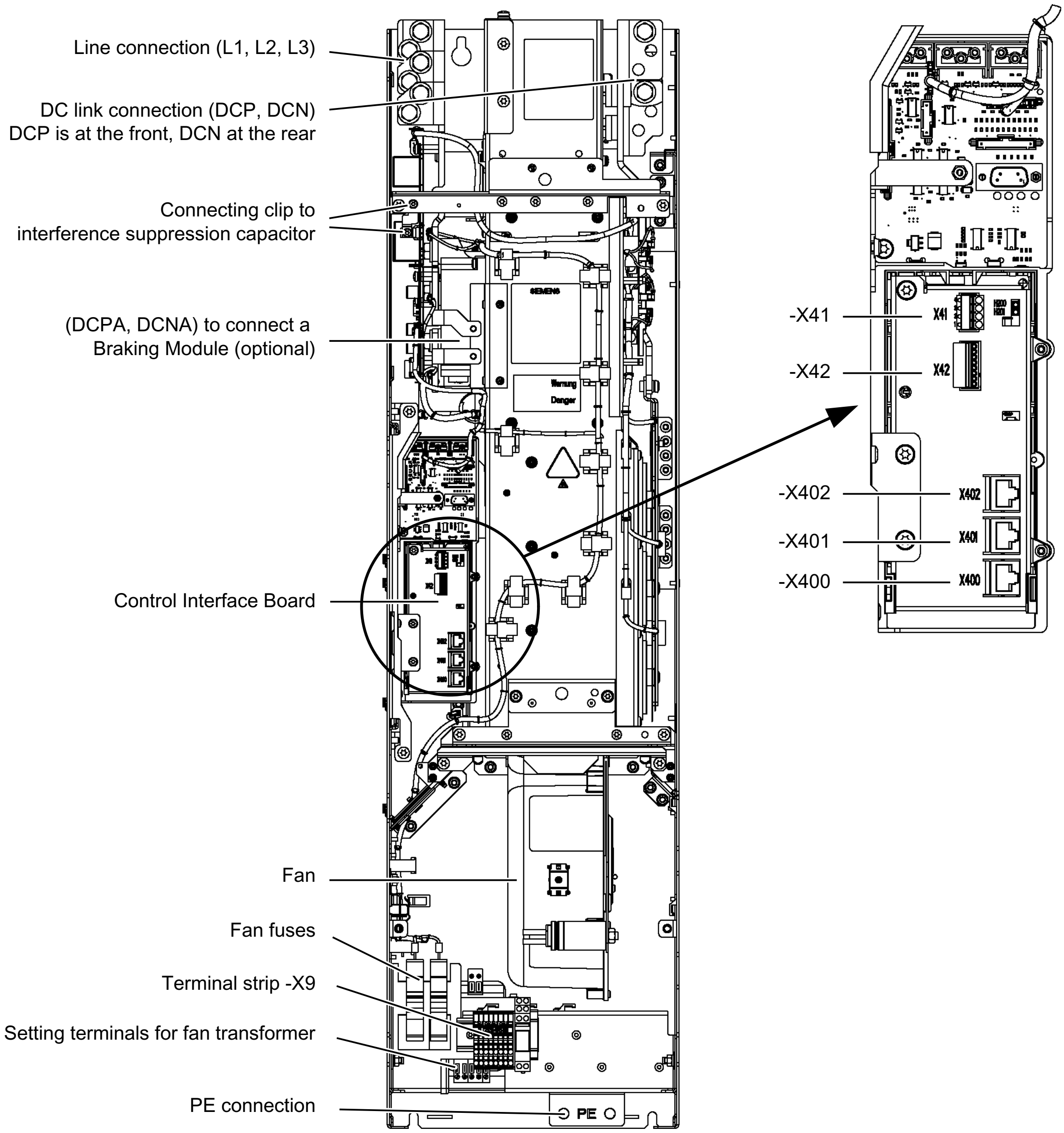


Figure 3-1 Basic Line Module, frame size FB

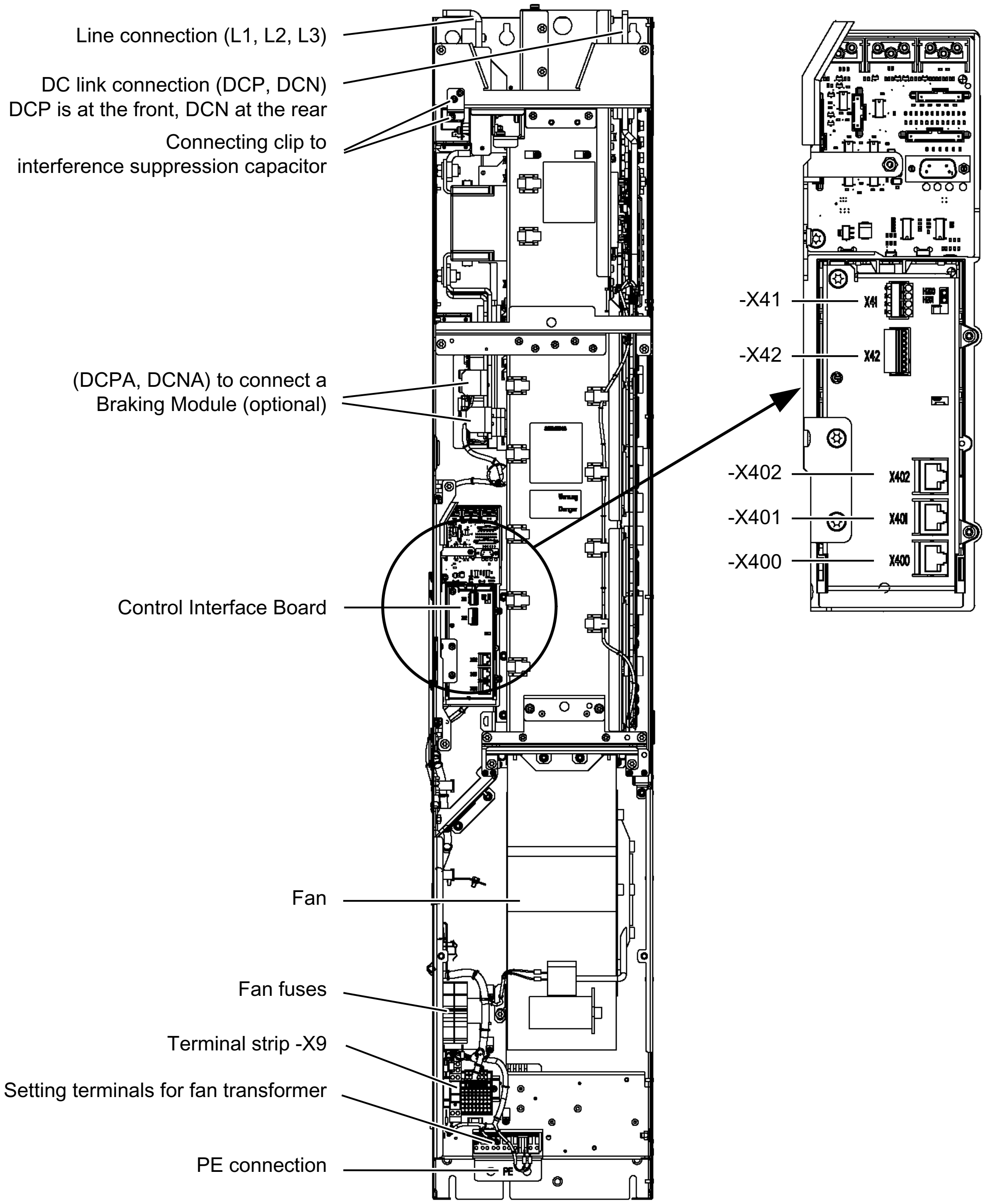


Figure 3-2 Basic Line Module, frame size GB

3.2.3.2 Connection example

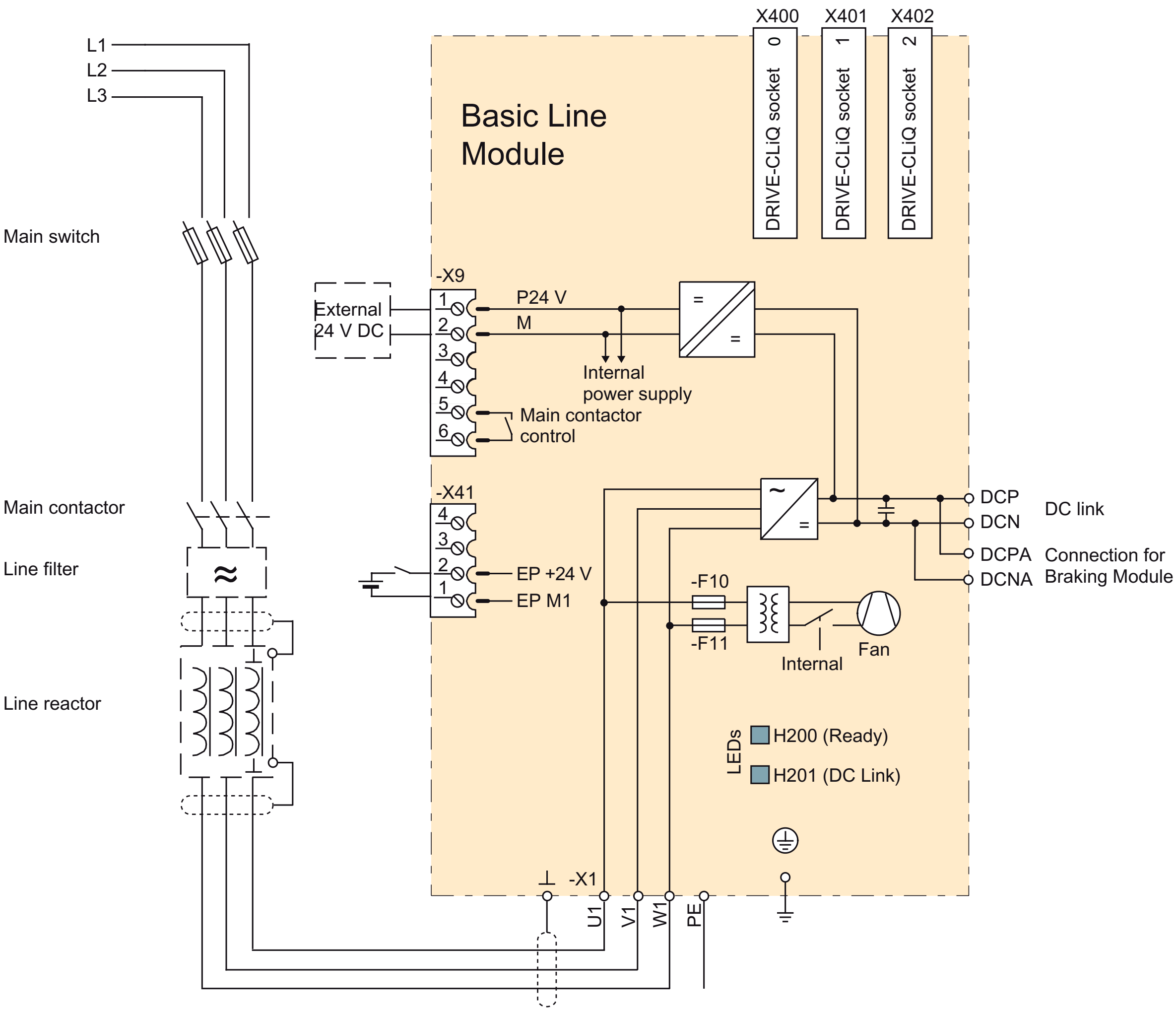


Figure 3-3 Connection example: Basic Line Module

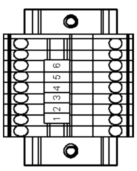
3.2.3.3 Line/load connection

Table 3- 2 Line/load connection of the Basic Line Module

Terminals	Technical specifications
U1, V1, W1 3 AC power input	Voltage: • 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 % • 3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 % Frequency: 47 Hz to 63 Hz Connecting thread: • Frame size FB: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame size GB: M12 / 50 Nm for ring cable lugs to DIN 46234
DCPA, DCNA Connection for Braking Module	Voltage: • 513 V to 648 V DC • 675 V to 932 V DC Connections: Frame sizes FB, GB: Threaded bolt M6 / 6 Nm for ring cable lugs to DIN 46234
DCP, DCN DC power output	Voltage: • 513 V to 648 V DC • 675 V to 932 V DC Connecting thread: • Frame size FB: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame size GB: M12 / 50 Nm for ring cable lugs to DIN 46234
PE connection	Connecting thread: • Frame size FB: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame size GB: M12 / 50 Nm for ring cable lugs to DIN 46234

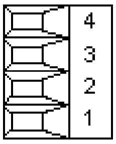
3.2.3.4 X9 terminal strip

Table 3- 3 X9 terminal strip

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: max. 1.1 A
	2	M	
	3	Reserved, do not use	
	4		
	5	Main contactor control	240 V AC: max. 8 A 30 V DC: max. 1 A isolated
	6		
Max. connectable cross-section 1.5 mm²			

3.2.3.5 X41 EP terminals

Table 3- 4 X41 terminal strip

	Terminal	Function	Technical specifications
	4	Not assigned	
	3	Not assigned	
	2	EP +24 V (enable pulses)	Supply voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: 10 mA Signal propagation times: L → H 100 μs H → L: 1000 μs
	1	EP M1 (enable pulses)	
Max. connectable cross-section 1.5mm^2			

Note

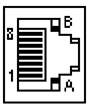
For operation, 24 V DC must be connected to terminal 2 and ground to terminal 1. Pulse suppression is activated when terminals are disconnected.

3.2.3.6 X42 terminal strip

Reserved, do not use!

3.2.3.7 DRIVE-CLiQ interfaces X400, X401, X402

Table 3- 5 DRIVE-CLiQ interfaces X400, X401, X402

	PIN	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order no.: Y-ConAS-13			

3.2.3.8 Meaning of the LEDs on the Control Interface Board in the Basic Line Module

Table 3- 6 Meaning of the LEDs on the Control Interface Board in the Basic Line Module

LED state		Description
H200	H201	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

WARNING

Irrespective of the state of LED "H201", hazardous DC link voltage can always be present.

The warning information on the component must be carefully observed!

3.2.4 Dimension drawing

Dimension drawing, frame size FB

The mandatory cooling clearances are indicated by the dotted line.

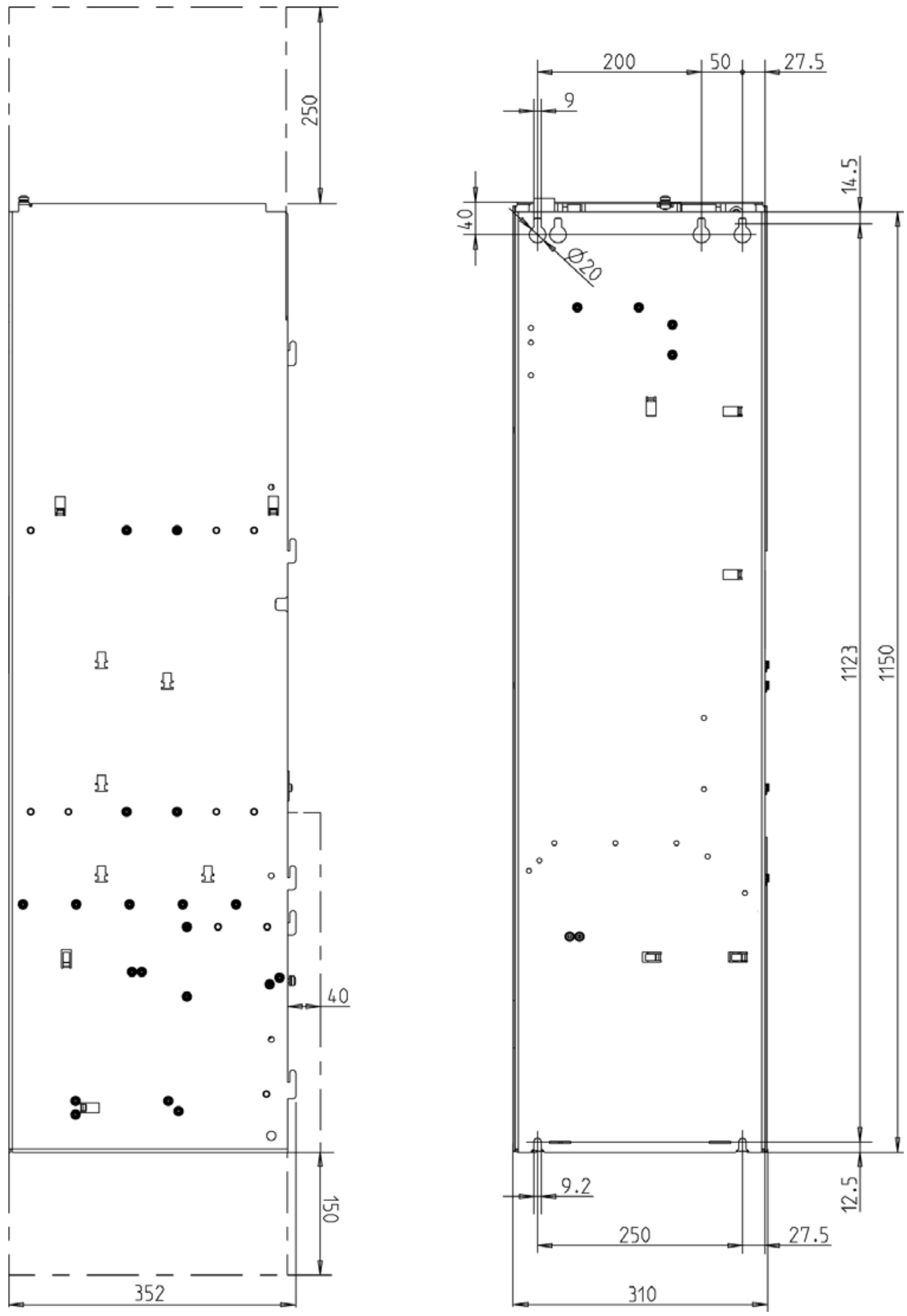


Figure 3-4 Dimension drawing, Basic Line Module, frame sizes FB, side view, front view

Dimension drawing, frame size GB

The mandatory cooling clearances are indicated by the dotted line.

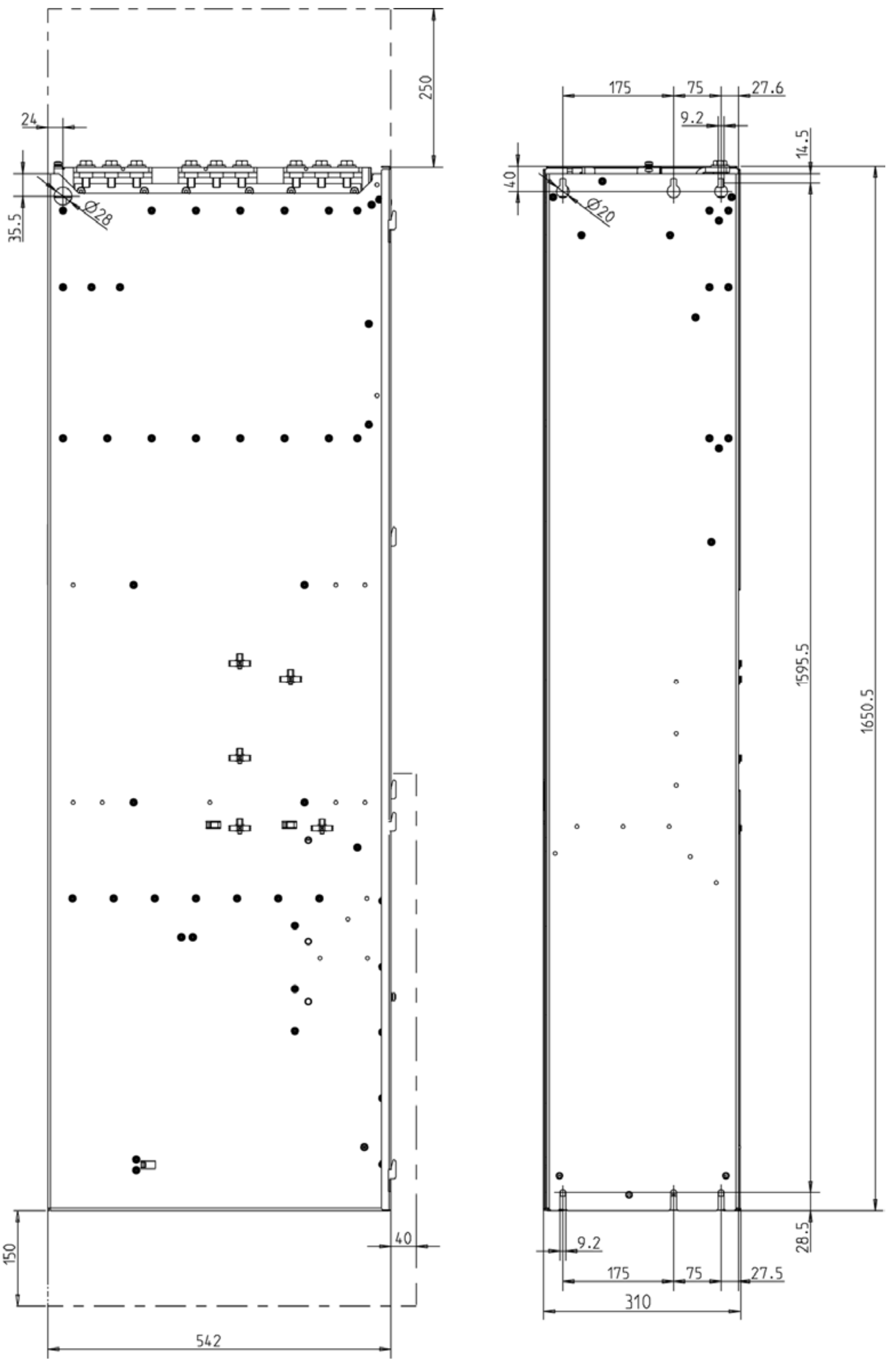


Figure 3-5 Dimension drawing, Basic Line Module, frame size GB Side view, rear view

3.2.5 Electrical connection

Operating a Basic Line Module from an insulated network (IT system)

When the device is operated on an isolated-neutral network (IT system), the connection bracket to the noise suppression capacitor must be removed (e.g.: see "1" in figure below).

The interface overview in the section "Interface description" shows the position of the connection bracket on the different frame sizes.

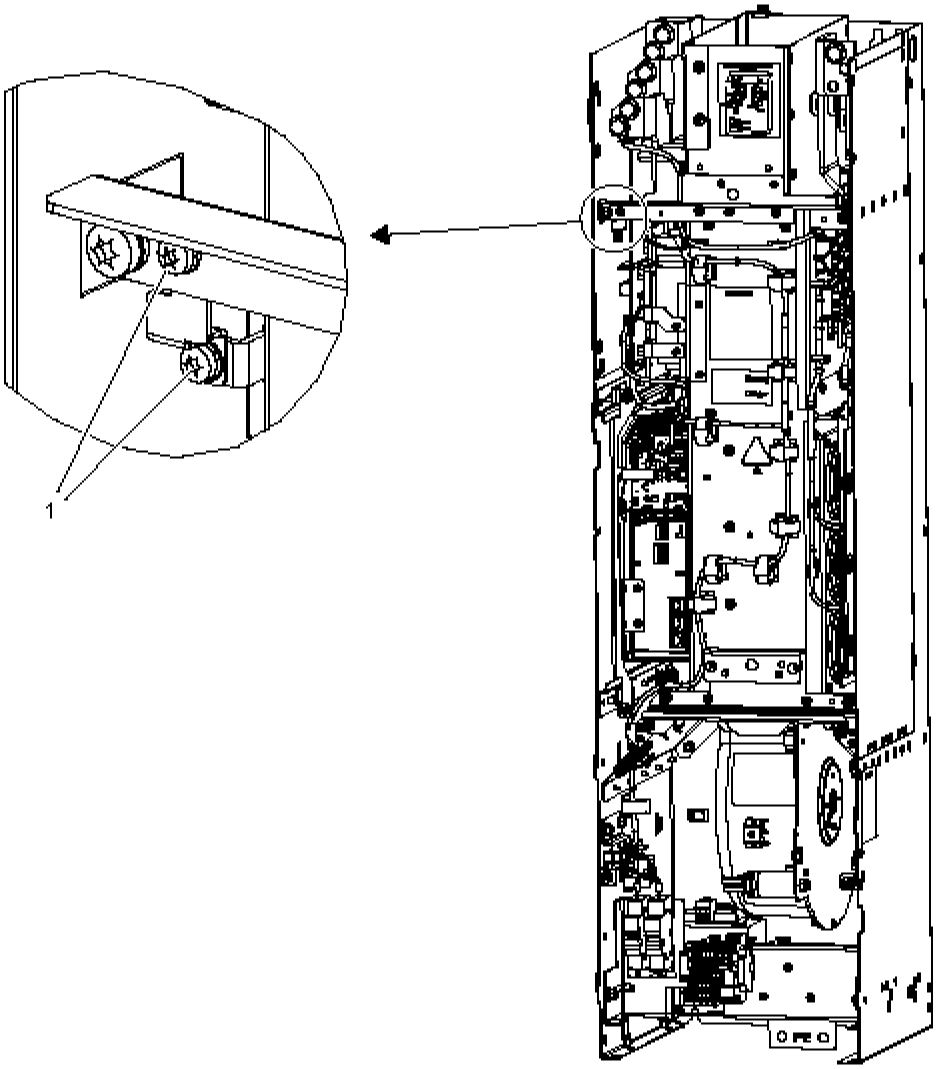


Figure 3-6 Removing the connection bracket to the noise suppression capacitor (example: frame size FB)

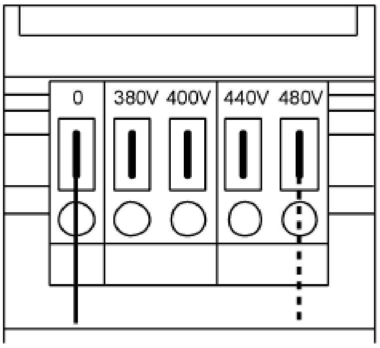
⚠ WARNING
Failing to remove the connection bracket for the noise suppression capacitor on a non-grounded system/IT system can cause significant damage to the unit.

Adjusting the fan voltage (-T10)

The power supply for the device fans (1-ph. 230 V AC) in the Basic Line Module (-T10) is taken from the line supply using transformers. The locations of the transformers are indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.



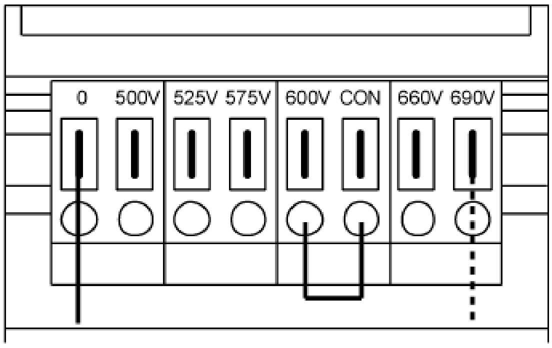


Figure 3-7 Setting terminals for the fan transformers (380 V – 480 V 3 AC / 500 V – 690 V 3 AC)

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V/0 V or 690 V/0 V).

Note

With the 500 V – 690 V 3 AC fan transformer, a jumper is inserted between the "600 V" terminal and the "CON" terminal. The "600 V" and "CON" terminals are for internal use.

CAUTION

If the terminals are not reconnected to the actual line voltage:

- The required cooling level will not be provided (risk of overheating).
- The fan fuses may blow (overload).

Table 3- 7 Line voltage assignment for setting the fan transformer (380 V – 480 V 3 AC)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10 %	380 V
400 V ± 10 %	400 V
440 V ± 10 %	440 V
480 V ± 10 %	480 V

Table 3- 8 Line voltage assignment for setting the fan transformer (500 V – 690 V 3 AC)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10 %	500 V
525 V ± 10 %	525 V
575 V ± 10 %	575 V
600 V ± 10 %	600 V
660 V ± 10 %	660 V
690 V ± 10 %	690 V

3.2.6 Technical specifications

Table 3- 9 Technical specifications for Basic Line Modules, 380 V – 480 V 3 AC, part 1

Order number	6SL3330–	1TE34–2AA0	1TE35–3AA0	1TE38–2AA0	1TE41–2AA0
Infeed power - Rated power Pn at 400 V 3 AC - Pmax at 400 V 3 AC	 kW kW	 200 300	 250 375	 400 600	 560 840
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 420 328 630	 530 413 795	 820 640 1230	 1200 936 1800
Input current - Rated current at 400 V 3 AC - maximum	 A A	 365 547	 460 690	 710 1065	 1010 1515
Supply voltages - Line voltage - Line frequency - Electronics power supply - Fan supply voltage - DC link voltage	 V_{ACrms} Hz V_{DC} V_{AC} V_{DC}	 380 V 3 AC -10 % (-15 % < 1 min) to 480 V 3 AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 230 (195.5 - 264.5) 1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Power requirements - Electronics power consumption (24 V DC) - Fan power consumption (230 V AC)	 A A	 1.1 1.1	 1.1 1.1	 1.1 1.1	 1.1 4.5
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance - Basic Line Module - Drive line-up, max.	 µF µF	 7200 57600	 9600 76800	 14600 116800	 23200 185600
Efficiency	η	0.991	0.992	0.992	0.992
Power loss, max.	kW	1.9	2.1	3.2	4.6
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 66 / 68	 66 / 68	 66 / 68	 71 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M10	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection	 mm² mm² mm²	 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240	 2 x 240 2 x 240 2 x 240	 6 x 185 6 x 185 4 x 240
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 2600 3900	 2600 3900	 2600 3900	 4000 6000
Degree of protection		IP00	IP00	IP00	IP00

Order number	6SL3330–	1TE34–2AA0	1TE35–3AA0	1TE38–2AA0	1TE41–2AA0
Dimensions - Width - Height - Depth	 mm mm mm	 310 1164 352	 310 1164 352	 310 1164 352	 310 1653 550
Frame size		FB	FB	FB	GB
Weight	kg	96	96	96	214
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1333-2 1 450 2	3NE1334-2 1 500 3	3NE1438-2 1 800 3	3NE1435-2 2 560 3

1) The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 10 Technical specifications for Basic Line Modules, 380 V – 480 V 3 AC, part 2

Order number	6SL3330–	1TE41–5AA0			
Infeed power - Rated power Pn at 400 V 3 AC - Pmax at 400 V 3 AC	 kW kW	 710 1065			
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 1500 1170 2250			
Input current - Rated current at 400 V 3 AC - maximum	 A A	 1265 1897			
Supply voltages - Line voltage - Line frequency - Electronics power supply - Fan supply voltage - DC link voltage	 V_{ACrms} Hz V_{DC} V_{AC} V_{DC}	 380 V 3 AC -10 % (-15 % < 1 min) to 480 V 3 AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 230 (195.5 - 264.5) 1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Power requirements - Electronics power consumption (24 V DC) - Fan power consumption (230 V AC)	 A A	 1.1 4.5			
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55			
DC link capacitance - Basic Line Module - Drive line-up, max.	 µF µF	 29000 232000			
Efficiency	η	0.992			
Power loss, max.	kW	5.5			
Cooling air requirement	m^3/s	0.36			
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 71 / 73			
Line/load connection		Flat connector for screw M12			
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection	 mm² mm² mm²	 6 x 185 6 x 185 4 x 240			
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 4000 6000			
Degree of protection		IP00			
Dimensions - Width - Height - Depth	 mm mm mm	 310 1653 550			
Frame size		GB			

Order number	6SL3330–	1TE41–5AA0			
Weight	kg	214			
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1437-2 2 710 3			

1) The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 11 Technical specifications for Basic Line Modules, 500 V – 690 V 3 AC, part 1

Order number	6SL3330–	1TH33–0AA0	1TH34–3AA0	1TH36–8AA0	1TH41–1AA0
Infeed power					
- Rated power Pn at 690 V 3 AC	kW	250	355	560	900
- Rated power Pn at 500 V 3 AC	kW	180	250	400	650
- Pmax at 690 V 3 AC	kW	375	532.5	840	1350
DC link current					
- Rated current I_{n_DC}	A	300	430	680	1100
- Base load current I_{H_DC}	A	234	335	530	858
- Maximum current I_{max_DC}	A	450	645	1020	1650
Input current					
- Rated current at 690 V 3 AC	A	260	375	575	925
- maximum	A	390	562.5	862.5	1387.5
Supply voltages					
- Line voltage	V_{ACrms}	500 V 3 AC -10 % (-15 % < 1 min) to 690 V 3 AC +10 %			
- Line frequency	Hz	47 to 63 Hz			
- Electronics power supply	V_{DC}	24 (20.4 - 28.8)			
- Fan supply voltage	V_{AC}	230 (195.5 - 264.5)			
- DC link voltage	V_{DC}	1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Power requirements					
- Electronics power consumption (24 V DC)	A	1.1	1.1	1.1	1.1
- Fan power consumption (230 V AC)	A	1.1	1.1	1.1	4.5
Max. ambient temperature					
- Without derating	°C	40	40	40	40
- With derating	°C	55	55	55	55
DC link capacitance					
- Basic Line Module	µF	3200	4800	7300	11600
- Drive line-up, max.	µF	25600	38400	58400	92800
Efficiency	η	0.994	0.994	0.995	0.994
Power loss, max.	kW	1.5	2.1	3.0	5.4
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB(A)	66 / 68	66 / 68	66 / 68	71 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M10	M12
Max. connection cross-sections					
- Line connection (U1, V1, W1)	mm²	2 x 240	2 x 240	2 x 240	6 x 185
- DC link connection (DCP, DCN)	mm²	2 x 240	2 x 240	2 x 240	6 x 185
- PE connection	mm²	2 x 240	2 x 240	2 x 240	4 x 240
Max. cable length (total of all motor cables and DC link)					
- shielded	m	1500	1500	1500	2250
- unshielded	m	2250	2250	2250	3375
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
- Width	mm	310	310	310	310
- Height	mm	1164	1164	1164	1653
- Depth	mm	352	352	352	550
Frame size		FB	FB	FB	GB

Order number	6SL3330–	1TH33–0AA0	1TH34–3AA0	1TH36–8AA0	1TH41–1AA0
Weight	kg	96	96	96	214
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1230-2 1 315 2	3NE1333-2 1 450 2	3NE1436-2 1 630 3	3NE1334-2 2 500 3

[1)] The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 12 Technical specifications for Basic Line Modules, 500 V – 690 V 3 AC, part 2

Order number	6SL3330–	1TH41–4AA0			
Infeed power - Rated power Pn at 690 V 3 AC - Rated power Pn at 500 V 3 AC - Pmax at 690 V 3 AC	 kW kW kW	 1100 800 1650			
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 1400 1092 2100			
Input current - Rated current at 690 V 3 AC - maximum	 A A	 1180 1770			
Supply voltages - Line voltage - Line frequency - Electronics power supply - Fan supply voltage - DC link voltage	 V_{ACrms} Hz V_{DC} V_{AC} V_{DC}	 500 V 3 AC -10 % (-15 % < 1 min) to 690 V 3 AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 230 (195.5 - 264.5) 1.35 x U_{line} (partial load) / 1.32 x U_{line} (full load)			
Power requirements - Electronics power consumption (24 V DC) - Fan power consumption (230 V AC)	 A A	 1.1 4.5			
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55			
DC link capacitance - Basic Line Module - Drive line-up, max.	 µF µF	 15470 123760			
Efficiency	η	0.995			
Power loss, max.	kW	5.8			
Cooling air requirement	m^3/s	0.36			
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 71 / 73			
Line/load connection		Flat connector for screw			
		M12			
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection	 mm² mm² mm²	 6 x 185 6 x 185 4 x 240			
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 2250 3375			
Degree of protection		IP00			
Dimensions - Width - Height - Depth	 mm mm mm	 310 1653 550			
Frame size		GB			

Order number	6SL3330–	1TH41–4AA0			
Weight	kg	214			
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1436-2 2 630 3			

1) The types of protection specified here are mandatory for installing a UL-approved system.

Overload capability

The Basic Line Modules have an overload reserve.

The criterion for overload is that the drive is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

High overload

The base load current for a high overload I_{H_DC} is based on a duty cycle of 150% for 60 s; the max. current Imax_DC can flow for 5 s.

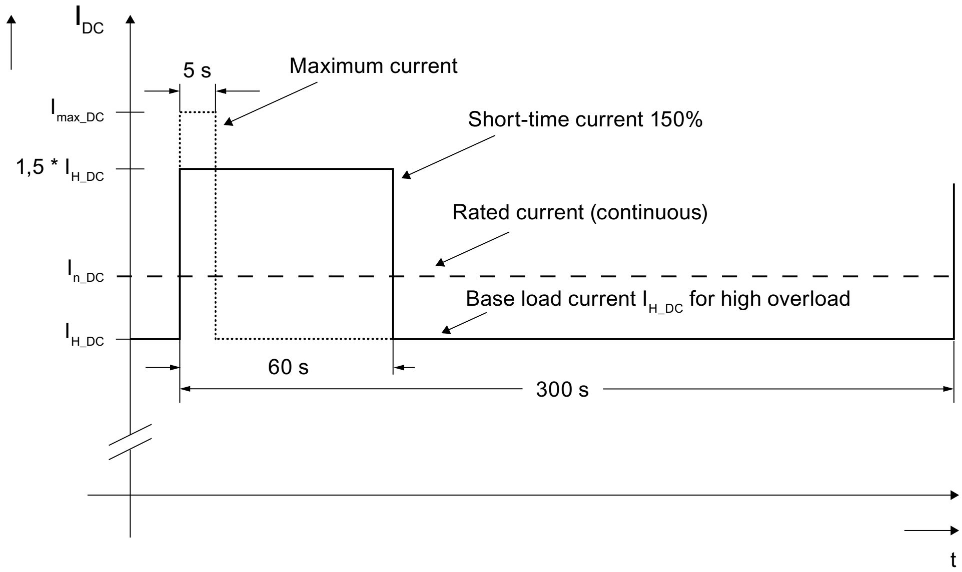


Figure 3-8 High overload

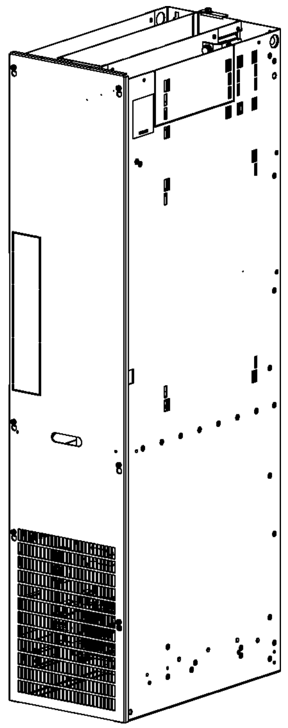
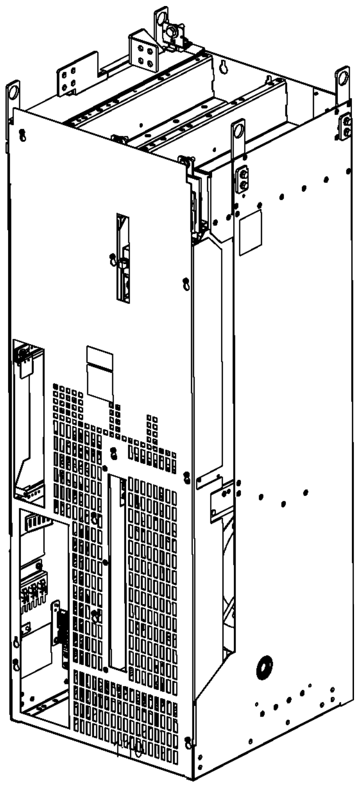
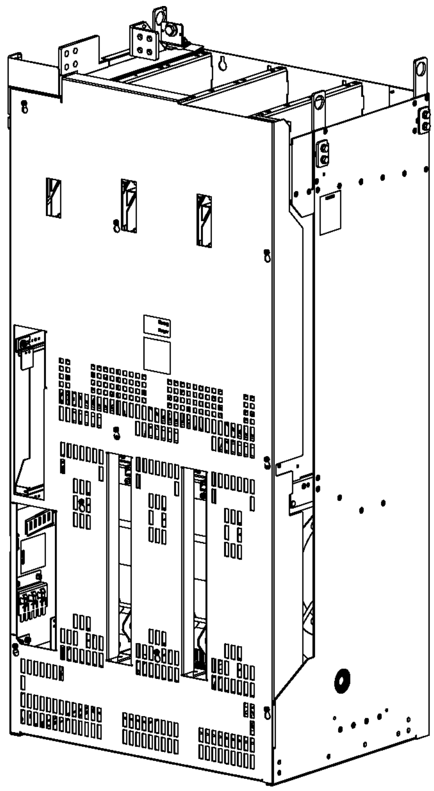
3.3 Smart Line Modules

3.3.1 Description

Smart Line Modules are infeed/regenerative feedback units. Like the Basic Line Module, they supply energy to the connected Motor Modules, but unlike the Basic Line Module, they can feed back regenerative energy.
The infeed occurs over a diode jumper, while stable, line-commutated regenerative feedback takes place via IGBTs with 100 % continuous energy regeneration.

The DC link voltage is greater than the rms value of the line rated voltage by a factor of 1.32 (under partial load) or 1.30 (under full load).

Table 3- 13 Overview of Smart Line Modules

		
Frame size GX	Frame size HX	Frame size JX

Components of the Smart Infeed

A Smart Infeed comprises a Smart Line Module and an external line connection, which comprises bridging contactor, precharging input circuit, fuse, and line reactor.

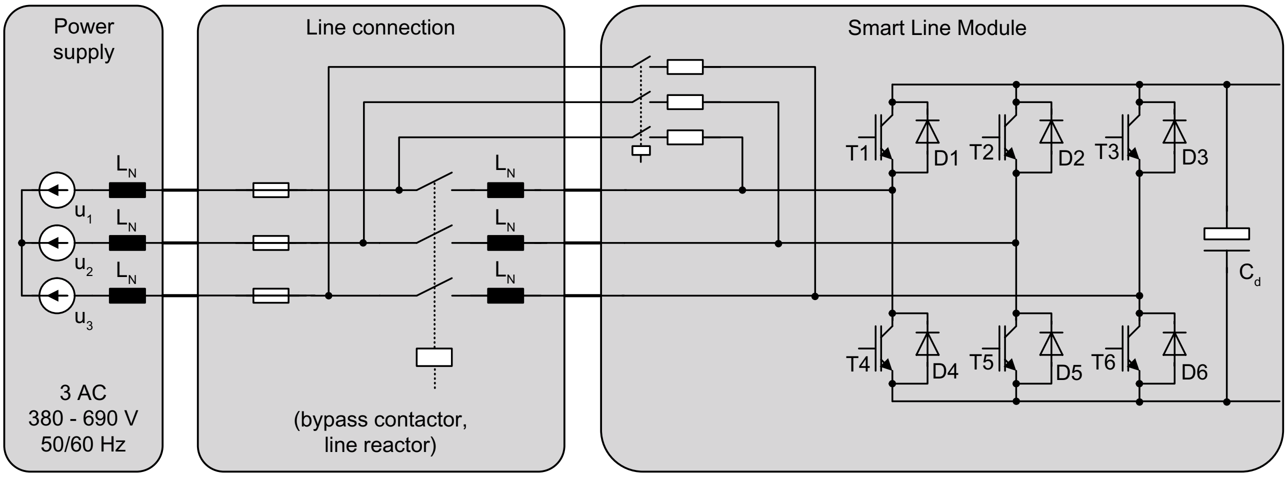


Figure 3-9 Overview of Smart Infeed

Operating principle

One or more Motor Modules can be connected to the power supply network via the Smart Line Module. The Smart Line Module provides the DC link voltage for the Motor Modules. The regenerative feedback capability of the Smart Line Module can be deactivated by parameterization.

The Smart Line Module is suitable for direct operation both on TN and on IT and TT systems.

In generator mode, the Smart Line Module feeds regenerative energy into the supply network.

The Smart Line Module is used for:

- Machines with medium dynamic requirements
- Infrequent braking cycles and high braking energy

3.3.2 Safety information

WARNING

A hazardous voltage will be present in the component for a further 5 minutes after all voltage supplies have been disconnected. Work cannot be carried out until this time has elapsed.

Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC link terminals DCP and DCN.

CAUTION

The DC link discharge time hazard warning must be affixed to the component in the relevant local language.

NOTICE

The cooling clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

CAUTION

In a supply system without regenerative capability (e.g. diesel generator), the regenerative feedback capability of the Smart Line Module must be deactivated in the relevant parameter (see Description of Functions). The braking energy must then be dissipated via an additional Braking Module with a braking resistor in the drive line-up.

DANGER

Smart Line Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Smart Line Modules, they or the relevant control cabinet must be permanently connected to PE.

According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

3.3.3 Interface description

3.3.3.1 Overview

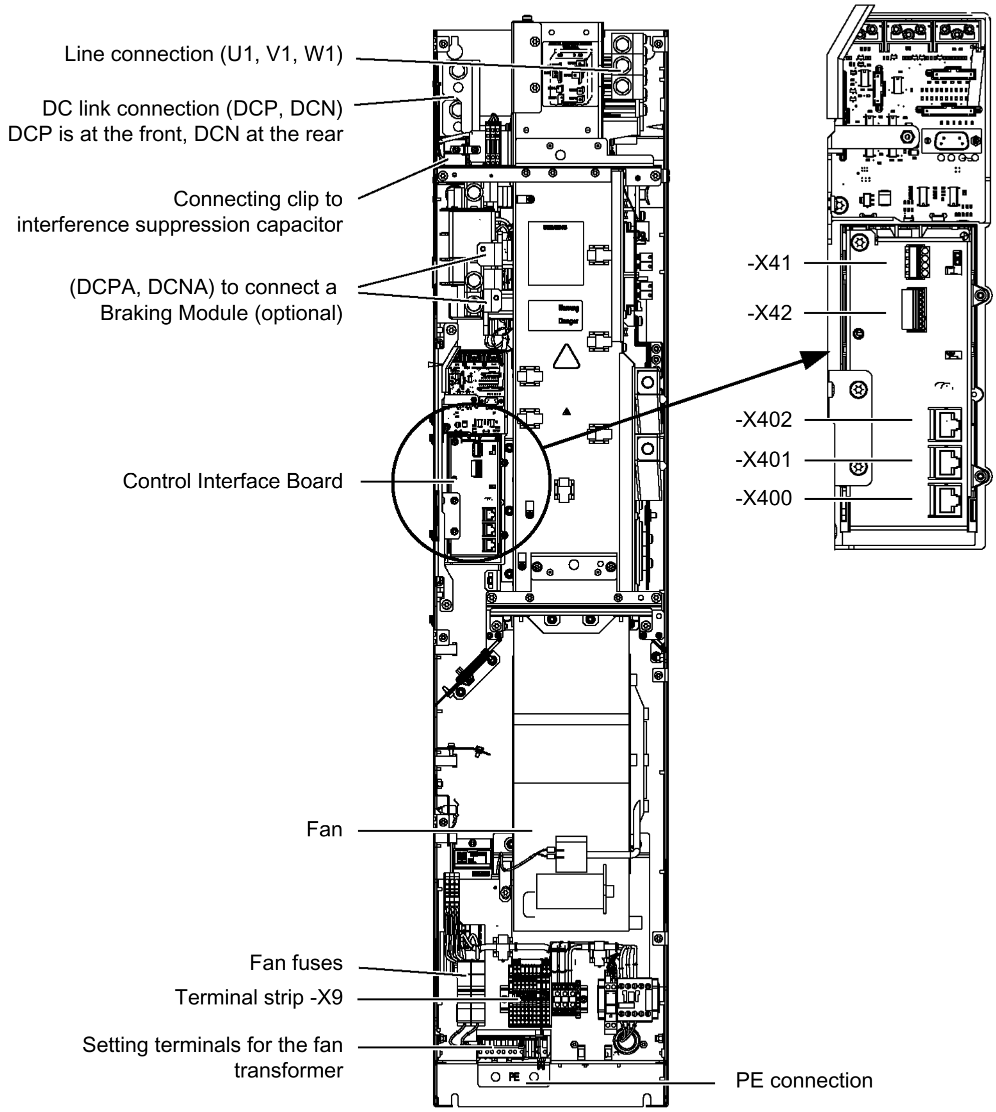


Figure 3-10 Smart Line Module, frame size GX

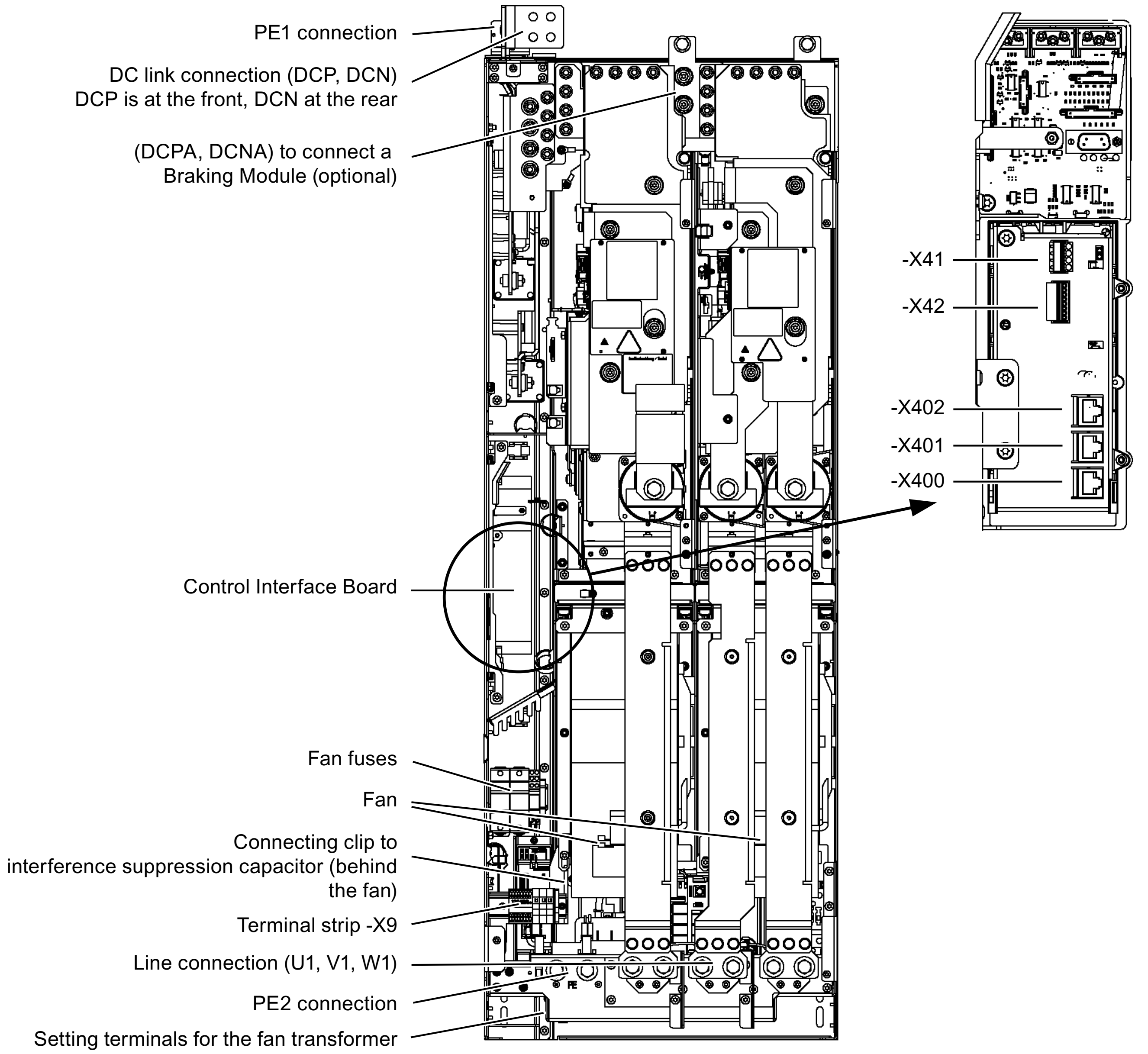


Figure 3-11 Smart Line Module, frame size HX

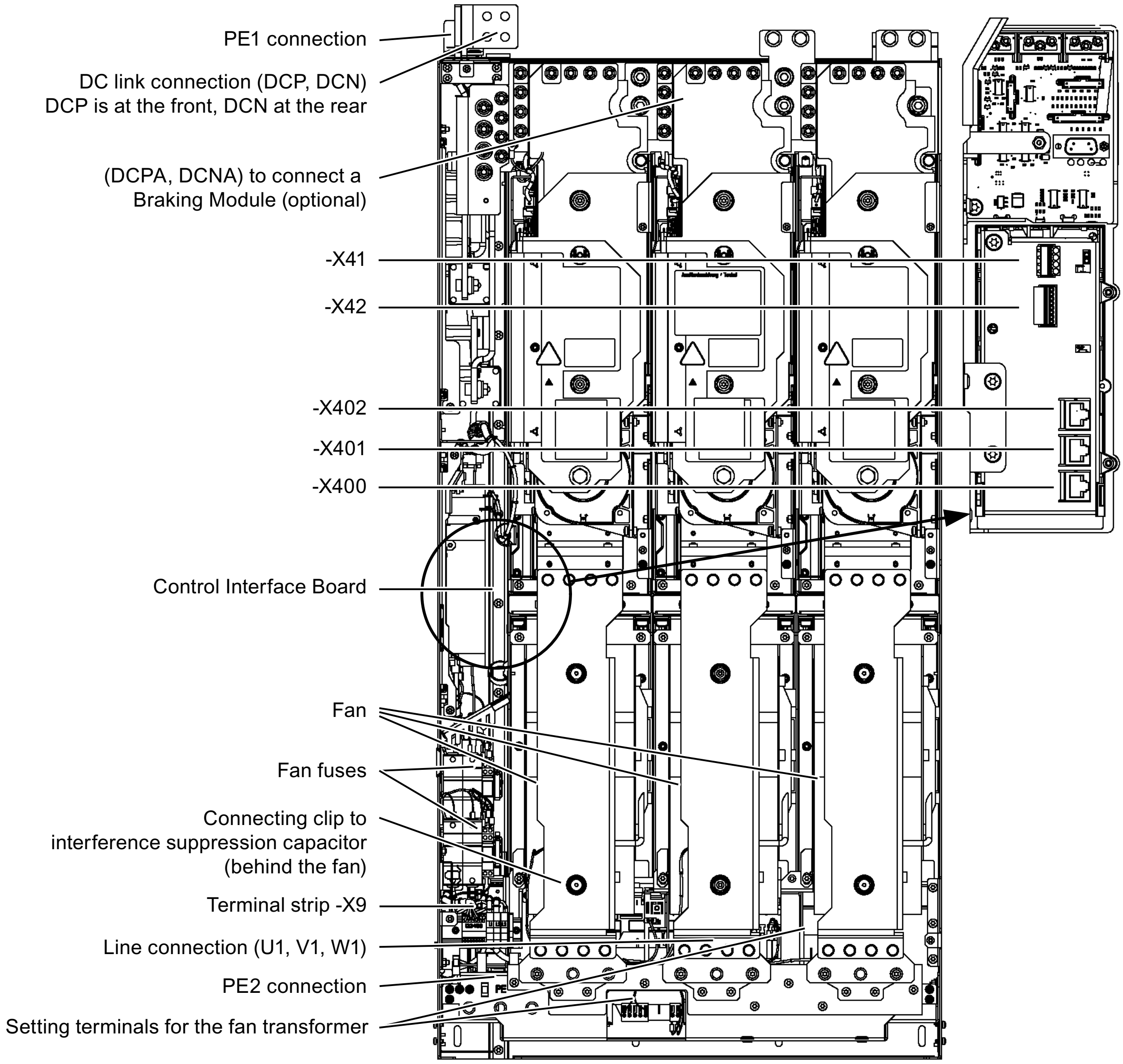
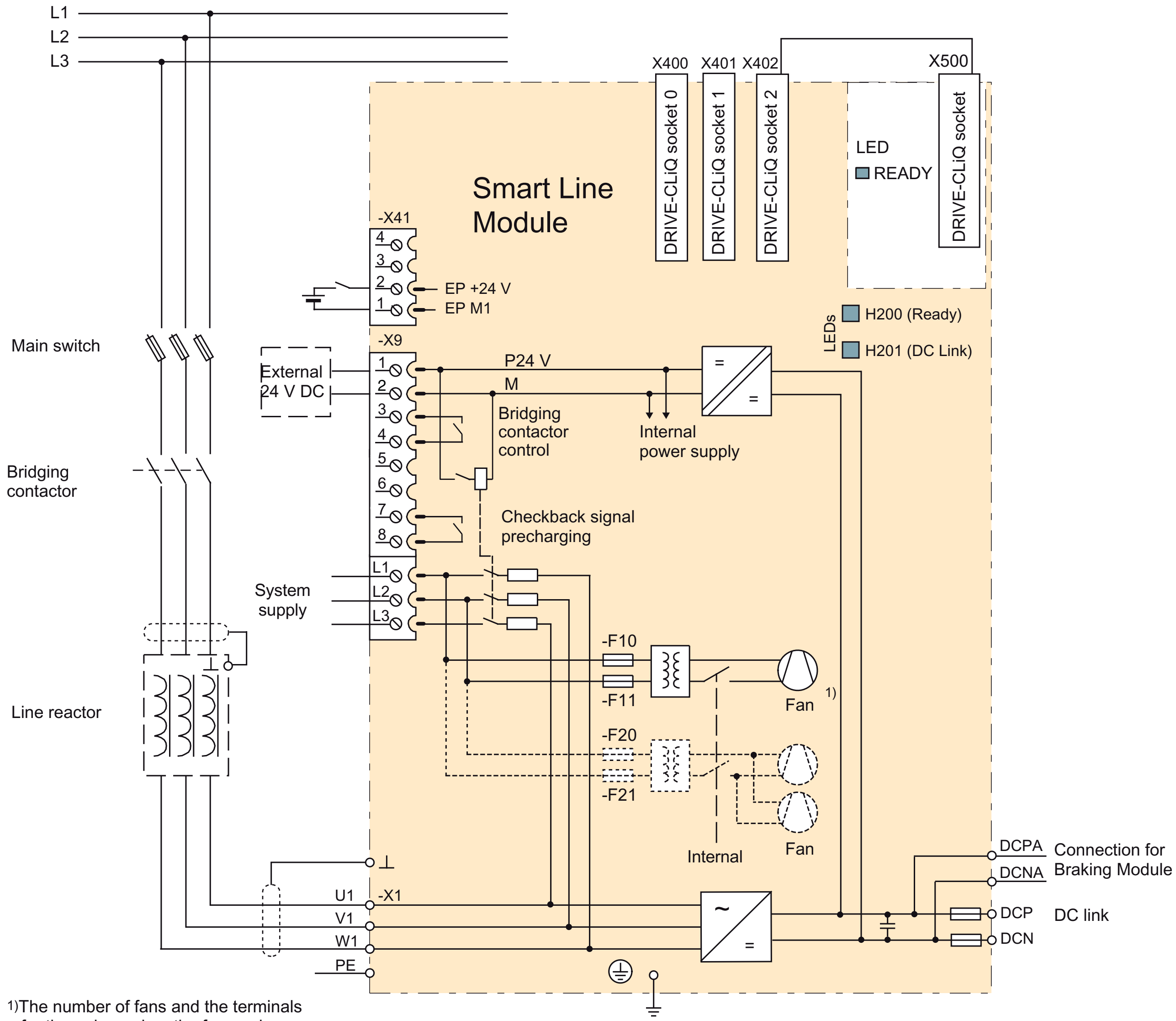


Figure 3-12 Smart Line Module, frame size JX

3.3.3.2 Connection example



1)The number of fans and the terminals for them depend on the frame size.

Figure 3-13 Smart Line Module wiring diagram

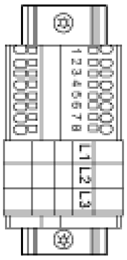
3.3.3.3 Line/load connection

Table 3- 14 Line/load connection of the Smart Line Module

Terminals	Technical specifications
U1, V1, W1 3 AC power input	Voltage: • 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 % • 3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 % Frequency: 47 Hz to 63 Hz Connecting thread: • Frame size GX: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: M12 / 50 Nm for ring cable lugs to DIN 46234
DCPA, DCNA Connection for Braking Module	Voltage: • 500 V to 630 V DC • 650 V to 900 V DC Connections: • Frame size GX: Threaded bolt M6 / 6 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: d = 13 mm (M12/50 Nm) flat connector for busbar
DCP, DCN DC power output	Voltage: • 500 V to 630 V DC • 650 V to 900 V DC Connections: • Frame size GX: Thread M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: d = 13 mm (M12/50 Nm) flat connector for busbar
PE connection PE1, PE2	Connecting thread: • Frame size GX: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: M12 / 50 Nm for ring cable lugs to DIN 46234

3.3.3.4 X9 terminal strip

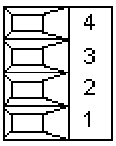
Table 3- 15 X9 terminal strip

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: max. 1.7 A
	2	M	
	3	Bridging contactor control	Voltage: 230 V AC Power consumption: max. 10 A isolated
	4		
	5	Not assigned	
	6		
	7	Checkback signal precharging contactor	Voltage: 230 V AC Maximum permissible current: 6 A isolated • Contact closed: Contactor is de-energized • Contact open: Contactor is energized
	8		
	L1	Connection of precharging circuit and fan supply	380 V 3 AC to 480 V 3 AC or 500 V 3 AC to 690 V 3 AC Power consumption: See technical specifications
	L2		
	L3		

Max. connectable cross-section: Terminals 1 - 8: 1.5 mm², Terminals L1 - L3: 16 mm²

3.3.3.5 X41 EP terminals

Table 3- 16 X41 terminal strip

	Terminal	Function	Technical specifications
	4	Not assigned	
	3	Not assigned	
	2	EP +24 V (enable pulses)	Supply voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: 10 mA Signal propagation times: L → H 100 µs H → L: 1000 µs
	1	EP M1 (enable pulses)	
Max. connectable cross-section 1.5mm²			

Note

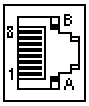
For operation, 24 V DC must be connected to terminal 2 and ground to terminal 1. Pulse suppression is activated when terminals are disconnected.

3.3.3.6 X42 terminal strip

Reserved, do not use!

3.3.3.7 DRIVE-CLiQ interfaces X400, X401, X402

Table 3- 17 DRIVE-CLiQ interfaces X400, X401, X402

	PIN	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order no.: Y-ConAS-13			

3.3.3.8 Meaning of the LEDs on the Control Interface Board in the Smart Line Module

Table 3- 18 Meaning of the LEDs on the Control Interface Board in the Smart Line Module

LED state		Description
H200	H201	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

WARNING

Irrespective of the state of LED "H201", hazardous DC link voltage can always be present.

The warning information on the component must be carefully observed!

3.3.4 Dimension drawing

Dimension drawing, frame size GX

The mandatory cooling clearances are indicated by the dotted line.

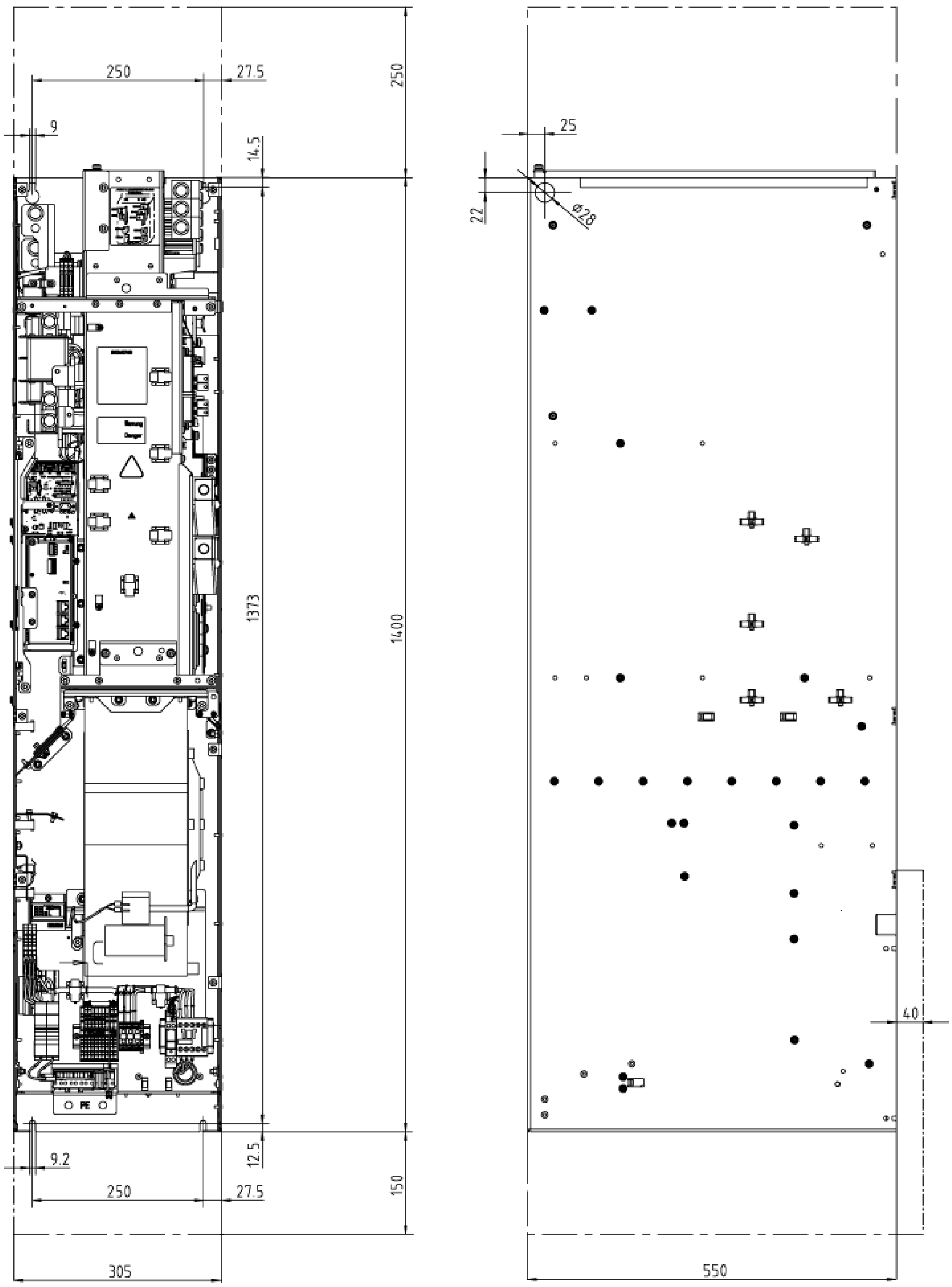


Figure 3-14 Dimension drawing Smart Line Module, frame size GX Front view, side view

Dimension drawing, frame size HX

The mandatory cooling clearances are indicated by the dotted line.

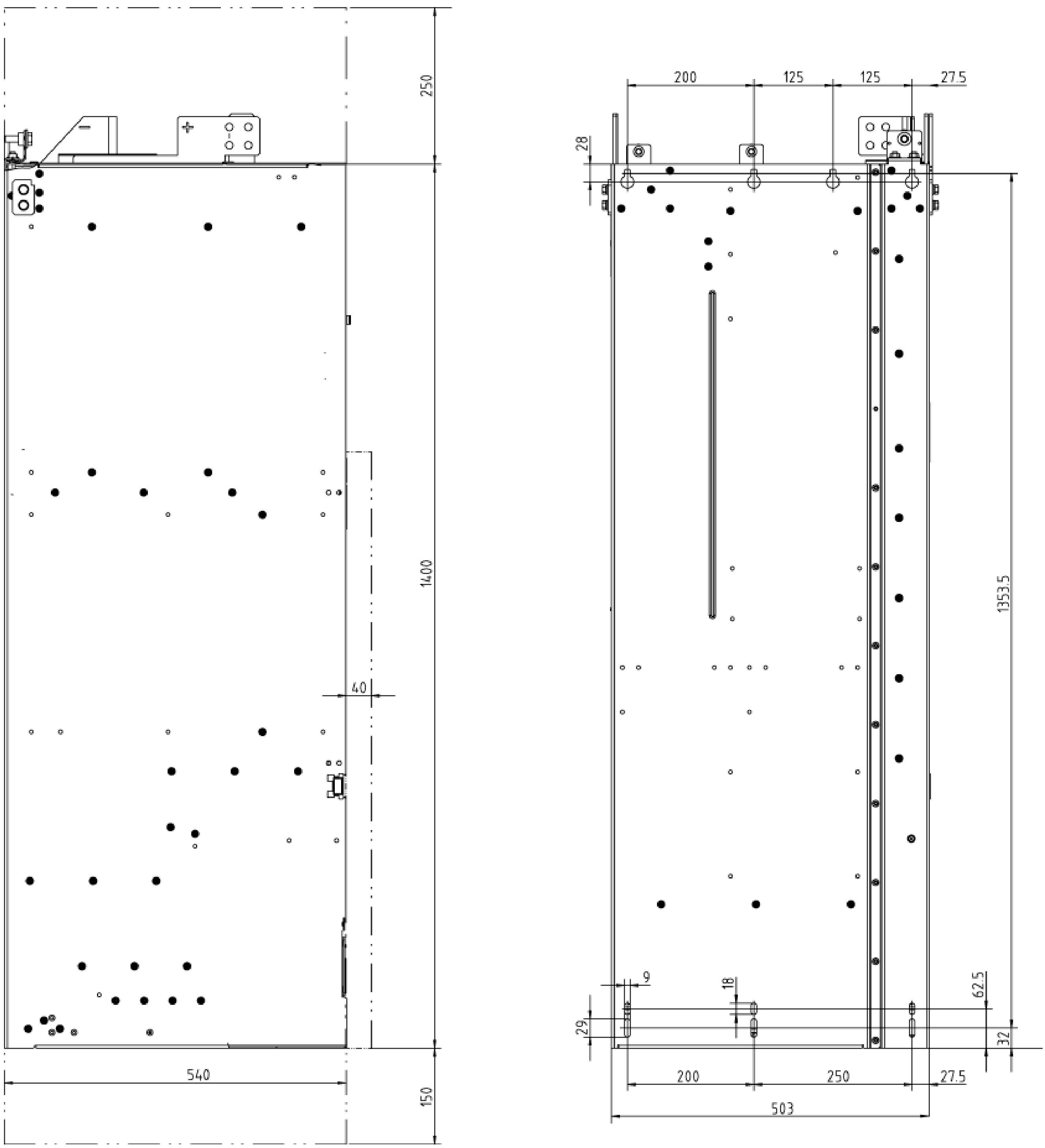


Figure 3-15 Dimension drawing Smart Line Module, frame size HX Side view, rear view

Dimension drawing, frame size JX

The mandatory cooling clearances are indicated by the dotted line.

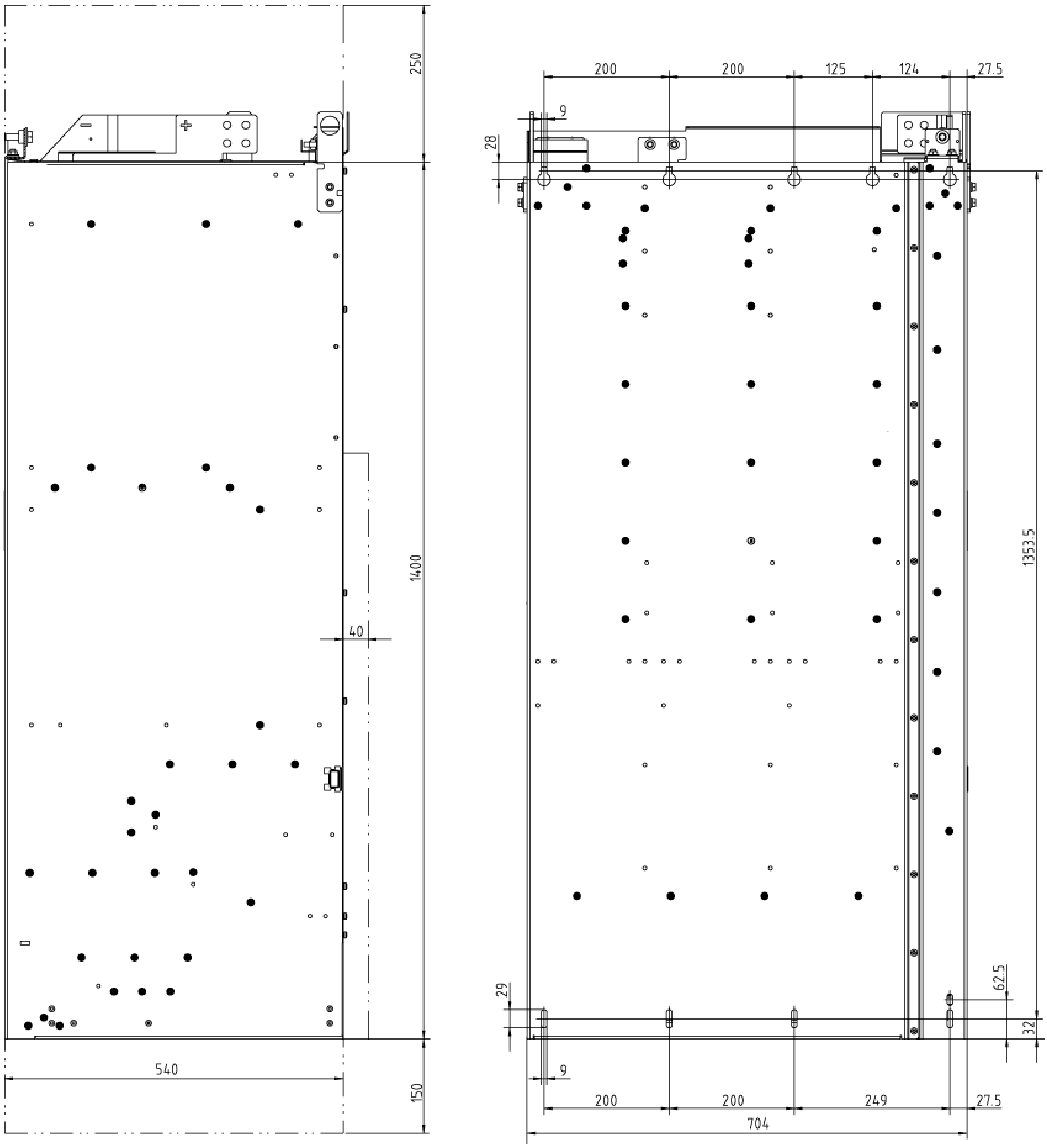


Figure 3-16 Dimension drawing Smart Line Module, frame size JX Side view, rear view

3.3.5 Electrical connection

Operating a Smart Line Module from an insulated network (IT system)

When the device is operated on an isolated-neutral network (IT system), the connection bracket to the noise suppression capacitor must be removed (e.g.: see "1" in figure below).

The interface overview in the section "Interface description" shows the position of the connection bracket on the different frame sizes.

With frame sizes HX and JX, you must remove the left-hand fan before removing the connection bracket (see "Replacing components").

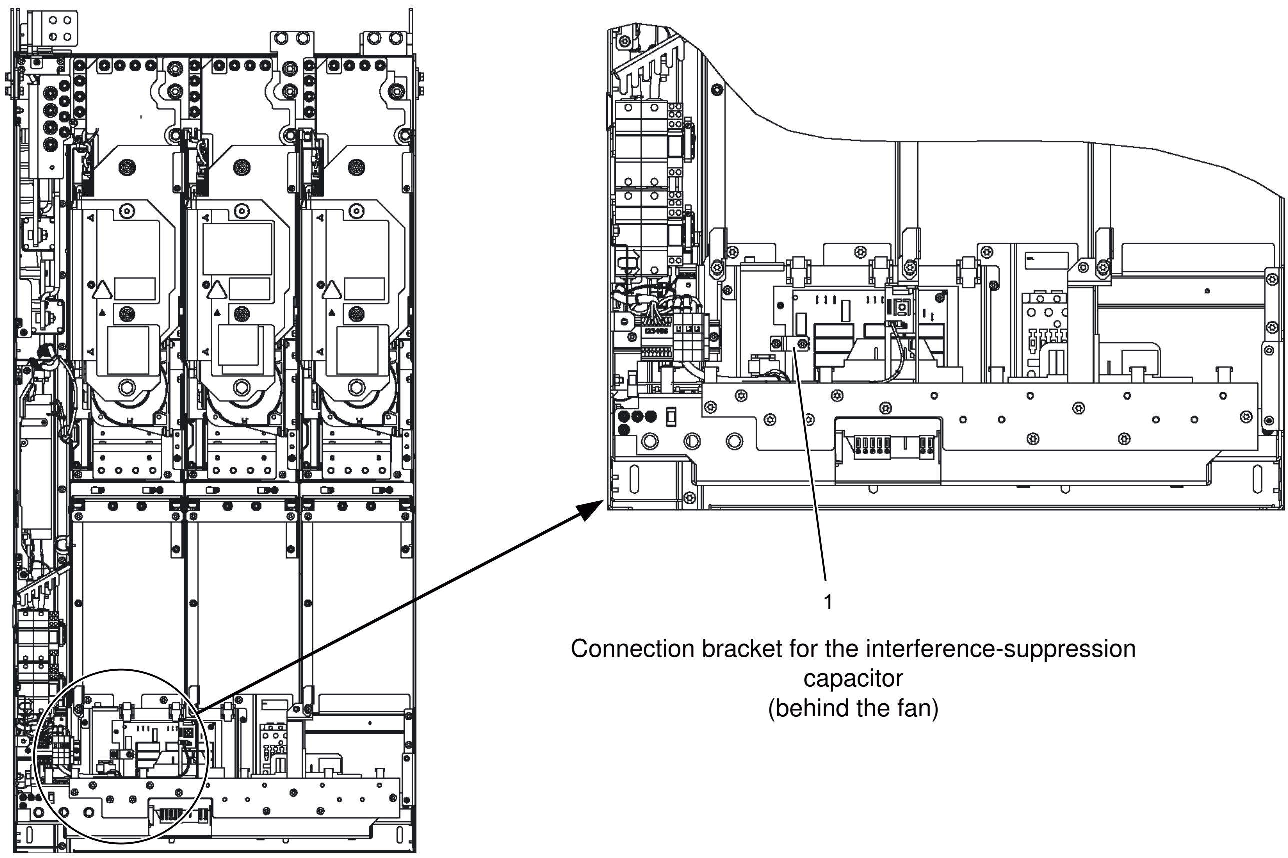


Figure 3-17 Removing the connection bracket to the noise suppression capacitor (example: Frame size JX)

⚠ WARNING
Failing to remove the connection bracket for the noise suppression capacitor on a non-grounded system/IT system can cause significant damage to the unit.

Adjusting the fan voltage (-T10)

The power supply for the device fans (1-ph. 230 V AC) in the Smart Line Module (-T10) is taken from the line supply using transformers. The locations of the transformers are indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

Note

Two transformers (–T10 and –T20) are installed in Smart Line Modules, frame size JX.
The two primary-side terminals on each of these devices must be adjusted together.

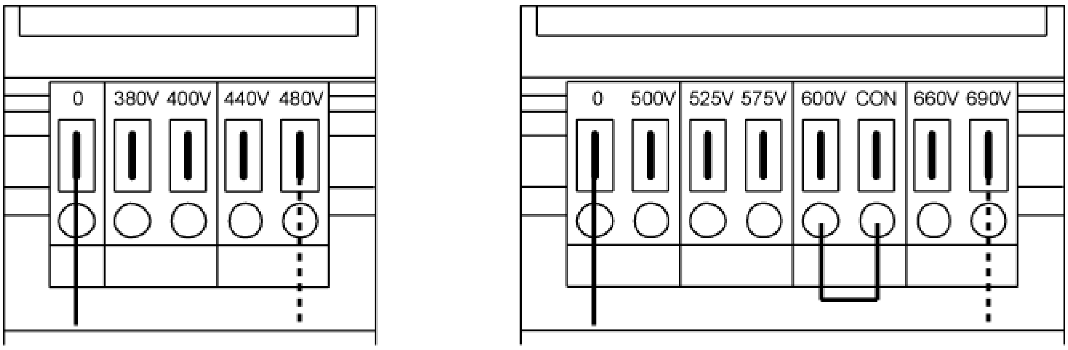


Figure 3-18 Setting terminals for the fan transformers (380 V – 480 V 3 AC / 500 V – 690 V 3 AC)

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V/0 V or 690 V/0 V).

Note

With the 500 V – 690 V 3 AC fan transformer, a jumper is inserted between the "600 V" terminal and the "CON" terminal. The "600 V" and "CON" terminals are for internal use.

CAUTION

If the terminals are not reconnected to the actual line voltage:

- The required cooling level will not be provided (risk of overheating).
- The fan fuses may blow (overload).

Table 3- 19 Line voltage assignment for setting the fan transformer (380 V – 480 V 3 AC)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10 %	380 V
400 V ± 10 %	400 V
440 V ± 10 %	440 V
480 V ± 10 %	480 V

Table 3- 20 Line voltage assignment for setting the fan transformer (500 V – 690 V 3 AC)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10 %	500 V
525 V ± 10 %	525 V
575 V ± 10 %	575 V
600 V ± 10 %	600 V
660 V ± 10 %	660 V
690 V ± 10 %	690 V

3.3.6 Technical specifications

Table 3- 21 Technical specifications for Smart Line Modules, 380 V – 480 V 3 AC, part 1

Order number	6SL3330–	6TE35-5AA0	6TE37–3AA0	6TE41-1AA0	6TE41–3AA0
Infeed power - Rated power Pn at 400 V 3 AC - Pmax at 400 V 3 AC	 kW kW	 250 375	 355 532.5	 500 750	 630 945
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 550 490 825	 730 650 1095	 1050 934 1575	 1300 1157 1950
Input current - Rated current at 400 V 3 AC - maximum	 A A	 463 694.5	 614 921	 883 1324.5	 1093 1639.5
Supply voltages - Line voltage - Line frequency - Electronics power supply - DC link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 380 V 3 AC -10 % (-15 % < 1 min) to 480 V 3 AC +10 % 47 to 63 Hz 24 (20.4 – 28.8) 1.32 x U_{line} (partial load) / 1.30 x U_{line} (full load)			
Power requirements - Electronics power consumption (24 V DC) - Fan power consumption (at 400 V AC)	 A A	 1.35 1.6	 1.35 1.6	 1.4 3.53	 1.5 5.2
Max. precharge current	A	33	33	98	98
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance - Smart Line Module - Drive line-up, max.	 μF μF	 8400 42000	 12000 60000	 16800 67200	 18900 75600
Efficiency	η	0.985	0.987	0.986	0.983
Power loss, max.	kW	3.7	4.7	7.1	11.0
Cooling air requirement	m^3/s	0.36	0.36	0.78	1.08
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 69 / 73	 69 / 73	 70 / 73	 70 / 73
Line/load connection		Flat connector for screw			
		M10	M10	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 1 x 185 2 x 185	 2 x 185 2 x 185 1 x 185 2 x 185	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 4000 6000	 4000 6000	 4800 7200	 4800 7200
Degree of protection		IP00	IP00	IP00	IP00

Order number	6SL3330–	6TE35-5AA0	6TE37–3AA0	6TE41-1AA0	6TE41–3AA0
Dimensions - Width - Height - Depth	 mm mm mm	 310 1400 550	 310 1400 550	 503 1400 550	 704 1400 550
Frame size		GX	GX	HX	JX
Weight, approx.	kg	150	150	294	458
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1435-2 1 560 3	3NE1437-2 1 710 3	3NE1334-2 2 500 3	3NE1436-2 2 630 3

1) The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 22 Technical specifications for Smart Line Modules, 380 V – 480 V 3 AC, part 2

Order number	6SL3330–	6TE41–7AA0			
Infeed power - Rated power Pn at 400 V 3 AC - Pmax at 400 V 3 AC	 kW kW	 800 1200			
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 1700 1513 2550			
Input current - Rated current at 400 V 3 AC - maximum	 A A	 1430 2145			
Supply voltages - Line voltage - Line frequency - Electronics power supply - DC link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 380 V 3 AC -10 % (-15 % < 1 min) to 480 V 3 AC +10 % 47 to 63 Hz 24 (20.4 – 28.8) 1.32 x U_{line} (partial load) / 1.30 x U_{line} (full load)			
Power requirements - Electronics power consumption (24 V DC) - Fan power consumption (at 400 V AC)	 A A	 1.7 5.2			
Max. precharge current	A	98			
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55			
DC link capacitance - Smart Line Module - Drive line-up, max.	 µF µF	 28800 115200			
Efficiency	η	0.986			
Power loss, max.	kW	11.5			
Cooling air requirement	m^3/s	1.08			
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 70 / 73			
Line/load connection		Flat connector for screw			
		M12			
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 6 x 240 Busbar 1 x 240 2 x 240			
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 4800 7200			
Degree of protection		IP00			
Dimensions - Width - Height - Depth	 mm mm mm	 704 1400 550			

Order number	6SL3330–	6TE41–7AA0			
Frame size		JX			
Weight, approx.	kg	458			
UL listed fuse [1] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1448-2 2 850 3			

[1] The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 23 Technical specifications for Smart Line Modules, 500 V – 690 V 3 AC

Order number	6SL3330–	6TG35–5AA0	6TG38–8AA0	6TG41–2AA0	6TG41–7AA0
Infeed power - Rated power Pn at 690 V 3 AC - Pmax at 690 V 3 AC	 kW kW	 450 675	 710 1065	 1000 1500	 1400 2100
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 550 490 825	 900 800 1350	 1200 1068 1800	 1700 1513 2550
Input current - Rated current at 690 V 3 AC - maximum	 A A	 463 694.5	 757 1135.5	 1009 1513.5	 1430 2145
Supply voltages - Line voltage - Line frequency - Electronics power supply - DC link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 500 V 3 AC -10 % (-15 % < 1 min) to 690 V 3 AC +10 % 47 to 63 Hz 24 (20.4 – 28.8) 1.32 x U_{line} (partial load) / 1.30 x U_{line} (full load)			
Power requirements - Electronics power consumption (24 V DC) - Fan power consumption (at 400 V AC)	 A A	 1.35 0.94	 1.4 2.1	 1.5 3.1	 1.7 3.1
Max. precharge current	A	41	122	122	122
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance - Smart Line Module - Drive line-up, max.	 µF µF	 5600 28000	 7400 29600	 11100 44400	 14400 57600
Efficiency	η	0.990	0.991	0.988	0.990
Power loss, max.	kW	4.3	6.5	12.0	13.8
Cooling air requirement	m^3/s	0.36	0.78	1.08	1.08
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 69 / 73	 70 / 73	 70 / 73	 70 / 73
Line/load connection		Flat connector for screw			
		M10	M12	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 1 x 185 2 x 185	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 2250 3375	 2750 4125	 2750 4125	 2750 4125
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 310 1400 550	 503 1400 550	 704 1400 550	 704 1400 550

Order number	6SL3330–	6TG35–5AA0	6TG38–8AA0	6TG41–2AA0	6TG41–7AA0
Frame size		GX	HX	JX	JX
Weight, approx.	kg	150	294	458	458
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1435-2 1 560 3	3NE1448-2 1 850 3	3NE1435-2 2 560 3	3NE1448-2 2 850 3

1) The types of protection specified here are mandatory for installing a UL-approved system.

Overload capability

The Smart Line Modules have an overload reserve.

The criterion for overload is that the drive is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

High overload

The base load current for a high overload I_{H_DC} is based on a duty cycle of 150 % for 60 s; the max. current I_{max_DC} can flow for 5 s.

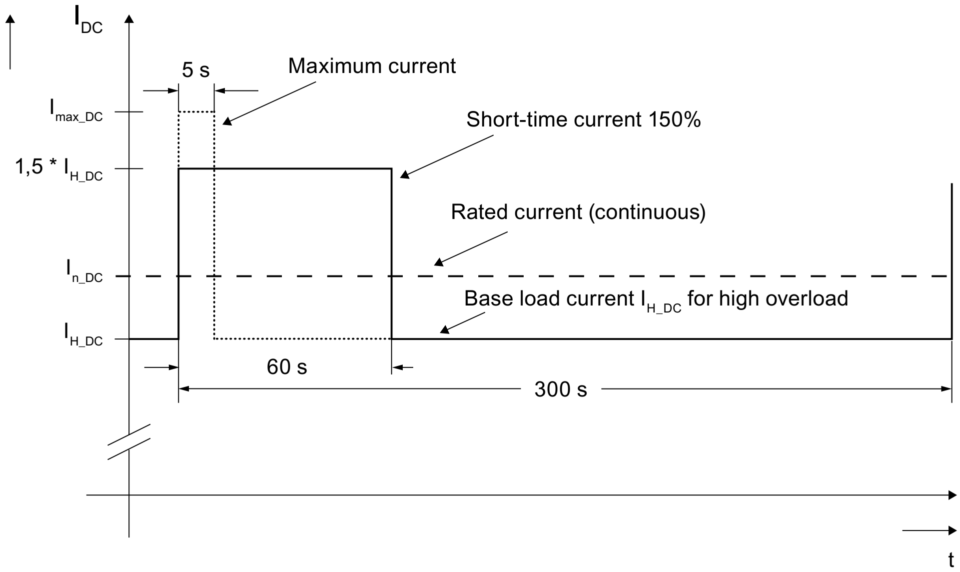


Figure 3-19 High overload

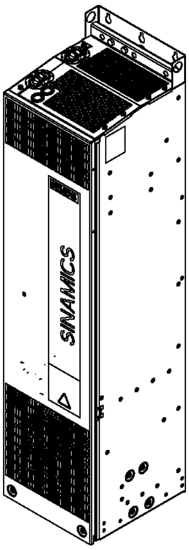
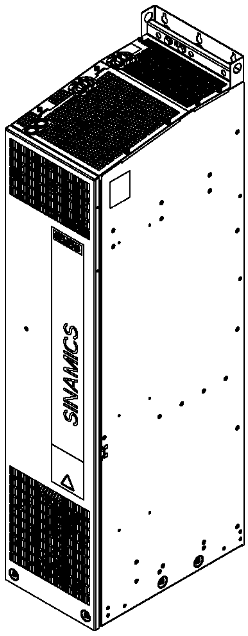
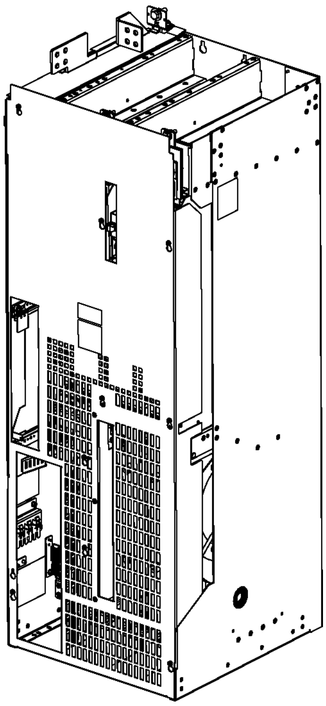
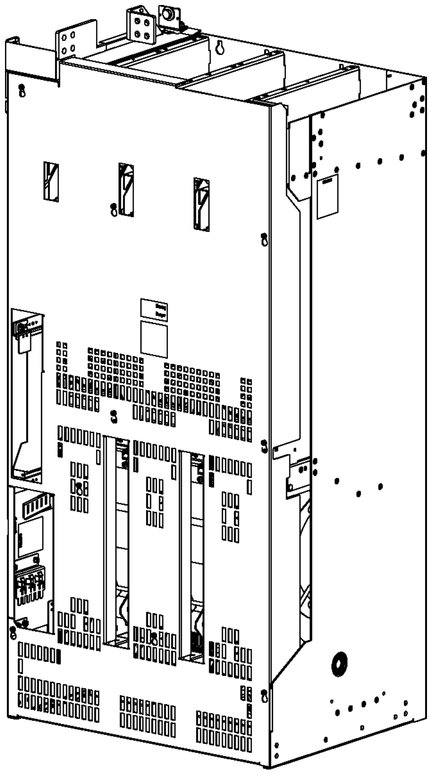
3.4 Active Line Modules

3.4.1 Description

The self-commutating infeed / regenerative feedback units act as step-up converters and generate a stabilized DC link voltage that is 1.5x greater than the rated line supply voltage. In this way, the connected Motor Modules are isolated from the supply voltage. This improves the dynamic response and control quality because line tolerances and fluctuations do not affect the motor voltage.

If required, the Active Line Modules can also provide reactive power compensation.

Table 3- 24 Overview of Active Line Modules

			
Frame size FX	Frame size GX	Frame size HX	Frame size JX

Active Infeed components

An Active Infeed comprises an Active Interface Module and an Active Line Module.

The bypass contactor is fitted in the relevant Active Interface Module on Active Infeeds which feature an Active Line Module of frame size FX or GX. The Active Interface Modules and Active Line Modules of these frame sizes have degree of protection IP20.

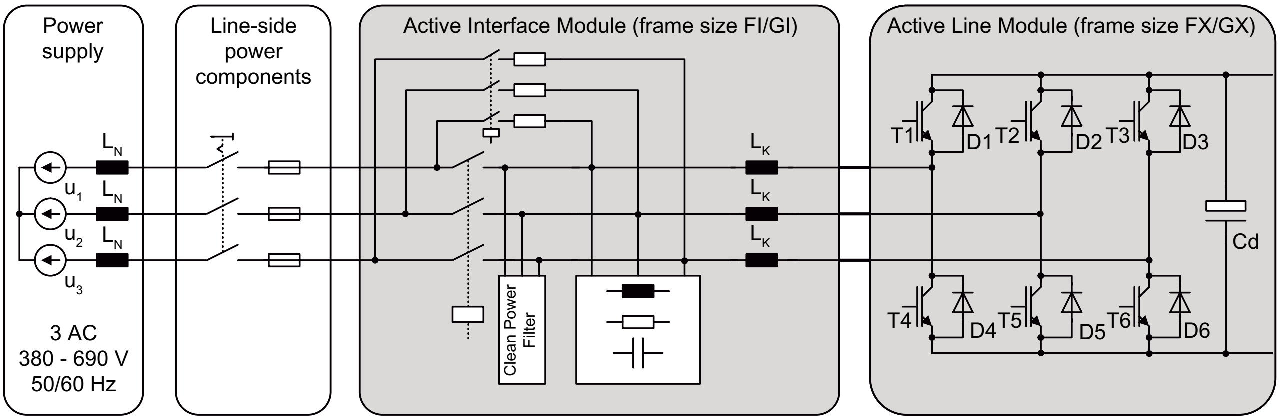


Figure 3-20 Overview of Active Infeed (frame sizes FI/FX and GI/GX)

In the case of an Active Infeed with an Active Line Module of frame sizes HX or JX, the bypass contactor is not included in the associated Active Interface Module, but must be provided separately. The Active Interface Modules and Active Line Modules of these frame sizes have degree of protection IP00.

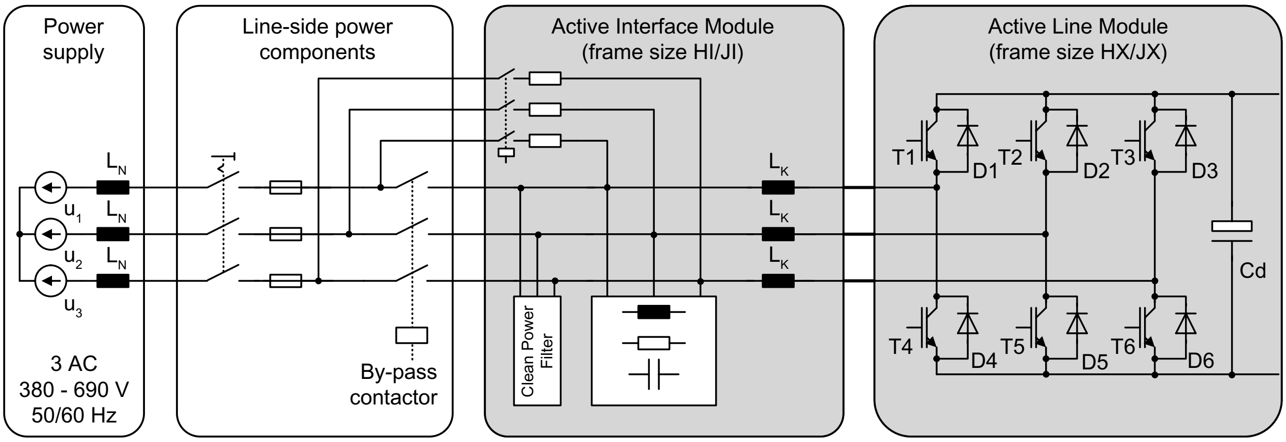


Figure 3-21 Overview of Active Infeed (frame sizes HI/HX and JI/JX)

Operating principle

One or more Motor Modules can be connected to the power supply network via the Active Line Module. The Active Line Module provides a constant DC link voltage for the Motor Modules. This ensures that they are not influenced by line voltage fluctuations. The regenerative feedback capability of the Active Line Module can be deactivated by parameterization.

The Active Line Module is suitable for direct operation both on TN and on IT and TT systems.

With the motors operating as generators, the Active Line Module feeds regenerative energy into the supply network.

The Active Line Module is used for:

- Machines with high dynamic drive requirements
- Frequent braking cycles and high braking energy

3.4.2 Safety information

WARNING
A hazardous voltage will be present in the component for a further 5 minutes after all voltage supplies have been disconnected. Work cannot be carried out until this time has elapsed. Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC link terminals DCP and DCN.

CAUTION
The DC link discharge time hazard warning must be affixed to the component in the relevant local language.

NOTICE
The cooling clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

CAUTION
In a supply system without regenerative capability (e.g. diesel generator), the regenerative feedback capability of the Active Line Module must be deactivated in the relevant parameter (see Description of Functions). The braking energy must then be dissipated via an additional Braking Module with a braking resistor in the drive line-up.

DANGER
Active Line Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Active Line Modules, they or the relevant control cabinet must be permanently connected to PE. According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

3.4.3 Interface description

3.4.3.1 Overview

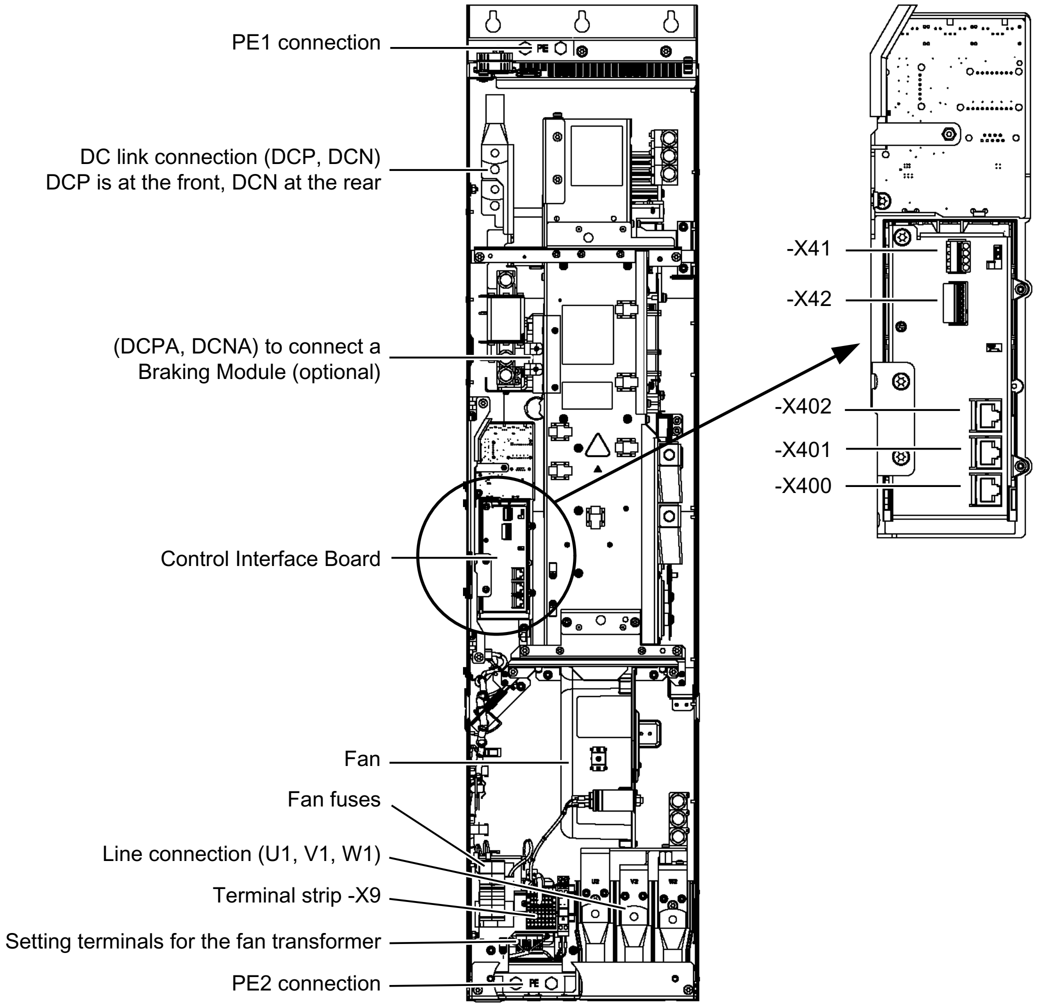


Figure 3-22 Active Line Module, frame size FX

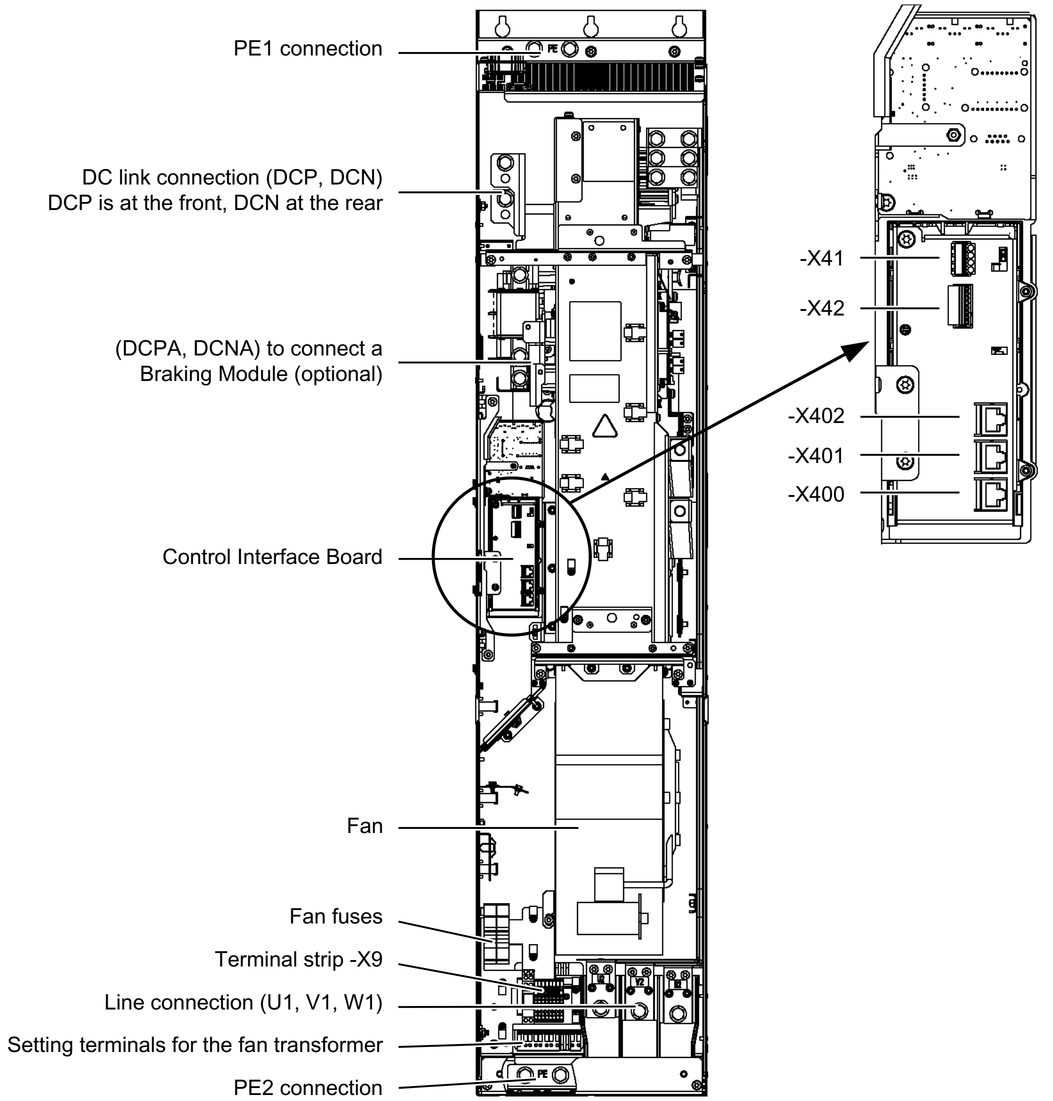


Figure 3-23 Active Line Module, frame size GX

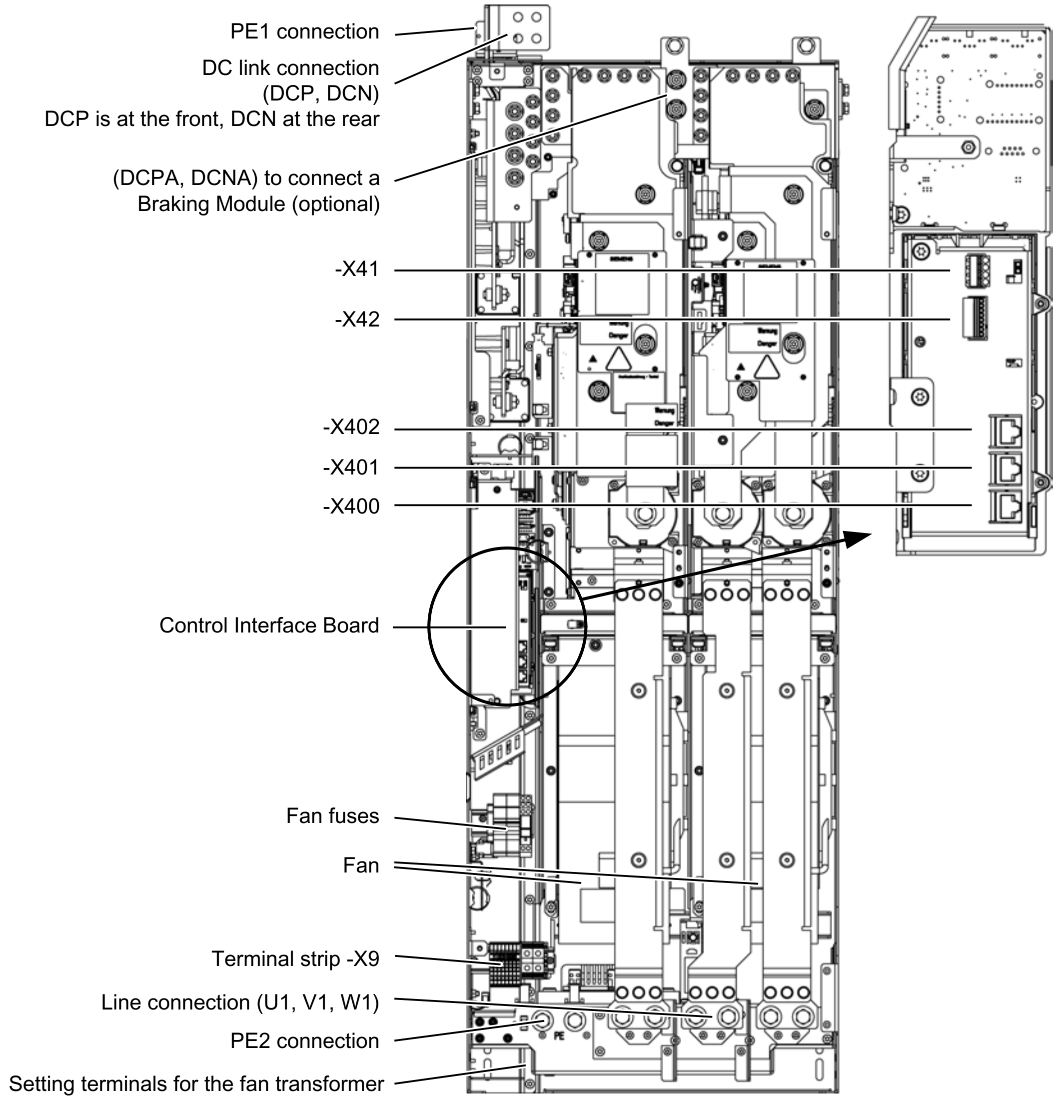


Figure 3-24 Active Line Module, frame size HX

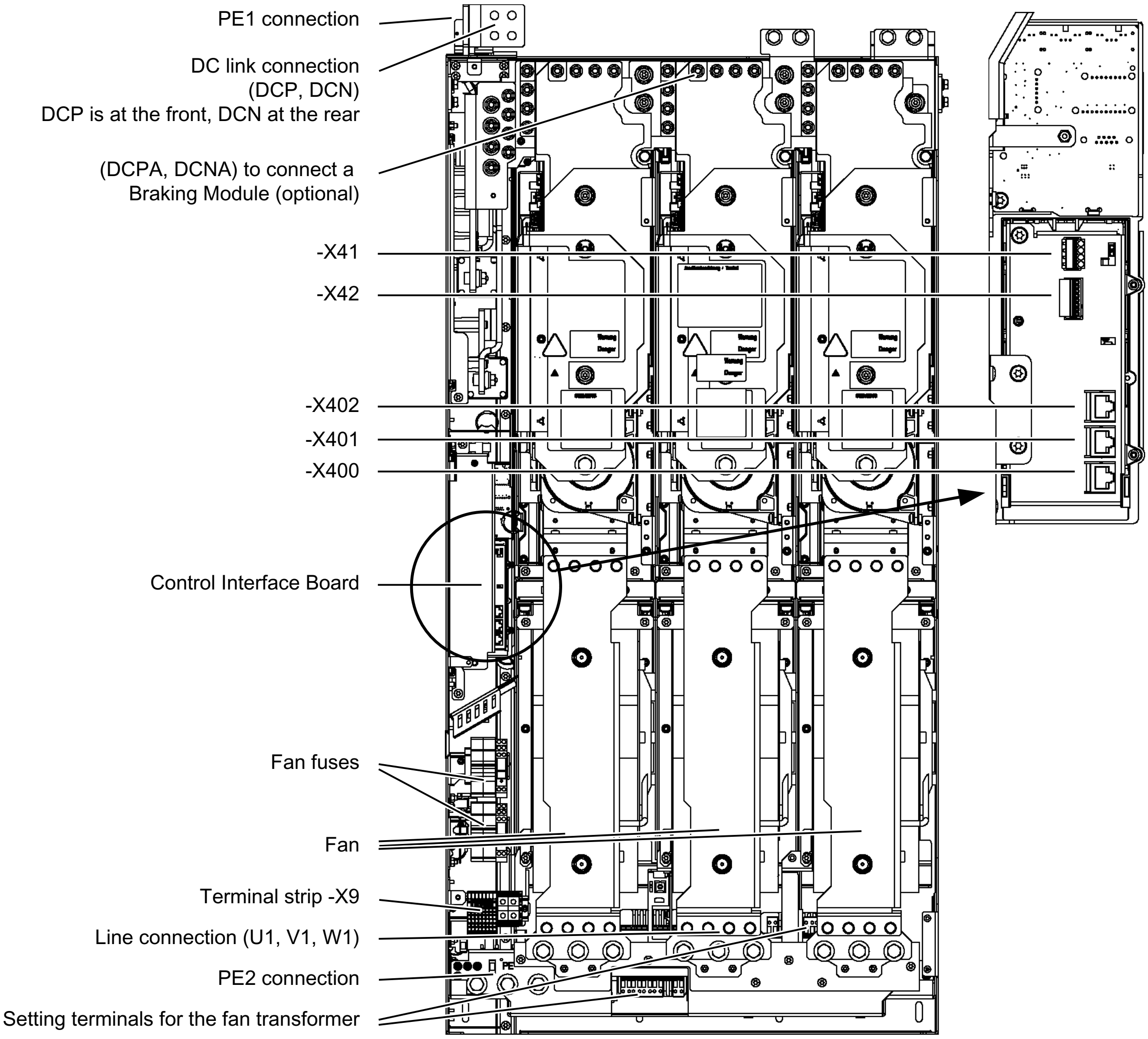
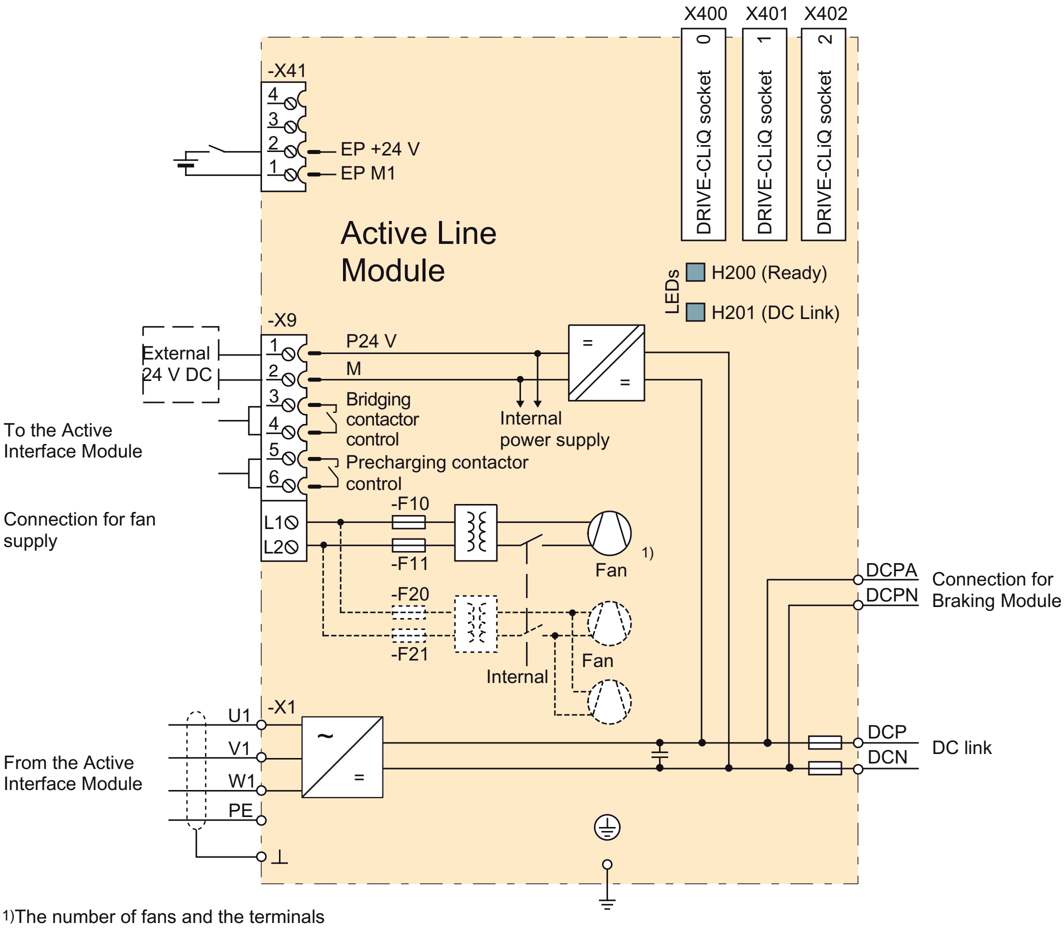


Figure 3-25 Active Line Module, frame size JX

3.4.3.2 Connection example



1)The number of fans and the terminals for them depend on the frame size.

Figure 3-26 Active Line Module wiring diagram

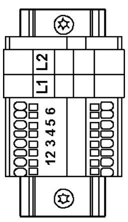
3.4.3.3 Line/load connection

Table 3- 25 Line/load connection of the Active Line Module

Terminals	Technical specifications
U1, V1, W1 3 AC power input	Voltage: • 3-ph. 380 V AC -10 % (-15 % < 1 min) to 3-ph. 480 V AC +10 % • 3-ph. 500 V AC -10 % (-15 % < 1 min) to 3-ph. 690 V AC +10 % Frequency: 47 Hz to 63 Hz Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: M12 / 50 Nm for ring cable lugs to DIN 46234
DCPA, DCNA Connection for Braking Module	Voltage: • 570 V to 720 V DC • 750 V to 1035 V DC Connections: • Frame sizes FX / GX: Threaded bolt M6 / 6 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: d = 13 mm (M12/50 Nm) flat connector for busbar
DCP, DCN DC power output	Voltage: • 570 V to 720 V DC • 750 V to 1035 V DC Connections: • Frame sizes FX / GX: Thread M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: d = 13 mm (M12/50 Nm) flat connector for busbar
PE connection PE1, PE2	Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: M12 / 50 Nm for ring cable lugs to DIN 46234

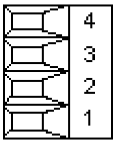
3.4.3.4 X9 terminal strip

Table 3- 26 X9 terminal strip

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: max. 1.7 A
	2	M	
	3	Bridging contactor control	for Active Interface Module, X609:11
	4		for Active Interface Module, X609:12
	5	Precharging contactor control	for Active Interface Module, X609:9
	6		for Active Interface Module, X609:10
	L1	Connection for fan supply	380 V to 480 V AC / 500 V to 690 V AC Power consumption: See technical specifications
	L2	(frames sizes HX and JX only)	
Max. connectable cross-section: Terminals 1 – 6: 1.5 mm², Terminals L1 - L2: 35 mm²			

3.4.3.5 X41 EP terminals

Table 3- 27 X41 terminal strip

	Terminal	Function	Technical specifications
	4	Not assigned	
	3	Not assigned	
	2	EP +24 V (enable pulses)	Supply voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: 10 mA Signal propagation times: L → H 100 µs H → L: 1000 µs
	1	EP M1 (enable pulses)	
Max. connectable cross-section 1.5mm²			

Note

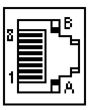
For operation, 24 V DC must be connected to terminal 2 and ground to terminal 1. Pulse suppression is activated when terminals are disconnected.

3.4.3.6 X42 terminal strip

Reserved, do not use!

3.4.3.7 DRIVE-CLiQ interfaces X400, X401, X402

Table 3- 28 DRIVE-CLiQ interfaces X400, X401, X402

	PIN	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order no.: Y-ConAS-13			

3.4.3.8 Meaning of the LEDs on the Control Interface Board in the Active Line Module

Table 3- 29 Meaning of the LEDs on the Control Interface Board in the Active Line Module

LED state		Description
H200	H201	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

WARNING

Irrespective of the state of LED "H201", hazardous DC link voltage can always be present.

The warning information on the component must be carefully observed!

3.4.4 Dimension drawing

Dimension drawing, frame size FX

The mandatory cooling clearances are indicated by the dotted line.

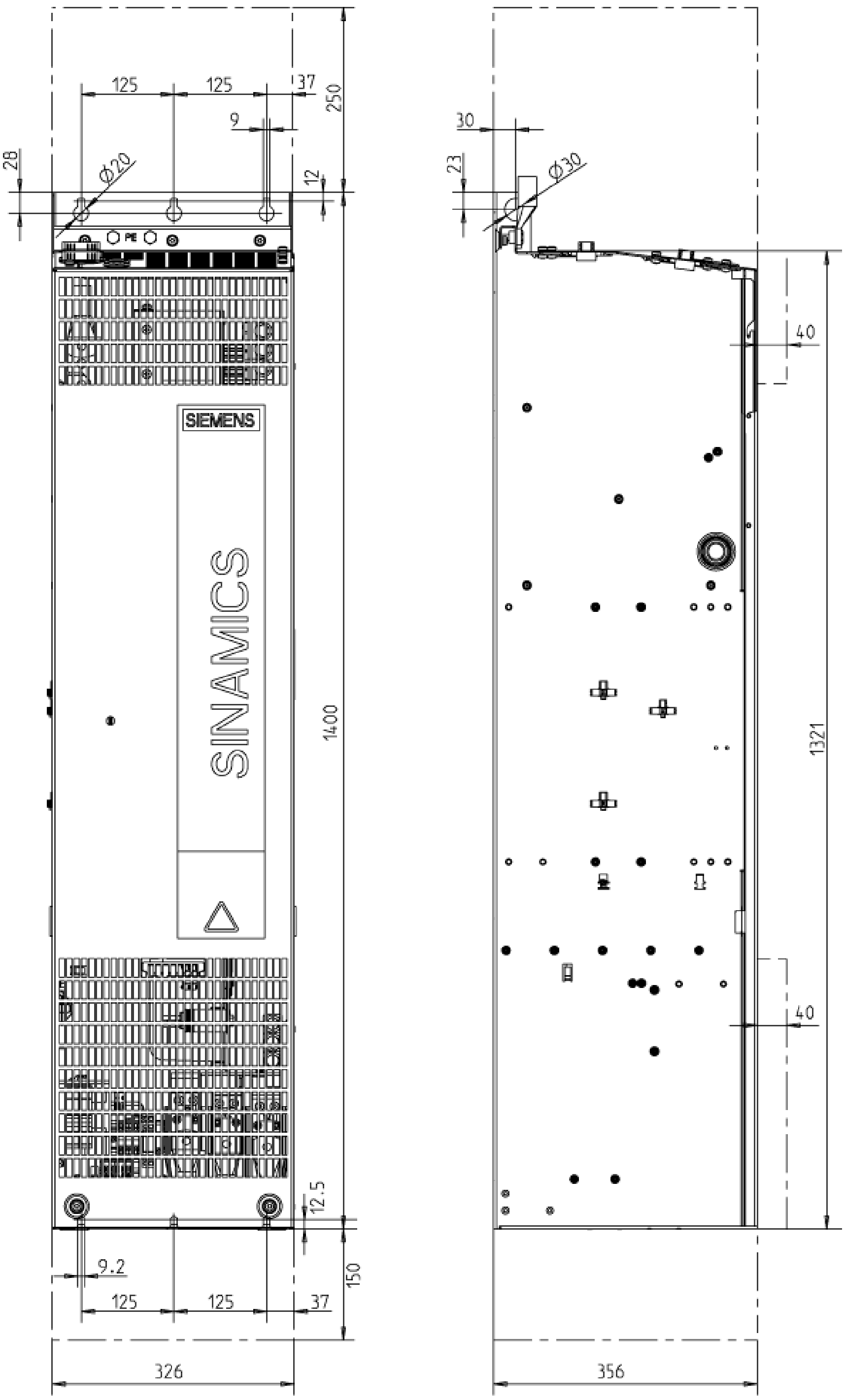


Figure 3-27 Dimension drawing Active Line Module, frame size FX Front view, side view

Dimension drawing, frame size GX

The mandatory cooling clearances are indicated by the dotted line.

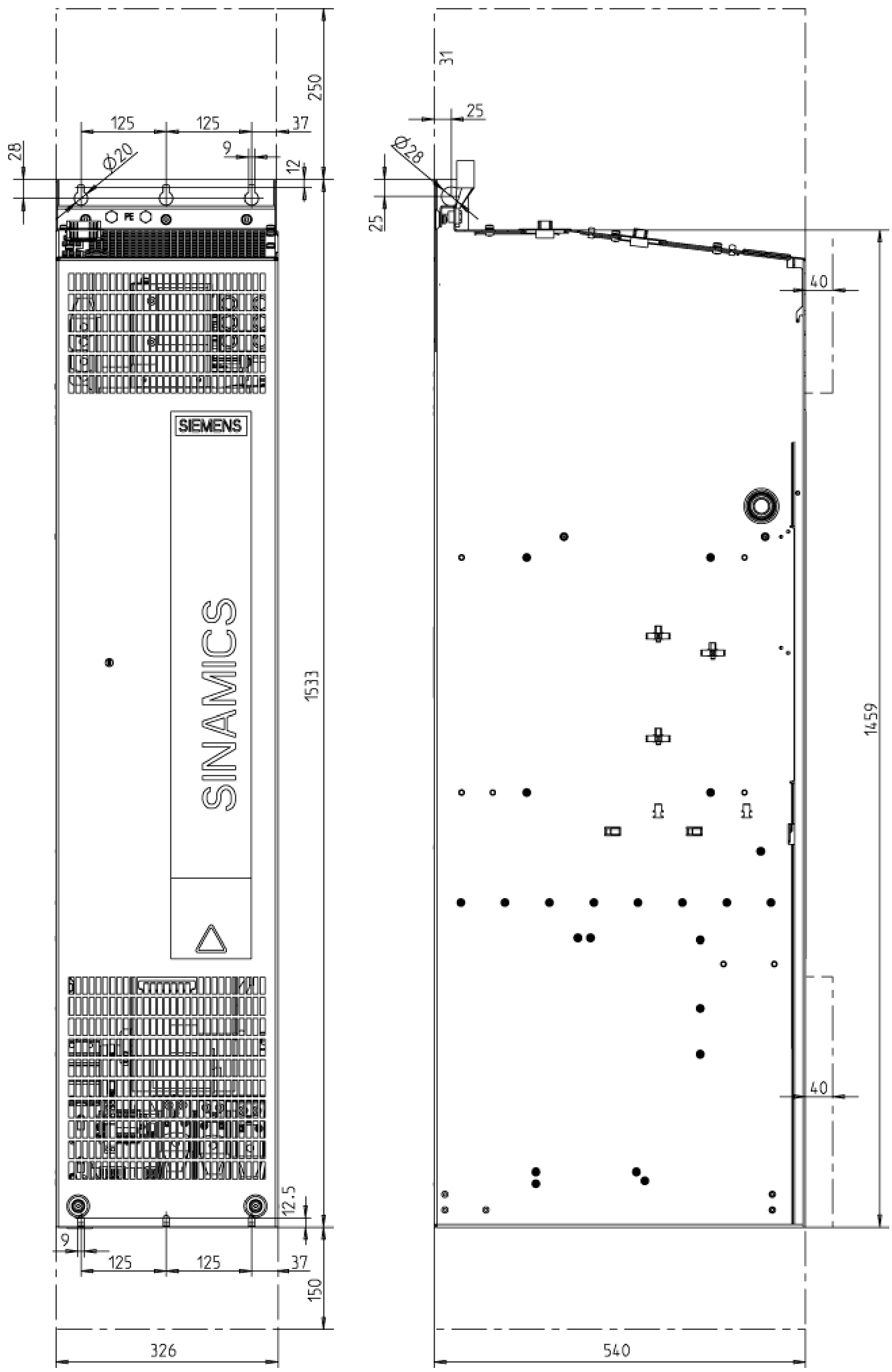


Figure 3-28 Dimension drawing Active Line Module, frame size GX Front view, side view

Dimension drawing, frame size HX

The mandatory cooling clearances are indicated by the dotted line.

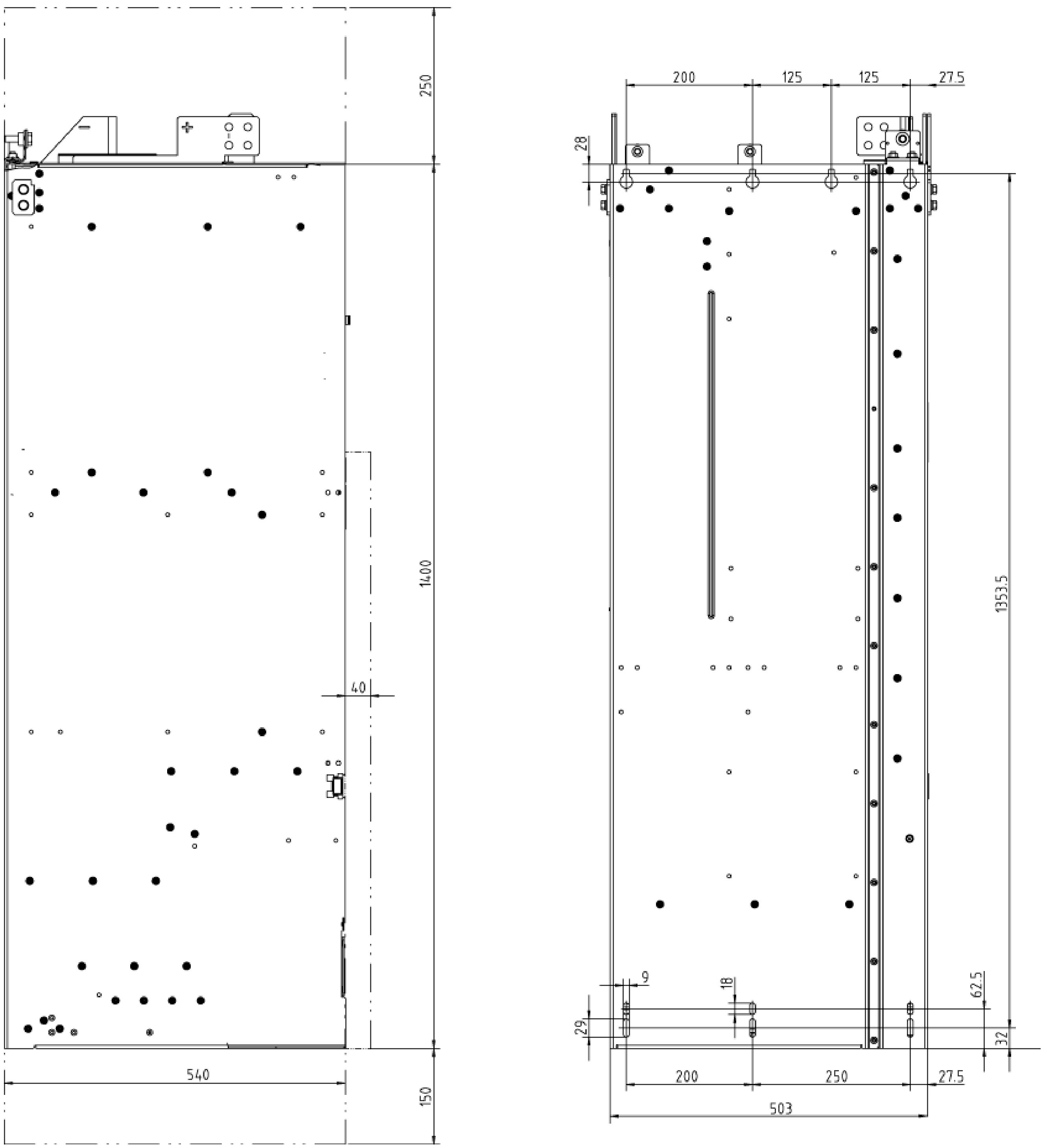


Figure 3-29 Dimension drawing Active Line Module, frame size HX Side view, rear view

Dimension drawing, frame size JX

The mandatory cooling clearances are indicated by the dotted line.

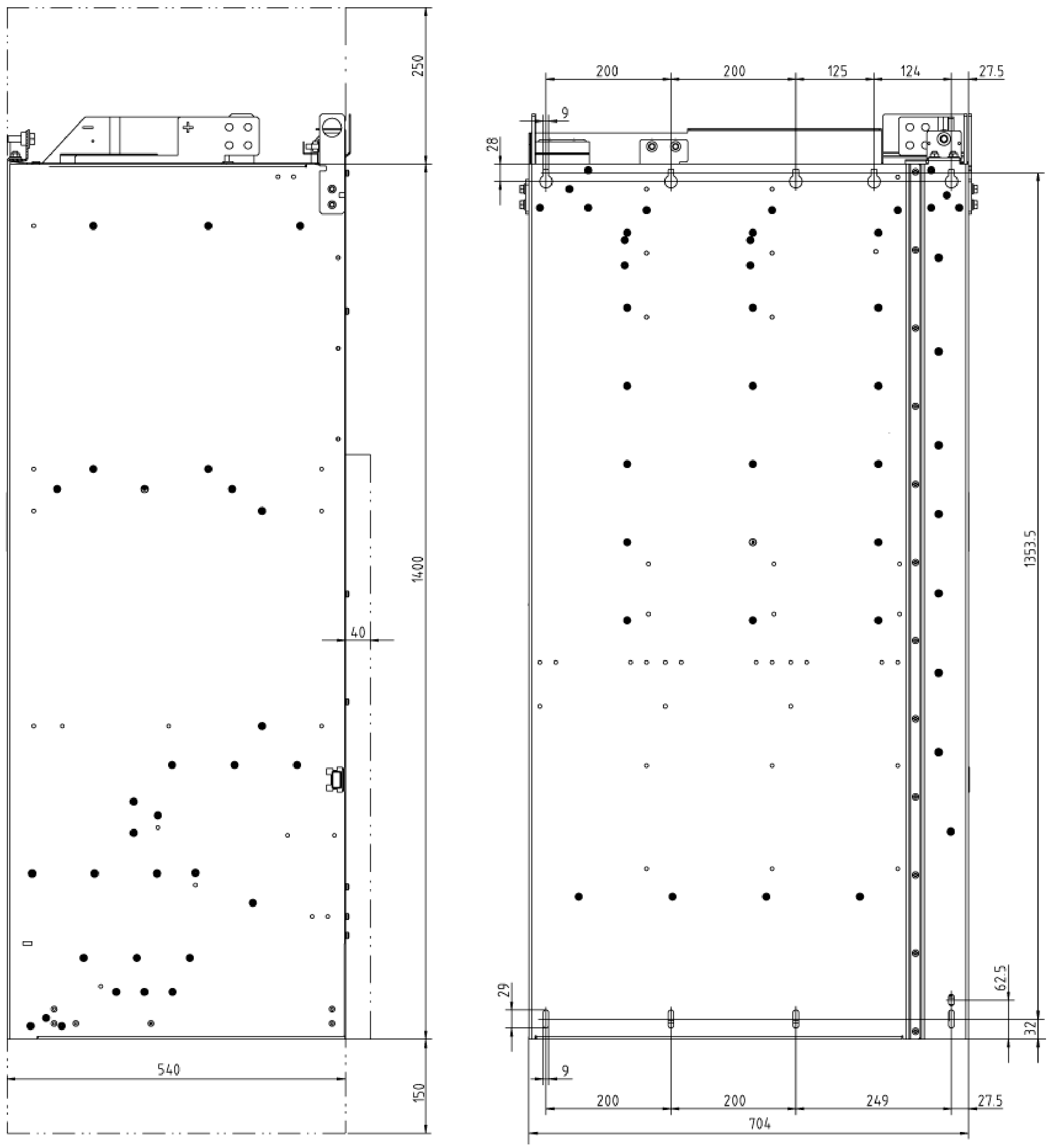


Figure 3-30 Dimension drawing Active Line Module, frame size JX Side view, rear view

3.4.5 Electrical connection

Adjusting the fan voltage (-T10)

The power supply for the device fans (1-ph. 230 V AC) in the Active Line Module (-T10) is taken from the line supply using transformers. The locations of the transformers are indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

Note

Two transformers (–T10 and –T20) are installed in Active Line Modules, frame size JX. The two primary-side terminals on each of these devices must be adjusted together.

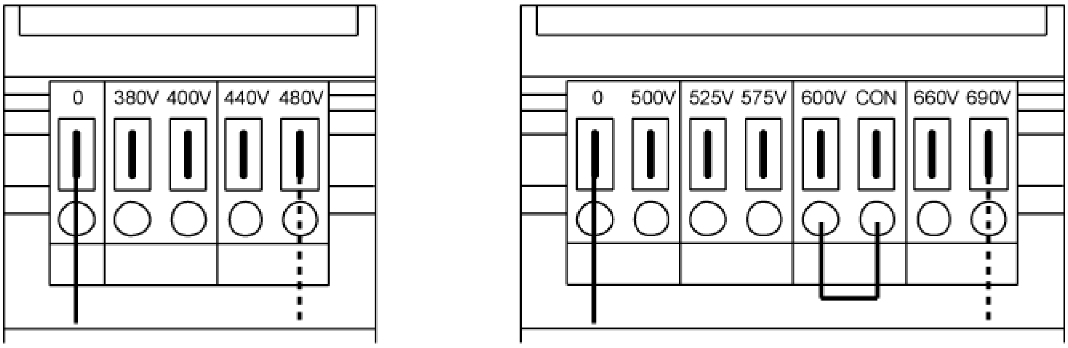


Figure 3-31 Setting terminals for the fan transformers (380 V – 480 V 3 AC / 500 V – 690 V 3 AC)

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V/0 V or 690 V/0 V).

Note

With the 500 V – 690 V 3 AC fan transformer, a jumper is inserted between the "600 V" terminal and the "CON" terminal. The "600V" and "CON" terminals are reserved for internal use.

CAUTION
If the terminals are not reconnected to the actual line voltage: • The required cooling level will not be provided (risk of overheating). • The fan fuses may blow (overload).

Table 3- 30 Line voltage assignments for setting the fan transformer (380 to 480 V AC, 3-phase)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10 %	380 V
400 V ± 10 %	400 V
440 V ± 10 %	440 V
480 V ± 10 %	480 V

Table 3- 31 Line voltage assignments for setting the fan transformer (500 V – 690 V AC, 3-phase)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10 %	500 V
525 V ± 10 %	525 V
575 V ± 10 %	575 V
600 V ± 10 %	600 V
660 V ± 10 %	660 V
690 V ± 10 %	690 V

3.4.6 Technical specifications

Table 3- 32 Technical specifications for Active Line Modules, 380 V – 480 V 3 AC, part 1

Order number	6SL3330–	7TE32–1AA0	7TE32–6AA0	7TE33–8AA0	7TE35–0AA0
Infeed/regenerative feedback power - Rated power Pn at 400 V 3 AC - Pmax at 400 V 3 AC	 kW kW	 132 198	 160 240	 235 352.5	 300 450
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 235 209 352	 291 259 436	 425 378 637	 549 489 823
Input current - Rated current at 400 V 3 AC - maximum	 A A	 210 315	 260 390	 380 570	 490 735
Supply voltages - Line voltage - Line frequency - Electronics power supply - DC link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 380 V 3 AC -10 % (-15 % < 1 min) to 480 V 3 AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 1.5 x U_{line}			
Power requirements - Electronics power consumption (24 V DC) - Total fan power consumption (at 400 V AC)	 A A	 1.1 0.63	 1.1 1.13	 1.35 1.6	 1.35 1.6
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	µF	4200	5200	7800	9600
Efficiency	η	0.98	0.98	0.98	0.98
Power loss	kW	2.3	2.9	4.2	5.1
Cooling air requirement	m^3/s	0.17	0.23	0.36	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 74 / 76	 75 / 77	 76 / 78	 76 / 78
Line/load connection		Flat connector for screw			
		M10	M10	M10	M10
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 1 x 185 2 x 185	 2 x 185 2 x 185 1 x 185 2 x 185	 2 x 185 2 x 185 1 x 185 2 x 185	 2 x 185 2 x 185 1 x 185 2 x 185
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 2700 4050	 2700 4050	 2700 4050	 2700 4050
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 326 1400 356	 326 1400 356	 326 1533 543	 326 1533 543

Order number	6SL3330–	7TE32–1AA0	7TE32–6AA0	7TE33–8AA0	7TE35–0AA0
Frame size		FX	FX	GX	GX
Weight	kg	88	88	152	152
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1230-2 1 315 2	3NE1331-2 1 350 2	3NE1334-2 1 500 3	3NE1436-2 1 630 3

1) The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 33 Technical specifications for Active Line Modules, 380 V – 480 V 3 AC, part 2

Order number	6SL3330–	7TE36–1AA0	7TE38–4AA0	7TE41–0AA0	7TE41–4AA0
Infeed/regenerative feedback power - Rated power Pn at 400 V 3 AC - Pmax at 400 V 3 AC	 kW kW	 380 570	 500 750	 630 945	 900 1350
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 678 603 1017	 940 837 1410	 1103 982 1654	 1574 1401 2361
Input current - Rated current at 400 V 3 AC - maximum	 A A	 605 907	 840 1260	 985 1477	 1405 2107
Supply voltages - Line voltage - Line frequency - Electronics power supply - DC link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 380 V 3 AC -10 % (-15 % < 1 min) to 480 V 3 AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 1.5 x U_{line}			
Power requirements - Electronics power consumption (24 V DC) - Total fan power consumption (at 400 V AC)	 A A	 1.4 5.2	 1.4 5.2	 1.5 7.8	 1.7 7.8
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	µF	12600	16800	18900	28800
Efficiency	η	0.98	0.98	0.98	0.98
Power loss	kW	6.2	7.7	10.1	13.3
Cooling air requirement	m^3/s	0.78	0.78	1.08	1.08
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 78 / 80	 78 / 80	 78 / 80	 78 / 80
Line/load connection		Flat connector for screw			
		M12	M12	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 4 x 240 Busbar 1 x 240 2 x 240	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 3900 5850	 3900 5850	 3900 5850	 3900 5850
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 503 1475 540	 503 1475 540	 704 1475 540	 704 1475 540
Frame size		HX	HX	JX	JX

Order number	6SL3330–	7TE36–1AA0	7TE38–4AA0	7TE41–0AA0	7TE41–4AA0
Weight	kg	290	290	450	450
UL listed fuse [1)] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1438-2 1 800 3	3NE1334-2 2 500 3	3NE1436-2 2 630 3	3NE1448-2 2 850 3

1) The types of protection specified here are mandatory for installing a UL-approved system.

Table 3- 34 Technical specifications for Active Line Modules, 500V–690 V 3 AC

Order number	6SL3330–	7TG35–8AA0	7TG37–4AA0	7TG41–0AA0	7TG41–3AA0
Infeed/regenerative feedback power - Rated power Pn at 690 V 3 AC - Rated power Pn at 500 V 3 AC - Pmax at 690 V 3 AC	 kW kW kW	 560 400 840	 800 560 1200	 1100 800 1650	 1400 1000 2100
DC link current - Rated current I_{n_DC} - Base load current I_{H_DC} - Maximum current I_{max_DC}	 A A A	 644 573 966	 823 732 1234	 1148 1022 1722	 1422 1266 2133
Input current - Rated current at 690 V 3 AC - maximum	 A A	 575 862	 735 1102	 1025 1537	 1270 1905
Supply voltages - Line voltage - Line frequency - Electronics power supply - DC link voltage	 V_{ACrms} Hz V_{DC} V_{DC}	 500 V 3 AC -10 % (-15 % < 1 min) to 690 V 3 AC +10 % 47 to 63 Hz 24 (20.4 - 28.8) 1.5 x U_{line}			
Power requirements - Electronics power consumption (24 V DC) - Total fan power consumption (at 690 V AC)	 A A	 1.4 3	 1.5 4.5	 1.7 4.5	 1.7 4.5
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	μF	7400	11100	14400	19200
Efficiency	η	0.98	0.98	0.98	0.98
Power loss	kW	6.8	10.2	13.6	16.5
Cooling air requirement	m^3/s	0.78	1.1	1.1	1.1
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 78 / 80	 78 / 80	 78 / 80	 78 / 80
Line/load connection		Flat connector for screw			
		M12	M12	M12	M12
Max. connection cross-sections - Line connection (U1, V1, W1) - DC link connection (DCP, DCN) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 4 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240	 6 x 240 Busbar 1 x 240 2 x 240
Max. cable length (total of all motor cables and DC link) - shielded - unshielded	 m m	 2250 3375	 2250 3375	 2250 3375	 2250 3375
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 503 1475 540	 704 1475 540	 704 1475 540	 704 1475 540
Frame size		HX	JX	JX	JX

Order number	6SL3330–	7TG35–8AA0	7TG37–4AA0	7TG41–0AA0	7TG41–3AA0
Weight	kg	290	450	450	450
UL listed fuse [1] - Number (connected in parallel) - Rated current - Frame size acc. to DIN 43620-1		3NE1447-2 1 670 3	3NE1448-2 1 850 3	3NE1436-2 2 630 3	3NE1438-2 2 800 3

[1] The types of protection specified here are mandatory for installing a UL-approved system.

Overload capability

The Active Line Modules have an overload reserve.

The criterion for overload is that the drive is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

High overload

The base load current for a high overload I_{H_DC} is based on a duty cycle of 150 % for 60 s; the max. current I_{max_DC} can flow for 5 s.

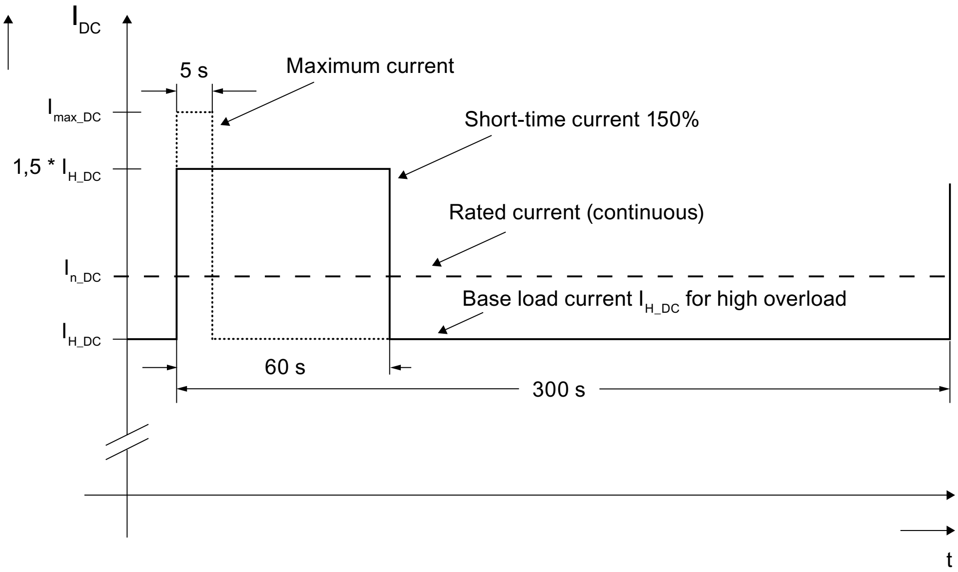


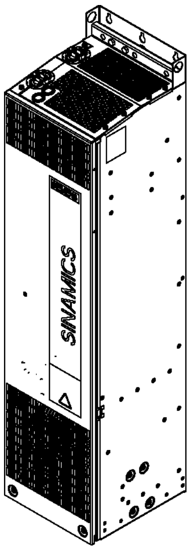
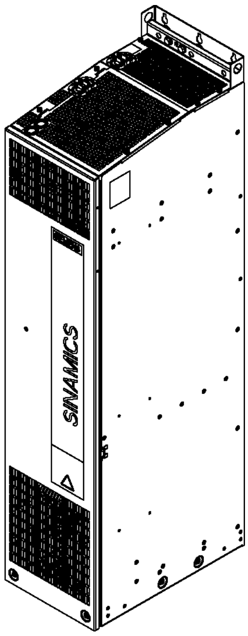
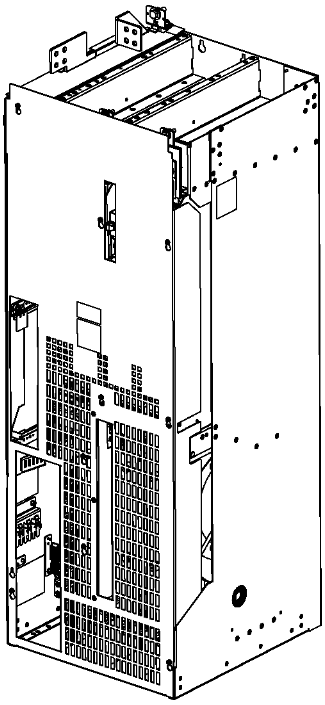
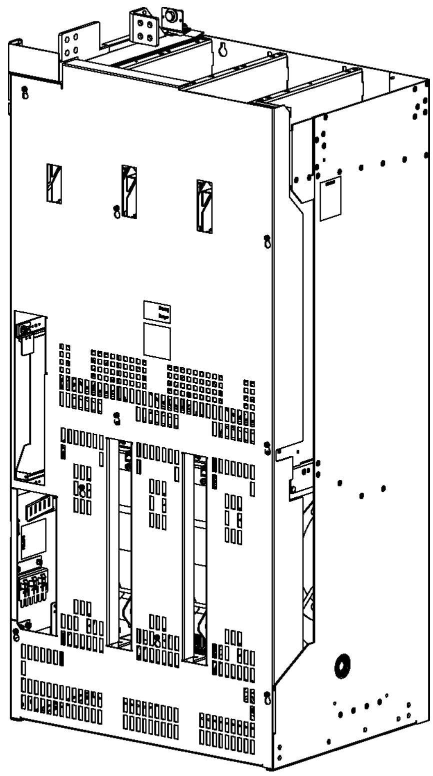
Figure 3-32 High overload

Motor Modules 4

4.1 Description

A Motor Module is a power unit (DC-AC inverter) that provides the power supply for the motor connected to it. Power is supplied by means of the DC link of the drive unit.
A Motor Module must be connected to a Control Unit via DRIVE-CLiQ. The open-loop and closed-loop control functions are stored in the Control Unit.

Table 4- 1 Overview of Motor Modules

			
Frame size FX	Frame size GX	Frame size HX	Frame size JX

Operating principle

Motor Modules are designed for multi-axis drive systems and are controlled by either a CU320 or a SIMOTION D Control Unit. Motor Modules are interconnected by means of a shared DC busbar.

One or more Motor Modules are supplied with energy for the motors via the DC link. Both synchronous and induction motors can be operated.

Since the Motor Modules share the same DC link, they can exchange energy with one another, i.e. if one Motor Module operating in generator mode produces energy, the energy can be used by another Motor Module operating in motor mode. The DC link is supplied with line voltage by a Line Module.

Characteristics of the Motor Modules

- Version for 510 V DC to 720 V DC from 210 A to 1405 A

  Version for 675 V DC to 1035 V DC from 85 A to 1270 A
- Internal air cooling
- Short-circuit/ground-fault-proof
- Electronic rating plate
- Operating status and error status via LEDs
- DRIVE-CLiQ interface for communication with the Control Unit and/or other components in the drive line-up.
- Integration in system diagnostics

4.2 Safety information

⚠ WARNING
After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. Work cannot be carried out until this time has elapsed. Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC link terminals DCP and DCN.

⚠ CAUTION
The DC link discharge time hazard warning must be affixed to the component in the relevant local language.

NOTICE
The cooling clearances above, below, and in front of the component, which are specified in the dimension drawings, must be observed.

⚠ WARNING
Cable shields and power cable conductors which are not used, must be connected to PE potential in order to discharge charges as a result of capacitive coupling. Non-observance can cause lethal shock voltages.

⚠ DANGER
Motor Modules discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with Motor Modules, they or the relevant control cabinet must be permanently connected to PE. According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

4.3 Interface description

4.3.1 Overview

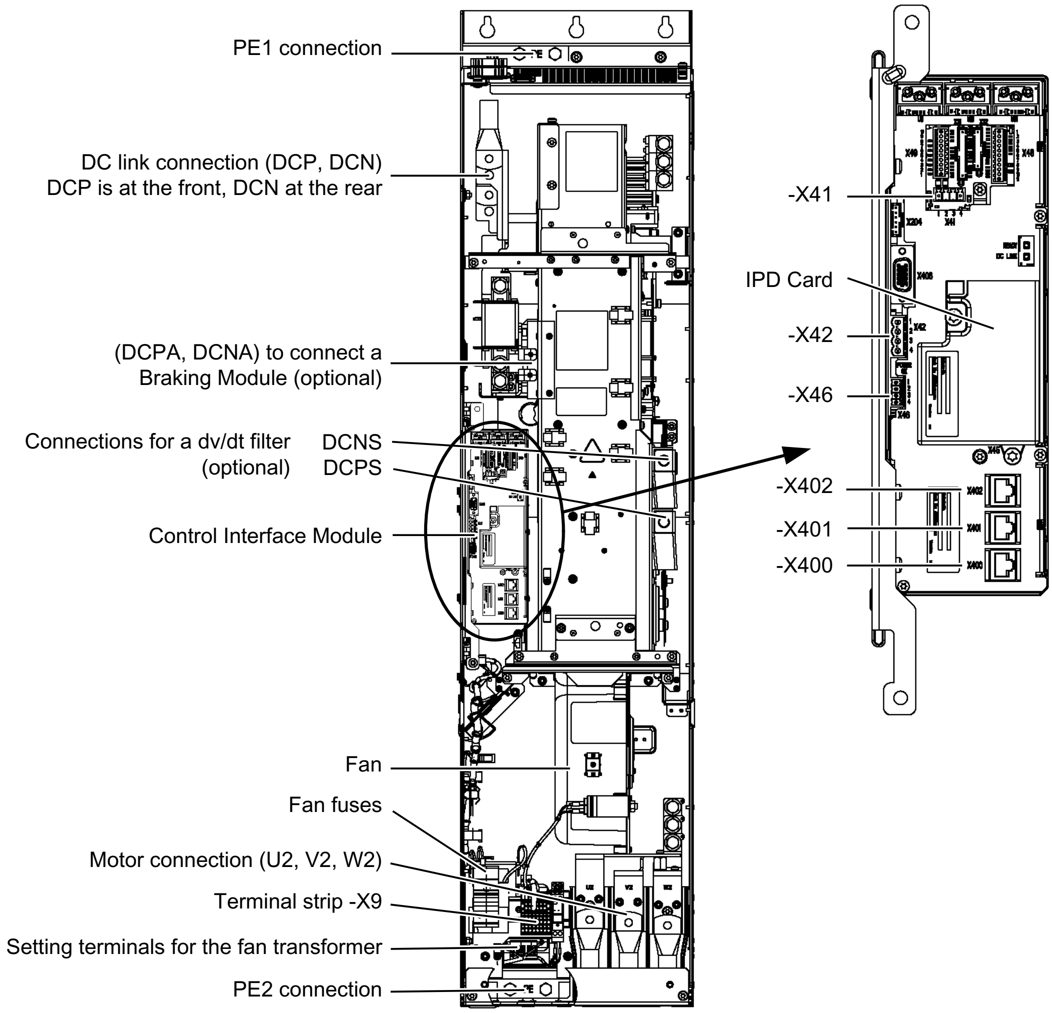


Figure 4-1 Motor Module, frame size FX, with order numbers 6SL3320–1Txxx–xAA3

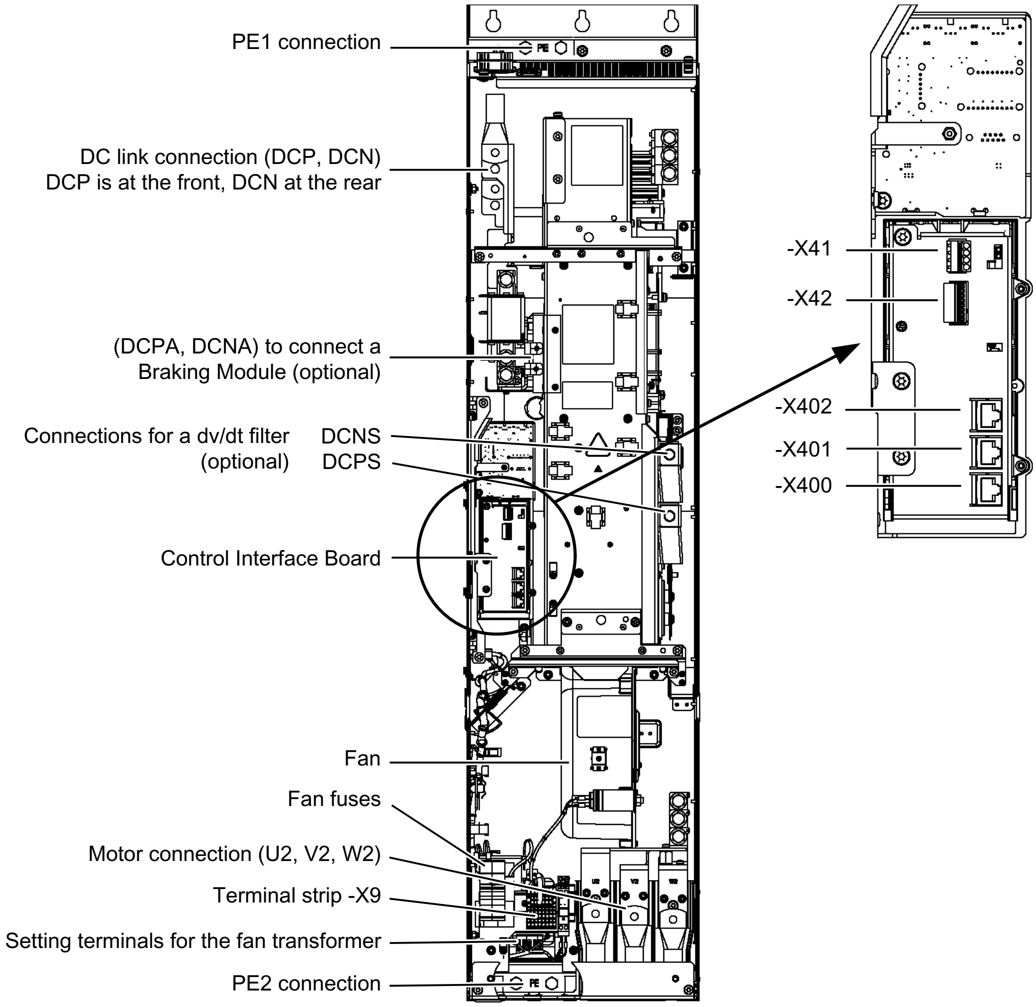


Figure 4-2 Motor Module, frame size FX, with order numbers 6SL3320–1Txxx–xAA0

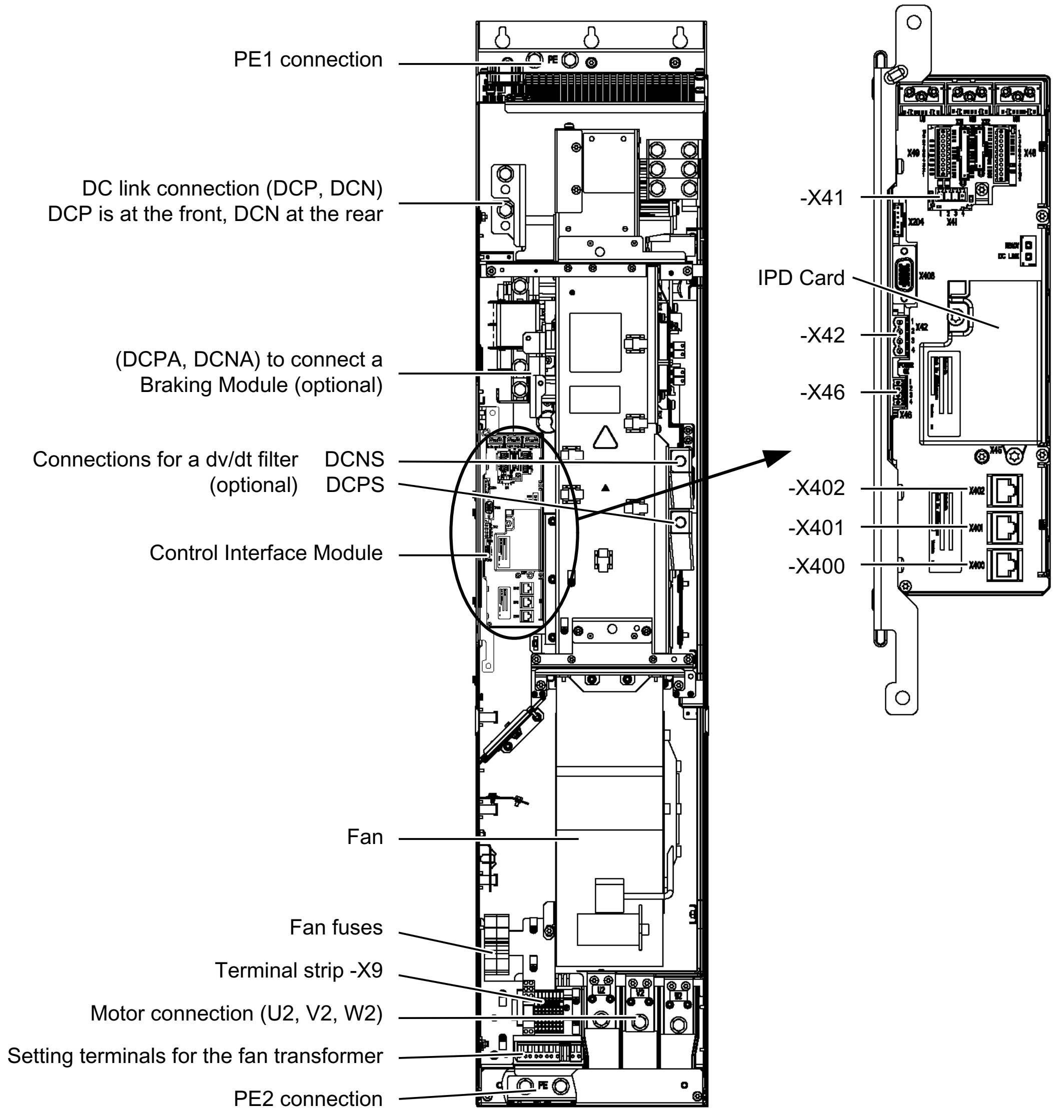


Figure 4-3 Motor Module, frame size GX, with order numbers 6SL3320–1Txxx–xAA3

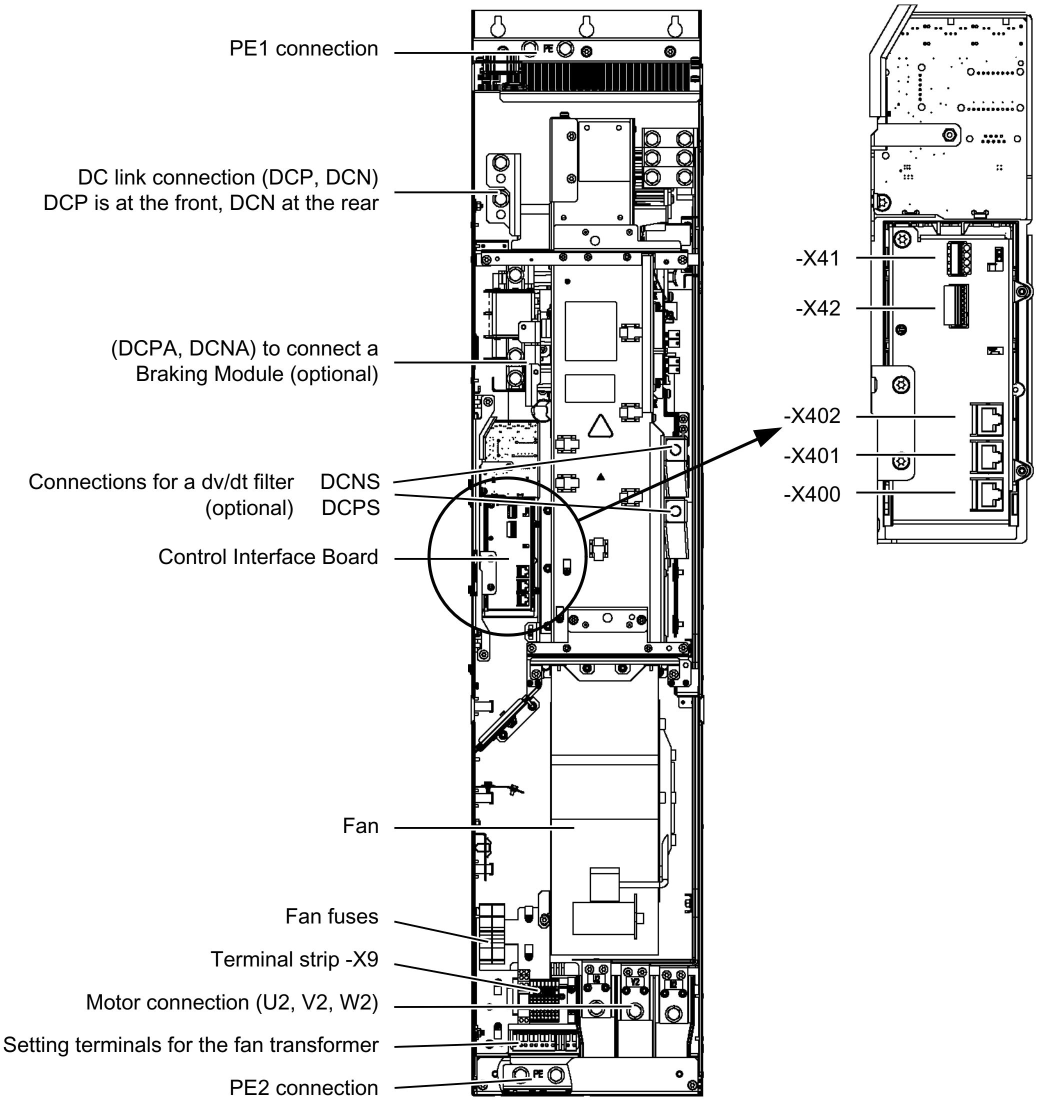


Figure 4-4 Motor Module, frame size GX, with order numbers 6SL3320–1Txxx–xAA0

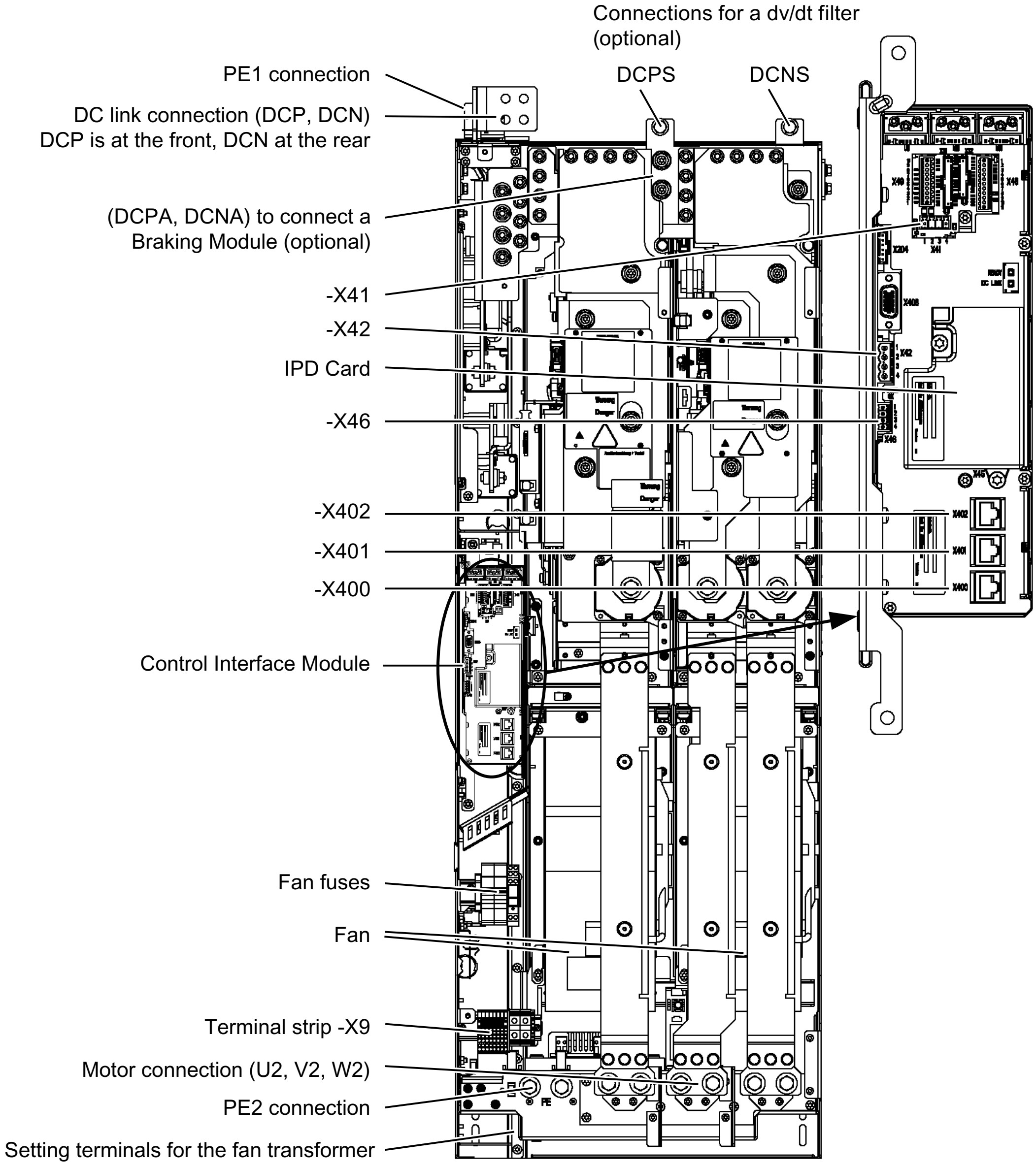


Figure 4-5 Motor Module, frame size HX, with order numbers 6SL3320–1Txxx–xAA3

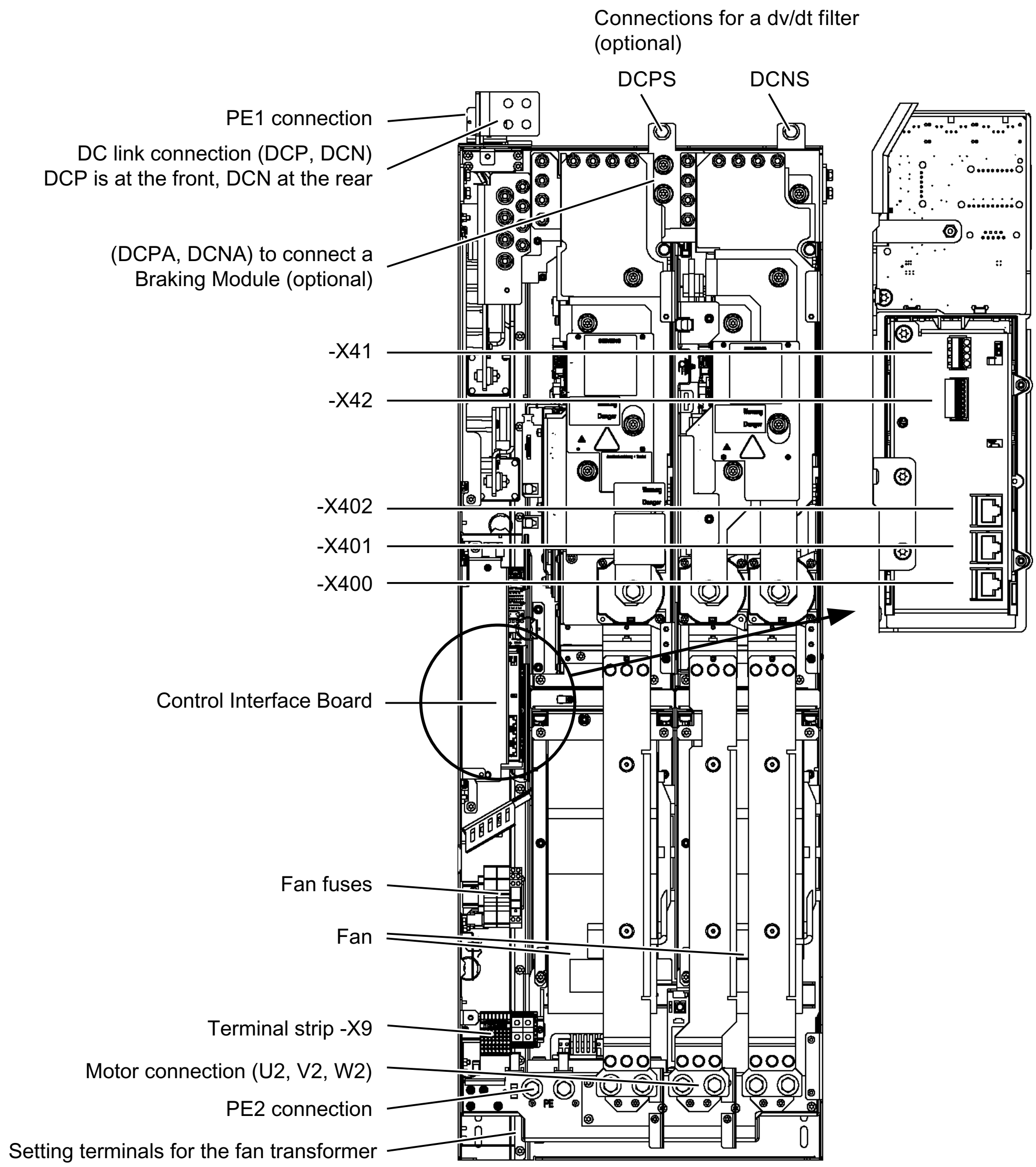


Figure 4-6 Motor Module, frame size HX, with order numbers 6SL3320–1Txxx–xAA0

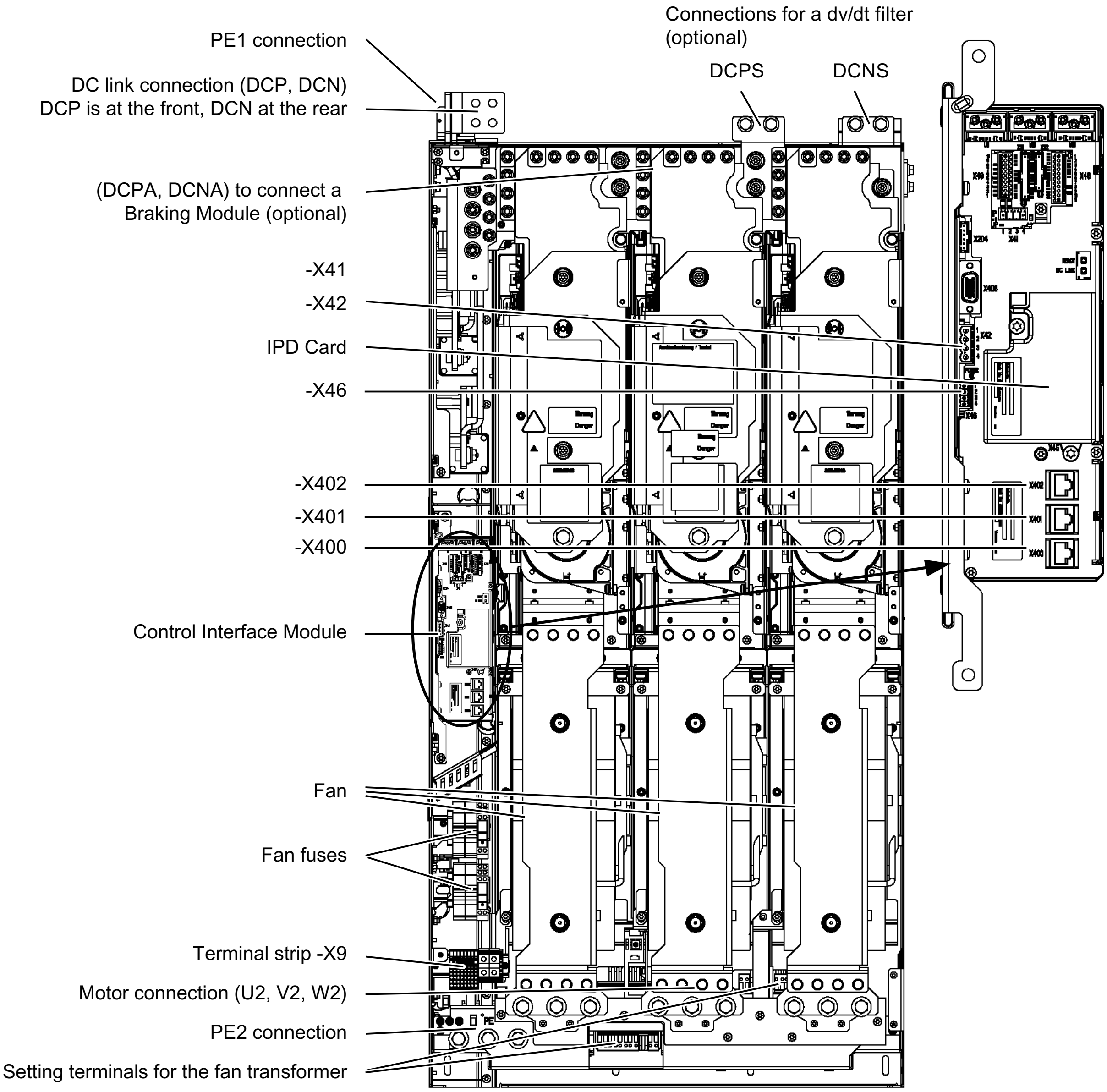


Figure 4-7 Motor Module, frame size JX, with order numbers 6SL3320–1Txxx–xAA3

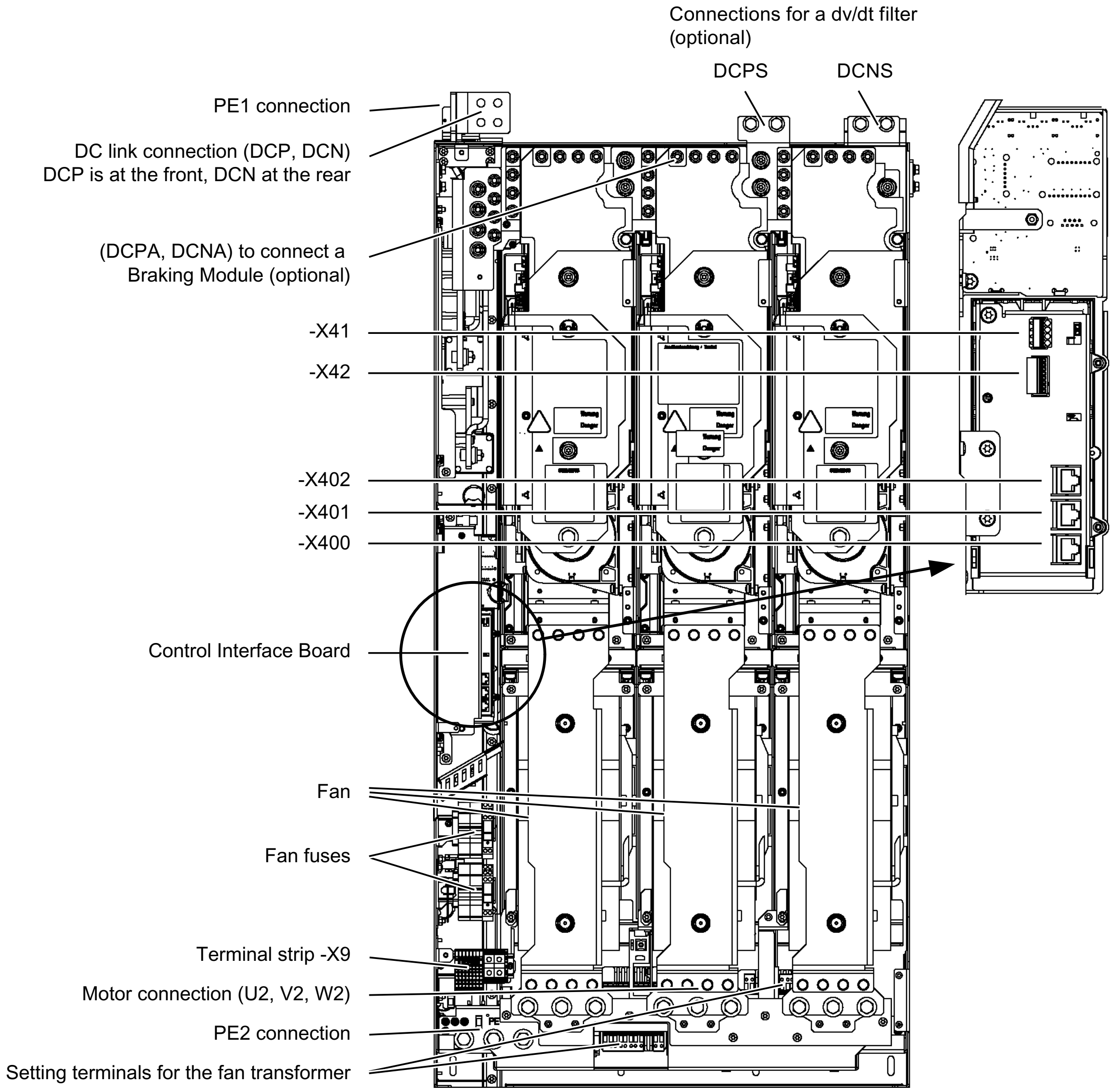
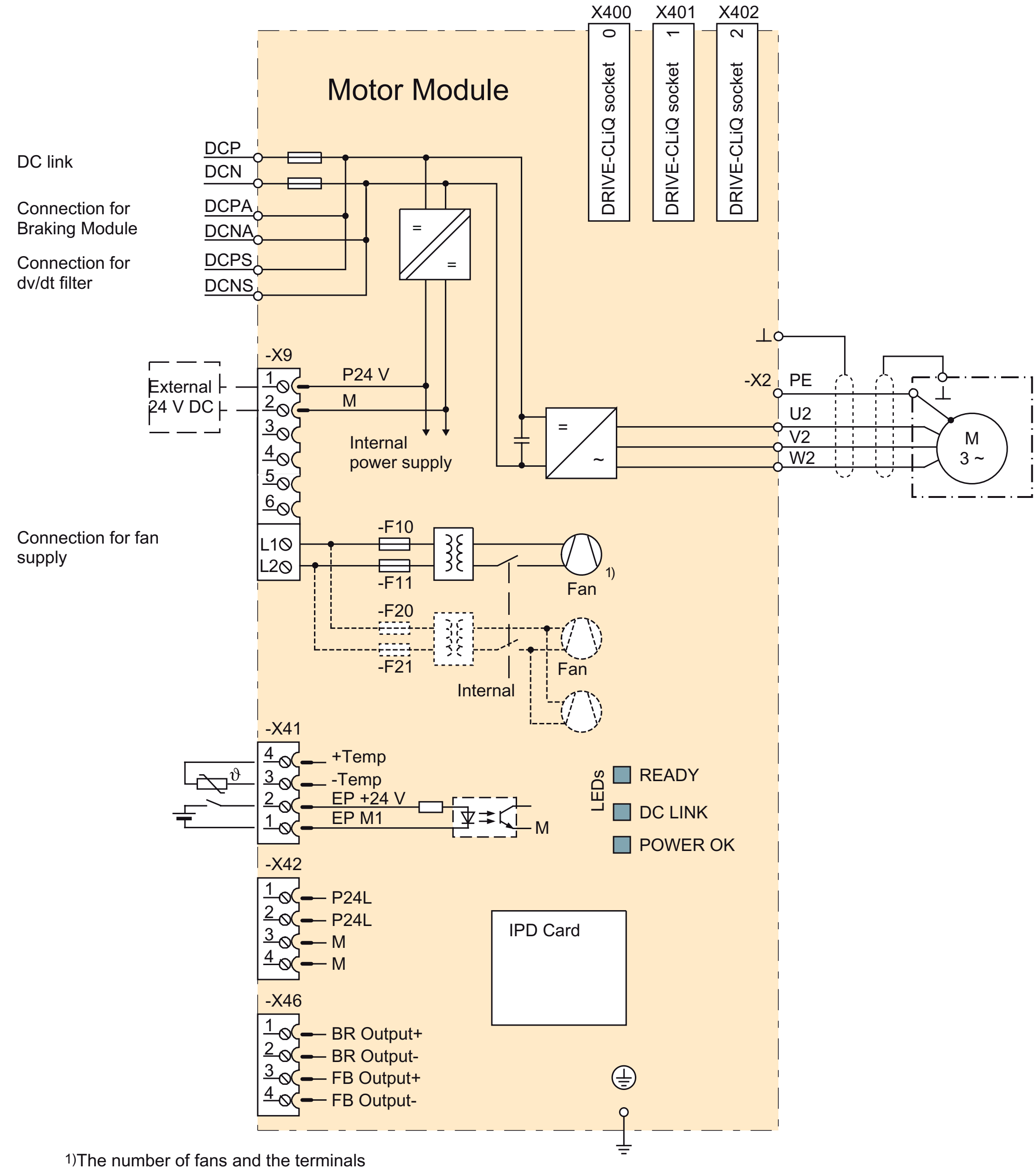


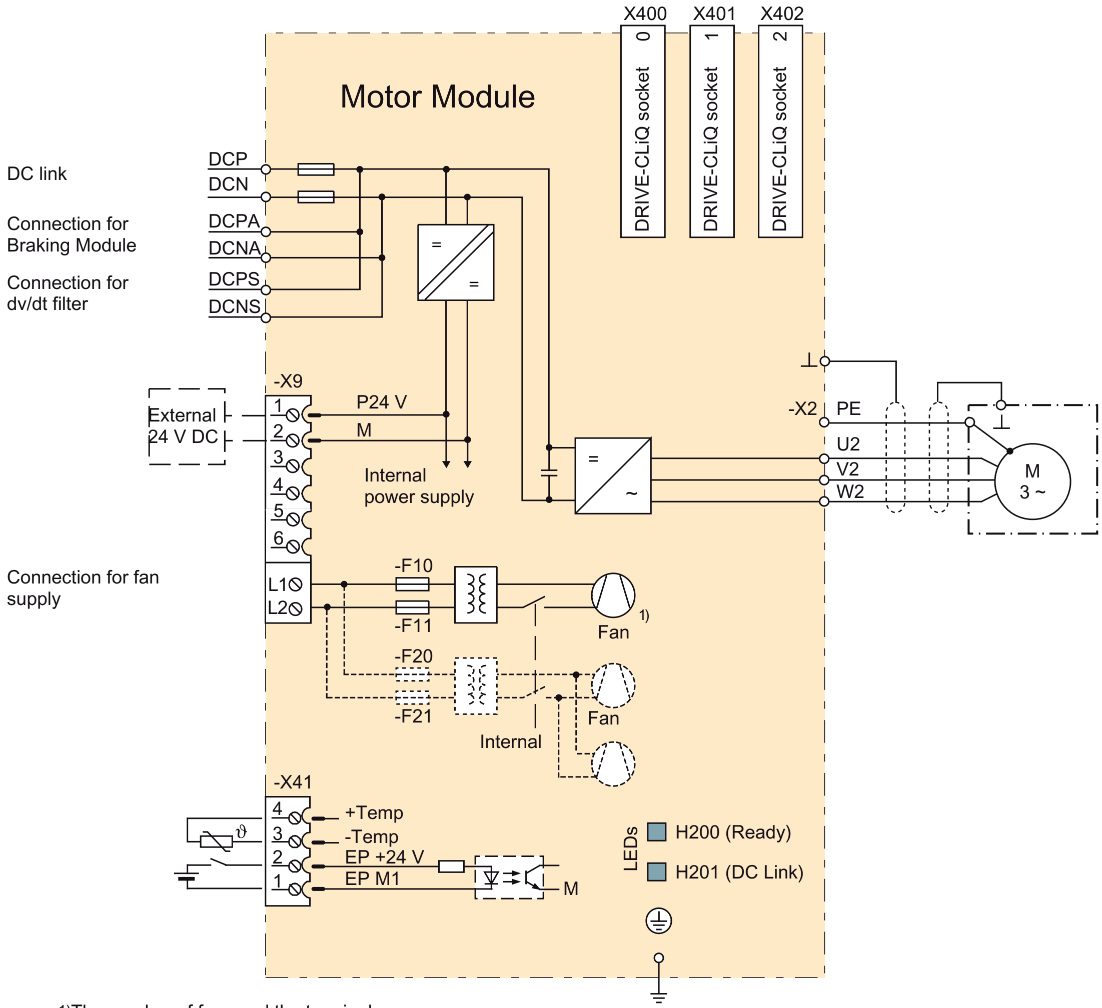
Figure 4-8 Motor Module, frame size JX, with order numbers 6SL3320–1Txxx–xAA0

4.3.2 Connection example



1)The number of fans and the terminals for them depend on the frame size.

Figure 4-9 Connection example of Motor Modules, with order numbers 6SL3320–1Txxx–xAA3



1)The number of fans and the terminals for them depend on the frame size.

Figure 4-10 Connection example of Motor Modules, with order numbers 6SL3320–1Txxx–xAA0

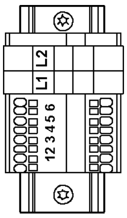
4.3.3 DC link/motor connection

Table 4- 2 DC link/motor connection of the Motor Module

Terminals	Technical specifications
DCP, DCN DC power input	Voltage: • 510 V to 720 V DC • 675 V to 1035 V DC Connections: • Frame sizes FX / GX: Thread M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: d = 13 mm (M12/50 Nm) flat connector for busbar
DCPA, DCNA Connection for Braking Module	Voltage: • 510 V to 720 V DC • 675 V to 1035 V DC Connections: • Frame sizes FX / GX: Threaded bolt M6 / 6 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: d = 13 mm (M12/50 Nm) flat connector for busbar
DCPS, DCNS connection for a dv/dt filter plus VPL	Voltage: • 510 V to 720 V DC • 675 V to 1035 V DC Connections: Frame sizes FX / GX: Threaded bolt M6 / 6 Nm for ring cable lugs to DIN 46234 Frame sizes HX / JX: d = 11 mm (M10 / 25 Nm) for ring cable lugs to DIN 46234
U2, V2, W2 3 AC power output	Voltage: • 0 VAC, 3-phase, to 0.72 x DC link voltage Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: M12 / 50 Nm for ring cable lugs to DIN 46234
PE connection PE1, PE2	Connecting thread: • Frame sizes FX / GX: M10 / 25 Nm for ring cable lugs to DIN 46234 • Frame sizes HX / JX: M12 / 50 Nm for ring cable lugs to DIN 46234

4.3.4 X9 terminal strip

Table 4- 3 X9 terminal strip

	Terminal	Signal name	Technical specifications
	1	P24V	Voltage: 24 V DC (20.4 V – 28.8 V) Power consumption: max. 1.4 A
	2	M	
	3	Reserved, do not use	
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	Reserved, do not use	
	L1	Connection for fan supply (frames sizes HX and JX only)	380 V to 480 V AC / 500 V to 690 V AC Power consumption: See technical specifications
	L2		
Max. connectable cross-section: Terminals 1 – 6: 1.5 mm², Terminals L1 - L2: 35 mm²			

4.3.5 DCPS, DCNS connection for a dv/dt filter

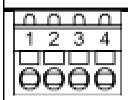
Table 4- 4 DCPS, DCNS

Frame size	Connectable cross-section	Terminal screw
FX	1 x 35 mm²	M8
GX	1 x 70 mm²	M8
HX	1 x 185 mm²	M10
JX	2 x 185 mm²	M10

With frame sizes FX and GX, the connecting cables are routed down through the Motor Module and out.

4.3.6 X41 EP terminal / temperature sensor connection

Table 4- 5 Terminal strip X41, with order numbers 6SL3320–1Txxx–xAA3

	Terminal	Function	Technical data
	1	EP M1 (enable pulses)	Supply voltage: 24 VDC (20.4 V – 28.8 V) Power consumption: 10 mA Signal propagation delay times: L → H 100 µs H → L: 1000 µs The pulse inhibit function is only available when Safety Integrated Basic Functions are enabled.
	2	EP +24 V (enable pulses)	
	3	- Temp	Temperature sensor connection KTY84-1C130/PTC / PT100
	4	+ Temp	
Max. connectable cross-section 1.5 mm²			

CAUTION

The temperature sensor must be connected in shielded form. The shielding must be attached to the shield support of the motor module.

NOTICE

The KTY temperature sensor must be connected with the correct polarity.

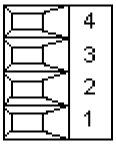
NOTICE

The function of the EP terminals is only available when Safety Integrated Basic Functions are enabled.

Note

The temperature sensor connection can be used for motors that are equipped with a KTY84-1C130 / PTC / PT100 probe in the stator windings.

Table 4- 6 Terminal strip X41, with order numbers 6SL3320–1Txxx–xAA0

	Terminal	Function	Technical data
	4	+ Temp	Temperature sensor connection KTY84–1C130/PTC
	3	- Temp	
	2	EP +24 V (enable pulses)	Supply voltage: 24 VDC (20.4 V – 28.8 V) Power consumption: 10 mA Signal propagation delay times: L → H 100 µs H → L: 1000 µs The pulse inhibit function is only available when Safety Integrated Basic Functions are enabled.
	1	EP M1 (enable pulses)	
Max. connectable cross-section 1.5 mm^2			

NOTICE

The KTY temperature sensor must be connected with the correct polarity.

NOTICE

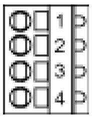
The function of the EP terminals is only available when Safety Integrated Basic Functions are enabled.

Note

The temperature sensor connection can be used for motors that are equipped with a KTY84-1C130 / PTC probe in the stator windings.

4.3.7 X42 terminal strip

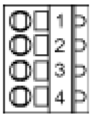
Table 4- 7 Terminal strip X42 brake control and monitoring, with order numbers 6SL3320–1Txxx–xAA3

	Terminal	Function	Technical specifications
	1	P24L	Voltage supply for Control Unit, Sensor Module and Terminal Module (18 to 28.8 V)
	2		
	3	M	
	4		
Max. connectable cross-section 2.5 mm^2			

With order numbers 6SL3320–1Txxx–xAA0: Reserved, do not use!

4.3.8 X46 Brake control and monitoring

Table 4- 8 Terminal strip X46 brake control and monitoring, with order numbers 6SL3320–1Txxx–xAA3

	Terminal	Function	Technical specifications
	1	BR output +	Supply voltage: 24 V DC max. load current: 150 mA
	2	BR output -	
	3	FB input +	
	4	FB input -	
Max. connectable cross-section 1.5 mm^2			

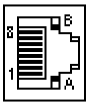
CAUTION

The length of the connecting lead at terminal strip X46 must not exceed 10 m, and the lead must not be brought out outside the control cabinet or control cabinet group.

Relay modules provided on the line side must be fitted inside the control cabinet or control cabinet group.

4.3.9 DRIVE-CLiQ interfaces X400, X401, X402

Table 4- 9 DRIVE-CLiQ interfaces X400, X401, X402

	PIN	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	24 V power supply
	B	M (0 V)	Electronics ground
Blanking plate for DRIVE-CLiQ interface: Yamaichi, order no.: Y-ConAS-13			

4.3.10 Meaning of the LEDs on the Control Interface Module in the Motor Module

Note

The description applies to Motor Modules with the order number 6SL3320–1Txxx–xAA3.

Table 4- 10 Meaning of the LEDs "READY" and "DC LINK" on the Control Interface Module in the Motor Module

LED state		Description
READY	DC LINK	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

Table 4- 11 Meaning of the LED "POWER OK" on the Control Interface Module in the Motor Module

LED	Color	Status	Description
POWER OK	Green	Off	DC link voltage < 100 V and voltage at -X9:1/2 less than 12 V.
		On	The component is ready for operation.
		Flashing light	There is a fault. If the LED continues to flash after you have performed a POWER ON, please contact your Siemens service center.

WARNING

Irrespective of the state of the LED "DC LINK", hazardous DC link voltages can always be present.

The warning information on the component must be carefully observed!

4.3.11 Meaning of the LEDs on the Control Interface Board in the Motor Module

> **Note**
>
> The description applies to Motor Modules with the order number 6SL3320–1Txxx–xAA0.

Table 4- 12 Meaning of the LEDs on the Control Interface Board in the Motor Module

LED state		Description
H200	H201	
Off	Off	The electronics power supply is missing or out of tolerance.
Green	Off	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place.
	Orange	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is present.
	Red	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is too high.
Orange	Orange	DRIVE-CLiQ communication is being established.
Red	---	At least one fault is present in this component. Note: LED is driven irrespective of the corresponding messages being reconfigured.
Flashing light 0.5 Hz: Green / red	---	Firmware is being downloaded.
2 Hz flashing: Green / red	---	Firmware download is complete. Waiting for POWER ON.
2 Hz flashing: Green / orange or red / orange	---	Component detection using LED is activated (p0124) Note: The two options depend on the LED status when module recognition is activated via p0124 = 1.

> **⚠ WARNING**
>
> Irrespective of the state of LED "H201", hazardous DC link voltage can always be present.
>
> The warning information on the component must be carefully observed!

4.4 Dimension drawing

Dimension drawing, frame size FX

The mandatory cooling clearances are indicated by the dotted line.

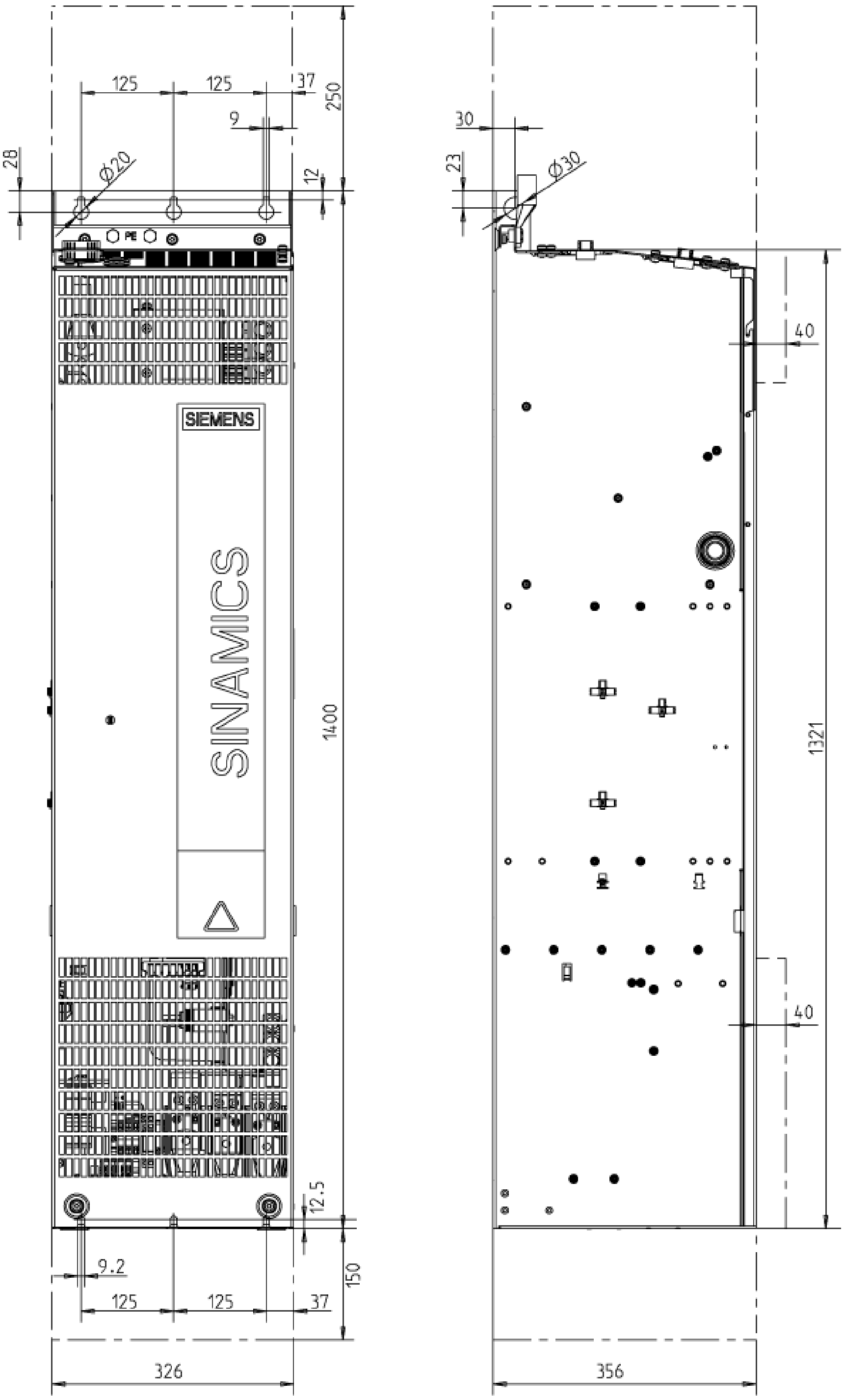


Figure 4-11 Dimension drawing Motor Module, frame size FX Front view, side view

Dimension drawing, frame size GX

The mandatory cooling clearances are indicated by the dotted line.

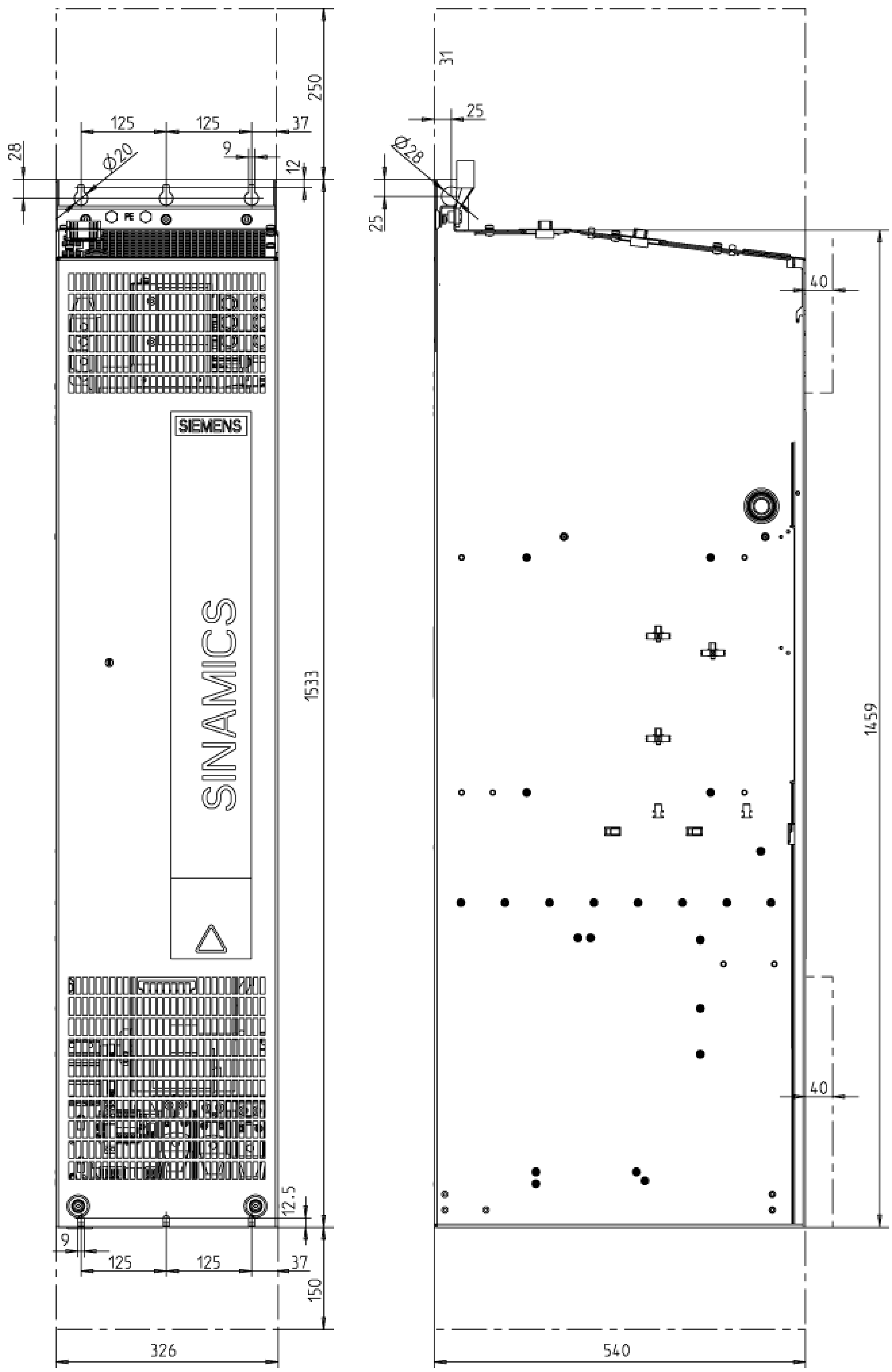


Figure 4-12 Dimension drawing Motor Module, frame size GX Front view, side view

Dimension drawing, frame size HX

The mandatory cooling clearances are indicated by the dotted line.

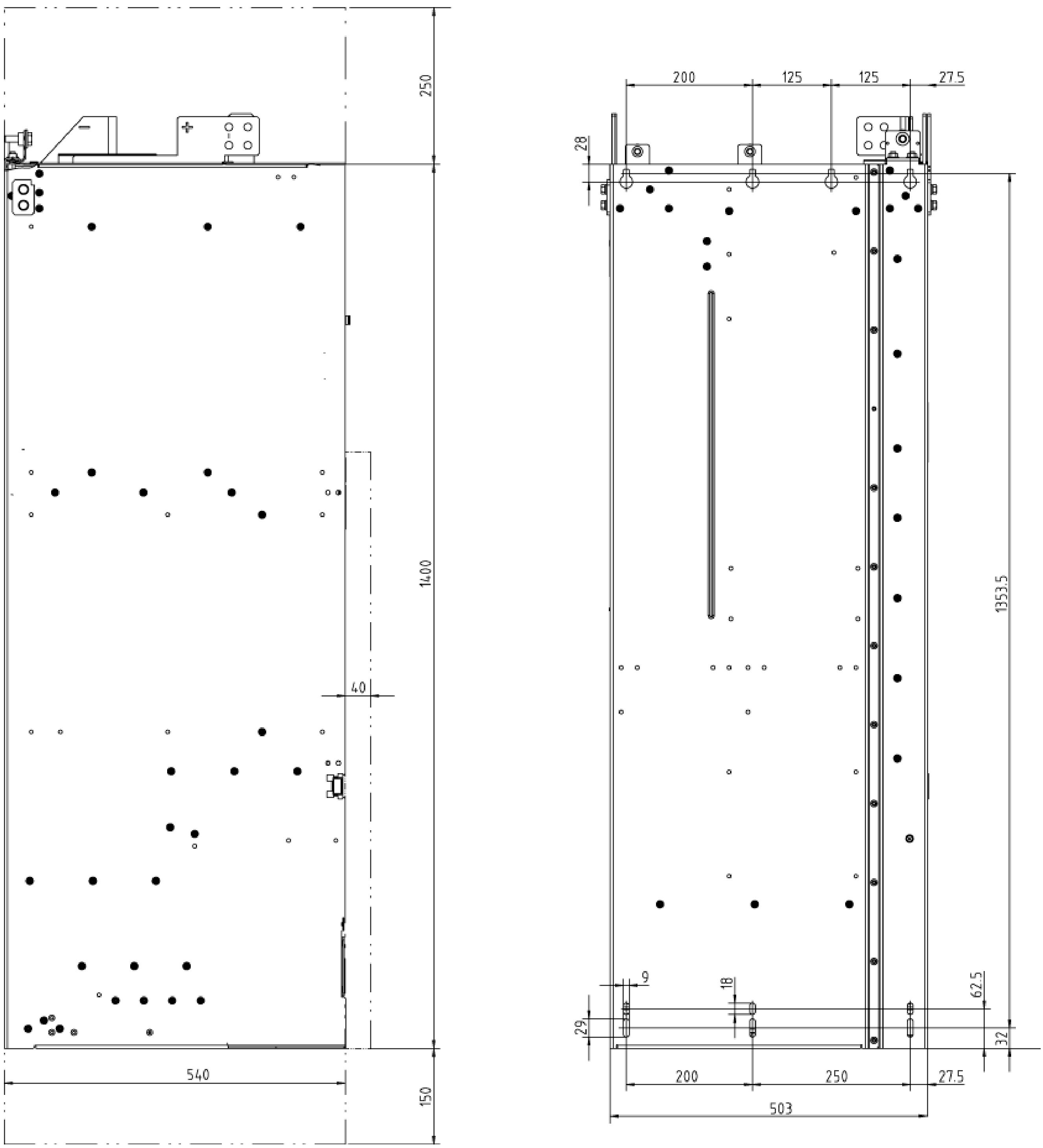


Figure 4-13 Dimension drawing Motor Module, frame size HX Side view, rear view

Dimension drawing, frame size JX

The mandatory cooling clearances are indicated by the dotted line.

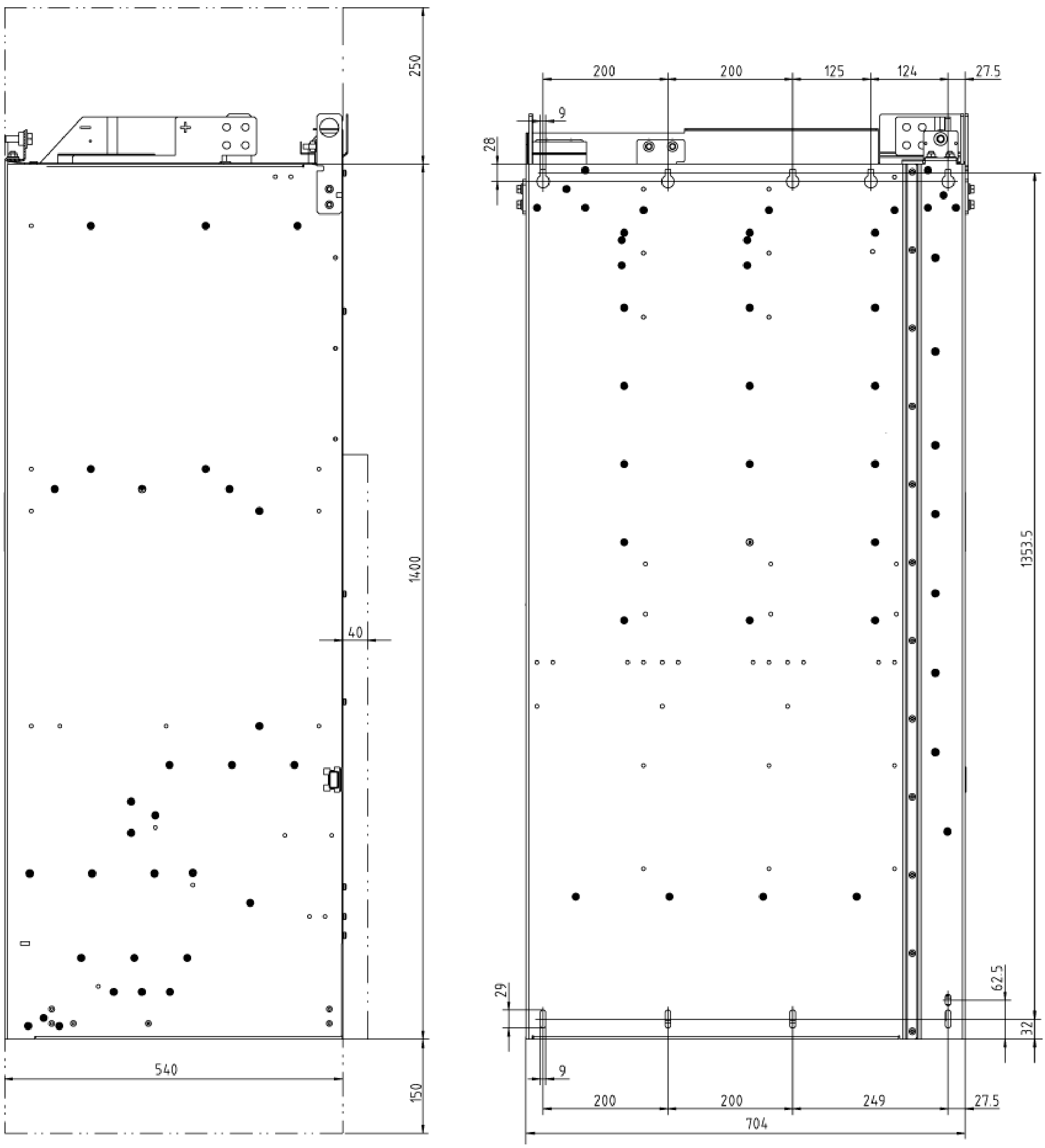


Figure 4-14 Dimension drawing Motor Module, frame size JX Side view, rear view

4.5 Electrical connection

Adjusting the fan voltage (-T10)

The power supply for the device fans (1-ph. 230 V AC) in the Motor Module (-T10) is taken from the line supply using transformers. The locations of the transformers are indicated in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line supply voltage.

If necessary, the connection fitted in the factory, shown with a dashed line, must be reconnected to the actual line voltage.

Note

Two transformers (T10 and -T20) are installed in Motor Modules frame size JX. The two primary-side terminals on each of these devices must be adjusted together.

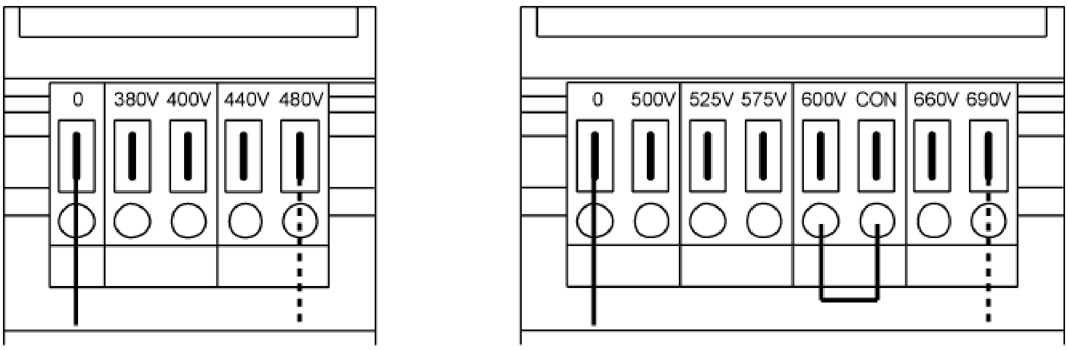


Figure 4-15 Setting terminals for the fan transformers
(380 V – 480 V 3 AC / 500 V – 690 V 3 AC)

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following tables (factory presetting: 480 V/0 V or 690 V/0 V).

Note

With the 500 V – 690 V 3 AC fan transformer, a jumper is inserted between the "600 V" terminal and the "CON" terminal. The "600 V" and "CON" terminals are reserved for internal use.

CAUTION

If the terminals are not reconnected to the actual line voltage:

- The required cooling level will not be provided (risk of overheating).
- The fan fuses may blow (overload).

Table 4- 13 Line voltage assignments for setting the fan transformer (380 to 480 V AC, 3-phase)

Line voltage	Tap at the fan transformer (-T10)
380 V ± 10 %	380 V
400 V ± 10 %	400 V
440 V ± 10 %	440 V
480 V ± 10 %	480 V

Table 4- 14 Line voltage assignments for setting the fan transformer (500 V – 690 V AC, 3-phase)

Line voltage	Tap at the fan transformer (-T10)
500 V ± 10 %	500 V
525 V ± 10 %	525 V
575 V ± 10 %	575 V
600 V ± 10 %	600 V
660 V ± 10 %	660 V
690 V ± 10 %	690 V

4.6 Technical specifications

4.6.1 510 V DC – 720 V DC Motor Modules

Table 4- 15 Technical specifications for Motor Module, 510 V DC – 720 V DC, Part 1

Order number	6SL3320–	1TE32–1AA0 1TE32–1AA3	1TE32–6AA0 1TE32–6AA3	1TE33–1AA0 1TE33–1AA3	1TE33–8AA0 1TE33–8AA3
Output current - Rated current I_n - Base load current I_L - Base load current I_H - for S6 operation (40 %) I_{S6} - Max. output current I_{max}	 A A A A A	 210 205 178 230 307	 260 250 233 285 375	 310 302 277 340 453	 380 370 340 430 555
Unit rating [1)] - Power on basis of I_n - Power on basis of I_H	 kW kW	 110 90	 132 110	 160 132	 200 160
Rated DC link current for power supplied via - Basic/Smart Line Module - Active Line Module	 A A	 252 227	 312 281	 372 335	 456 411
Supply voltages - DC link voltage - Electronics power supply - Output voltage	 V_{DC} V_{DC} V_{ACrms}	 510 to 720 24 (20.4 – 28.8) 0 to 0.72 x DC link voltage			
Rated pulse frequency - Max. pulse frequency without derating - Max. pulse frequency with derating	kHz kHz kHz	2 2 8	2 2 8	2 2 8	2 2 8
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	µF	4200	5200	6300	7800
Power requirements - Electronics power consumption (24 V DC) - Fan supply, 400 V 2 AC, 50/60 Hz	 A A	 0.9 0.63 / 0.95	 0.9 1.13 / 1.7	 1.2 1.6 / 2.4	 1.2 1.6 / 2.4
Power loss, max.	kW	1.94	2.6	3.1	3.8
Cooling air requirement	m^3/s	0.17	0.23	0.36	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 < 67	 < 69	 < 69	 < 69
DC link/motor connection		Flat connector for screws M10	M10	M10	M10
Max. conductor cross-sections - DC link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185
Max. motor cable length shielded / unshielded	 m	 300 / 450	 300 / 450	 300 / 450	 300 / 450
Degree of protection		IP20	IP20	IP20	IP20

Order number	6SL3320–	1TE32–1AA0 1TE32–1AA3	1TE32–6AA0 1TE32–6AA3	1TE33–1AA0 1TE33–1AA3	1TE33–8AA0 1TE33–8AA3
Dimensions - Width - Height - Depth	 mm mm mm	 326 1400 356	 326 1400 356	 326 1533 545	 326 1533 545
Frame size		FX	FX	GX	GX
Weight	kg	88	88	152	152

1) Rated power of a typical standard induction motor at 400 V 3 AC.

Table 4- 16 Technical specifications for Motor Module, 510 V DC – 720 V DC, Part 2

Order number	6SL3320–	1TE35–0AA0 1TE35–0AA3	1TE36–1AA0 1TE36–1AA3	1TE37–5AA0 1TE37–5AA3	1TE38–4AA0 1TE38–4AA3
Output current - Rated current I_n - Base load current I_L - Base load current I_H - for S6 operation (40 %) I_{S6} - Max. output current I_{max}	 A A A A A	 490 477 438 540 715	 605 590 460 -- 885	 745 725 570 -- 1087	 840 820 700 --- 1230
Unit rating [1)] - Power on basis of I_n - Power on basis of I_H	 kW kW	 250 200	 315 250	 400 315	 450 400
Rated DC link current for power supplied via - Basic/Smart Line Module - Active Line Module	 A A	 588 530	 726 653	 894 805	 1008 907
Supply voltages - DC link voltage - Electronics power supply - Output voltage	 V_{DC} V_{DC} V_{ACrms}	 510 to 720 24 (20.4 – 28.8) 0 to 0.72 x DC link voltage			
Rated pulse frequency - Max. pulse frequency without derating - Max. pulse frequency with derating	kHz kHz kHz	2 2 8	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	µF	9600	12600	15600	16800
Power requirements - Electronics power consumption (24 V DC) - Fan supply, 400 V 2 AC, 50/60 Hz	 A A	 1.2 1.6 / 2.4	 1.0 3.2	 1.0 3.2	 1.0 3.2
Power loss, max.	kW	4.5	5.84	6.68	7.15
Cooling air requirement	m^3/s	0.36	0.78	0.78	0.78
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 < 69	 < 72	 < 72	 < 72
DC link/motor connection		Flat connector for screws			
		M10	M12	M12	M12
Max. conductor cross-sections - DC link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm^2 mm^2 mm^2 mm^2	 2 x 185 2 x 185 2 x 185 2 x 185	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240
Max. motor cable length shielded / unshielded	 m	 300 / 450	 300 / 450	 300 / 450	 300 / 450
Degree of protection		IP20	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 326 1533 545	 503 1475 540	 503 1475 540	 503 1475 540

Order number	6SL3320–	1TE35–0AA0 1TE35–0AA3	1TE36–1AA0 1TE36–1AA3	1TE37–5AA0 1TE37–5AA3	1TE38–4AA0 1TE38–4AA3
Frame size		GX	HX	HX	HX
Weight	kg	152	290	290	290

1) Rated power of a typical standard induction motor at 400 V 3 AC.

Table 4- 17 Technical specifications for Motor Module, 510 V DC – 720 V DC, Part 3

Order number	6SL3320–	1TE41–0AA0 1TE41–0AA3	1TE41–2AA0 1TE41–2AA3	1TE41–4AA0 1TE41–4AA3	
Output current - Rated current I_n - Base load current I_L - Base load current I_H - for S6 operation (40 %) I_{S6} - Max. output current I_{max}	 A A A A A	 985 960 860 -- 1440	 1260 1230 1127 -- 1845	 1405 1370 1257 -- 2055	
Unit rating [1)] - Power on basis of I_n - Power on basis of I_H	 kW kW	 560 450	 710 560	 800 710	
Rated DC link current for power supplied via - Basic/Smart Line Module - Active Line Module	 A A	 1182 1064	 1512 1361	 1686 1517	
Supply voltages - DC link voltage - Electronics power supply - Output voltage	 V_{DC} V_{DC} V_{ACrms}	 510 to 720 24 (20.4 – 28.8) 0 to 0.72 x DC link voltage			
Rated pulse frequency - Max. pulse frequency without derating - Max. pulse frequency with derating	kHz kHz kHz	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5	
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	
DC link capacitance	µF	18900	26100	28800	
Power requirements - Electronics power consumption (24 V DC) - Fan supply, 400 V 2 AC, 50/60 Hz	 A A	 1.25 4.7	 1.4 4.7	 1.4 4.7	
Power loss, max.	kW	9.5	11.1	12.0	
Cooling air requirement	m^3/s	1.1	1.1	1.1	
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 < 72	 < 72	 < 72	
DC link/motor connection		Flat connector for screws			
		M12	M12	M12	
Max. conductor cross-sections - DC link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 Busbar 6 x 240 1 x 240 2 x 240	 Busbar 6 x 240 1 x 240 2 x 240	 Busbar 6 x 240 1 x 240 2 x 240	
Max. motor cable length shielded / unshielded	 m	 300 / 450	 300 / 450	 300 / 450	
Degree of protection		IP00	IP00	IP00	
Dimensions - Width - Height - Depth	 mm mm mm	 704 1475 540	 704 1475 540	 704 1475 540	

Order number	6SL3320–	1TE41–0AA0 1TE41–0AA3	1TE41–2AA0 1TE41–2AA3	1TE41–4AA0 1TE41–4AA3	
Frame size		JX	JX	JX	
Weight	kg	450	450	450	

1) Rated power of a typical standard induction motor at 400 V 3 AC.

4.6.2 675 V DC – 1035 V DC Motor Modules

Table 4- 18 Technical specifications for Motor Module, 675 V DC – 1035 V DC, Part 1

Order number	6SL3320–	1TG28–5AA0 1TG28–5AA3	1TG31–0AA0 1TG31–0AA3	1TG31–2AA0 1TG31–2AA3	1TG31–5AA0 1TG31–5AA3
Output current - Rated current I_n - Base load current I_L - Base load current I_H - Max. output current I_{max}	 A A A A	 85 80 76 120	 100 95 89 142	 120 115 107 172	 150 142 134 213
Unit rating 1) - Power on basis of I_n - Power on basis of I_H	 kW kW	 75 55	 90 75	 110 90	 132 110
Rated DC link current for power supplied via - Basic-/Smart Line Module - Active Line Module	 A A	 102 92	 120 108	 144 130	 180 162
Supply voltages - DC link voltage - Electronics power supply - Output voltage	 V_{DC} V_{DC} V_{ACrms}	 675 to 1035 24 (20.4 – 28.8) 0 - 0.72 x DC link voltage			
Rated pulse frequency - Max. pulse frequency without derating - Max. pulse frequency with derating	kHz kHz kHz	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	µF	1200	1200	1600	2800
Power requirements - Electronics power consumption (24 V DC) - Fan supply, 690 V 2 AC, 50/60 Hz	 A A	 1.0 0.4 / 0.5	 1.0 0.4 / 0.5	 1.0 0.4 / 0.5	 1.0 0.4 / 0.5
Power loss, max.	kW	1.17	1.43	1.89	1.80
Cooling air requirement	m^3/s	0.17	0.17	0.17	0.17
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 < 67	 < 67	 < 67	 < 67
DC link/motor connection		Flat connector for screws			
		M10	M10	M10	M10
Max. conductor cross-sections - DC link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185
Max. motor cable length shielded / unshielded	 m	 300 / 450	 300 / 450	 300 / 450	 300 / 450
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 326 1400 356	 326 1400 356	 326 1400 356	 326 1400 356

Order number	6SL3320–	1TG28–5AA0 1TG28–5AA3	1TG31–0AA0 1TG31–0AA3	1TG31–2AA0 1TG31–2AA3	1TG31–5AA0 1TG31–5AA3
Frame size		FX	FX	FX	FX
Weight	kg	88	88	88	88

1) Rated power of a typical standard induction motor at 690 V 3 AC.

Table 4- 19 Technical specifications for Motor Module, 675 V DC – 1035 V DC, Part 2

Order number	6SL3320–	1TG31–8AA0 1TG31–8AA3	1TG32–2AA0 1TG32–2AA3	1TG32–6AA0 1TG32–6AA3	1TG33–3AA0 1TG33–3AA3
Output current - Rated current I_n - Base load current I_L - Base load current I_H - Max. output current I_{max}	 A A A A	 175 170 157 255	 215 208 192 312	 260 250 233 375	 330 320 280 480
Unit rating [1)] - Power on basis of I_n - Power on basis of I_H	 kW kW	 160 132	 200 160	 250 200	 315 250
Rated DC link current for power supplied via - Basic-/Smart Line Module - Active Line Module	 A A	 210 189	 258 232	 312 281	 396 356
Supply voltages - DC link voltage - Electronics power supply - Output voltage	 V_{DC} V_{DC} V_{ACrms}	 675 to 1035 24 (20.4 – 28.8) 0 - 0.72 x DC link voltage			
Rated pulse frequency - Max. pulse frequency without derating - Max. pulse frequency with derating	kHz kHz kHz	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	µF	2800	2800	3900	4200
Power requirements - Electronics power consumption (24 V DC) - Fan supply, 690 V 2 AC, 50/60 Hz	 A A	 1.2 0.94 / 1.4	 1.2 0.94 / 1.4	 1.2 0.94 / 1.4	 1.2 0.94 / 1.4
Power loss, max.	kW	2.67	3.09	3.62	4.34
Cooling air requirement	m^3/s	0.36	0.36	0.36	0.36
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 < 69	 < 69	 < 69	 < 69
DC link/motor connection		Flat connector for screws			
		M10	M10	M10	M10
Max. conductor cross-sections - DC link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185	 2 x 185 2 x 185 2 x 185 2 x 185
Max. motor cable length shielded / unshielded	 m	 300 / 450	 300 / 450	 300 / 450	 300 / 450
Degree of protection		IP20	IP20	IP20	IP20
Dimensions - Width - Height - Depth	 mm mm mm	 326 1533 545	 326 1533 545	 326 1533 545	 326 1533 545
Frame size		GX	GX	GX	GX
Weight	kg	152	152	152	152

1) Rated power of a typical standard induction motor at 690 V 3 AC.

Table 4- 20 Technical specifications for Motor Module, 675 V DC – 1035 V DC, Part 3

Order number	6SL3320–	1TG34–1AA0 1TG34–1AA3	1TG34–7AA0 1TG34–7AA3	1TG35–8AA0 1TG35–8AA3	1TG37–4AA0 1TG37–4AA3
Output current - Rated current I_n - Base load current I_L - Base load current I_H - Max. output current I_{max}	 A A A A	 410 400 367 600	 465 452 416 678	 575 560 514 840	 735 710 657 1065
Unit rating 1) - Power on basis of I_n - Power on basis of I_H	 kW kW	 400 315	 450 400	 560 450	 710 630
Rated DC link current for power supplied via - Basic-/Smart Line Module - Active Line Module	 A A	 492 443	 558 502	 690 621	 882 794
Supply voltages - DC link voltage - Electronics power supply - Output voltage	 V_{DC} V_{DC} V_{ACrms}	 675 to 1035 24 (20.4 – 28.8) 0 - 0.72 x DC link voltage			
Rated pulse frequency - Max. pulse frequency without derating - Max. pulse frequency with derating	kHz kHz kHz	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5	1.25 1.25 5
Max. ambient temperature - Without derating - With derating	 °C °C	 40 55	 40 55	 40 55	 40 55
DC link capacitance	μF	7400	7400	7400	11100
Power requirements - Electronics power consumption (24 V DC) - Fan supply, 690 V 2 AC, 50/60 Hz	 A A	 1.0 1.84	 1.0 1.84	 1.0 2.74	 1.25 2.74
Power loss, max.	kW	6.13	6.80	10.3	10.9
Cooling air requirement	m³/s	0.78	0.78	0.78	1.474
Sound pressure level L_{pA} (1 m) at 50/60 Hz	 dB(A)	 < 72	 < 72	 < 72	 < 72
DC link/motor connection		Flat connector for screws			
		M12	M12	M12	M12
Max. conductor cross-sections - DC link connection (DCP, DCN) - Motor connection (U2, V2, W2) - PE connection PE1 - PE connection PE2	 mm² mm² mm² mm²	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 4 x 240 1 x 240 2 x 240	 Busbar 6 x 240 1 x 240 2 x 240
Max. motor cable length shielded / unshielded	 m	 300 / 450	 300 / 450	 300 / 450	 300 / 450
Degree of protection		IP00	IP00	IP00	IP00
Dimensions - Width - Height - Depth	 mm mm mm	 503 1475 540	 503 1475 540	 503 1475 540	 704 1475 540
Frame size		HX	HX	HX	JX
Weight	kg	290	290	290	450

1) Rated power of a typical standard induction motor at 690 V 3 AC.

Table 4- 21 Technical specifications for Motor Module, 675 V DC – 1035 V DC, Part 4

Order number	6SL3320–	1TG38–1AA0 1TG38–1AA3	1TG38–8AA0 1TG38–8AA3	1TG41–0AA0 1TG41–0AA3	1TG41–3AA0 1TG41–3AA3
Output current					
- Rated current I_n	A	810	910	1025	1270
- Base load current I_L	A	790	880	1000	1230
- Base load current I_H	A	724	814	917	1136
- Max. output current I_{max}	A	1185	1320	1500	1845
Unit rating [1]					
- Power on basis of I_n	kW	800	900	1000	1200
- Power on basis of I_H	kW	710	800	900	1000
Rated DC link current for power supplied via					
- Basic-/Smart Line Module	A	972	1092	1230	1524
- Active Line Module	A	875	983	1107	1372
Supply voltages					
- DC link voltage	V_{DC}	675 to 1035			
- Electronics power supply	V_{DC}	24 (20.4 – 28.8)			
- Output voltage	V_{ACrms}	0 - 0.72 x DC link voltage			
Rated pulse frequency	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency without derating	kHz	1.25	1.25	1.25	1.25
- Max. pulse frequency with derating	kHz	5	5	5	5
Max. ambient temperature					
- Without derating	°C	40	40	40	40
- With derating	°C	55	55	55	55
DC link capacitance	µF	11100	14400	14400	19200
Power requirements					
- Electronics power consumption (24 V DC)	A	1.25	1.4	1.4	1.4
- Fan supply, 690 V 2 AC, 50/60 Hz	A	2.74	2.74	2.74	2.74
Power loss, max.	kW	11.5	11.7	13.2	16.0
Cooling air requirement	m^3/s	1.474	1.474	1.474	1.474
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB(A)	< 72	< 72	< 72	< 72
DC link/motor connection		Flat connector for screws			
		M12	M12	M12	M12
Max. conductor cross-sections					
- DC link connection (DCP, DCN)	mm²	Busbar	Busbar	Busbar	Busbar
- Motor connection (U2, V2, W2)	mm²	6 x 240	6 x 240	6 x 240	6 x 240
- PE connection PE1	mm²	1 x 240	1 x 240	1 x 240	1 x 240
- PE connection PE2	mm²	2 x 240	2 x 240	2 x 240	2 x 240
Max. motor cable length shielded / unshielded	m	300 / 450	300 / 450	300 / 450	300 / 450
Degree of protection		IP00	IP00	IP00	IP00
Dimensions					
- Width	mm	704	704	704	704
- Height	mm	1475	1475	1475	1475
- Depth	mm	540	540	540	540
Frame size		JX	JX	JX	JX
Weight	kg	450	450	450	450

[1] Rated power of a typical standard induction motor at 690 V 3 AC.

4.6.3 Overload capability

The Motor Modules have an overload reserve e.g. to handle breakaway torques.

In the case of drives with overload requirements, the appropriate base-load current must, therefore, be used as a basis for the required load.

The criterion for overload is that the Motor Module is operated with its base load current before and after the overload occurs (a load duration of 300 s is used as a basis here).

Low overload

The base load current for low overload (I_L) is based on a load duty cycle of 110 % for 60 s or 150 % for 10 s.

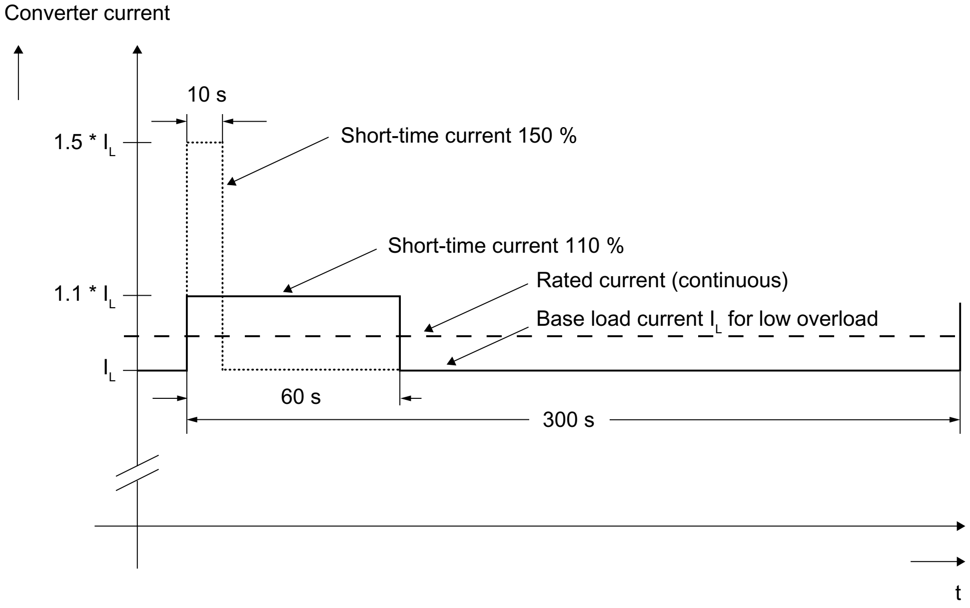


Figure 4-16 Low overload

High overload

The base load current for a high overload I_H is based on a duty cycle of 150 % for 60 s or 160 % for 10 s.

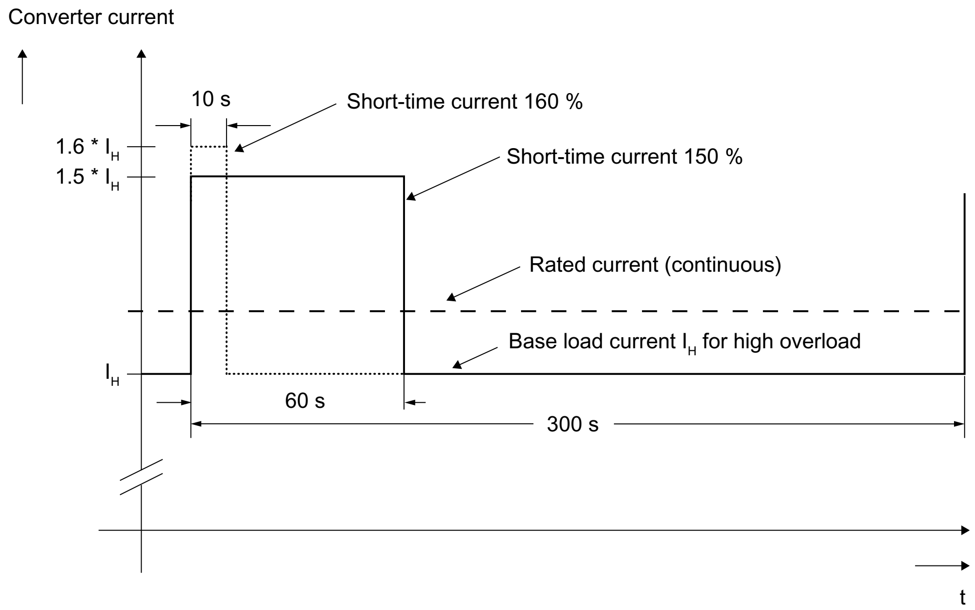


Figure 4-17 High overload

4.6.4 Current de-rating depending on the pulse frequency

When the pulse frequency is increased, the derating factor of the output current must be taken into account. This derating factor must be applied to the currents specified in the technical specifications for Motor Modules.

Table 4- 22 Derating factor of the output current as a function of the pulse frequency for devices with a rated pulse frequency of 2 kHz

Order no. 6SL3320-...	Power [kW]	Output current for a pulse frequency of 2 kHz [A]	Derating factor for a pulse frequency of 4 kHz
Connection voltage 510 – 720 V DC			
1TE32-1AAx	110	210	82 %
1TE32-6AAx	132	260	83 %
1TE33-1AAx	160	310	88 %
1TE33-8AAx	200	380	87 %
1TE35-0AAx	250	490	78 %

Table 4- 23 Derating factor of the output current as a function of the pulse frequency for devices with a rated pulse frequency of 1.25 kHz

Order no. 6SL3320-...	Power [kW]	Output current for a pulse frequency of 1.25 kHz [A]	Derating factor for a pulse frequency of 2.5 kHz
Connection voltage 510 – 720 V DC			
1TE36-1AAx	315	605	72 %
1TE37-5AAx	400	745	72 %
1TE38-4AAx	450	840	79 %
1TE41-0AAx	560	985	87 %
1TE41-2AAx	710	1260	87 %
1TE41-4AAx	800	1405	95 %
Connection voltage 675 – 1035 V DC			
1TG28-5AAx	75	85	89 %
1TG31-0AAx	90	100	88 %
1TG31-2AAx	110	120	88 %
1TG31-5AAx	132	150	84 %
1TG31-8AAx	160	175	87 %
1TG32-2AAx	200	215	87 %
1TG32-6AAx	250	260	88 %
1TG33-3AAx	315	330	82 %
1TG34-1AAx	400	410	82 %
1TG34-7AAx	450	465	87 %
1TG35-8AAx	560	575	85 %
1TG37-4AAx	710	735	79 %
1TG38-1AAx	800	810	95 %
1TG38-8AAx	900	910	87 %
1TG41-0AAx	1000	1025	86 %
1TG41-3AAx	1200	1270	79 %

Maximum output frequencies achieved by increasing the pulse frequency

By multiplying the rated pulse frequency with a multiple integer, the following output frequencies can be achieved taking into account the derating factors in the tables above:

Table 4- 24 Maximum output frequencies achieved by increasing the pulse frequency

Pulse frequency [kHz]	Maximum output frequency [Hz]
1.25	100
2	160
2.5	200
4	300 [1)]
5	300 [1)]

1) The maximum output frequency is limited to 300 Hz due to the closed-loop control.

4.6.5 Parallel connection of Motor Modules

The following rules must be observed when connecting Motor Modules in parallel:

- Up to 4 identical Motor Modules can be connected in parallel.
- A common Control Unit is required whenever the modules are connected in parallel.
- The motor supply cables must be the same length (symmetrical design).
- Power must be supplied to the Motor Modules from a common DC link.
- For motors with a single winding system, the length of the supply cables must be kept to a minimum or motor reactors must be used. The cable lengths are listed in the following tables.
- A derating factor of 5 % must be taken into consideration, regardless of the number of modules connected in parallel.

Minimum cable lengths for parallel connection and connection to a motor with a single-winding system

NOTICE
The minimum motor cable lengths specified in the tables below must be observed when two or more Motor Modules are connected in parallel and there is a connection to a motor with a single-winding system. If the cable length required for the application cannot be achieved, a motor reactor must be provided.

Table 4- 25 510 V DC – 720 V DC Motor Modules

Order number	Power [kW]	Output current [A]	Minimum cable length [m]
6SL3320-1TE32-1AAx	110	210	30
6SL3320-1TE32-6AAx	132	260	27
6SL3320-1TE33-1AAx	160	310	20
6SL3320-1TE33-8AAx	200	380	17
6SL3320-1TE35-0AAx	250	490	15
6SL3320-1TE36-1AAx	315	605	13
6SL3320-1TE37-5AAx	400	745	10
6SL3320-1TE38-4AAx	450	840	9
6SL3320-1TE41-0AAx	560	985	8
6SL3320-1TE41-2AAx	710	1260	6
6SL3320-1TE41-4AAx	800	1405	5

Table 4- 26 675 V DC – 1035 V DC Motor Modules

Order number	Power [kW]	Output current [A]	Minimum cable length [m]
6SL3320-1TG28-5AAx	75	85	100
6SL3320-1TG31-0AAx	90	100	90
6SL3320-1TG31-2AAx	110	120	80
6SL3320-1TG31-5AAx	132	150	70
6SL3320-1TG31-8AAx	160	175	60
6SL3320-1TG32-2AAx	200	215	50
6SL3320-1TG32-6AAx	250	260	40
6SL3320-1TG33-3AAx	315	330	30
6SL3320-1TG34-1AAx	400	410	25
6SL3320-1TG34-7AAx	450	465	25
6SL3320-1TG35-8AAx	560	575	20
6SL3320-1TG37-4AAx	710	735	18
6SL3320-1TG38-1AAx	800	810	15
6SL3320-1TG38-8AAx	900	910	12
6SL3320-1TG41-0AAx	1000	1025	10
6SL3320-1TG41-3AAx	1200	1270	8

DC link components 5

5.1 Braking Module

5.1.1 Description

A Braking Module and an external braking resistor are required to bring drives to a controlled standstill in the event of a power failure (e.g. emergency retraction or EMERGENCY STOP category 1) or limit the DC link voltage if the generator is operated for a short period of time, for example because there is no regenerative feedback capability into the supply network when a Basic Line Module is used). The Braking Module contains the power electronics and the associated control.

During operation the DC link energy is converted into heat loss in an external braking resistor outside of the control cabinet. Braking Modules function autonomously. Parallel operation of several braking modules is possible. In this case, each Braking Module must have its own braking resistor.

Up to three slots are available depending on the size of the Basic Line Module, Smart Line Module, Active Line Module, or Motor Module:

Frame sizes FB, GB, FX, GX:	1 mounting location
Frame size HX:	2 mounting locations
Frame size JX:	3 mounting locations

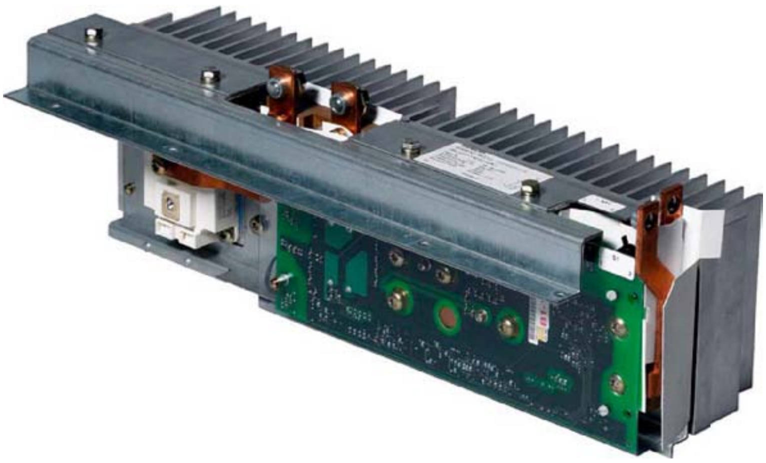


Figure 5-1 Braking Module

Layout

The Braking Module in chassis format is inserted in a mounting location inside the Basic Line Modules, Smart Line Modules, Active Line Modules, or Motor Modules, the fan of which ensures forced cooling. The supply voltage for the electronics is drawn from the DC link. The

Braking Module is connected to the DC link by means of the busbar sets and flexible cables, which are supplied as standard.

The activation threshold of the Braking Module can be adjusted by means of a DIP switch. The braking power values specified in the technical specifications apply to the upper activation threshold.

The Braking Module has as standard, the following interfaces:

- The DC link is connected through busbars and flexible cables
- Connecting terminal for external braking resistor
- 1 digital input (inhibit Braking Module with high signal / acknowledge error with negative edge high-low)
- 1 digital output (Braking Module inhibited)
- 1 DIP switch for adjusting the activation threshold

Note

To install a frame size GX Braking Module in a frame size GB Basic Line Module a cable harness set is required, which is available under order number 6SL3366-2NG00-0AA0.

5.1.2 Safety information

WARNING

After disconnecting all the supply voltages, a hazardous voltage will be present in all components for another 5 minutes. Work may not be carried out on the components until after this time has elapsed.

Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC link terminals DCP and DCN.

CAUTION

The DC link discharge voltage hazard warning must be affixed to the modules in the local language.

CAUTION

The connection to the braking resistors must be short-circuit/ground-fault proof.

Note

If braking resistors are used that have not been released by SIEMENS for SINAMICS, then the braking resistors could be destroyed.

5.1.3 Interface description

5.1.3.1 Braking Module for frame sizes FX, FB

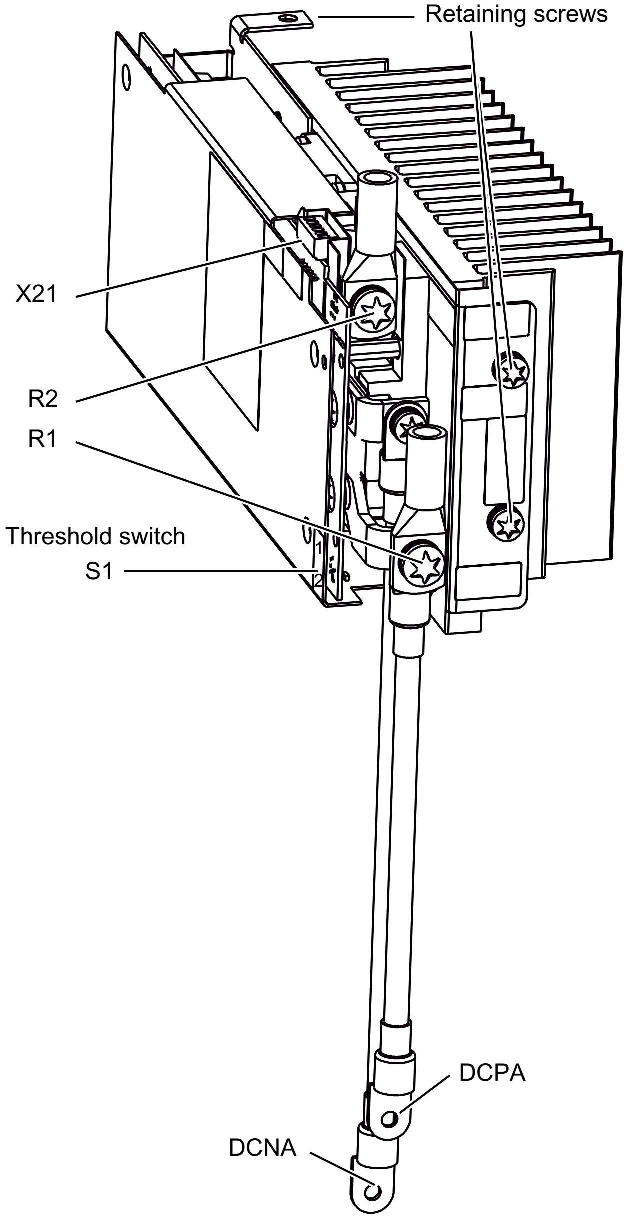


Figure 5-2 Braking Module for Active Line Module / Motor Module, frame size FX and for Basic Line Module, frame size FB

Note

With this Braking Module, the R1 and DCPA interfaces use the same connection.

5.1.3.2 Braking Module for frame sizes GX, GB

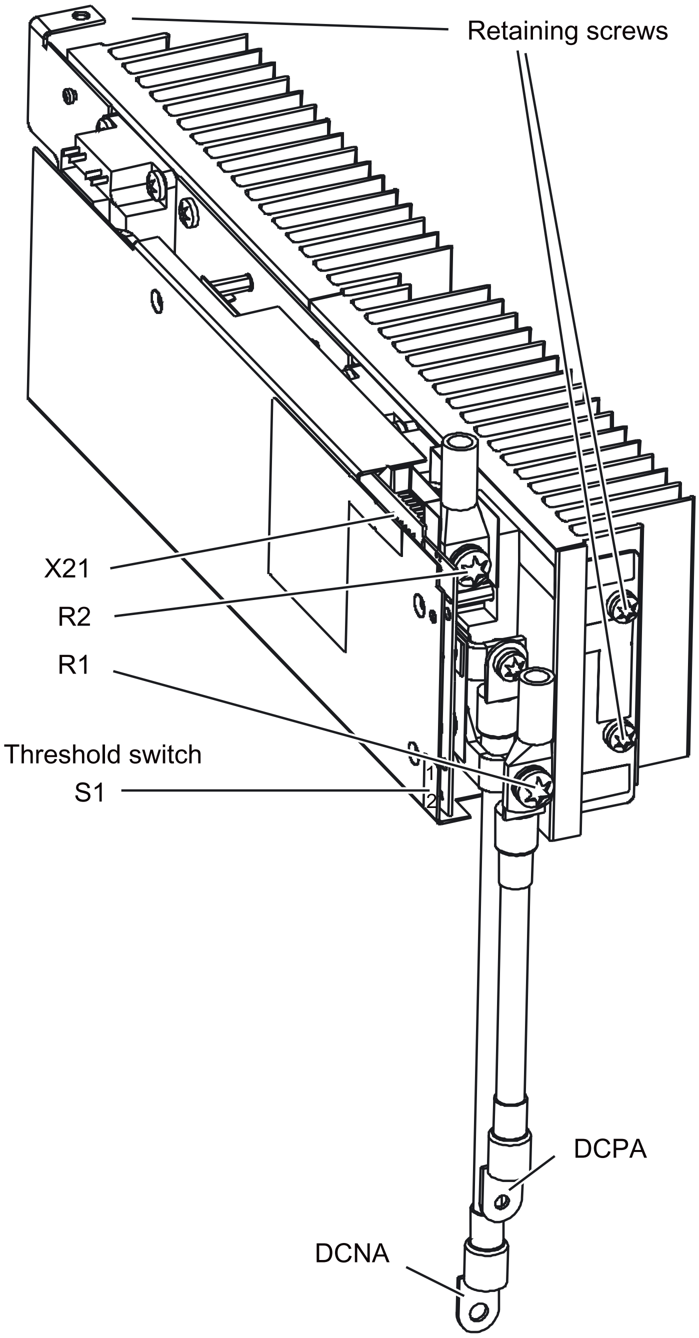


Figure 5-3 Braking Module for Smart Line Module / Active Line Module / Motor Module, frame size GX and for Basic Line Module, frame size GB

Note

With this Braking Module, the R1 and DCPA interfaces use the same connection.

5.1.3.3 Braking Module for frame sizes HX, JX

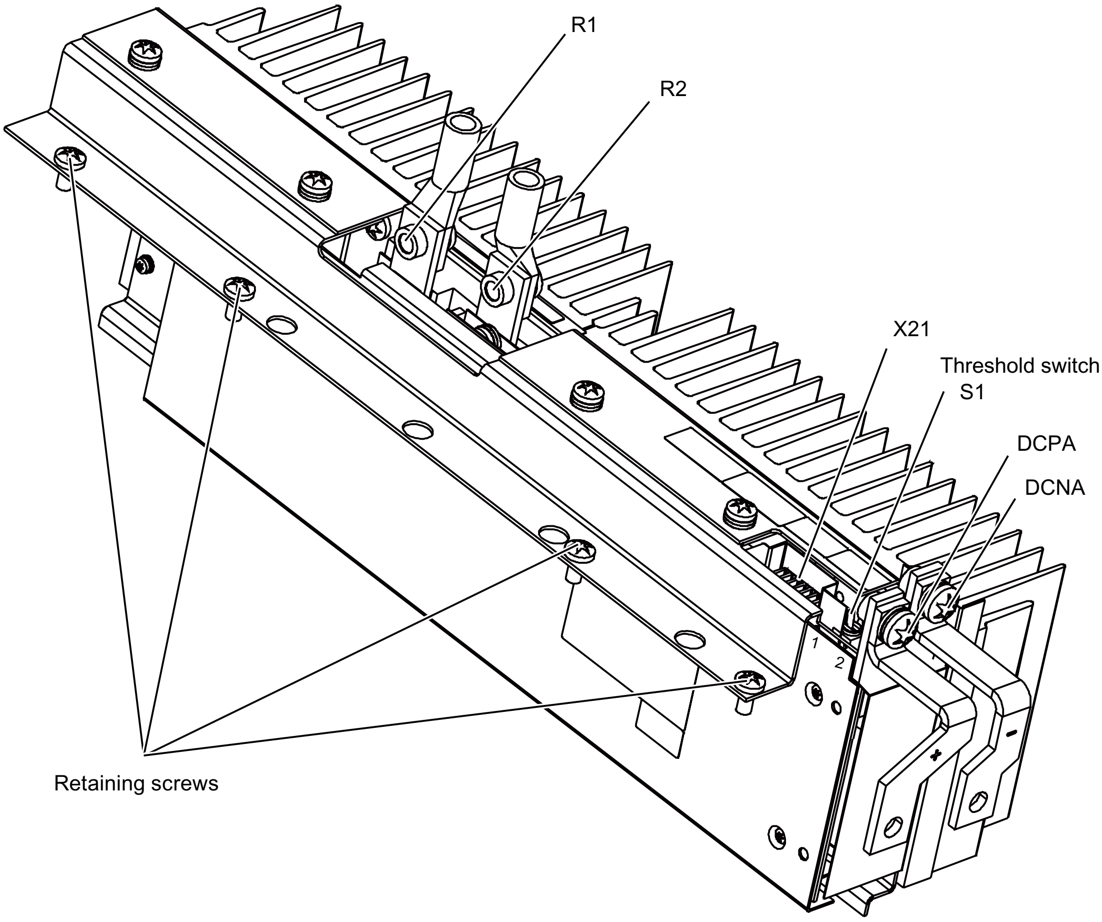


Figure 5-4 Braking Module for Smart Line Module / Active Line Module / Motor Module, frame sizes HX / JX

5.1.3.4 Connection example

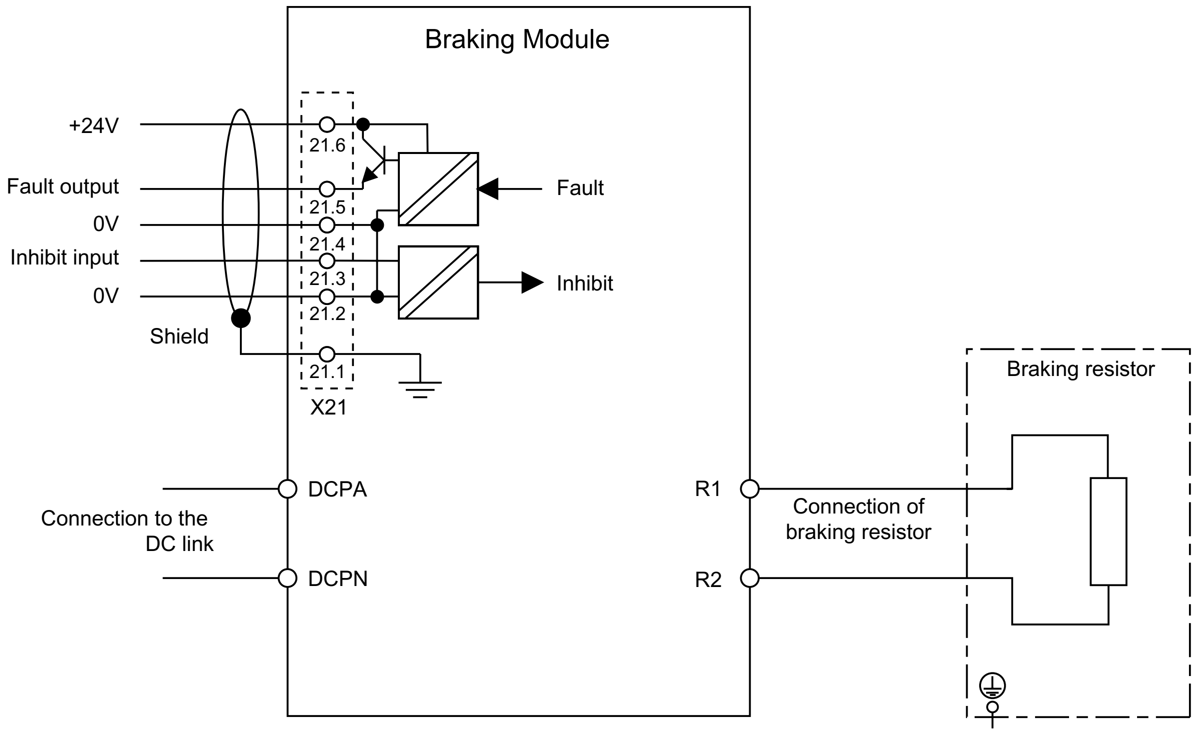


Figure 5-5 Connection example for Braking Module

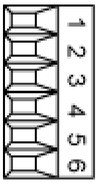
5.1.3.5 Braking resistor connection

Table 5- 1 Braking resistor connection

Terminal	Designation
R1	Braking resistor connection R+
R2	Braking resistor connection R-
Recommended conductor cross-sections: for 25/125 kW: 35 mm², for 50/250 kW: 50 mm²	

5.1.3.6 X21 digital inputs/outputs

Table 5- 2 X21 terminal strip

	Terminal	Designation[1)]	Technical specifications
	1	Shield	Shield connection for terminals 2 ... 6
	2	0 V	High signal level: +15 V to 30 V Current consumption: 2 mA to 15 mA Low signal level: -3 V to 5 V
	3	DI inhibit input	
	4	0 V	High signal: No fault Low signal: Fault present Voltage: 24 V DC Load current: 0.5 mA to 0.6 mA
	5	DO fault output	
	6	+24 V	Voltage: +18 V to 30 V Typical current consumption: 10 mA at 24 V DC
Max. connectable cross-section 1.5 mm²			

1) DI: digital input; DO: Digital output

Note

Applying a high signal to terminal X21.3 inhibits the Braking Module. On a falling edge, pending error signals are acknowledged.

Note

You will find setting instructions for wiring the signals in the SINAMICS S120 Function Manual.

5.1.3.7 S1 Threshold switch

The response threshold at which the Braking Module is activated and the DC link voltage generated during braking are specified in the following table.

⚠ WARNING
The threshold switch must only be used when the Basic Line, Smart Line, Active Line, or Motor Module are switched off and the DC link capacitors are discharged.

Table 5- 3 Response thresholds of the Braking Modules

Voltage	Response threshold	Switch position	Remark
380 V - 480 V 3 AC	673 V	1	774 V is the default factory setting. With supply voltages of between 380 V and 400 V 3 AC, the response threshold can be set to 673 V to reduce the voltage stress on the motor and converter. This does, however, reduce the possible braking power with the square of the voltage $(673/774)^2 = 0.75$. The maximum possible braking power is, therefore, 75 %.
	774 V	2	
500 V - 600 V 3 AC	841 V	1	967 V is the default factory setting. With a supply voltage of 500 V 3 AC, the response threshold can be set to 841 V to reduce the voltage stress on the motor and converter. This does, however, reduce the possible braking power with the square of the voltage $(841/967)^2 = 0.75$. The maximum possible braking power is, therefore, 75 %.
	967 V	2	
660 V - 690 V 3 AC	1070 V	1	1158 V is the default factory setting. With a supply voltage of 660 V 3 AC, the response threshold can be set to 1070 V to reduce the voltage stress on the motor and converter. This does, however, reduce the possible braking power with the square of the voltage $(1070/1158)^2 = 0.85$. The maximum possible braking power is, therefore, 85%.
	1158 V	2	

Note

The switch positions of the threshold switches of the Braking Modules are positioned on the panel as follows:

- Braking Modules for frame sizes FX, FB, GX, GB: Position "1" is at the top; position "2" is at the bottom
- Braking Modules for frame sizes HX and JX: Position "1" is at the back; position "2" is at the front

CAUTION

Even when the response threshold is set to a low value, the DC link voltage can still reach the maximum voltage value (hardware shutdown threshold), thus triggering the "Overvoltage" fault. This can occur, for example, in cases where there is too much regenerative energy for the available braking power.

To prevent the DC link voltage from exceeding the threshold, the Vdc-max controller must be enabled (p1240) and the device supply voltage set accordingly (p0210).

5.1.4 Installation

5.1.4.1 Installing the Braking Module in an Active Line Module / Motor Module, frame size FX

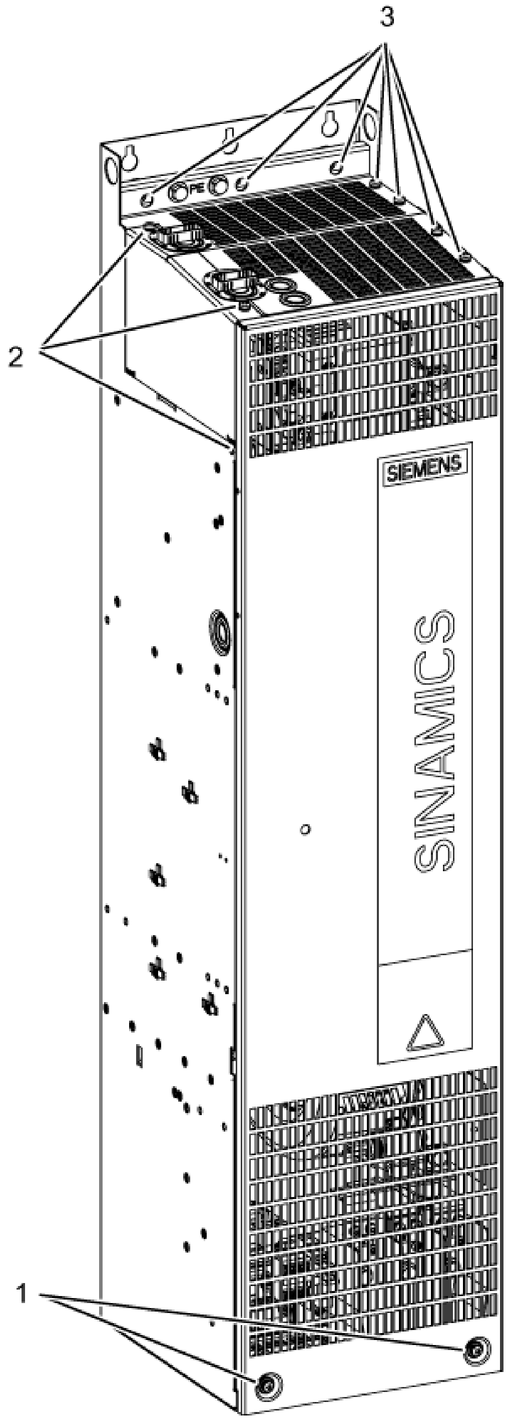


Figure 5-6 Installing the Braking Module in an Active Line Module / Motor Module, frame size FX – steps 1 - 3

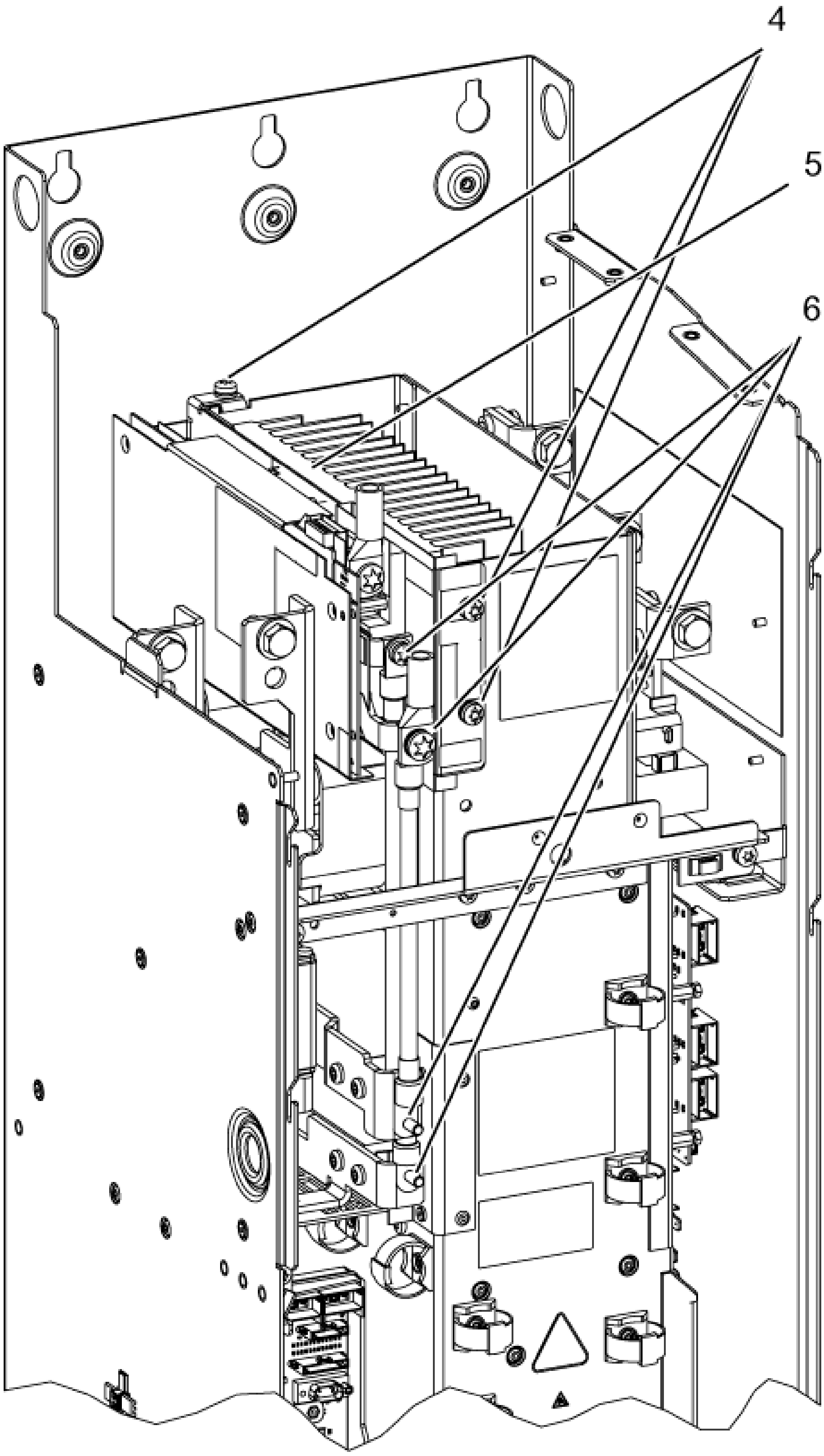


Figure 5-7 Installing the Braking Module in an Active Line Module / Motor Module, frame size FX – steps 4 - 6

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagrams in front of them.

1. Unscrew the 2 M6 screws from the front cover and lift off the cover.
2. Unscrew the 2 screws from the upper cover plate.

   Loosen the 1 M6 nut on the left

   Remove the left cover
3. Unscrew the 4 screws from the upper cover plate.

   Unscrew the 3 screws from the rear cut-out sections

   Remove the top covers.
4. Unscrew the 3 screws for the blanking plate.

   Remove the plate.
5. Insert the Braking Module where the cover used to be and secure it using the 3 screws (from step 4).
6. Secure the connecting cable to the DC link with 2 screws (Braking Module connection) and 2 nuts (DC link connection).

Carry out the subsequent steps in reverse order from steps 1 – 3.

An opening above the connections for the braking resistor (R1, R2) is provided in the cover for connecting the cable to the braking resistor.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed.

5.1.4.2 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size GX

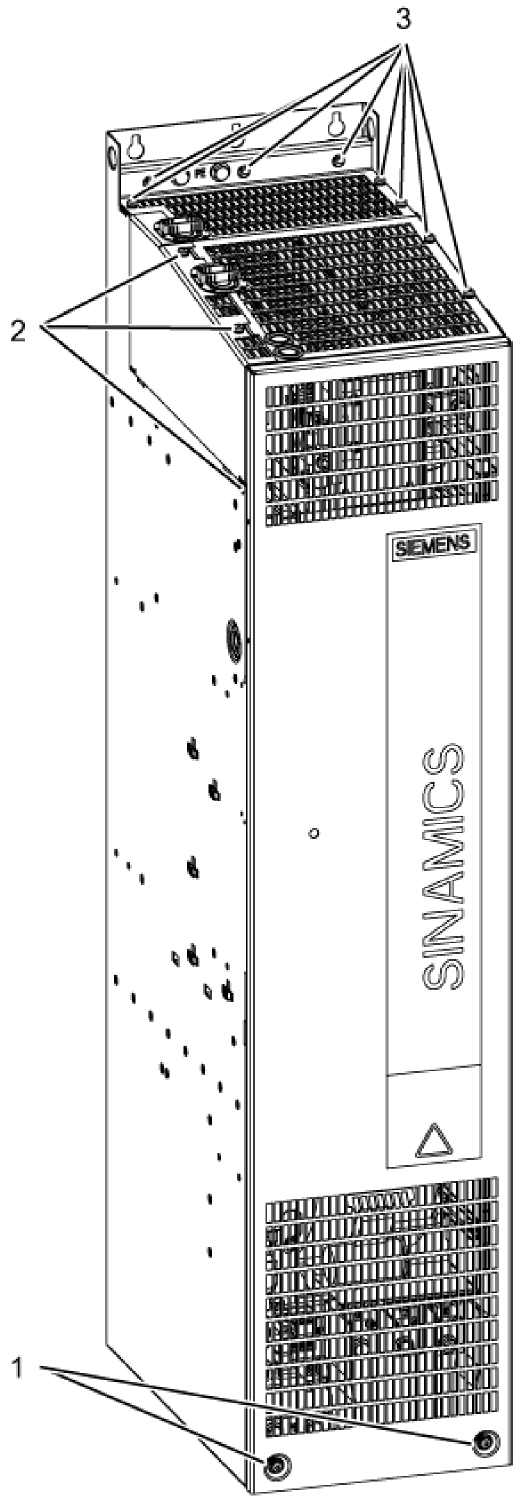


Figure 5-8 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size GX – steps 1 - 3

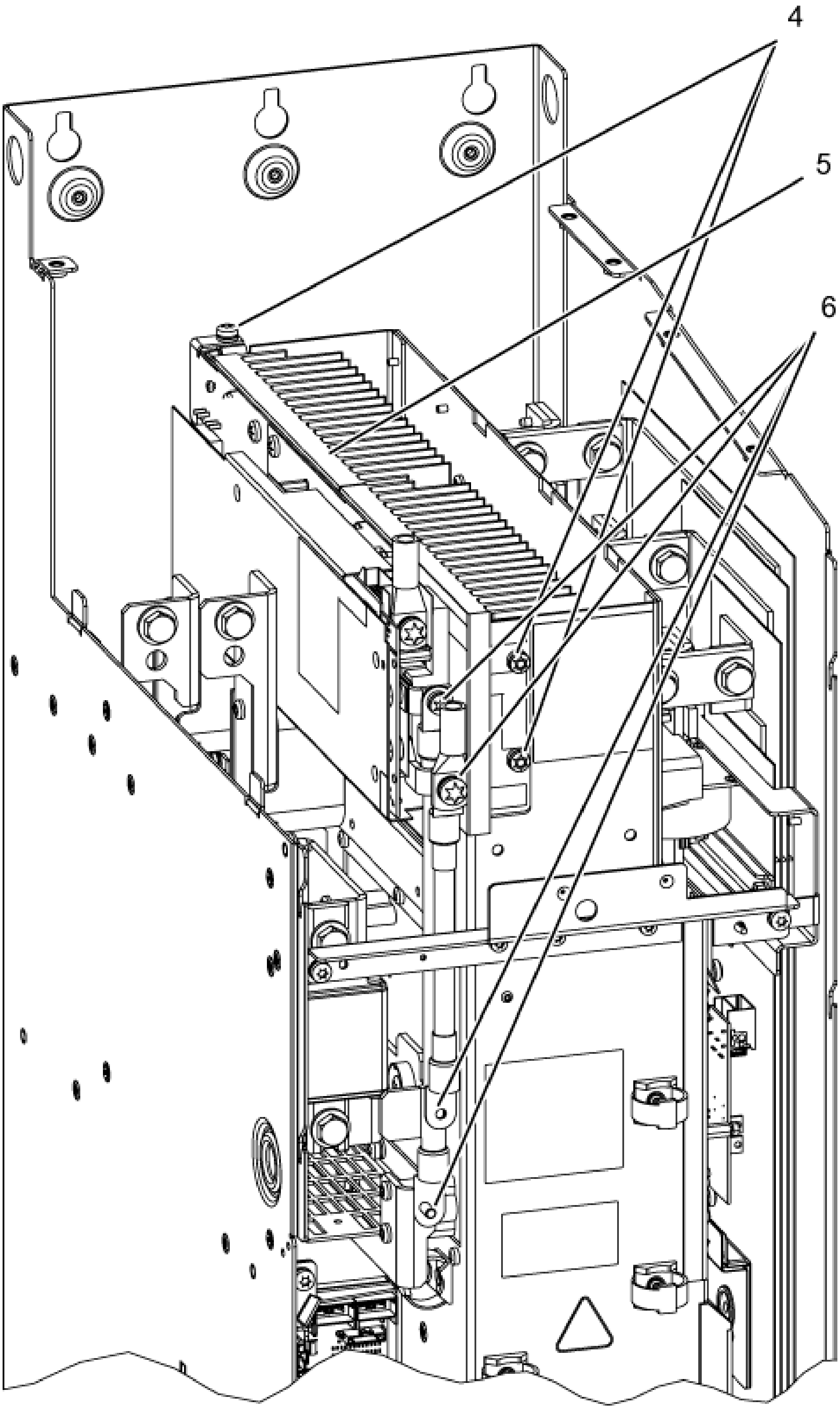


Figure 5-9 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size GX – steps 4 - 6

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagrams in front of them.

1. Unscrew the 2 M6 screws from the front cover and lift off the cover.
2. Unscrew the 2 screws from the upper cover plate.

   Loosen the 1 M6 nut on the left.

   Remove the left cover
3. Unscrew the 4 screws from the upper cover plate.

   Unscrew the 3 screws from the rear cut-out sections.

   Remove the top covers.
4. Unscrew the 3 screws for the blanking plate.

   Remove the plate.
5. Insert the Braking Module where the cover used to be and secure it using the 3 screws (from step 4).
6. Secure the connecting cable to the DC link with 2 screws (Braking Module connection) and 2 nuts (DC link connection).

Carry out the subsequent steps in reverse order from steps 1 – 3.

An opening above the connections for the braking resistor (R1, R2) is provided in the cover for connecting the cable to the braking resistor.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed.

5.1.4.3 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size HX

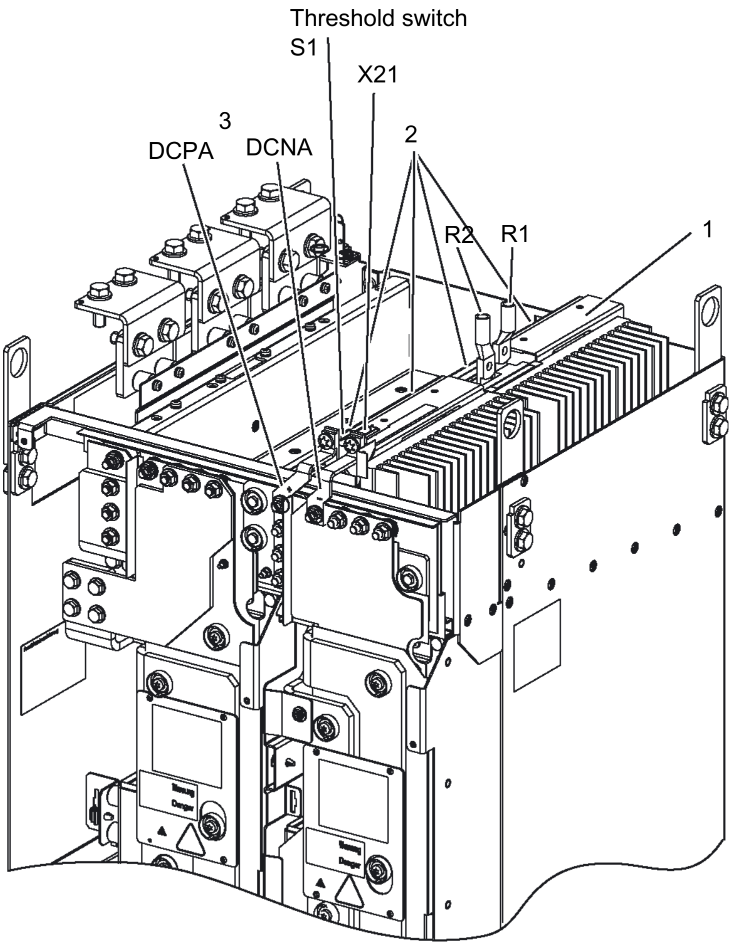


Figure 5-10 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size HX

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagram in front of them.

1. Insert the Braking Module.
2. Tighten the 4 retaining screws for the Braking Module.
3. Install the connection bracket for the DC link (DCPA/DCNA).

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed.

5.1.4.4 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size JX

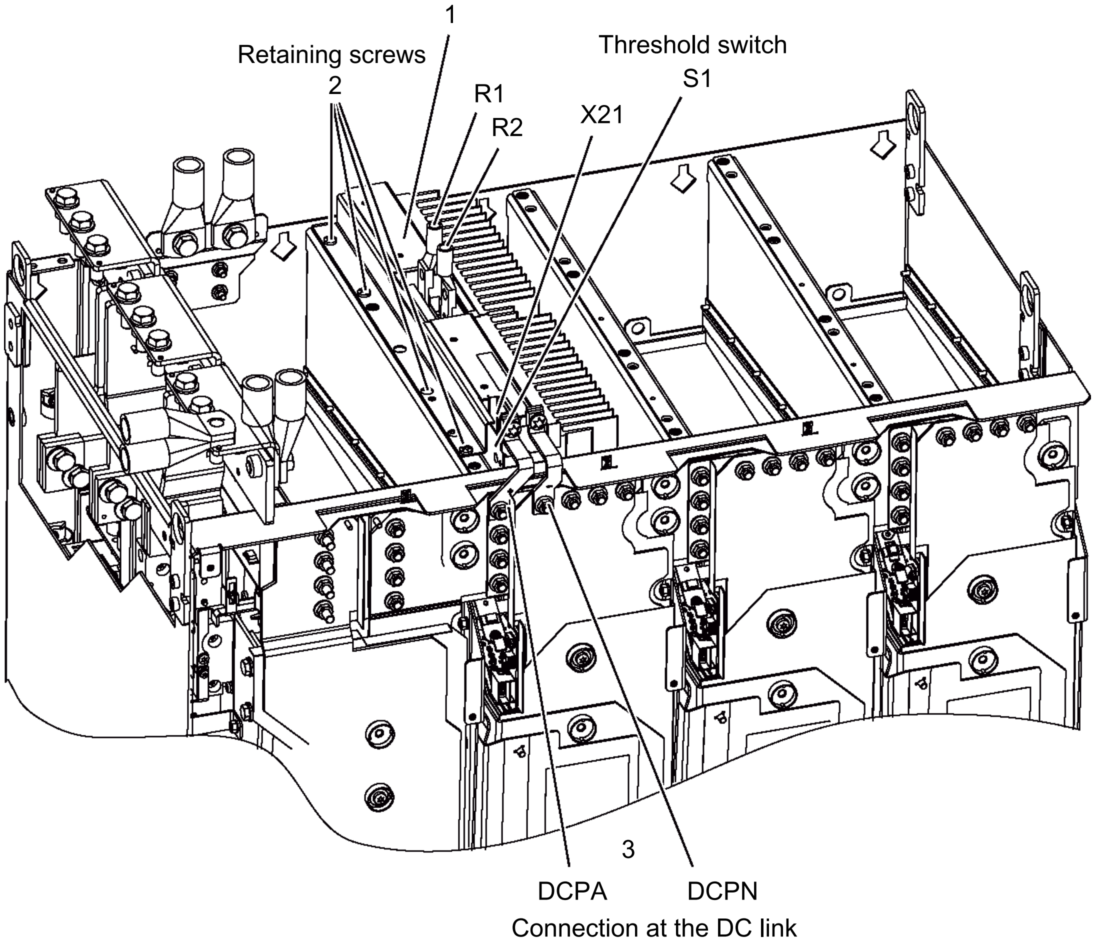


Figure 5-11 Installing the Braking Module in a Smart Line Module / Active Line Module / Motor Module, frame size JX

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagram.

1. Insert the Braking Module.
2. Tighten the 4 retaining screws for the Braking Module.
3. Install the connection bracket for the DC link (DCPA/DCNA).

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed.

5.1.4.5 Installing the Braking Module in a Basic Line Module, frame size FB

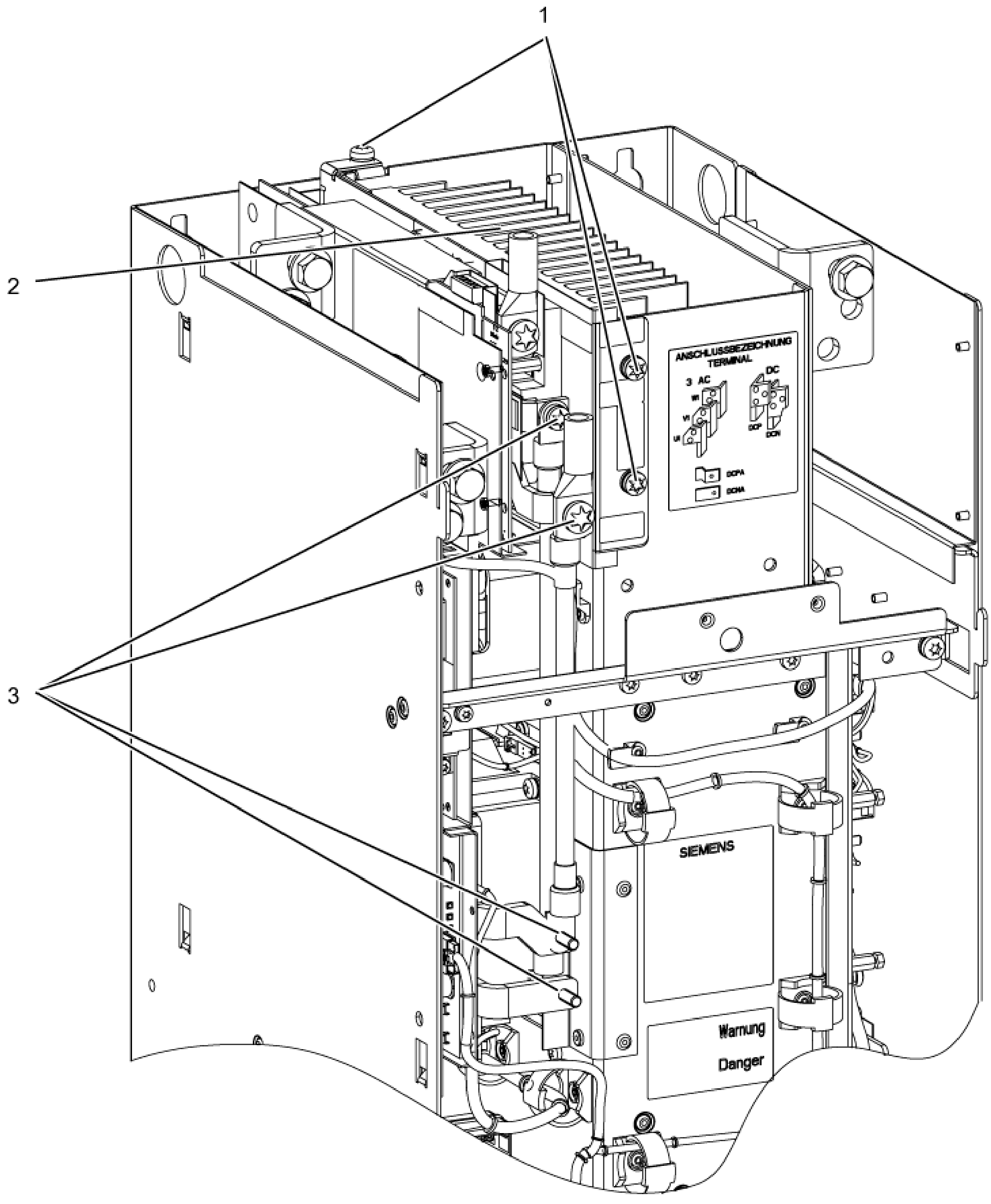


Figure 5-12 Installing the Braking Module in a Basic Line Module, frame size FB

Installing the Braking Module

The steps for the installation procedure are numbered in accordance with the diagram.

1. Unscrew the 3 screws for the blanking plate.

   Remove the plate.

2. Insert the Braking Module where the cover used to be and secure it using the 3 screws (from step 1).
3. Secure the connecting cable to the DC link with 2 screws (Braking Module connection) and 2 nuts (DC link connection).

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed.

5.1.4.6 Installing the Braking Module in a Basic Line Module, frame size GB

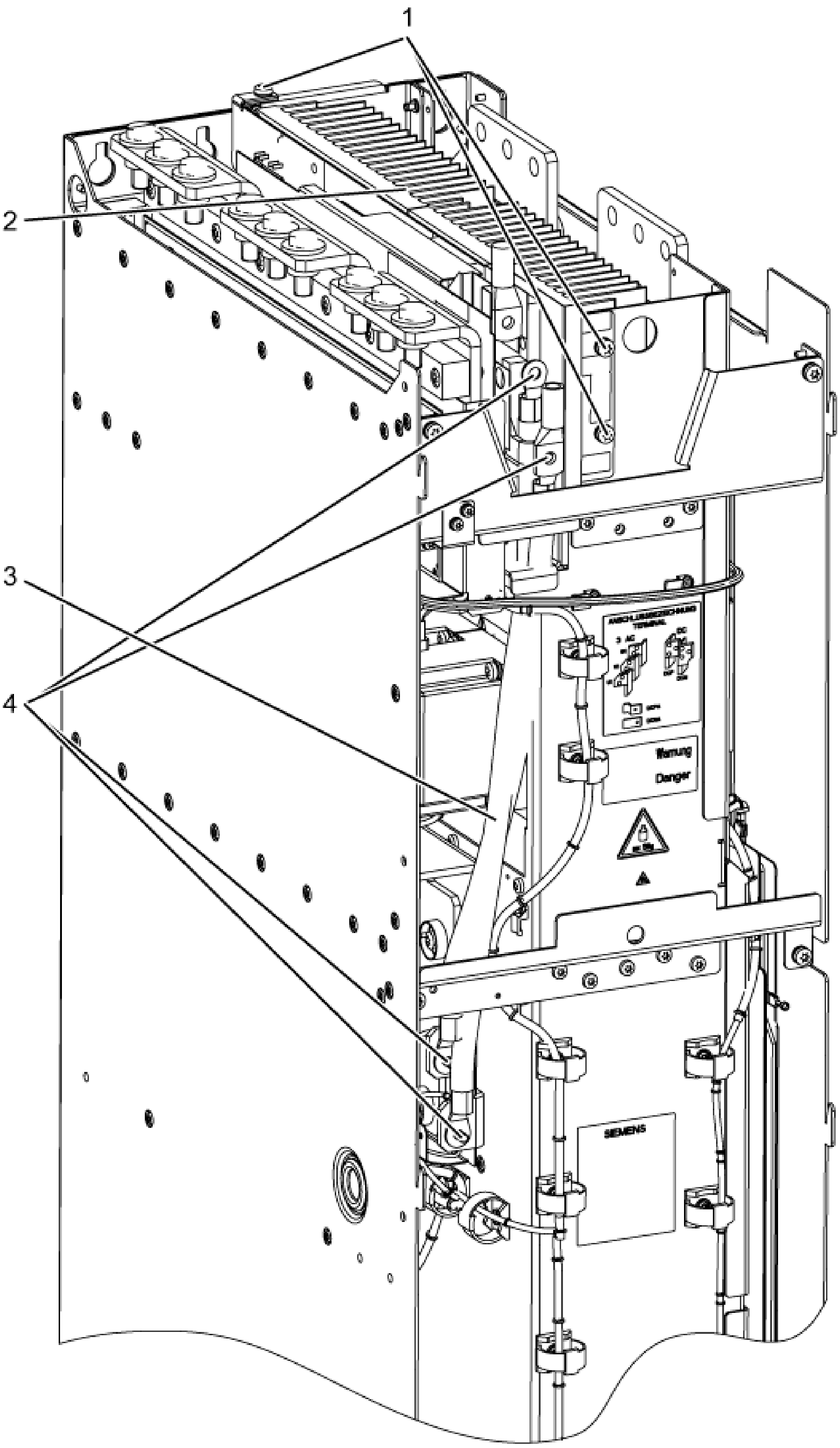


Figure 5-13 Installing the Braking Module in a Basic Line Module, frame size GB

Installing the Braking Module

Note

To install a frame size GX Braking Module in a frame size GB Basic Line Module a cable harness set is required, which is available under order number 6SL3366-2NG00-0AA0.

The steps for the installation procedure are numbered in accordance with the diagram.

1. Unscrew the 3 screws for the blanking plate.

   Remove the plate.
2. Insert the Braking Module where the cover used to be and secure it using the 3 screws (from step 1).
3. Use the connecting cable in the cable harness set (order number 6SL3366-2NG00-0AA0).
4. Secure the connecting cable to the DC link with 2 screws (Braking Module connection) and 2 nuts (DC link connection).

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed.

5.1.5 Technical specifications

Table 5- 4 Technical specifications of Braking Modules, 380 V – 480 V 3 AC

Braking Module 6SL3300-	1AE31-3AA0	1AE32-5AA0	1AE32-5BA0
Suitable for installation in: Smart Line Module / Active Line Module / Motor Module, frame size Basic Line Module, frame size	 FX FB	 GX GB	 HX / JX --
P_{DB} power (rated power)	25 kW	50 kW	50 kW
P_{15} power (peak power)	125 kW	250 kW	250 kW
P_{20} power	100 kW	200 kW	200 kW
P_{40} power	50 kW	100 kW	100 kW
Variable response thresholds	774 V (673 V)		
Digital input			
Voltage	-3 V to 30 V		
Low level (an open digital input is interpreted as "low")	-3 V to 5 V		
High level	15 V to 30 V		
Typical current consumption (at 24 V DC)	10 mA		
Max. connectable cross-section	1.5 mm²		
Digital output (continuously short-circuit proof)			
Voltage	24 V DC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm²		
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. conductor cross-section R1/R2	35 mm²	50 mm²	50 mm²
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Table 5- 5 Technical specifications of Braking Modules, 500 V – 600 V 3 AC

Braking Module 6SL3300-	1AF31-3AA0	1AF32-5AA0	1AF32-5BA0
Suitable for installation in: Smart Line Module / Active Line Module / Motor Module, frame size Basic Line Module, frame size	 FX FB	 GX GB	 HX / JX --
P_{DB} power (rated power)	25 kW	50 kW	50 kW
P_{15} power (peak power)	125 kW	250 kW	250 kW
P_{20} power	100 kW	200 kW	200 kW
P_{40} power	50 kW	100 kW	100 kW
Variable response thresholds	967 V (841 V)		
Digital input			
Voltage	-3 V to 30 V		
Low level (an open digital input is interpreted as "low")	-3 V to 5 V		
High level	15 V to 30 V		
Typical current consumption (at 24 V DC)	10 mA		
Max. connectable cross-section	1.5 mm²		
Digital output (continuously short-circuit proof)			
Voltage	24 V DC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm²		
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. conductor cross-section R1/R2	35 mm²	50 mm²	50 mm²
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Table 5- 6 Technical specifications of Braking Modules, 660 V – 690 V 3 AC

Braking Module 6SL3300-	1AH31-3AA0	1AH32-5AA0	1AH32-5BA0
Suitable for installation in: Smart Line Module / Active Line Module / Motor Module, frame size Basic Line Module, frame size	 FX FB	 GX GB	 HX / JX
P_{DB} power (rated power)	25 kW	50 kW	50 kW
P_{15} power (peak power)	125 kW	250 kW	250 kW
P_{20} power	100 kW	200 kW	200 kW
P_{40} power	50 kW	100 kW	100 kW
Variable response thresholds	1158 V (1,070 V)		
Digital input			
Voltage	-3 V to 30 V		
Low level (an open digital input is interpreted as "low")	-3 V to 5 V		
High level	15 V to 30 V		
Typical current consumption (at 24 V DC)	10 mA		
Max. connectable cross-section	1.5 mm²		
Digital output (continuously short-circuit proof)			
Voltage	24 V DC		
Max. load current of the digital output	500 mA		
Max. connectable cross-section	1.5 mm²		
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. conductor cross-section R1/R2	35 mm²	50 mm²	50 mm²
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

5.2 Braking resistors

5.2.1 Description

The excess energy of the DC link is dissipated via the braking resistor.

The braking resistor is connected to a Braking Module. The braking resistor is positioned outside the cabinet unit or switchgear room. This enables the resulting heat loss around the Basic Line Modules, Smart Line Modules, Active Line Modules, or Motor Modules to be dissipated. This reduces the level of air conditioning required.

Resistors with rated powers of 25 kW and 50 kW are available.

Greater outputs can be implemented by connecting Braking Modules and braking resistors in parallel. In this case, the Braking Modules are installed in the air duct of the Basic Line Modules, Smart Line Modules, Active Line Modules, or Motor Modules. Depending on the size of the respective module, up to three mounting locations are available.

Since the braking resistors can be used in converters with a wide voltage range, the voltage can be adjusted (for example, to reduce the voltage stress on the motor and converter) by setting the response thresholds on the Braking Module.

A thermostat monitors the braking resistor for excessively high temperatures and issues a signal on a floating contact if the limit value is exceeded.

5.2.2 Safety information

CAUTION
A cooling clearance of 200 m must be maintained on all sides of the component (with ventilation meshes).

CAUTION
The braking resistor cables must be laid in such a way that they are short-circuit and ground-fault proof.

Note

The connecting cables to the Braking Module in the Basic Line Module, Smart Line Module, Active Line Module, or Motor Module must be kept as short as possible (maximum of 100 m).

The braking resistors are only suitable for floor mounting.

Sufficient space must be available for dissipating the energy converted by the braking resistor.

A sufficient distance from flammable objects must be ensured.

The braking resistor must be installed as a free-standing unit.

Objects must not be placed on or anywhere above the braking resistor.

The braking resistor should not be installed underneath fire detection systems, since these could be triggered by the resulting heat.

For outdoor installation, a hood should be provided to protect the braking resistor against precipitation (in accordance with degree of protection IP20).

CAUTION
The surface temperature of the braking resistors may exceed 80 °C.

5.2.3 Dimension drawing

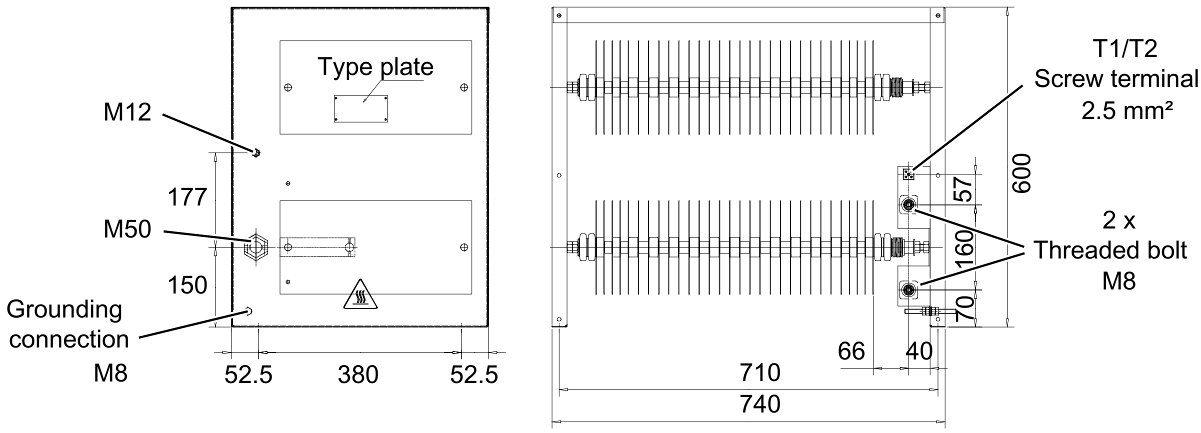


Figure 5-14 Dimension drawing braking resistor 25 kW/125 kW

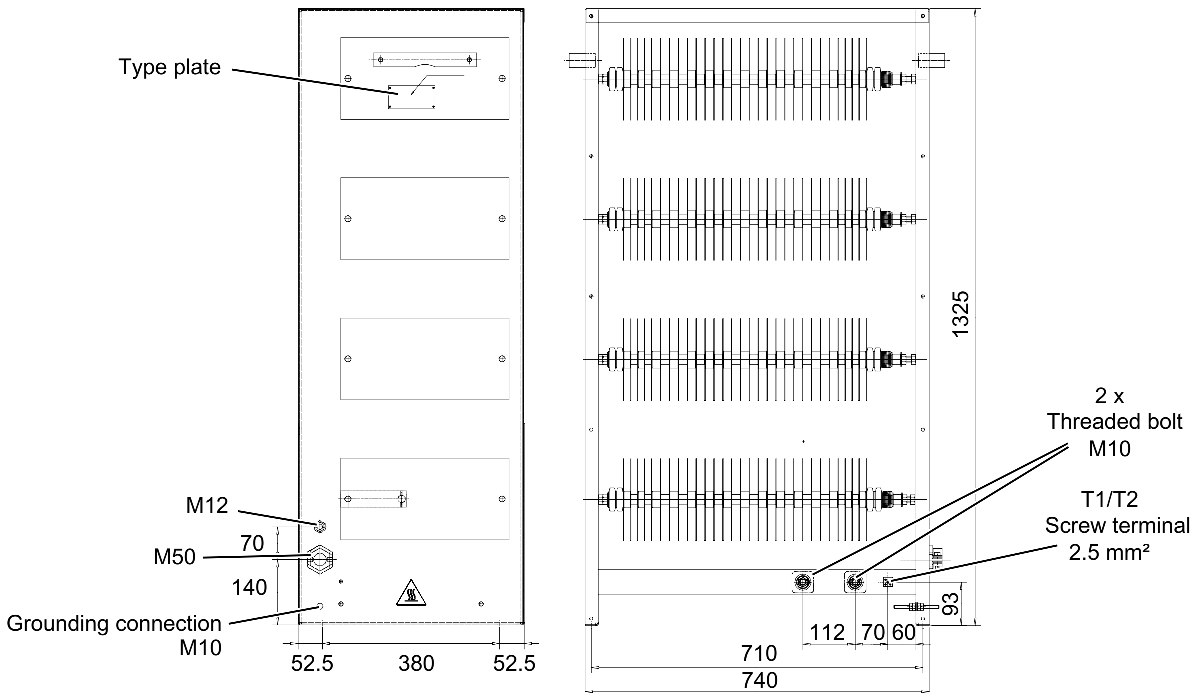


Figure 5-15 Dimension drawing braking resistor 50 kW/250 kW

5.2.4 Electrical connection

⚠ WARNING
The Braking Module must only be connected when the Basic Line Module, Smart Line Module, Active Line Module, or Motor Module has been disconnected from the power supply and the DC link has been discharged.

CAUTION
The braking resistor cables must be laid in such a way that they are short-circuit and ground-fault proof. The length of the connecting cables between the Braking Module and external braking resistor must not exceed 100 m.

Recommended cable cross-sections:

- For 25/125 kW: 35 mm²
- For 50/250 kW: 50 mm²

Thermostatic switch

A thermostatic switch is installed to protect the braking resistor against overload. Its floating contacts must be integrated in the fault chain on the line side.

Table 5- 7 Thermostatic switch connection

Terminal	Function	Technical specifications
T1	Thermostatic switch connection	Voltage: 250 V AC Load current: max. 1 A
T2	Thermostatic switch connection	

Max. connectable cross-section: 2.5 mm²

5.2.5 Technical specifications

Table 5- 8 Technical specifications of braking resistors 380 V – 480 V 3 AC

Order number	Unit	6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
P_{DB} (rated power)	kW	25	50
P_{15} (peak power)	kW	125	250
Max. current	A	189	378
Resistance	Ω	4.4 (± 7.5 %)	2.2 (± 7.5 %)
Cable entry		via M50 cable gland	via M50 cable gland
Power connection		Via M8 bolt-type screw terminal	via M10 bolt-type terminal
Max. connectable cable cross-section	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Weight, approx.	kg	50	120

Table 5- 9 Technical specifications of braking resistors 500 V – 600 V 3 AC

Order number	Unit	6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
P_{DB} (rated power)	kW	25	50
P_{15} (peak power)	kW	125	250
Max. current	A	153	306
Resistance	Ω	6.8 (± 7.5 %)	3.4 (± 7.5 %)
Cable entry		via M50 cable gland	via M50 cable gland
Power connection		Via M8 bolt-type screw terminal	via M10 bolt-type terminal
Max. connectable cable cross-section	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Weight, approx.	kg	50	120

Table 5- 10 Technical specifications of braking resistors 660 V – 690 V 3 AC

Order number	Unit	6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
P_{DB} (rated power)	kW	25	50
P_{15} (peak power)	kW	125	250
Max. current	A	125	255
Resistance	Ω	9.8 (± 7.5 %)	4.9 (± 7.5 %)
Cable entry		via M50 cable gland	via M50 cable gland
Power connection		Via M8 bolt-type screw terminal	via M10 bolt-type terminal
Max. connectable cable cross-section	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Weight, approx.	kg	50	120

Duty cycle

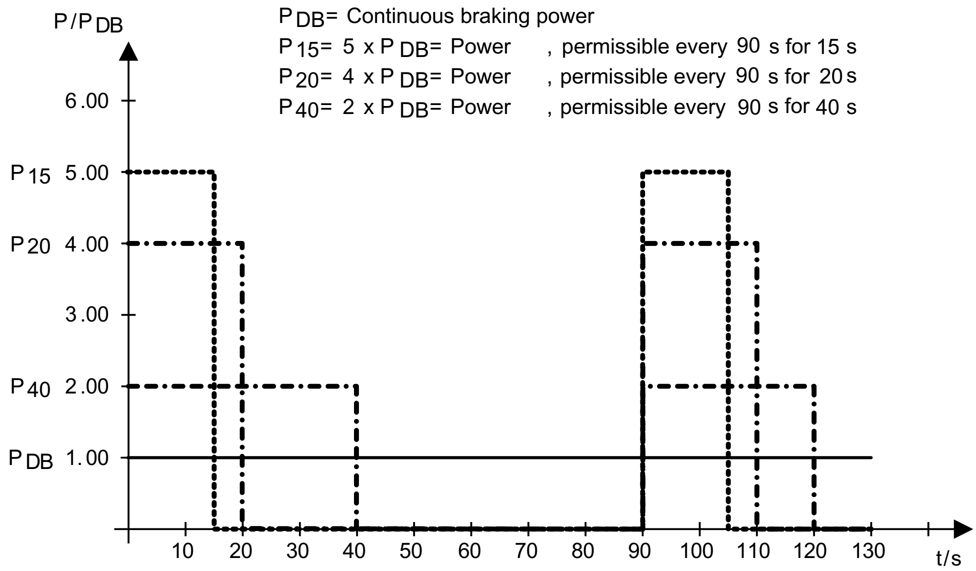


Figure 5-16 Duty cycle for braking resistors

Motor-side power components 6

6.1 Sine-wave filter

6.1.1 Description

If a sine-wave filter is connected to the output of the Motor Module, the voltage between the motor terminals is virtually sinusoidal. This reduces the voltage load on the motor windings and prevents motor noise that would be induced by the pulse frequency.

Sine-wave filters are available up to a converter type power rating of 250 kW (without consideration for derating).

The pulse frequency of the Motor Modules must be set to 4 kHz for the sine-wave filters. This reduces the output current of the Motor Module.

When a sine-wave filter is used, the available output voltage decreases by 15 %.

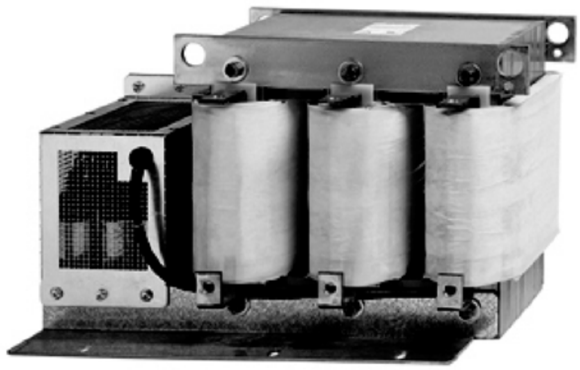


Figure 6-1 Sine-wave filter

6.1.2 Safety information

CAUTION
The 100 mm cooling clearances above and to the side of the components must be observed.

Note

The connecting cables to the Motor Module must be kept as short as possible (max. 5 m).

CAUTION
The connections must not be interchanged: • Incoming cable to the Motor Modules 1U1, 1V1, 1W1, and • Outgoing cable to the load 1U2, 1V2, 1W2. Non-observance may damage the sine-wave filter.

CAUTION
If sine-wave filters are used that have not been approved for SINAMICS by SIEMENS, the Motor Modules may be damaged or may malfunction.

⚠ CAUTION
The surface temperature of the sine-wave filters can exceed 80 °C.

CAUTION
If a sine-wave filter is connected to the Motor Module, the converter must be activated during commissioning (p0230 = 3) to prevent the filter from being destroyed. If a sine-wave filter is connected to the Motor Module, the Motor Module must not be operated without a connected motor because otherwise the filter can be destroyed.

CAUTION
The maximum permissible output frequency when sine-wave filters are used is 150 Hz.

⚠ DANGER
Sine-wave filters discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with sine-wave filters, they or the relevant control cabinet must be permanently connected to PE. According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

6.1.3 Dimension drawing

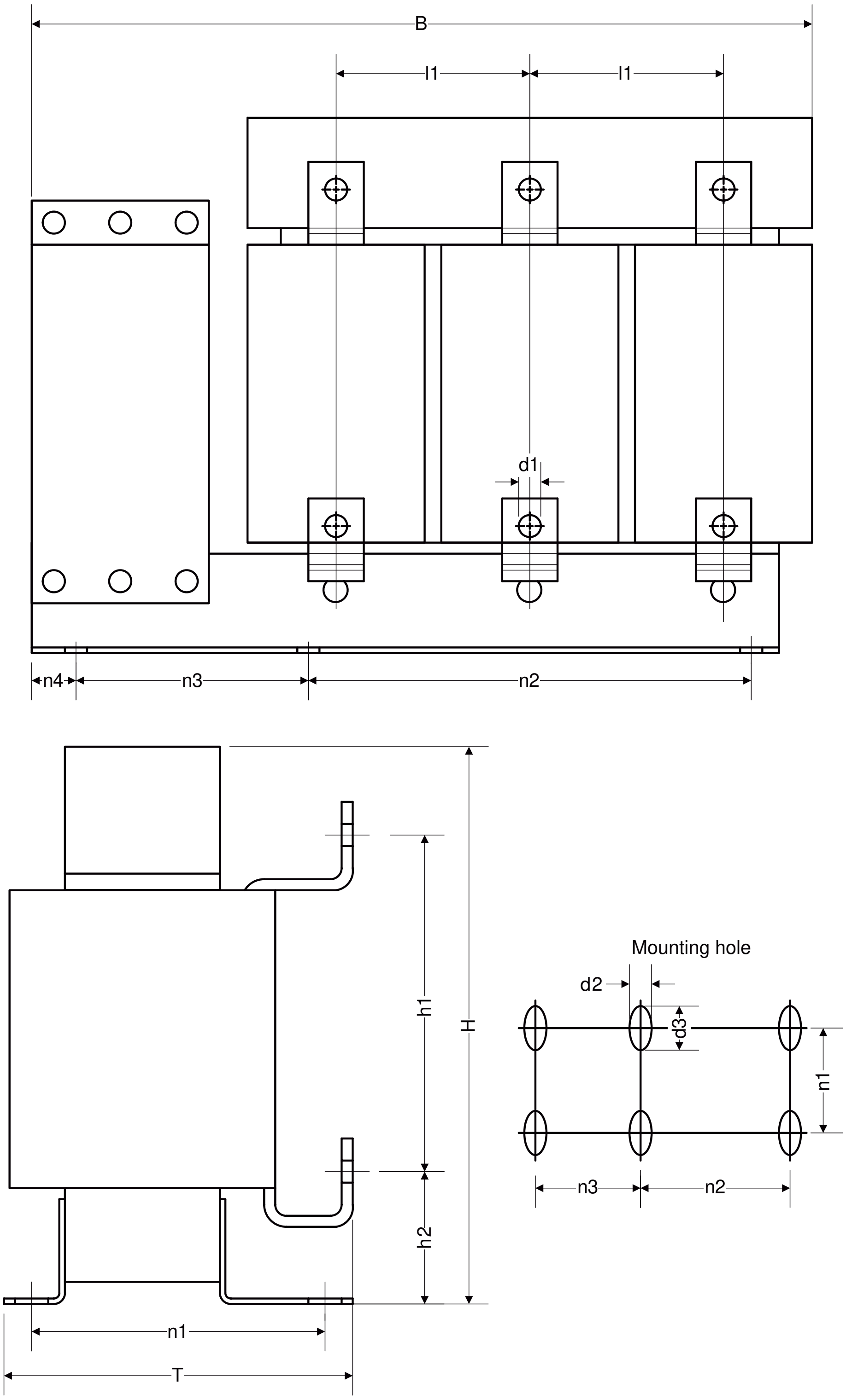


Figure 6-2 Dimension drawing, sine-wave filter

Table 6- 1 Dimensions of the sine-wave filter (all values in mm)

6SL3000-	2CE32-3AA0	2CE32-8AA0	2CE33-3AA0	2CE34-1AA0
B	620	620	620	620
H	320	320	360	360
T	300	300	370	370
l1	140	140	140	140
h1	180	180	220	220
h2	65	65	65	65
n1 [1)]	280	280	320	320
n2 [1)]	150	150	150	150
n3 [1)]	225	225	225	225
n4	105	105	105	105
d1	12	12	12	12
d2	11	11	11	11
d3	22	22	22	22

[1)] The lengths n1, n2 and n3 correspond to the drill hole spacing

6.1.4 Technical specifications

Table 6- 2 Technical specifications of sine-wave filters 380 V – 480 V 3 AC

Order number	6SL3000-	2CE32-3AA0	2CE32-3AA0	2CE32-8AA0	2CE33-3AA0	2CE34-1AA0
Suitable for Motor Module	6SL3320-	1TE32-1AA0	1TE32-6AA0	1TE33-1AA0	1TE33-8AA0	1TE35-0AA0
Rated current (unit rating) of the Motor Module with sine-wave filter at pulse frequency of 4 kHz		170 A (90 kW)	215 A (110 kW)	270 A (132 kW)	330 A (160 kW)	380 A (200 kW)
Rated current	A	225	225	276	333	408
Maximum output frequency	Hz	150	150	150	150	150
Power loss - at 50 Hz - at 150 Hz	 kW kW	 0.35 0.6	 0.35 0.6	 0.4 0.69	 0.245 0.53	 0.38 0.7
Connections - to the Motor Module - load		 M10 connection lugs M10 connection lugs				
Max. permissible cable length between sine-wave filter and motor	m	300 (shielded) 450 (unshielded)				
Degree of protection		IP00	IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 620 300 320	 620 300 320	 620 300 320	 620 370 360	 620 370 360
Weight	kg	124	124	127	136	198

6.2 Motor reactors

6.2.1 Description

Motor reactors reduce the voltage stress on the motor windings by reducing the voltage gradients at the motor terminals that occur when motors are fed from drive converters. At the same time, the capacitive charge/discharge currents that also occur on the output of the Motor Module when long motor cables are used are reduced.

6.2.2 Safety information

CAUTION
The 100 mm cooling clearances above and to the side of the components must be observed.

Note

The connecting cables to the Motor Module must be kept as short as possible (max. 5 m).

CAUTION
Using motor reactors not approved by SIEMENS for SINAMICS can result in thermal damage to the reactor.

⚠ CAUTION
The surface temperature of the motor reactors can exceed 80 °C.

CAUTION
If a motor reactor is connected to the Motor Module, it is essential that it is activated during commissioning (p0230 = 1).

CAUTION
The maximum permissible output frequency when sine-wave filters are used is 150 Hz.

CAUTION
The maximum permissible pulse frequency when motor reactors are used is 2.5 Hz or 4 kHz.

6.2.3 Dimension drawing

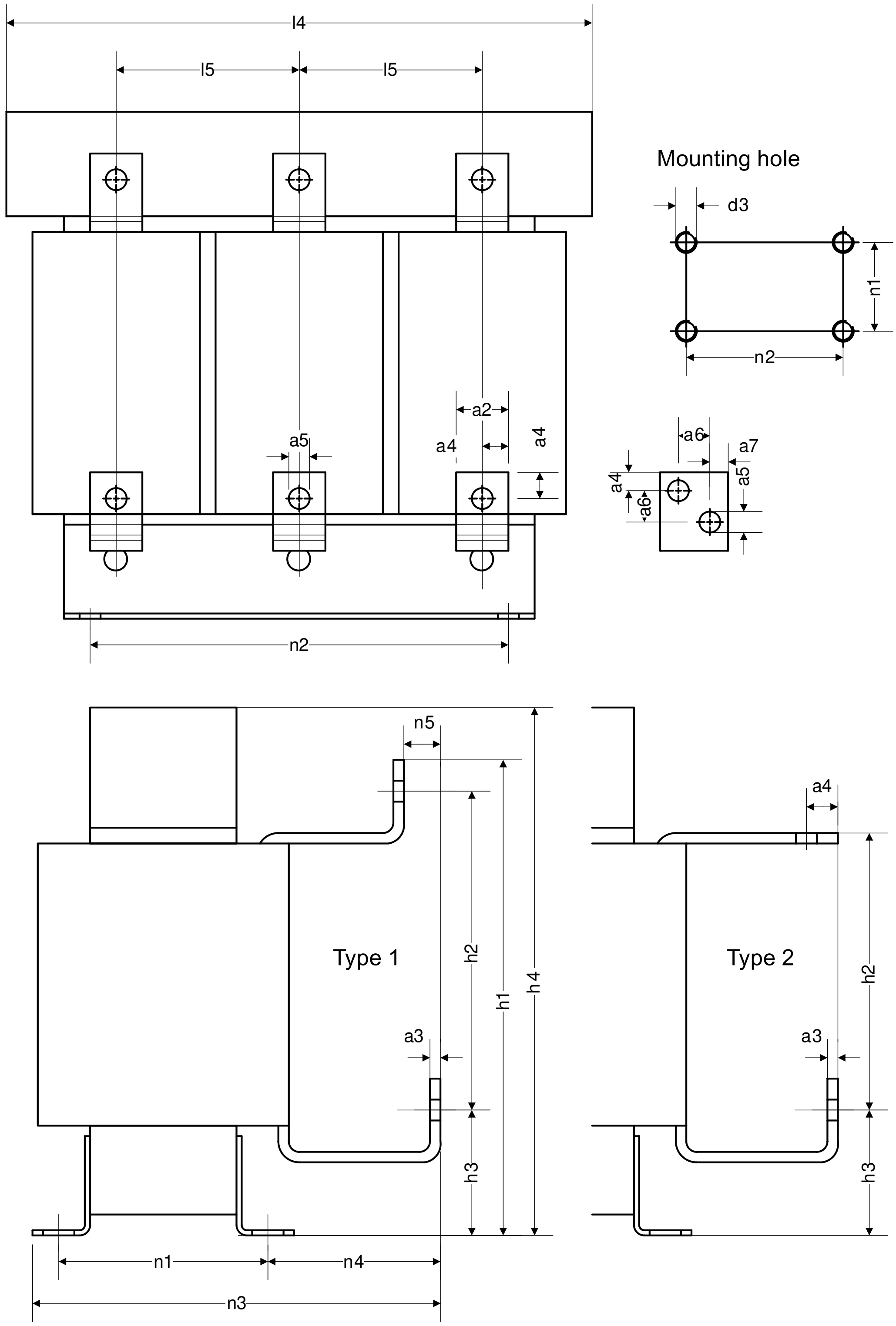


Figure 6-3 Dimension drawing, motor reactor

Table 6- 3 Dimensions of motor reactor, 380 V – 480 V 3 AC, part 1 (all specifications in mm)

6SL3000-	2BE32-1AA0	2BE32-6AA0	2BE33-2AA0	2BE33-8AA0	2BE35-0AA0
Connection type	Type 1	Type 1	Type 1	Type 1	Type 2
a2	25	25	25	25	30
a3	5	5	5	5	6
a4	12.5	12.5	12.5	12.5	15
a5	11	11	11	11	14
l4	300	300	300	300	300
l5	100	100	100	100	100
h1	-	-	-	-	-
h2	194	227	194	194	245
h3	60	60	60	60	60
h4	285	315	285	285	365
n1 [1)]	163	183	163	183	183
n2 [1)]	224	224	224	224	224
n3	257	277	257	277	277
n4	79	79	79	79	79
d3	M8	M8	M8	M8	M8

[1)] Lengths n1 and n2 correspond to the distance between holes

Table 6- 4 Dimensions of motor reactor, 380 V – 480 V 3 AC, part 2 (all specifications in mm)

6SL3000-	2AE36-1AA0	2AE38-4AA0	2AE41-0AA0	2AE41-4AA0	
Connection type	Type 1	Type 1	Type 1	Type 1	
a2	40	40	40	60	
a3	8	8	8	12	
a4	20	20	20	17	
a5	14	14	14	14	
a6	-	-	-	22	
a7	-	-	-	19	
l4	410	410	410	460	
l5	140	140	140	160	
h1	392	392	392	392	
h2	252	252	252	255	
h3	120	120	120	120	
h4	385	385	385	385	
n1 [1)]	191	191	206	212	
n2 [1)]	316	316	316	356	
n3	292	292	302	326	
n4	84.5	84.5	79.5	94.5	
n5	30	30	-	-	
d3	M10	M10	M10	M10	

[1)] Lengths n1 and n2 correspond to the distance between holes

Table 6- 5 Dimensions of motor reactor, 500 V – 690 V 3 AC, part 1 (all specifications in mm)

6SL3000-	2AH31-0AA0	2AH31-5AA0	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0
Connection type	Type 1	Type 1	Type 1	Type 1	Type 1
a2	25	25	25	25	25
a3	5	5	5	5	5
a4	12.5	12.5	12.5	12.5	12.5
a5	11	11	11	11	11
l4	270	270	300	300	300
l5	88	88	100	100	100
h1	-	-	-	-	-
h2	150	150	194	194	194
h3	60	60	60	60	60
h4	248	248	285	285	285
n1 [1)]	103	103	118	118	118
n2 [1)]	200	200	224	224	224
n3	200	200	212	212	212
n4	82	82	79	79	79
d3	M8	M8	M8	M8	M8

1) Lengths n1 and n2 correspond to the distance between holes

Table 6- 6 Dimensions of motor reactor, 500 V – 690 V 3 AC, part 2 (all specifications in mm)

6SL3000-	2AH33-6AA0	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Connection type	Type 1	Type 1	Type 1	Type 1	Type 1
a2	25	30	40	40	40
a3	5	6	8	8	8
a4	12.5	15	20	20	20
a5	11	14	14	14	14
l4	300	350	410	410	410
l5	100	120	140	140	140
h1	-	-	392	392	392
h2	194	235	252	252	252
h3	60	60	120	120	120
h4	285	330	385	385	385
n1 [1)]	118	138	141	141	183
n2 [1)]	224	264	316	316	316
n3	212	215	292	292	279
n4	79	63	134.5	134.5	79.5
n5	-	-	30	30	-
d3	M8	M8	M10	M10	M10

1) Lengths n1 and n2 correspond to the distance between holes

Table 6- 7 Dimensions of motor reactor, 500 V – 690 V 3 AC, part 3 (all specifications in mm)

6SL3000-	2AH41-0AA0	2AH41-1AA0	2AH41-3AA0		
Connection type	Type 1	Type 1	Type 1		
a2	40	50	60		
a3	8	8	12		
a4	20	14	17		
a5	14	14	14		
a6	-	22	22		
a7	-	-	19		
l4	410	410	460		
l5	140	140	160		
h1	392	392	392		
h2	252	258	255		
h3	120	120	120		
h4	385	385	385		
n1 [1)]	183	206	182		
n2 [1)]	316	316	356		
n3	279	317	296		
n4	79.5	94.5	94.5		
d3	M10	M10	M10		

[1)] Lengths n1 and n2 correspond to the distance between holes

6.2.4 Technical specifications

Table 6- 8 Technical specifications of motor reactors, 380 V – 480 V 3 AC, part 1

Order number	6SL3000-	2BE32-1AA0	2BE32-6AA0	2BE33-2AA0	2BE33-8AA0
Suitable for Motor Module	6SL3320-	1TE32-1AA0	1TE32-6AA0	1TE33-1AA0	1TE33-8AA0
Unit rating of the Motor Module	kW	110	132	160	200
Rated current	A	210	260	310	380
Power loss	kW	0.486	0.5	0.47	0.5
Connections - to the Motor Module - load - PE		 M10 M10 M8	 M10 M10 M8	 M10 M10 M8	 M10 M10 M8
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 285 257	 300 315 277	 300 285 257	 300 285 277
Weight, approx.	kg	66	66	66	73

Table 6- 9 Technical specifications of motor reactors, 380 V – 480 V 3 AC, part 2

Order number	6SL3000-	2BE35-0AA0	2AE36-1AA0	2AE38-4AA0	2AE38-4AA0
Suitable for Motor Module	6SL3320-	1TE35-0AA0	1TE36-1AA0	1TE37-5AA0	1TE38-4AA0
Unit rating of the Motor Module	kW	250	315	400	450
Rated current	A	490	605	840	840
Power loss	kW	0.5	0.9	0.83	0.943
Connections - to the Motor Module - load - PE		 M12 M12 M8	 M12 M12 M10	 M12 M12 M10	 M12 M12 M10
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 365 277	 410 392 292	 410 392 292	 410 392 292
Weight, approx.	kg	100	130	140	140

Table 6- 10 Technical specifications of motor reactors, 380 V – 480 V 3 AC, part 3

Order number	6SL3000-	2AE41-0AA0	2AE41-4AA0	2AE41-4AA0	
Suitable for Motor Module	6SL3320-	1TE41-0AA0	1TE41-2AA0	1TE41-4AA0	
Unit rating of the Motor Module	kW	560	710	800	
Rated current	A	985	1405	1405	
Power loss	kW	1.062	0.962	1.054	
Connections - to the Motor Module - load - PE		 M12 M12 M10	 2 x M12 2 x M12 M10	 2 x M12 2 x M12 M10	
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	
Dimensions Width Height Depth	 mm mm mm	 410 392 302	 460 392 326	 460 392 326	
Weight, approx.	kg	146	179	179	

Table 6- 11 Technical specifications of motor reactors, 500 V – 690 V 3 AC, part 1

Order number	6SL3000-	2AH31-0AA0	2AH31-0AA0	2AH31-5AA0	2AH31-5AA0
Suitable for Motor Module	6SL3320-	1TG28-5AA0	1TG31-0AA0	1TG31-2AA0	1TG31-5AA0
Unit rating of the Motor Module	kW	75	90	110	132
Rated current	A	100	100	150	150
Power loss	kW	0.257	0.3	0.318	0.335
Connections - to the Motor Module - load - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 270 248 200	 270 248 200	 270 248 200	 270 248 200
Weight, approx.	kg	25	25	25.8	25.8

Table 6- 12 Technical specifications of motor reactors, 500 V – 690 V 3 AC, part 2

Order number	6SL3000-	2AH31-8AA0	2AH32-4AA0	2AH32-6AA0	2AH33-6AA0
Suitable for Motor Module	6SL3320-	1TG31-8AA0	1TG32-2AA0	1TG32-6AA0	1TG33-3AA0
Unit rating of the Motor Module	kW	160	200	250	315
Rated current	A	175	215	260	330
Power loss	kW	0.4	0.425	0.44	0.45
Connections - to the Motor Module - load - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 300 285 212	 300 285 212	 300 285 212	 300 285 212
Weight, approx.	kg	34	34	40	46

Table 6- 13 Technical specifications of motor reactors, 500 V – 690 V 3 AC, part 3

Order number	6SL3000-	2AH34-5AA0	2AH34-7AA0	2AH35-8AA0	2AH38-1AA0
Suitable for Motor Module	6SL3320-	1TG34-1AA0	1TG34-7AA0	1TG35-8AA0	1TG37-4AA0
Unit rating of the Motor Module	kW	400	450	560	710
Rated current	A	410	465	575	810
Power loss	kW	0.545	0.72	0.8	0.96
Connections - to the Motor Module - load - PE		 M12 M12 M8	 M12 M12 M8	 M12 M12 M8	 M12 M12 M8
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 350 330 215	 410 392 292	 410 392 292	 410 392 279
Weight, approx.	kg	68	80	80	146

Table 6- 14 Technical specifications of motor reactors, 500 V – 690 V 3 AC, part 4

Order number	6SL3000-	2AH38-1AA0	2AH41-0AA0	2AH41-1AA0	2AH41-3AA0
Suitable for Motor Module	6SL3320-	1TG38-1AA0	1TG38-8AA0	1TG41-0AA0	1TG41-3AA0
Unit rating of the Motor Module	kW	800	900	1000	1200
Rated current	A	810	910	1025	1270
Power loss	kW	1.0	0.97	1.05	0.95
Connections - to the Motor Module - load - PE		 M12 M12 M8	 M12 M12 M8	 M12 M12 M8	 M12 M12 M8
Max. permissible cable length between motor reactor and motor - with 1 motor reactor - with 2 motor reactors in series	 m m	 300 (shielded) / 450 (unshielded) 525 (shielded) / 787 (unshielded)			
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 410 392 279	 410 392 279	 410 392 317	 460 392 296
Weight, approx.	kg	146	150	163	153

6.3 dv/dt filter plus Voltage Peak Limiter

6.3.1 Description

The dv/dt filter plus Voltage Peak Limiter comprises two components: the dv/dt reactor and the voltage-limiting network (Voltage Peak Limiter), which cuts off the voltage peaks and returns energy to the DC link. The dv/dt filters plus Voltage Peak Limiter must be used for motors for which the proof voltage of the insulation system is unknown or insufficient.

The dv/dt filters plus Voltage Peak Limiter limit the rate of voltage rise to values < 500 V/µs and the typical voltage peaks with rated line voltages to the following values:

< 1000 V at U_{line} < 575 V

< 1250 V at 660 V < U_{line} < 690 V.

When a dv/dt filter plus Voltage Peak Limiter is used, the available output voltage decreases by approx. 1 %.

Components

The order numbers of the individual components (dv/dt reactor and voltage peak limiter) are listed in the following table:

Table 6- 15 dv/dt filter plus Voltage Peak Limiter, order numbers of the individual components

dv/dt filter plus Voltage Peak Limiter	dv/dt reactor	Voltage Peak Limiter
Supply voltage 380 V – 480 V		
6SL3000-2DE32-6AA0	6SL3000-2DE32-6CA0	6SL3000-2DE32-6BA0
6SL3000-2DE35-0AA0	6SL3000-2DE35-0CA0	6SL3000-2DE35-0BA0
6SL3000-2DE38-4AA0	6SL3000-2DE38-4CA0	6SL3000-2DE38-4BA0
6SL3000-2DE41-4AA0	2 x 6SL3000-2DE41-4DA0	6SL3000-2DE41-4BA0
Supply voltage 500 V – 690 V		
6SL3000-2DH31-0AA0	6SL3000-2DH31-0CA0	6SL3000-2DH31-0BA0
6SL3000-2DH31-5AA0	6SL3000-2DH31-5CA0	6SL3000-2DH31-5BA0
6SL3000-2DH32-2AA0	6SL3000-2DH32-2CA0	6SL3000-2DH32-2BA0
6SL3000-2DH33-3AA0	6SL3000-2DH33-3CA0	6SL3000-2DH33-3BA0
6SL3000-2DH34-1AA0	6SL3000-2DH34-1CA0	6SL3000-2DH34-1BA0
6SL3000-2DH35-8AA0	6SL3000-2DH35-8CA0	6SL3000-2DH35-8BA0
6SL3000-2DH38-1AA0	2 x 6SL3000-2DH38-1DA0	6SL3000-2DH38-1BA0
6SL3000-2DH41-3AA0	2 x 6SL3000-2DH41-3DA0	6SL3000-2DH41-3BA0

WARNING

When a dv/dt filter is used, the pulse frequency of the Motor Module must not exceed 2.5 kHz or 4 kHz. If a higher pulse frequency is set, then this could destroy the dv/dt filter.

Table 6- 16 Max. pulse frequency when a dv/dt filter is used in units with a rated pulse frequency of 2 kHz

Order no. 6SL3320-...	Power [kW]	Output current for a pulse frequency of 2 kHz [A]	Max. pulse frequency when a dv/dt filter is used
Connection voltage 510 – 720 V DC			
1TE32-1AA0	110	210	4 kHz
1TE32-6AA0	132	260	4 kHz
1TE33-1AA0	160	310	4 kHz
1TE33-8AA0	200	380	4 kHz
1TE35-0AA0	250	490	4 kHz

Table 6- 17 Max. pulse frequency when a dv/dt filter is used in units with a rated pulse frequency of 1.25 kHz

Order no. 6SL3320-...	Power [kW]	Output current for a pulse frequency of 1.25 kHz [A]	Max. pulse frequency when a dv/dt filter is used
Connection voltage 510 – 720 V DC			
1TE36-1AA0	315	605	2.5 kHz
1TE37-5AA0	400	745	2.5 kHz
1TE38-4AA0	450	840	2.5 kHz
1TE41-0AA0	560	985	2.5 kHz
1TE41-2AA0	710	1260	2.5 kHz
1TE41-4AA0	800	1405	2.5 kHz
Connection voltage 675 – 1035 V DC			
1TG28-5AA0	75	85	2.5 kHz
1TG31-0AA0	90	100	2.5 kHz
1TG31-2AA0	110	120	2.5 kHz
1TG31-5AA0	132	150	2.5 kHz
1TG31-8AA0	160	175	2.5 kHz
1TG32-2AA0	200	215	2.5 kHz
1TG32-6AA0	250	260	2.5 kHz
1TG33-3AA0	315	330	2.5 kHz
1TG34-1AA0	400	410	2.5 kHz
1TG34-7AA0	450	465	2.5 kHz
1TG35-8AA0	560	575	2.5 kHz
1TG37-4AA0	710	735	2.5 kHz
1TG38-1AA0	800	810	2.5 kHz
1TG38-8AA0	900	910	2.5 kHz
1TG41-0AA0	1000	1025	2.5 kHz
1TG41-3AA0	1200	1270	2.5 kHz

6.3.2 Safety information

CAUTION
The cooling clearances of 100 mm above and below the components must be observed.

Note

The connecting cables to the Motor Module must be kept as short as possible (max. 5 m).

CAUTION
The terminals on the voltage limiting network (Voltage Peak Limiter) must always be connected as follows: • Cable from the DC link to the Motor Module at DCPS, DCNS and • Cable to the dv/dt reactor 1U2, 1V2, 1W2. Failure to connect the terminals correctly could damage the Voltage Peak Limiter.

CAUTION
When using dv/dt filters that SIEMENS has not approved for SINAMICS, then these dv/dt filters can be thermally damaged.

⚠ CAUTION
The surface temperature of the dv/dt reactors may exceed 80 °C.

CAUTION
If a dv/dt filter plus Voltage Peak Limiter is connected to the Motor Module, it is essential that it is activated during commissioning (p0230 = 2).

CAUTION
The maximum permissible output frequency when using dv/dt filters is 150 Hz.

⚠ DANGER
dv/dt filters plus Voltage Peak Limiter discharge a high leakage current to the protective ground conductor. Due to the high leakage current associated with dv/dt filters, they or the relevant control cabinet must be permanently connected to PE. According to EN 61800-5-1, Section 6.3.6.7, the minimum cross-section of the protective ground conductor must conform to the local safety regulations for protective ground conductors for equipment with a high leakage current.

6.3.3 Interface description

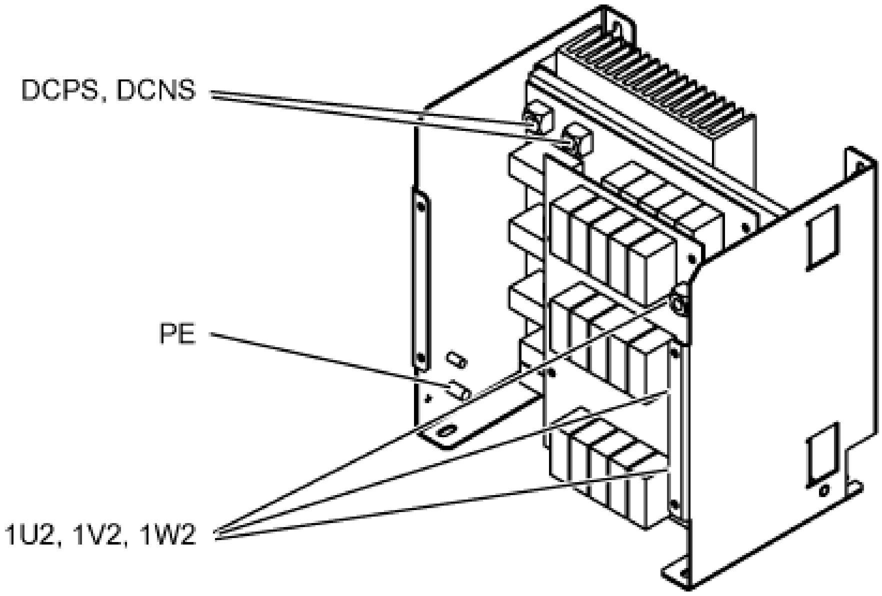


Figure 6-4 Interface overview, voltage peak limiter, type 1

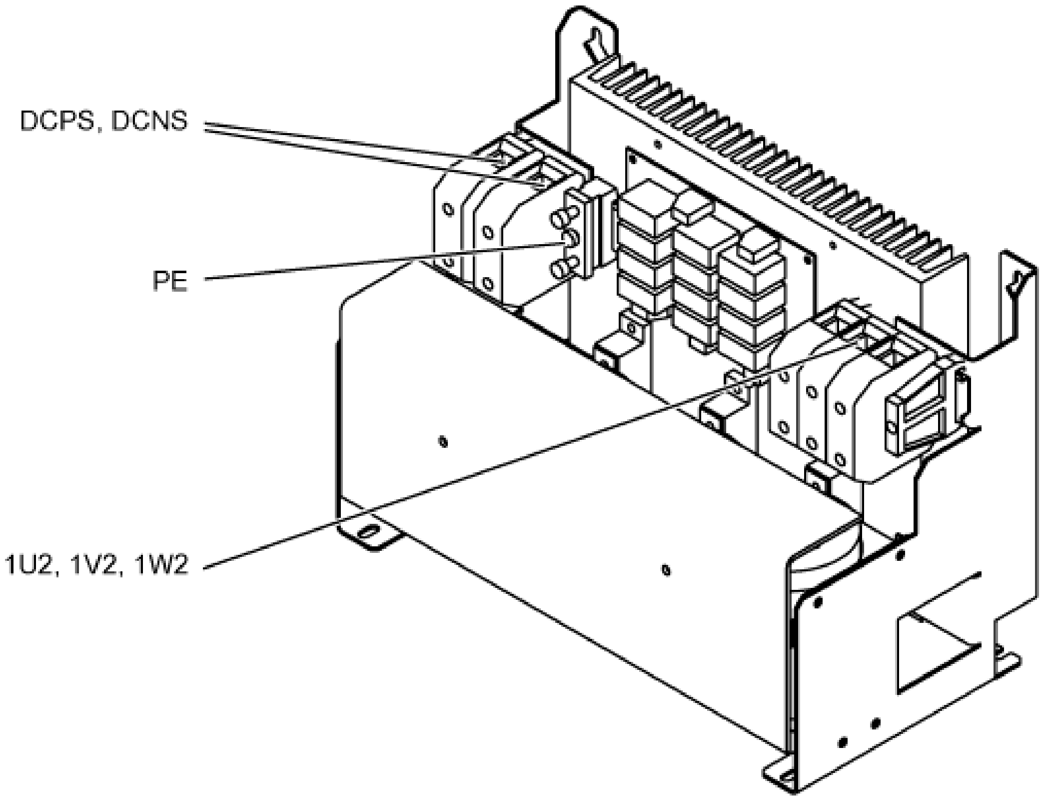


Figure 6-5 Interface overview, voltage peak limiter, type 2

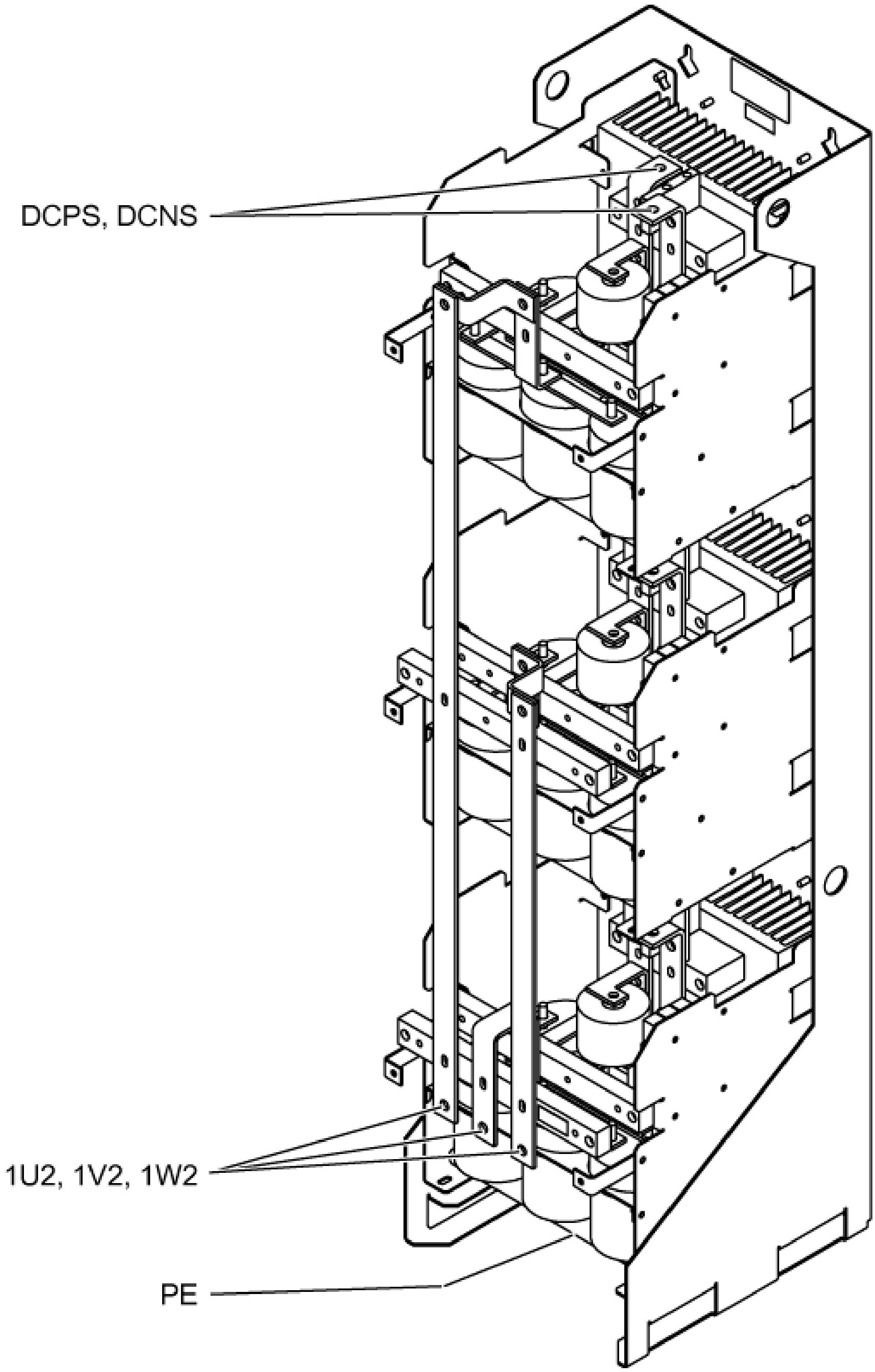


Figure 6-6 Interface overview, voltage peak limiter, type 3

6.3.4 Connecting the dv/dt filter plus Voltage Peak Limiter

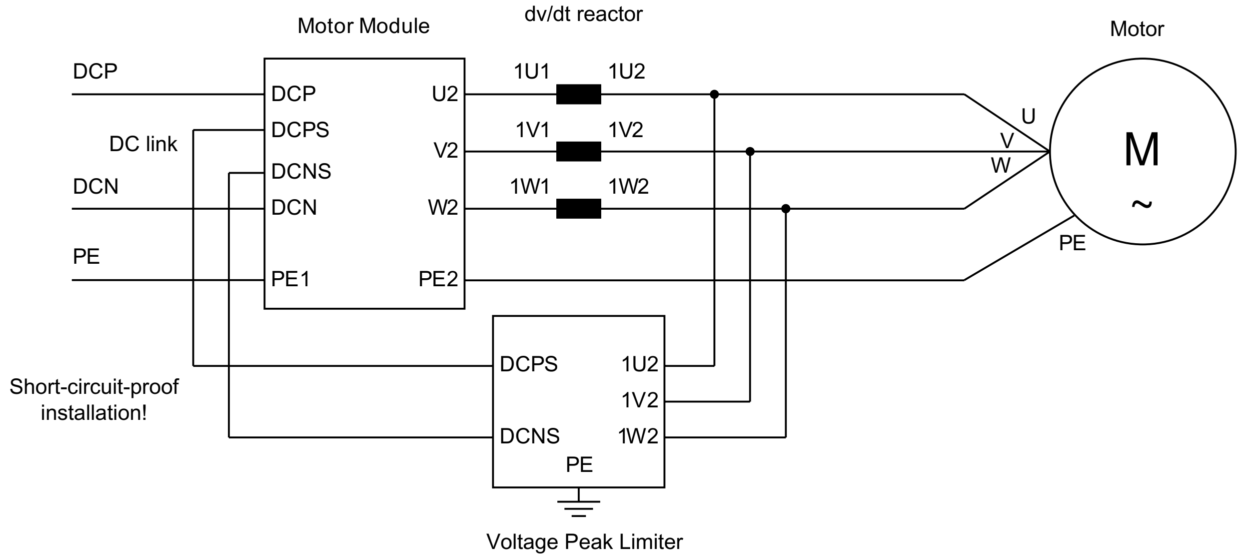


Figure 6-7 Connecting a dv/dt filter plus Voltage Peak Limiter for versions with one dv/dt reactor

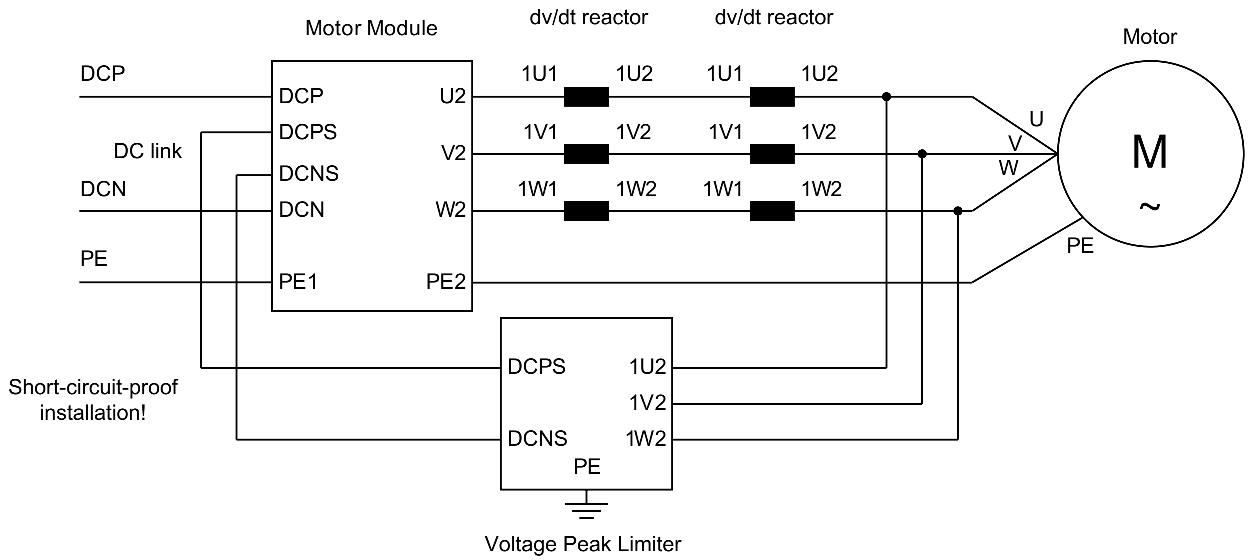


Figure 6-8 Connecting a dv/dt filter plus Voltage Peak Limiter for versions with two dv/dt reactors

Cable cross-sections

Table 6- 18 Cable cross-sections for connections between the dv/dt filter plus Voltage Peak Limiter and Motor Module

dv/dt filter plus Voltage Peak Limiter	Connection to the DC link (DCPS/DCNS) [mm²]	Connection between dv/dt reactor and Voltage Peak Limiter (1U2, 1V2, 1W2) [mm²]
Supply voltage 380 V – 480 V		
6SL3000-2DE32-6AA0	35	10
6SL3000-2DE35-0AA0	70	16
6SL3000-2DE38-4AA0	2 x 50	50
6SL3000-2DE41-4AA0	2 x 120	120
Supply voltage 500 V – 690 V		
6SL3000-2DH31-0AA0	16	6
6SL3000-2DH31-5AA0	16	6
6SL3000-2DH32-2AA0	70	16
6SL3000-2DH33-3AA0	70	16
6SL3000-2DH34-1AA0	120	35
6SL3000-2DH35-8AA0	120	35
6SL3000-2DH38-1AA0	2 x 70	70
6SL3000-2DH41-3AA0	2 x 120	120

WARNING

The connection to the DC link of the Motor Module must be short-circuit proof.

Note

The connections should be kept as short as possible.
The maximum cable length for the specified connections is 5 m in each case.

6.3.5 Dimension drawing, dv/dt reactor

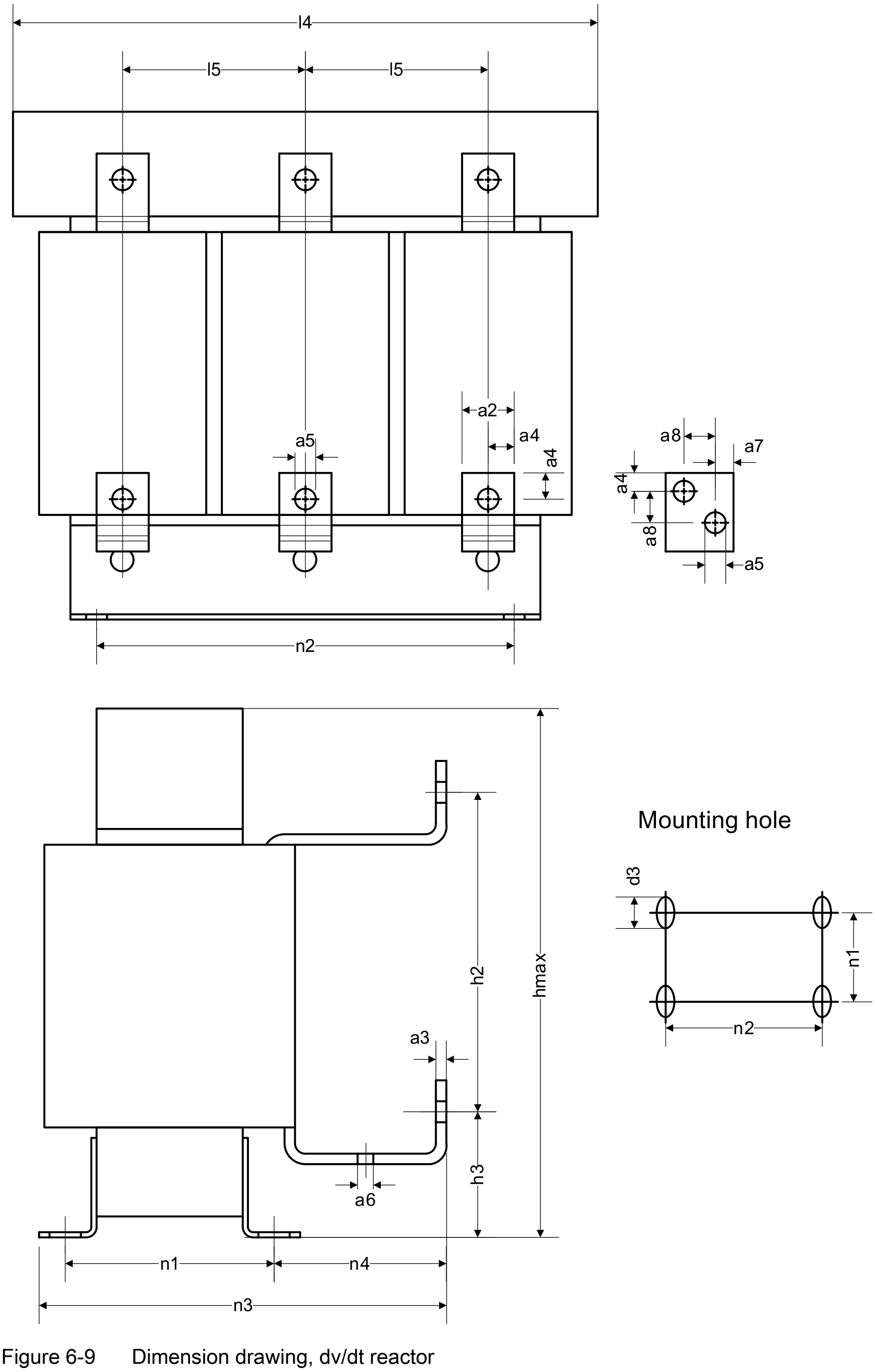


Figure 6-9 Dimension drawing, dv/dt reactor

Table 6- 19 Dimensions of dv/dt reactor, 380 V – 480 V 3 AC (all specifications in mm)

6SL3000-	2DE32-6CA0	2DE35-0CA0	2DE38-4CA0	2DE41-4DA0	
a2	25	30	40	60	
a3	5	6	8	10	
a4	14	17	22	19	
a5	10.5 x 14	14 x 18	14 x 18	14 x 18	
a6	7	9	11	11	
a7	-	-	-	17	
a8	-	-	-	26	
l4	410	460	460	445	
l5	135	152.5	152.5	145	
hmax	370	370	385	385	
h2	258	240	280	250	
h3	76	83	78	121	
n1 [1)]	141	182	212	212	
n2 [1)]	316	356	356	341	
n3	229	275	312	312	
n4	72	71	78	78	
d3	M10 (12 x 18)	M12 (15 x 22)	M12 (15 x 22)	M12 (15 x 22)	

1) Lengths n1 and n2 correspond to the distance between holes

Table 6- 20 Dimensions of dv/dt reactor, 500 V – 690 V 3 AC, part 1 (all specifications in mm)

6SL3000-	2DH31-0CA0	2DH31-5CA0	2DH32-2CA0	2DH33-3CA0	2DH34-1CA0
a2	25	25	25	25	30
a3	6	6	5	5	6
a4	14	14	14	14	17
a5	10.5 x 14	10.5 x 14	10.5 x 14	10.5 x 14	14 x 18
a6	7	7	7	9	11
a7	-	-	-	-	-
a8	-	-	-	-	-
l4	350	350	460	460	460
l5	120	120	152.5	152.5	152.5
hmax	320	320	360	360	385
h2	215	215	240	240	280
h3	70	70	86	86	83
n1 [1)]	138	138	155	212	212
n2 [1)]	264	264	356	356	356
n3	227	227	275	275	312
n4	74	74	101	42	78
d3	M8	M8	M12 (15 x 22)	M12 (15 x 22)	M12 (15 x 22)

1) Lengths n1 and n2 correspond to the distance between holes

Table 6- 21 Dimensions of dv/dt reactor, 500 V – 690 V 3 AC, part 2 (all specifications in mm)

6SL3000-	2DH35-8CA0	2DH38-1DA0	2DH41-3DA0		
a2	40	50	60		
a3	8	8	10		
a4	22	16	19		
a5	14 x 18	14 x 18	14 x 18		
a6	11	11	11		
a7	-	14	17		
a8	-	22	26		
l4	460	445	445		
l5	152.5	145	145		
hmax	385	385	385		
h2	280	255	250		
h3	78	114	121		
n1 [1)]	212	212	212		
n2 [1)]	356	341	341		
n3	312	312	312		
n4	78	78	78		
d3	M12 (15 x 22)	M12 (15 x 22)	M12 (15 x 22)		

[1)] Lengths n1 and n2 correspond to the distance between holes

6.3.6 Dimension drawing of the Voltage Peak Limiter

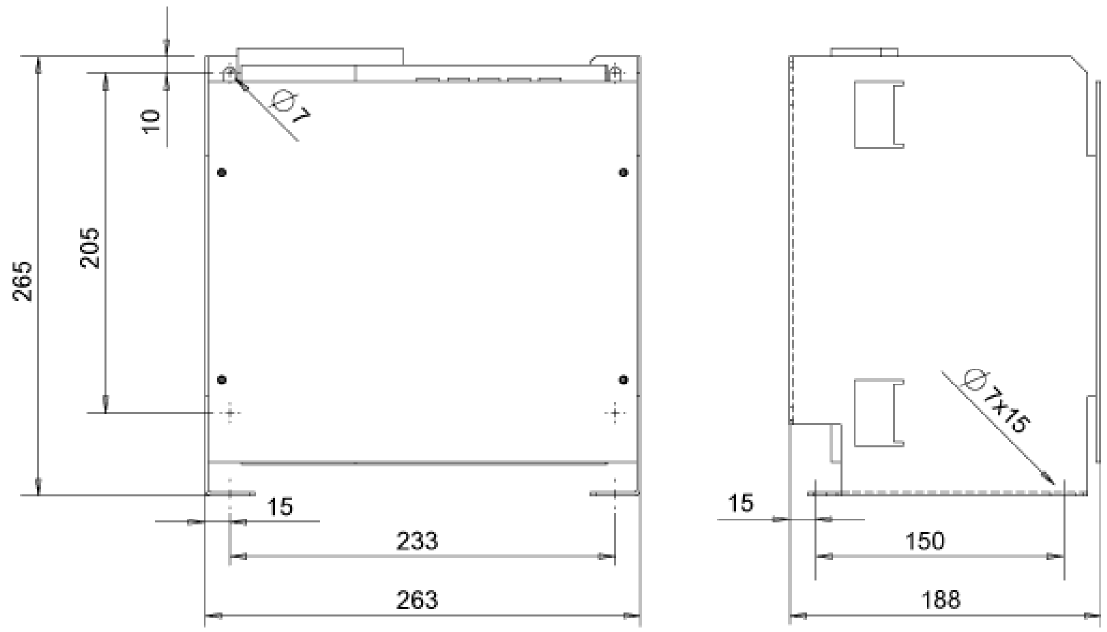


Figure 6-10 Dimension drawing of the Voltage Peak Limiter, type 1

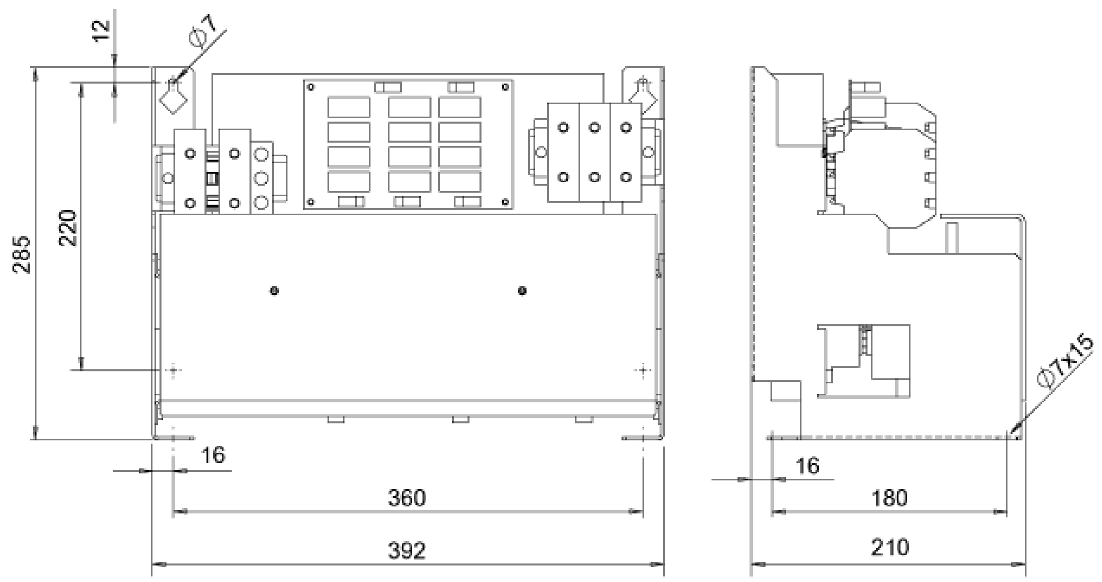


Figure 6-11 Dimension drawing of the Voltage Peak Limiter, type 2

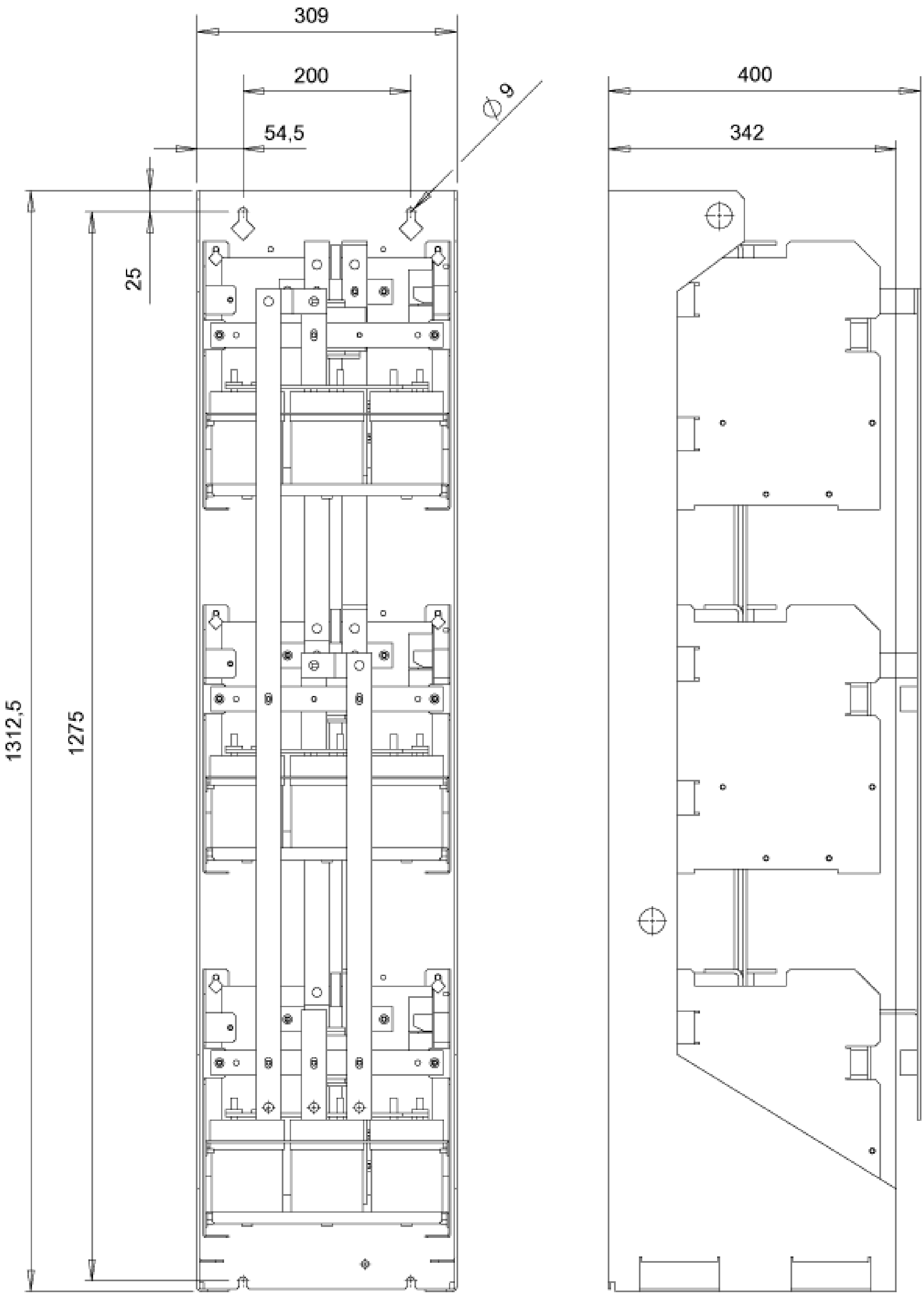


Figure 6-12 Dimension drawing of the Voltage Peak Limiter, type 3

Table 6- 22 Assigning Voltage Peak Limiter to dimension drawings

Voltage Peak Limiter	Dimension drawing type
Supply voltage 380 V – 480 V	
6SL3000-2DE32-6BA0	Type 1
6SL3000-2DE35-0BA0	Type 2
6SL3000-2DE38-4BA0	Type 3
6SL3000-2DE41-4BA0	Type 3
Supply voltage 500 V – 690 V	
6SL3000-2DH31-0BA0	Type 1
6SL3000-2DH31-5BA0	Type 1
6SL3000-2DH32-2BA0	Type 2
6SL3000-2DH33-3BA0	Type 2
6SL3000-2DH34-1BA0	Type 3
6SL3000-2DH35-8BA0	Type 3
6SL3000-2DH38-1BA0	Type 3
6SL3000-2DH41-3BA0	Type 3

6.3.7 Technical specifications

Table 6- 23 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 380 V – 480 V AC, Part 1

Order number	**6SL3000-**	**2DE32-6AA0**	**2DE32-6AA0**	**2DE35-0AA0**	**2DE35-0AA0**
Suitable for Motor Module	6SL3320-	1TE32-1AA0	1TE32-6AA0	1TE33-1AA0	1TE33-8AA0
Unit rating of the Motor Module	kW	110	132	160	200
I_{thmax}	A	260	260	490	490
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss, typical	kW	0.573	0.573	0.696	0.696
Connections - to the Motor Module - load - PE		 M10 M10 M6	 M10 M10 M6	 M12 M12 M6	 M12 M12 M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 410 370 229	 410 370 229	 460 370 275	 460 370 275
Weight, approx.	kg	66	66	122	122
Voltage Peak Limiter					
Power loss, typical	kW	0.029	0.029	0.042	0.042
Connections - to the dv/dt reactor - DC - PE		 M8 M8 M8	 M8 M8 M8	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²
Dimensions Width Height Depth	 mm mm mm	 263 265 188	 263 265 188	 392 285 210	 392 285 210
Weight, approx.	kg	6	6	16	16

Table 6- 24 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 380 V – 480 V AC, Part 2

Order number	6SL3000-	2DE35-0AA0	2DE38-4AA0	2DE38-4AA0	2DE38-4AA0
Suitable for Motor Module	6SL3320-	1TE35-0AA0	1TE36-1AA0	1TE37-5AA0	1TE38-4AA0
Unit rating of the Motor Module	kW	250	315	400	450
I_{thmax}	A	490	840	840	840
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss, typical	kW	0.696	0.901	0.901	0.901
Connections - to the Motor Module - load - PE		 M12 M12 M6	 M12 M12 M6	 M12 M12 M6	 M12 M12 M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 460 370 275	 460 385 312	 460 385 312	 460 385 312
Weight, approx.	kg	122	149	149	149
Voltage Peak Limiter					
Power loss, typical	kW	0.042	0.077	0.077	0.077
Connections - to the dv/dt reactor - DC - PE		 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 M8 M8 M8	 M8 M8 M8	 M8 M8 M8
Dimensions Width Height Depth	 mm mm mm	 392 285 210	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400
Weight, approx.	kg	16	48	48	48

Table 6- 25 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 380 V – 480 V AC, Part 3

Order number	6SL3000-	2DE41-4AA0 [1]	2DE41-4AA0 [1]	2DE41-4AA0 [1]	
Suitable for Motor Module	6SL3320-	1TE41-0AA0	1TE41-2AA0	1TE41-4AA0	
Unit rating of the Motor Module	kW	560	710	800	
I_{thmax}	A	1405	1405	1405	
Degree of protection		IP00	IP00	IP00	
dv/dt reactor					
Power loss, typical	kW	0.903	0.903	0.903	
Connections - to the Motor Module - load - PE		 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 445 385 312	 445 385 312	 445 385 312	
Weight, approx.	kg	158	158	158	
Voltage Peak Limiter					
Power loss, typical	kW	0.134	0.134	0.134	
Connections - to the dv/dt reactor - DC - PE		 M10 M10 M8	 M10 M10 M8	 M10 M10 M8	
Dimensions Width Height Depth	 mm mm mm	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400	
Weight, approx.	kg	72	72	72	

1) Two dv/dt reactors are required for these dv/dt filters. The technical specifications provided apply to one dv/dt reactor.

Note

For versions with two dv/dt reactors, the cable lengths specified in the table do not change.

Table 6- 26 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 500 V – 690 V AC, Part 1

Order number	6SL3000-	2DH31-0AA0	2DH31-0AA0	2DH31-5AA0	2DH31-5AA0
Suitable for Motor Module	6SL3320-	1TG28-5AA0	1TG31-0AA0	1TG31-2AA0	1TG31-5AA0
Unit rating of the Motor Module	kW	75	90	110	132
I_{thmax}	A	100	100	150	150
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss, typical	kW	0.396	0.396	0.327	0.327
Connections - to the Motor Module - load - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 350 320 227	 350 320 227	 350 320 227	 350 320 227
Weight, approx.	kg	48	48	50	50
Voltage Peak Limiter					
Power loss, typical	kW	0.016	0.016	0.020	0.020
Connections - to the dv/dt reactor - DC - PE		 M8 M8 M8	 M8 M8 M8	 M8 M8 M8	 M8 M8 M8
Dimensions Width Height Depth	 mm mm mm	 263 265 188	 263 265 188	 263 265 188	 263 265 188
Weight, approx.	kg	6	6	6	6

Table 6- 27 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 500 V – 690 V AC, Part 2

Order number	6SL3000-	2DH32-2AA0	2DH32-2AA0	2DH33-3AA0	2DH33-3AA0
Suitable for Motor Module	6SL3320-	1TG31-8AA0	1TG32-2AA0	1TG32-6AA0	1TG33-3AA0
Unit rating of the Motor Module	kW	160	200	250	315
I_{thmax}	A	215	215	330	330
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss, typical	kW	0.481	0.481	0.489	0.489
Connections - to the Motor Module - load - PE		 M10 M10 M6	 M10 M10 M6	 M10 M10 M6	 M10 M10 M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 460 360 275	 460 360 275	 460 360 275	 460 360 275
Weight, approx.	kg	83	83	135	135
Voltage Peak Limiter					
Power loss, typical	kW	0.032	0.032	0.042	0.042
Connections - to the dv/dt reactor - DC - PE		 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²	 Terminal 70 mm² Terminal 70 mm² Terminal 35 mm²
Dimensions Width Height Depth	 mm mm mm	 392 285 210	 392 285 210	 392 285 210	 392 285 210
Weight, approx.	kg	16	16	16	16

Table 6- 28 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 500 V – 690 V AC, Part 3

Order number	6SL3000-	2DH34-1AA0	2DH35-8AA0	2DH35-8AA0	2DH38-1AA0 [1)]
Suitable for Motor Module	6SL3320-	1TG34-1AA0	1TG34-7AA0	1TG35-8AA0	1TG37-4AA0
Unit rating of the Motor Module	kW	400	450	560	710
I_{thmax}	A	410	575	575	810
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss, typical	kW	0.666	0.72	0.72	0.693
Connections - to the Motor Module - load - PE		 M12 M12 M6	 M12 M12 M6	 M12 M12 M6	 2 x M12 2 x M12 M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 460 385 312	 460 385 312	 460 385 312	 445 385 312
Weight, approx.	kg	147	172	172	160
Voltage Peak Limiter					
Power loss, typical	kW	0.051	0.063	0.063	0.106
Connections - to the dv/dt reactor - DC - PE		 M8 M8 M8	 M8 M8 M8	 M8 M8 M8	 M10 M10 M8
Dimensions Width Height Depth	 mm mm mm	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400
Weight, approx.	kg	48	48	48	72

1) Two dv/dt reactors are required for these dv/dt filters. The technical specifications provided apply to one dv/dt reactor.

Note

For versions with two dv/dt reactors, the cable lengths specified in the table do not change.

Table 6- 29 Technical specifications for the dv/dt filter plus Voltage Peak Limiter, 3-ph. 500 V – 690 V AC, Part 4

Order number	6SL3000-	2DH38-1AA0 [1)]	2DH41-3AA0 [1)]	2DH41-3AA0 [1)]	2DH41-3AA0 [1)]
Suitable for Motor Module	6SL3320-	1TG38-1AA0	1TG38-8AA0	1TG41-0AA0	1TG41-3AA0
Unit rating of the Motor Module	kW	800	900	1000	1200
I_{thmax}	A	810	1270	1270	1270
Degree of protection		IP00	IP00	IP00	IP00
dv/dt reactor					
Power loss, typical	kW	0.693	0.715	0.715	0.715
Connections - to the Motor Module - load - PE		 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6	 2 x M12 2 x M12 M6
Max. permissible cable length between dv/dt reactor and motor	m	300 (shielded) 450 (unshielded)			
Dimensions Width Height Depth	 mm mm mm	 445 385 312	 445 385 312	 445 385 312	 445 385 312
Weight, approx.	kg	160	164	164	164
Voltage Peak Limiter					
Power loss, typical	kW	0.106	0.15	0.15	0.15
Connections - to the dv/dt reactor - DC - PE		 M10 M10 M8	 M10 M10 M8	 M10 M10 M8	 M10 M10 M8
Dimensions Width Height Depth	 mm mm mm	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400	 309 1312.5 400
Weight, approx.	kg	72	72	72	72

1) Two dv/dt reactors are required for these dv/dt filters. The technical specifications provided apply to one dv/dt reactor.

Note

For versions with two dv/dt reactors, the cable lengths specified in the table do not change.

7 Cabinet design and EMC

7.1 Information

7.1.1 General

The modular concept of SINAMICS S120 allows a wide range of potential device combinations. For this reason, it is impossible to describe each individual combination. This section instead aims to provide some basic information and general rules on the basis of which special device combinations can be constructed and to ensure electromagnetic compatibility.

The SINAMICS S120 components are designed for installation in enclosures, which can take the form of cabinet units or control boxes made of steel that provide protection against shock and other environmental influences. They are also part of the EMC concept.

7.1.2 Safety information

⚠ WARNING
When transporting the devices and replacing components, note the following: • Some of the devices and components are heavy or top heavy. • Due to their weight, the devices must be handled with care by trained personnel. Serious injury or even death and substantial material damage can occur if the devices are not lifted or transported properly.

Note

When installing the cabinet unit, make sure that no foreign bodies – especially metallic objects, such as drill swarf, wire end ferrules, or cable cut-offs – fall into the device. If necessary, cover the ventilation slots.

Note

Safety regulations governing shock protection must be observed. See also EN 60204-1.

CAUTION
To ensure that the entire system functions properly, you are advised to use original Siemens accessories. Only original DRIVE-CLiQ cables may be used for wiring the DRIVE-CLiQ nodes. Before commissioning, check the tightening torque of all the terminal screws.

⚠ WARNING
Cable shields and unused cores/conductors of the power cables must be connected to PE potential. Non-observance can cause lethal shock voltages.

Note

On ungrounded systems and systems with a grounded phase conductor and a line voltage > 600 V AC, measures must be taken on the line side to limit overvoltages to overvoltage category II in accordance with IEC 60664-1.

Maximum cable lengths

Table 7- 1 Maximum cable lengths

Type	Maximum length [m]
24 V DC power cables [1)]	10
24 V signal cables [1)]	30
Power cable between the Motor Module and motor	300 (shielded) 450 (non-shielded)
DRIVE-CLiQ cables	
• Inside cabinet unit e.g. connection between CU320 and the first Motor Module or between the Motor Modules	70
• DRIVE-CLiQ MOTION-CONNECT connecting cables for external components	100
Power cable between Braking Module and braking resistor	50

[1)] For greater lengths, suitable wiring must be provided by the user for overvoltage protection.

Table 7- 2 Recommendations for overvoltage protection

DC supply	24 V signal cables
Weidmüller Type: PU DS 24V 16A Type no.: 868210 0000	Weidmüller Type no.: MCZ OVP TAZ
Weidmüller GmbH & Co. KG	

7.1.3 Standards and guidelines

The table below shows some important standards and guidelines that must be observed to ensure safe, EMC-compliant installation. The standards and guidelines apply to installations in industrial environments. (other conditions apply to installations in public networks).

Directives

The product satisfies the protection targets of the following EU Directives applicable within the European Union:

Table 7- 3 Directives

Directive	Description
2006/95/EC	Directive of the European Parliament and Council of December 12, 2006, on the approximation of the laws of the member states relating to electrical equipment designed for use within certain voltage limits. Low voltage directive
98/37/EC	Directive of the Council of July 22, 1998 on the approximation of laws and regulations of the member states relating to machinery. Machine directive
2004/108/EC	Directive of the European Parliament and Council of December 15, 2004, which repeals directive 89/336/EEC, on the approximation of laws of the member states relating to electromagnetic compatibility. EMC directive

Standards

A number of standards relevant to application of the product are listed below.

Table 7- 4 Standards

Standard	Description
EN ISO 12100-1 (01.11.2003)	Safety of machinery Basic concepts, general principles for design Part 1: Basic terminology, methodology
EN ISO 12100-2 (01.11.2003)	Safety of machinery Basic concepts, general principles for design Part 2: Technical principles
EN ISO 13849-1 (01.11.2006)	Safety of machinery Safety-related parts of control systems Part 1: General design principles
EN 1037+A1 (01.04.2008)	Safety of machinery Prevention of unexpected startup
IEC 61800-5-1 (01.09.2007)	Adjustable-speed electrical power drive systems Part 5-1: Safety requirements – Electrical, thermal, and energy
EN 60204–1	Safety of machinery Electrical equipment of machines Part 1: General requirements
EN 60439–1	Low-voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies
EN 60529	Degrees of protection provided by enclosures (IP code)
EN 61800–3	Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods
UL 508C	Power conversion equipment

7.2 EMC-compliant design and control cabinet configuration

For detailed configuration instructions regarding the EMC-compliant design of drives and control cabinet configuration, refer to the "SINAMICS Low Voltage Configuration Manual".

7.3 Cabinet air conditioning

7.3.1 General

The minimum dimensions listed below for ventilation clearances must be observed. No other components or cables may be installed in or laid through these areas.

CAUTION
If the guidelines for installing SINAMICS S120 Chassis devices are not observed, this can significantly reduce the service life of the components and result in premature component failure.

You must take into account the following specifications when using a SINAMICS S120 Chassis drive line-up:

- Ventilation clearance
- Cabling
- Air guidance

Table 7- 5 Ventilation clearances for the components

Component	Frame size	Clearance (front) [mm]	Clearance (above) [mm]	Clearance (below) [mm]
Basic Line Module	FB, GB	40 [1)]	250	150
Active Interface Module	FI	40 [1)]	250	150
Active Interface Module	GI	50 [1)]	250	150
Active Interface Module	HI, JI	40 [1)]	250	0
Smart Line Module	GX, HX, JX	40 [1)]	250	150
Active Line Module	FX, GX, HX, JX	40 [1)]	250	150
Motor Module	FX, GX, HX, JX	40 [1)]	250	150

1) The clearances refer to the area around the ventilation slots on the front cover.

Note

The dimensions refer to the outer edges of the devices.

Dimension drawings are available in the relevant chapters.

7.3.2 Ventilation

The SINAMICS S120 Chassis devices are forced-ventilated by means of integrated fans. To ensure an adequate air supply, suitable openings for the inlet air (e.g.,ventilation slots in the cabinet door) and discharged air (e.g.,by means of a hood) must be provided.

The cooling air must flow through the components vertically from bottom (cooler region) to top (region heated by operation).

You must ensure that the air is flowing in the right direction. You must also ensure that the warm air can escape at the top. The specified ventilation clearances must be observed.

Note

Cables must not be routed directly on the components. The ventilation grilles must not be covered.

Cold air must not be allowed to blow directly onto electronic equipment.

CAUTION
Air guidance, as well as the arrangement of and settings for the cooling equipment, must be chosen in such a way as to prevent condensation even with the highest relative humidity. If necessary, cabinet enclosure heating may have to be installed.

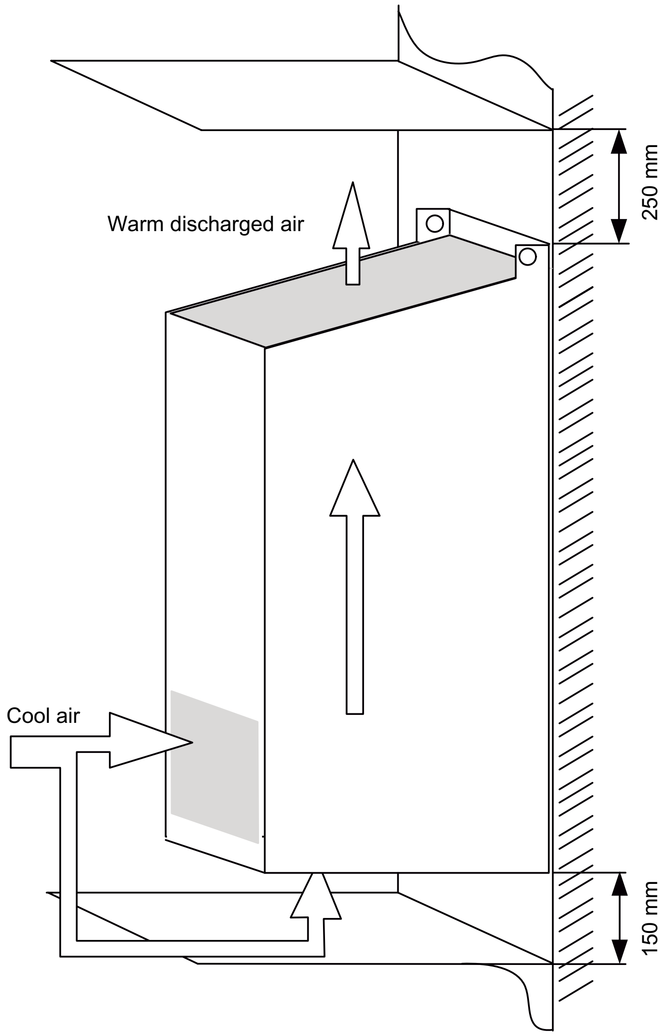


Figure 7-1 Air guidance for Active Interface Module, frame sizes FI, GI

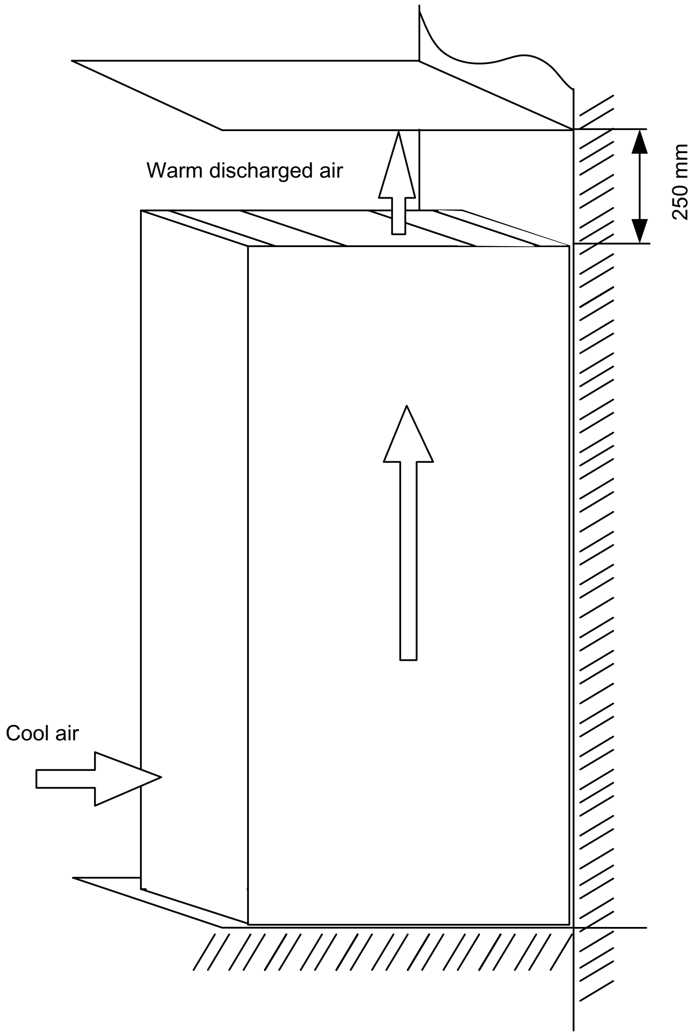


Figure 7-2 Air guidance for Active Interface Module, frame sizes HI, JI

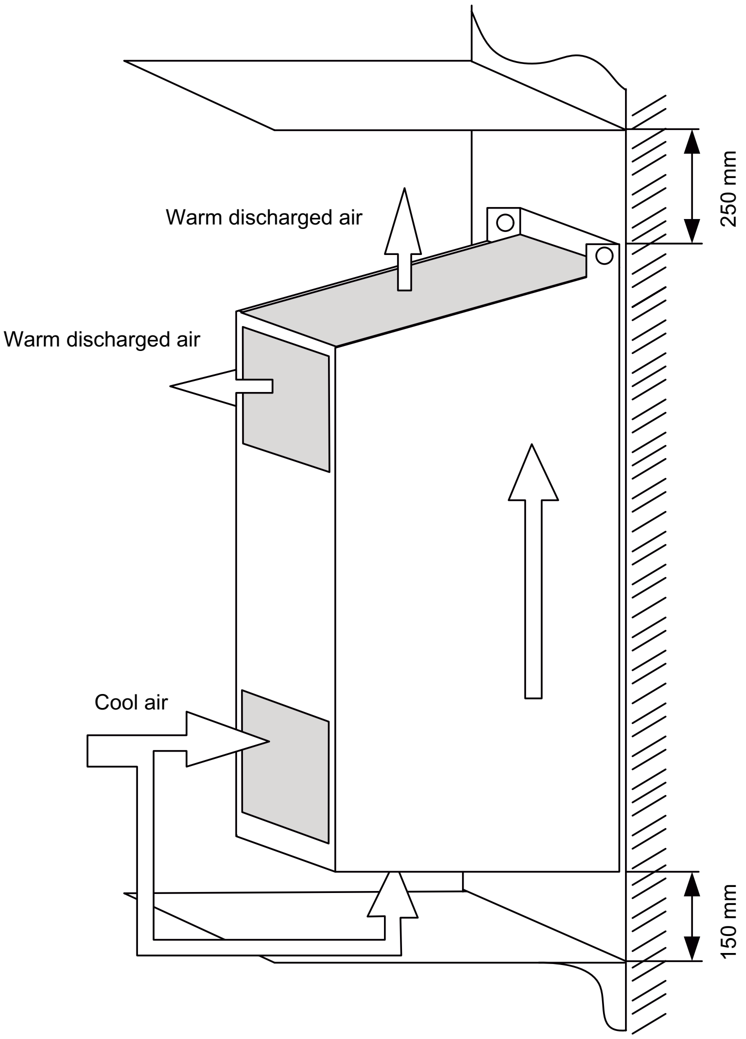


Figure 7-3 Air guidance for Smart Line Module, Active Line Module, Motor Module, frame sizes FX, GX

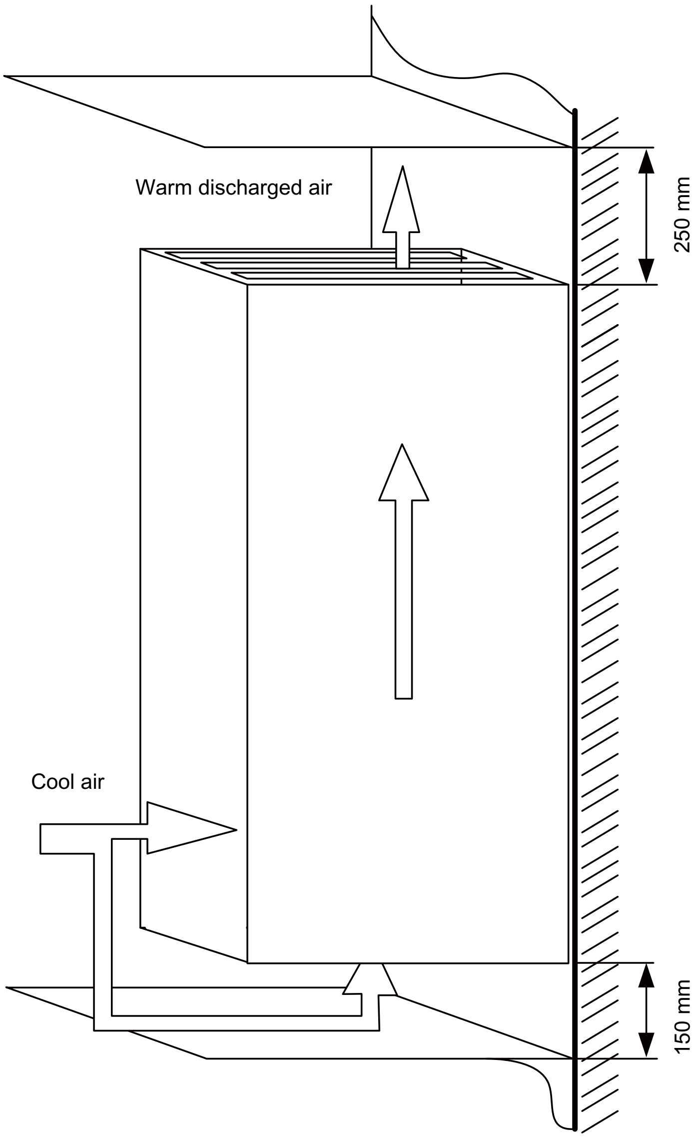


Figure 7-4 Air guidance for Smart Line Module, Active Line Module, Motor Module, frame sizes HX, JX

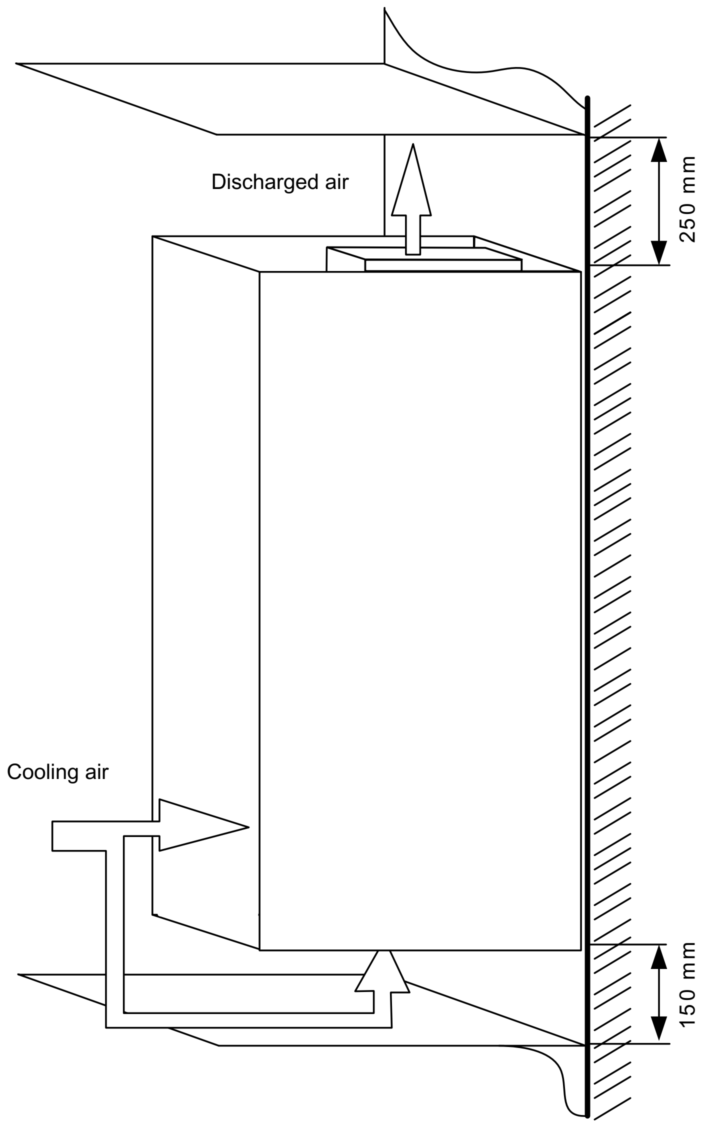


Figure 7-5 Air guidance for Basic Line Module, frame sizes FB, GB

Devices must not be operated in an "air short circuit", since this can damage equipment or cause it to fail.

The pull of the fan causes negative pressure to build up at the ventilation openings in the cabinet doors. The pressure is dependent on the volume flow rate and the hydraulic cross-section of the openings.

The air, which blows out of the top of the device, accumulates under the top cover/hood, resulting in overpressure.

The difference between the overpressure at the top of the cabinet and the negative pressure at the bottom creates a flow of air (air short circuit). This can vary in strength depending on the cross-section of the door and cover openings and the volumetric flow of the fan.

Due to the flow of air within the cabinet, the device fan draws in pre-heated air. This heats up the components considerably and the fan does not function effectively.

CAUTION
Devices must not be operated in an "air short circuit", since this can damage equipment or cause it to fail. Suitable barriers must be in place to prevent an air short circuit.

Barriers must be installed in such a way that no air can flow along the outer sides on the top and bottom of the devices. In particular, air must be prevented from flowing from the top (warm discharged air) to the bottom (cold cooling air). Suitable plates can be used as barriers. The barriers must reach up to the side panels or cabinet doors. They must be set up in such a way that the outgoing air current is not forced into the cabinet cross-beams but is instead diverted around them. Barriers must be in place for all degrees of protection higher than IP20.

The cabinets adjacent to the converter cabinets must also be taken into account when barriers are installed.

To ensure adequate ventilation of the equipment, the minimum opening sizes specified in the following table must be observed.

The specified opening cross-sections comprise several small openings. To ensure that pressure loss is kept to a minimum and that the flow resistance does not become too great, the cross sectional area of each opening must be at least 280 mm² (e.g., 7 mm x 40 mm).

To ensure that the devices operate continuously, suitable measures must be taken to prevent the ingress of dirt and dust. Wire lattices (wire fabric DIN 4189-St-vzk-1x0.28) or filter mats (min. filter class G2) must be used for this purpose. The choice of filter mats depends on the required degree of protection and the ambient conditions. If cabinets are installed in an environment containing fine dust particles or oil vapors, micro-filter mats must be used to prevent the devices from becoming contaminated.

If dirt filters are used, the specified opening cross-sections and the filter areas must be adjusted upwards.

CAUTION
If dirt filters are used, the specified replacement intervals must be observed.

If the filter mats are heavily contaminated, the volume of air drawn is reduced due to the increased flow resistance. This can cause the fans integrated in the devices to overload, or it could cause the devices themselves to overheat and become damaged.

The opening cross-sections specified in the table refer in each case to one device. If more than one device is installed in a cabinet, the opening cross-section increases accordingly. If the required openings cannot be made in the cabinet, the devices must be distributed across several cabinets, which are separated from each other by means of partitions.

The warm air must be discharged via the top cover/hood or via side openings in the cabinet at the level of the top of the device. The size of the opening cross-section must also be taken into account here.

With degrees of protection higher than IP20 and if a hood is used, it may be necessary to use an "active" hood. An "active" hood contains fans that blow the air current forwards. The hood is closed, with the exception of the air outlet point.

If you choose an "active" hood, you must ensure that the fans are sufficiently powerful to prevent air from accumulating in the cabinet. If air accumulates, the cooling capacity is reduced. This can overheat and destroy the devices. The air capacity of the fans should at least be equivalent to the device fan data.

Table 7- 6 Volume flow rate, opening cross-sections

Active Interface Module							
Order number	6SL3300 –	7TE32-6AA0	7TE33-8AA0 7TE35-0AA0	7TE38-4AA0 7TE41-4AA0 7TG35-8AA0 7TG37-4AA0 7TG41-3AA0			
Cooling air requirement	[m³/s]	0.24	0.47	0.4			
Min. opening cross-section in cabinet inlet outlet	 [m²] [m²]	 0.1 0.1	 0.20 0.20	 0.16 0.16			
Basic Line Module							
Order number	6SL3330 -	1TE34-2AA0 1TE35-3AA0 1TE38-2AA0 1TH33-0AA0 1TH34-3AA0 1TH36-8AA0	1TE41-2AA0 1TE41-5AA0 1TH41-1AA0 1TH41-4AA0				
Cooling air requirement	[m³/s]	0.17	0.36				
Min. opening cross-section in cabinet inlet outlet	 [m²] [m²]	 0.1 0.1	 0.16 0.16				
Smart Line Module							
Order number	6SL3330 -	6TE35-5AA0 6TE37-3AA0 6TG35-5AA0	6TE41-1AA0 6TG38-8AA0	6TE41-3AA0 6TE41-7AA0 6TG41-2AA0 6TG41-7AA0			
Cooling air requirement	[m³/s]	0.36	0.78	1.08			
Min. opening cross-section in cabinet inlet outlet	 [m²] [m²]	 0.16 0.16	 0.28 0.28	 0.4 0.4			

Active Line Module							
Order number	6SL3330 -	7TE32-1AA0	7TE32-6AA0	7TE33-8AA0 7TE35-0AA0	7TE36-1AA0 7TE38-4AA0	7TE41-0AA0 7TE41-4AA0	7TG37-4AA0 7TG41-0AA0 7TG41-3AA0
Cooling air requirement	[m³/s]	0.17	0.23	0.36	0.78	1.08	1.1
Min. opening cross-section in cabinet inlet outlet	 [m²] [m²]	 0.1 0.1	 0.1 0.1	 0.16 0.16	 0.28 0.28	 0.4 0.4	 0.4 0.4
Motor Module							
Order number	6SL3320 -	1TE32-1AAx 1TG28-5AAx 1TG31-0AAx 1TG31-2AAx 1TG31-5AAx	1TE32-6AAx	1TE33-1AAx 1TE33-8AAx 1TE35-0AAx 1TG31-8AAx 1TG32-2AAx 1TG32-6AAx 1TG33-3AAx	1TE36-1AAx 1TE37-5AAx 1TE38-4AAx 1TG34-1AAx 1TG34-7AAx 1TG35-8AAx	1TE41-0AAx 1TE41-2AAx 1TE41-4AAx	1TG37-4AAx 1TG38-1AAx 1TG38-8AAx 1TG41-0AAx 1TG41-3AAx
Cooling air requirement	[m³/s]	0.17	0.23	0.36	0.78	1.1	1.474
Min. opening cross-section in cabinet inlet outlet	 [m²] [m²]	 0.1 0.1	 0.1 0.1	 0.16 0.16	 0.28 0.28	 0.4 0.4	 0.55 0.55

Maintenance and Servicing 8

8.1 Chapter content

This chapter provides information on the following:

- Maintenance and servicing procedures that have to be carried out on a regular basis to ensure the availability of the components.
- Exchanging device components when the unit is serviced
- Forming the DC link capacitors

⚠ DANGER
Before carrying out any maintenance or repair work on the de-energized unit, wait for 5 minutes after switching off the supply voltage. This allows the capacitors to discharge to a harmless level (< 25 V) after the supply voltage has been switched off. Before starting work, you should also measure the voltage after the 5 minutes have elapsed. The voltage can be measured on DC link terminals DCP and DCN.

⚠ DANGER
When the external power supply or the external 230 V AC auxiliary supply is connected, dangerous voltages are still present in components even when the main circuit-breaker is open.

8.2 Maintenance

The devices comprise mostly electronic components. Apart from the fan(s), therefore, they contain hardly any components that are subject to wear or that require maintenance or servicing. Maintenance is intended to ensure that the equipment remains in the specified condition. Dirt and contamination must be removed regularly and parts subject to wear replaced.

The following points must generally be observed.

Cleaning

Dust deposits

Dust deposits inside the device must be removed at regular intervals (or at least once a year) by qualified personnel in line with the relevant safety regulations. The unit must be cleaned using a brush and vacuum cleaner, and dry compressed air (max. 1 bar) for areas that cannot be easily reached.

Ventilation

The ventilation openings in the devices must never be obstructed. The fans must be checked to make sure that they are functioning correctly.

Cable and screw terminals

Cable and screw terminals must be checked regularly to ensure that they are secure in position, and if necessary, retightened. Cabling must be checked for defects. Defective parts must be replaced immediately.

Note

The actual intervals at which maintenance procedures are to be performed depend on the installation conditions (cabinet environment) and the operating conditions.

Siemens offers its customers support in the form of a service contract. For further details, contact your regional office or sales office.

8.3 Servicing

Servicing involves activities and procedures for maintaining and restoring the specified condition of the devices.

Required tools

The following tools are required for replacing components:

- Spanner or socket spanner (w/f 10)
- Spanner or socket spanner (w/f 13)
- Spanner or socket spanner (w/f 16/17)
- Spanner or socket spanner (w/f 18/19)
- Hexagon-socket spanner (size 8)
- Torque wrench up to 50 Nm
- Screwdriver size 1 / 2
- Screwdriver Torx T20
- Screwdriver Torx T30

Tightening torques for current-carrying parts

When securing connections for current-carrying parts (DC link/motor connections, busbars), you must observe the following tightening torques.

Table 8- 1 Tightening torques for connecting current-carrying parts

Bolt	Torque
M6	6 Nm
M8	13 Nm
M10	25 Nm
M12	50 Nm

Installation device

Description

The mounting device is used for installing and removing the power blocks for the Basic Line Modules, Smart Line Modules, Active Line Modules, and Motor Modules in chassis format.

It is used as a mounting aid and is placed in front of and secured to the module. The telescopic rails allow the withdrawable device to be adjusted according to the height at which the power blocks are installed. Once the mechanical and electrical connections have been undone, the power block can be removed from the module, whereby the power block is guided and supported by the guide rails on the withdrawable devices.

Figure 8-1 Installation device

Order number

The order number for the mounting device is 6SL3766-1FA00-0AA0.

8.4 Replacing components

8.4.1 Safety information

WARNING

When transporting the devices and replacing components, note the following:

- Some of the devices and components are heavy or top heavy.
- Due to their weight, the devices must be handled with care by trained personnel.
- Serious injury or even death and substantial material damage can occur if the devices are not lifted or transported properly.

WARNING

The devices are operated with high voltages.

All connection work must be carried out when the cabinet is de-energized!

All work on the device must be carried out by trained personnel only. Death, serious injury, or substantial material damage can result if these warnings are not taken into account.

Work on an open device must be carried out with extreme caution because external supply voltages may be present. The power and control terminals may be live even when the motor is not running.

Dangerously high voltage levels are still present in the device up to five minutes after it has been disconnected due to the DC link capacitors. For this reason, the cabinet should not be opened until a reasonable period of time has elapsed.

DANGER

Five safety rules

When carrying out any kind of work on electrical devices, the "five safety rules" must always be observed:

1. Disconnect the system.
2. Protect against reconnection.
3. Make sure that the equipment is de-energized.
4. Ground and short-circuit.
5. Cover or enclose adjacent components that are still live.

8.4.2 Replacing the power block, Motor Module, frame size FX

Replacing the power block

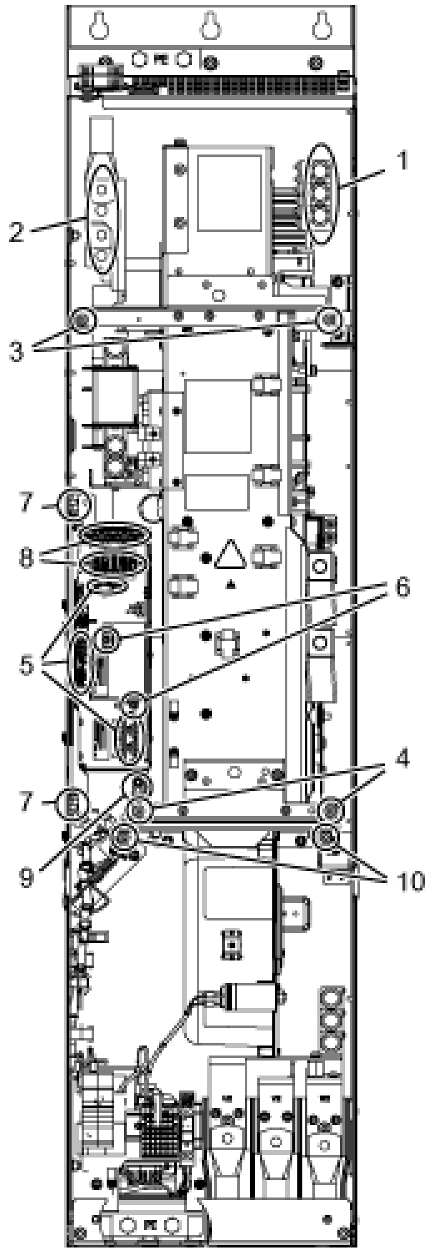


Figure 8-2 Replacing the power block, Motor Module, frame size FX

Note

These instructions apply only to order numbers 6SL3320–1Txxx–xAA3.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the motor connection (3 screws).
2. Unscrew the connection to the DC link (4 screws).
3. Remove the retaining screws at the top (2 screws).
4. Remove the retaining screws at the bottom (2 screws).
5. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 / –X46 (6 plugs).
6. Take out the retaining screws for the IPD card (2 screws) and remove the IPD card from connector –X45 on the Control Interface Module.
7. Remove the mounts for the Control Interface Module (2 nuts) and carefully pull out the Control Interface Module.

   When removing the Control Interface Module, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).
8. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
9. Disconnect the plug for the thermocouple.
10. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.3 Replacing the power block, Active Line Module, and Motor Module, frame size FX

Replacing the power block

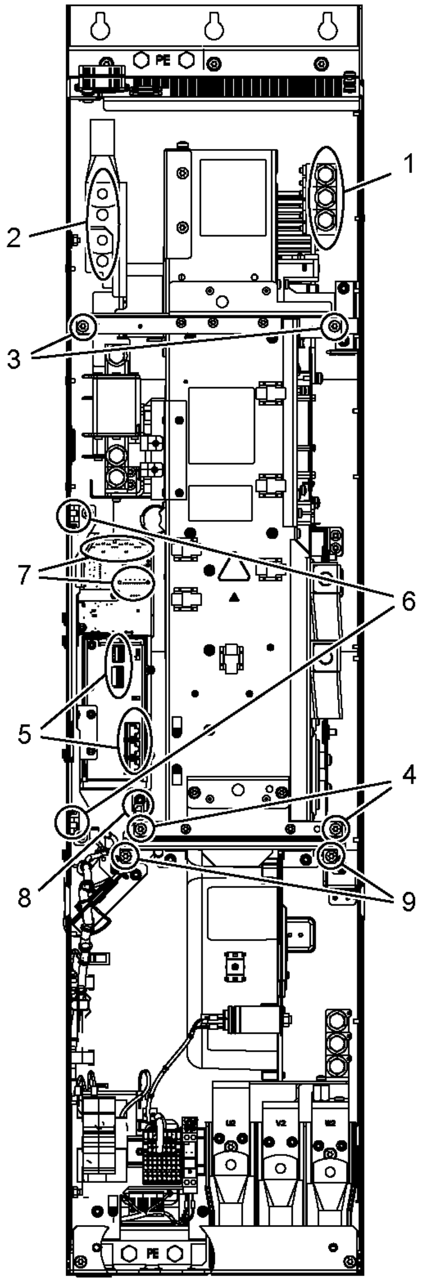


Figure 8-3 Replacing the power block, Active Line Module, and Motor Module (type FX)

Note

These instructions apply only to Motor Modules with order numbers 6SL3320–1Txxx–xAA0.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the connection to the line or to the motor (3 screws).
2. Unscrew the connection to the DC link (4 screws).
3. Remove the retaining screws at the top (2 screws).
4. Remove the retaining screws at the bottom (2 screws).
5. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
6. Remove the mounts for the slide-in electronics unit (2 nuts) and carefully remove the slide-in electronics unit.

   When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).
7. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
8. Disconnect the plug for the thermocouple.
9. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.4 Replacing the power block, Motor Module, frame size GX

Replacing the power block

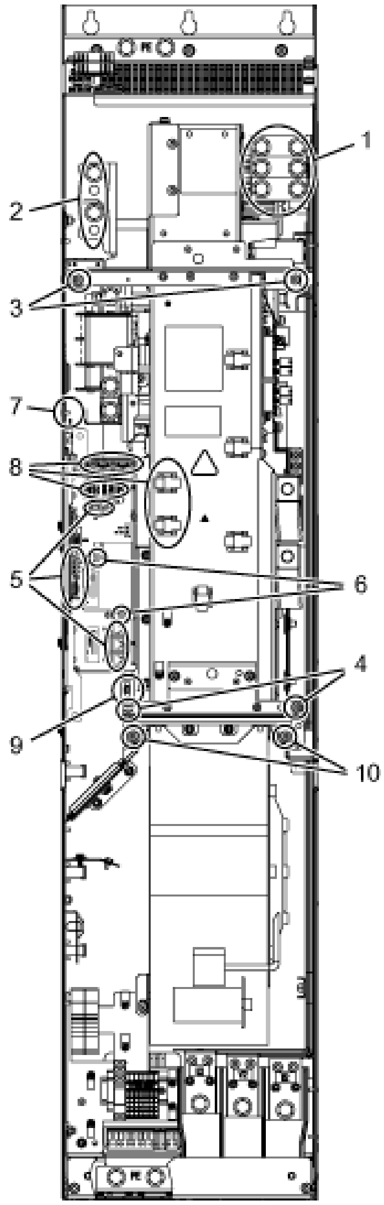


Figure 8-4 Replacing the power block, Motor Module, frame size GX

Note

These instructions apply only to order numbers 6SL3320–1Txxx–xAA3.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the motor connection (3 screws).
2. Unscrew the connection to the DC link (4 screws).
3. Remove the retaining screws at the top (2 screws).
4. Remove the retaining screws at the bottom (2 screws).
5. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 / –X46 (6 plugs).
6. Take out the retaining screws for the IPD card (2 screws) and remove the IPD card from connector –X45 on the Control Interface Module.
7. Remove the mount for the Control Interface Module (1 nut) and carefully pull out the Control Interface Module.

   When removing the Control Interface Module, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).
8. Disconnect the plug-in connections for the fiber optic cables and signal cables (5 plugs) and release the cable connectors for the signal cables (2 connectors).
9. Disconnect the plug for the thermocouple.
10. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.5 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Replacing the power block

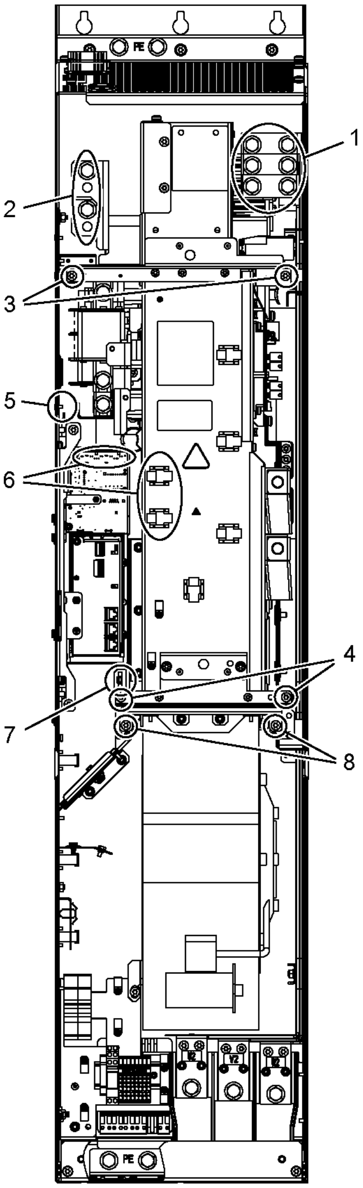


Figure 8-5 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Note

These instructions apply only to Motor Modules with order numbers 6SL3320–1Txxx–xAA0.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the connection to the line or to the motor (3 screws).
2. Unscrew the connection to the DC link (4 screws).
3. Remove the retaining screws at the top (2 screws).
4. Remove the retaining screws at the bottom (2 screws).
5. Remove the mount for the slide-in electronics unit (1 nut) and carefully pull out the slide-in electronics unit.

   When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).
6. Disconnect the plug-in connections for the fiber optic cables and signal cables (5 plugs) and release the cable connectors for the signal cables (2 connectors).
7. Disconnect the plug for the thermocouple.
8. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.6 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the left-hand power block

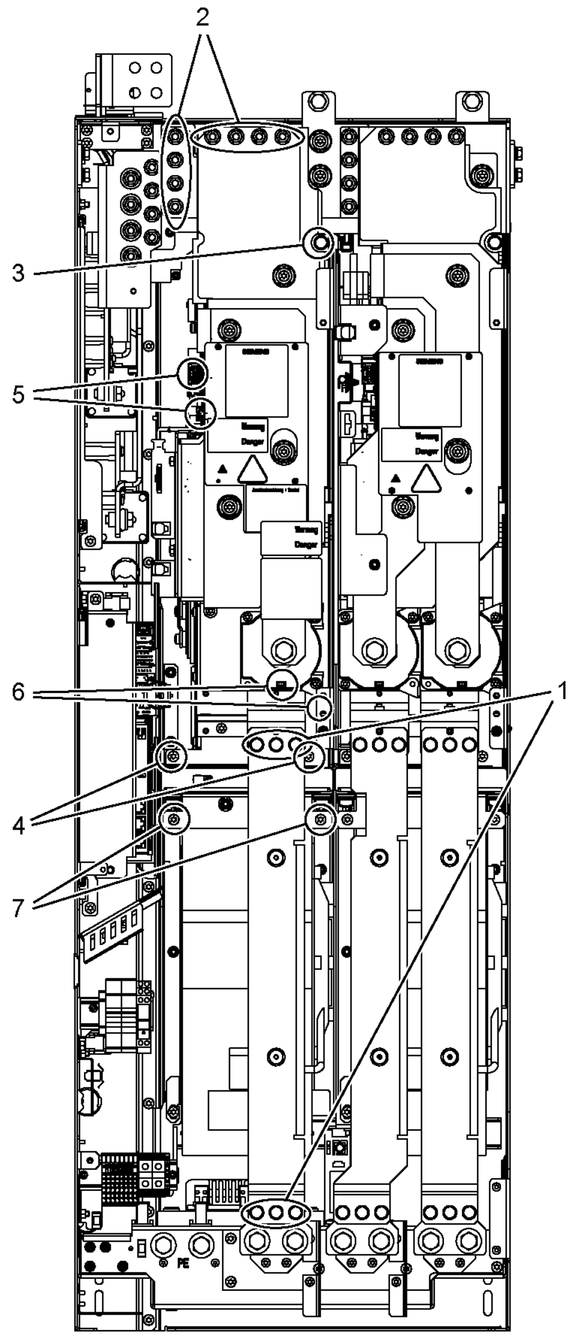


Figure 8-6 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size HX - left power block

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the busbar (6 screws).
2. Unscrew the connection to the DC link (8 nuts).
3. Remove the retaining screw at the top (1 screw).
4. Remove the retaining screws at the bottom (2 screws).
5. Disconnect the plug-in connections for the fiber-optic cables and signal cables (2 plugs).
6. Remove the connection for the current transformer and associated PE connection (1 plug).
7. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

Replacing the right-hand power block

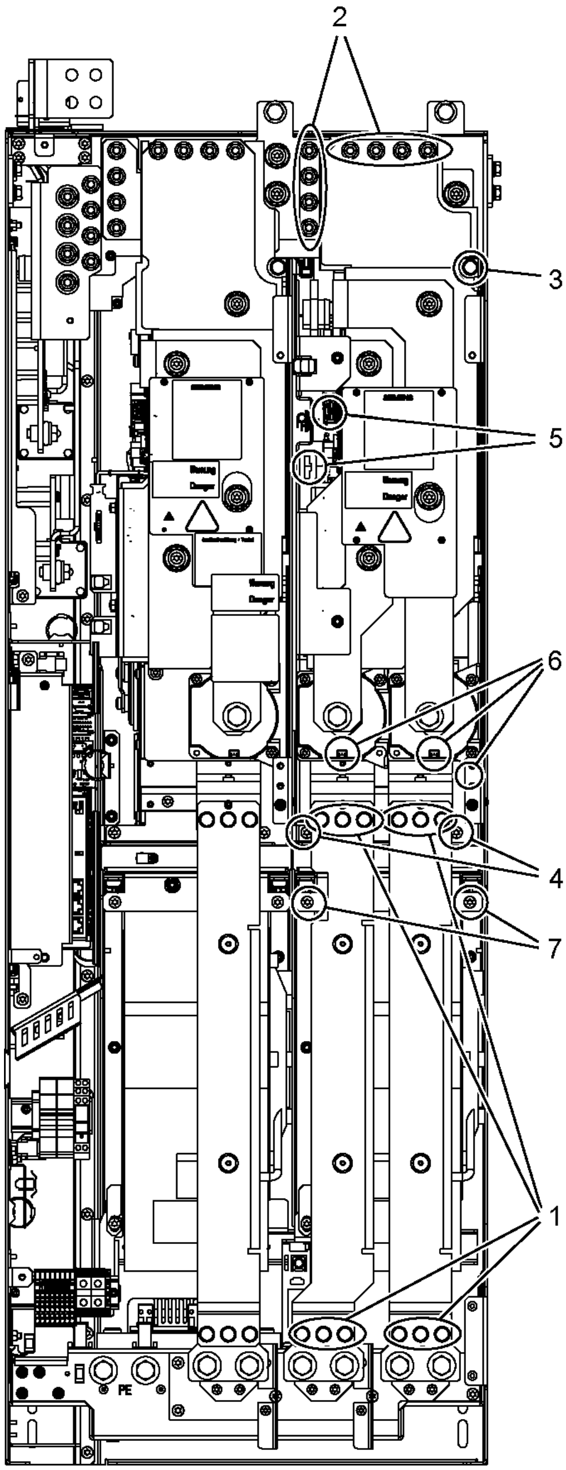


Figure 8-7 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size HX - right power block

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the busbar (12 screws).
2. Unscrew the connection to the DC link (8 nuts).
3. Remove the retaining screw at the top (1 screw).
4. Remove the retaining screws at the bottom (2 screws).
5. Disconnect the plug-in connections for the fiber-optic cables and signal cables (2 plugs).

   The second plug connection for the fiber optic cables cannot be disconnected until the power block has been pulled out slightly.
6. Remove the connection for the current transformer and associated PE connection (2 plugs).
7. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables. The second plug connection for the fiber optic cables cannot be disconnected until the power block has been pulled out slightly (see Step 5).

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.7 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the power block

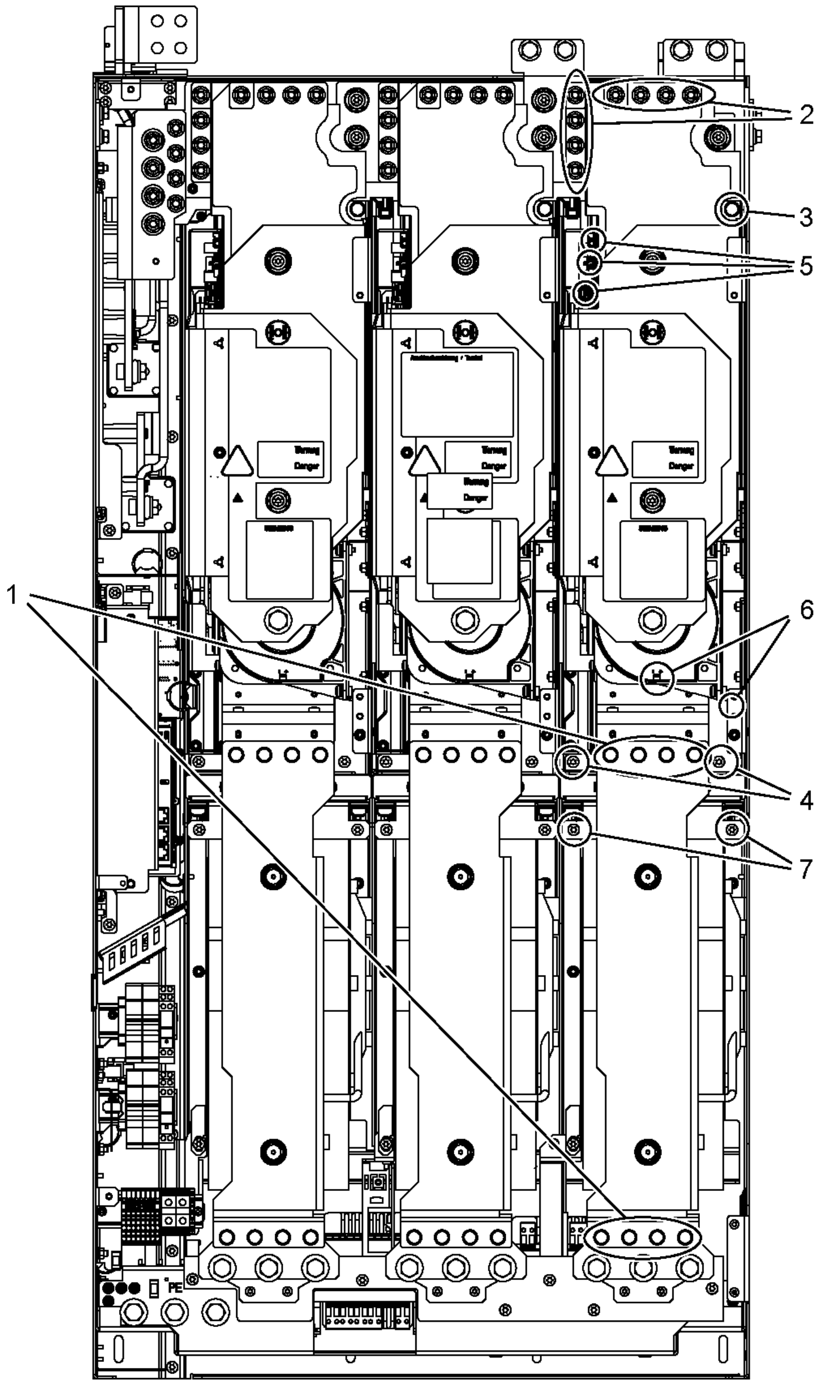


Figure 8-8 Replacing the power block, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the connection to the line or to the motor (8 screws).
2. Unscrew the connection to the DC link (8 nuts).
3. Remove the retaining screw at the top (1 screw).
4. Remove the retaining screws at the bottom (2 screws).
5. Disconnect the plug-in connections for the fiber-optic cables and signal cables (3 plugs).
6. Remove the connection for the current transformer and associated PE connection (1 plug).
7. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.8 Replacing the power block, Basic Line Module, frame size FB

Replacing the power block

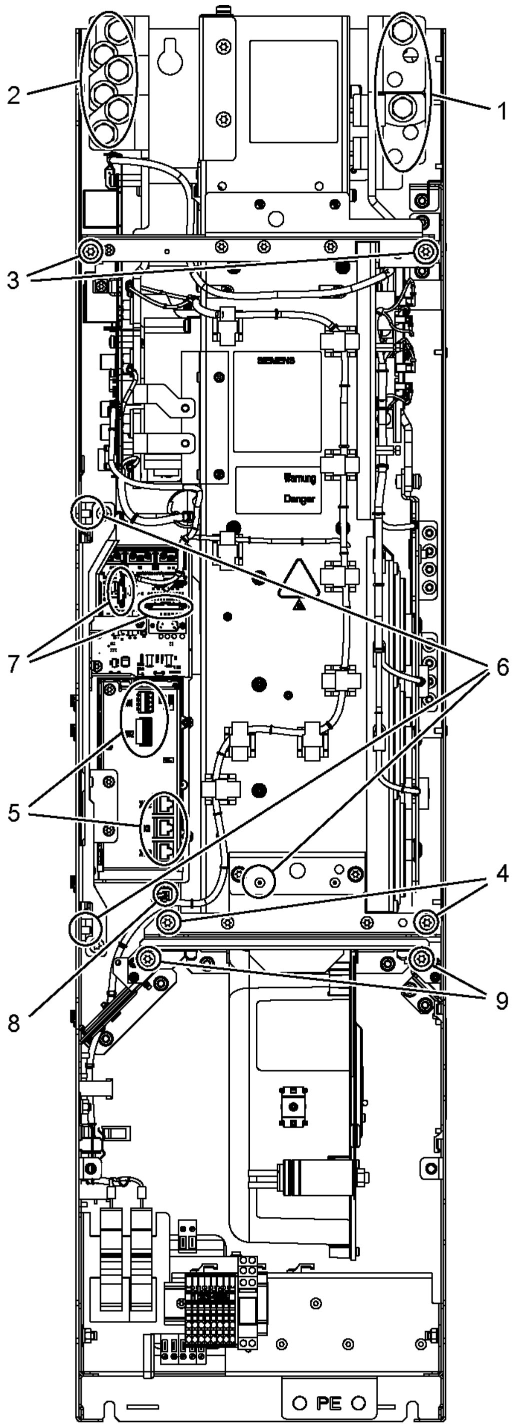


Figure 8-9 Replacing the power block, Basic Line Module, frame size FB

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the connection to the DC link (8 screws).
2. Unscrew the connection to the line connection (8 screws).
3. Remove the retaining screws at the top (2 screws).
4. Remove the retaining screws at the bottom (2 screws).
5. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
6. Remove the mounts for the Control Interface Board (1 screw and 2 nuts) and carefully pull out the Control Interface Board.
7. Disconnect the plug-in connections for the signal cables (2 plugs).
8. Disconnect the plug for the thermocouple.
9. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.9 Replacing the power block, Basic Line Module, frame size GB

Replacing the power block

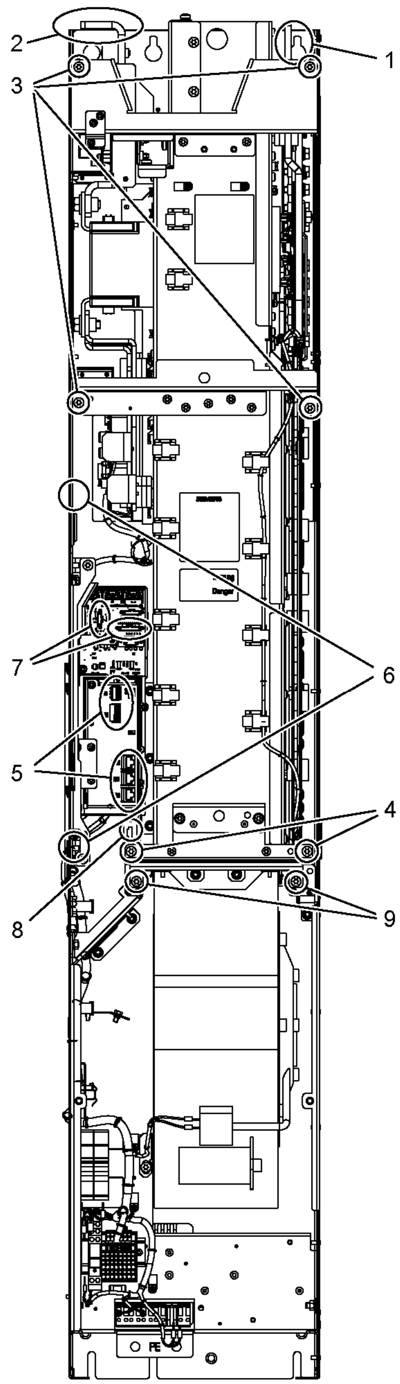


Figure 8-10 Replacing the power block, Basic Line Module, frame size GB

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access to the power block
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Unscrew the connection to the DC link (6 screws).
2. Unscrew the connection to the line connection (9 screws).
3. Remove the retaining screws at the top (4 screws).
4. Remove the retaining screws at the bottom (2 screws).
5. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
6. Remove the mounts for the Control Interface Board (2 nuts) and carefully pull out the Control Interface Board.
7. Disconnect the plug-in connections for the signal cables (2 plugs).
8. Disconnect the plug for the thermocouple.
9. Unscrew the two retaining screws for the fan and attach the equipment for assembling the power block at this position.

You can now remove the power block.

CAUTION
When removing the power block, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.10 Replacing the Control Interface Module, Motor Module, frame size FX

Replacing the Control Interface Module

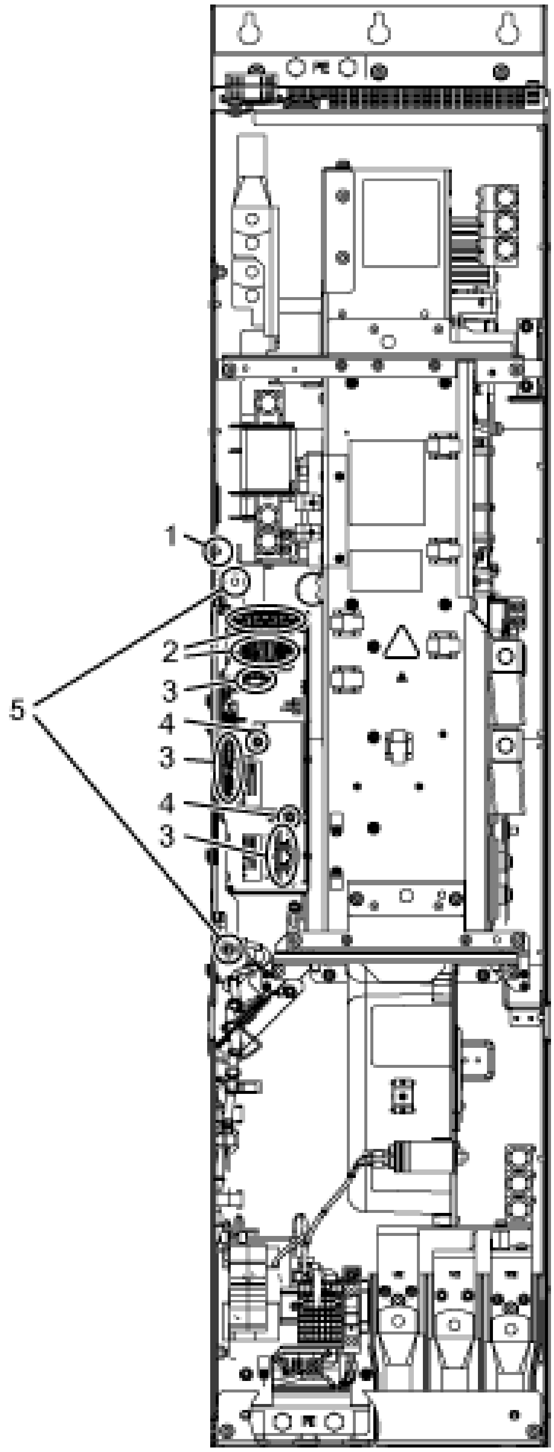


Figure 8-11 Replacing the Control Interface Module, Motor Module, frame size FX

Note

These instructions apply only to order numbers 6SL3320–1Txxx–xAA3.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 / –X46 (6 plugs).
4. Take out the retaining screws for the IPD card (2 screws) and remove the IPD card from connector –X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (2 screws).

When removing the Control Interface Module, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.11 Replacing the Control Interface Board, Active Line Module and Motor Module, frame size FX

Replacing the Control Interface Board

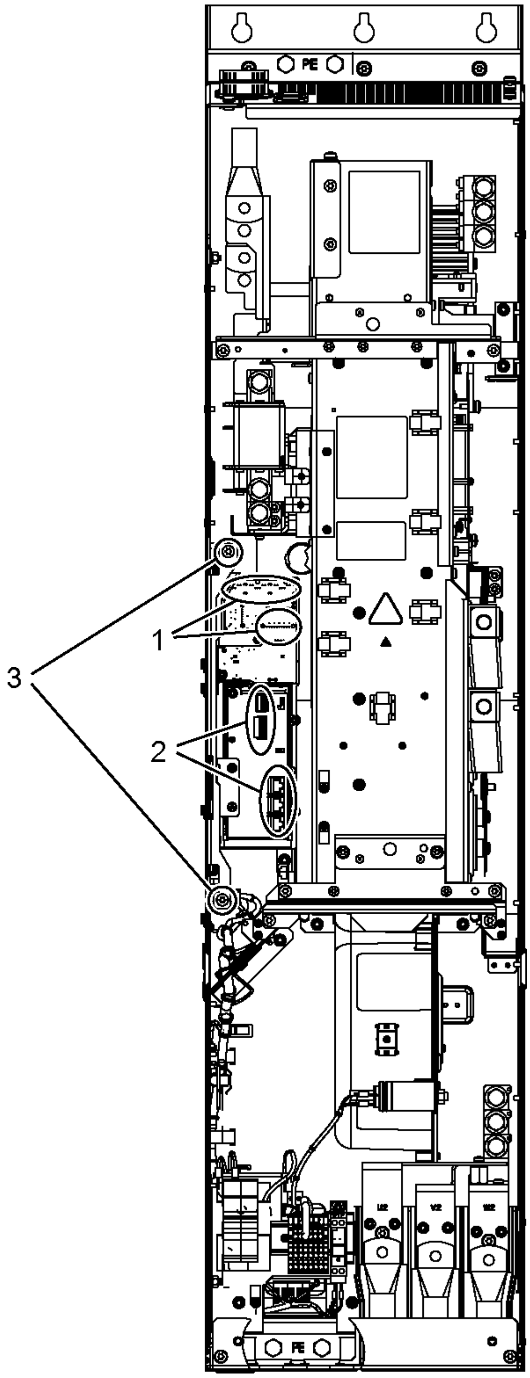


Figure 8-12 Replacing the Control Interface Board, Active Line Module and Motor Module, frame size FX

Note

These instructions apply only to Motor Modules with order numbers 6SL3320–1Txxx–xAA0.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
2. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
3. Remove the retaining screws for the slide-in electronics unit (2 screws).

When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

The Control Interface Board can then be removed from the slide-in electronics unit.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.12 Replacing the Control Interface Module, Motor Module, frame size GX

Replacing the Control Interface Module

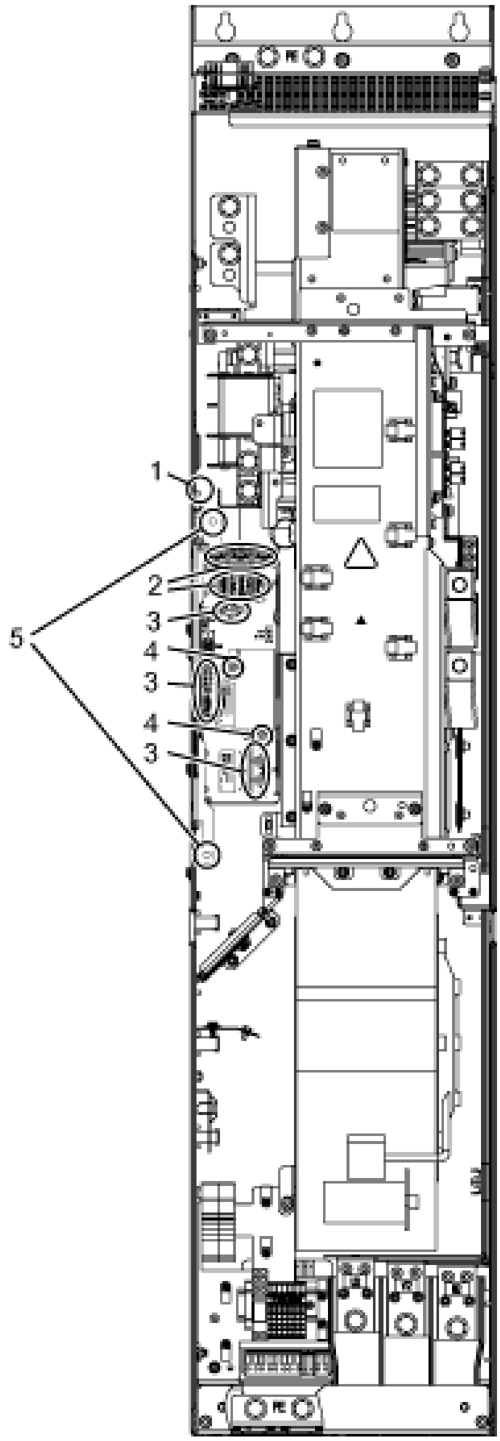


Figure 8-13 Replacing the Control Interface Module, Motor Module, frame size GX

Note

These instructions apply only to order numbers 6SL3320–1Txxx–xAA3.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 / –X46 (6 plugs).
4. Take out the retaining screws for the IPD card (2 screws) and remove the IPD card from connector –X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (2 screws).

When removing the Control Interface Module, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.13 Replacing the Control Interface Board, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Replacing the Control Interface Board

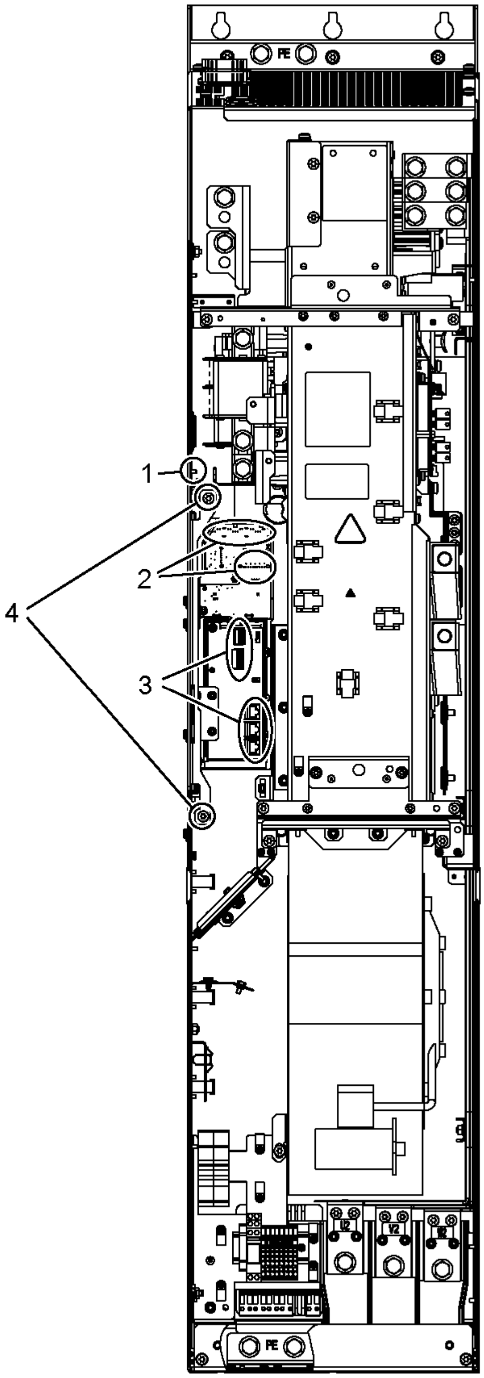


Figure 8-14 Replacing the Control Interface Board, Smart Line Module, Active Line Module, and Motor Module, frame size GX

Note

These instructions apply only to Motor Modules with order numbers 6SL3320–1Txxx–xAA0.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
4. Remove the retaining screws for the slide-in electronics unit (2 screws).

When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

The Control Interface Board can then be removed from the slide-in electronics unit.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.14 Replacing the Control Interface Module, Motor Module, frame size HX

Replacing the Control Interface Module

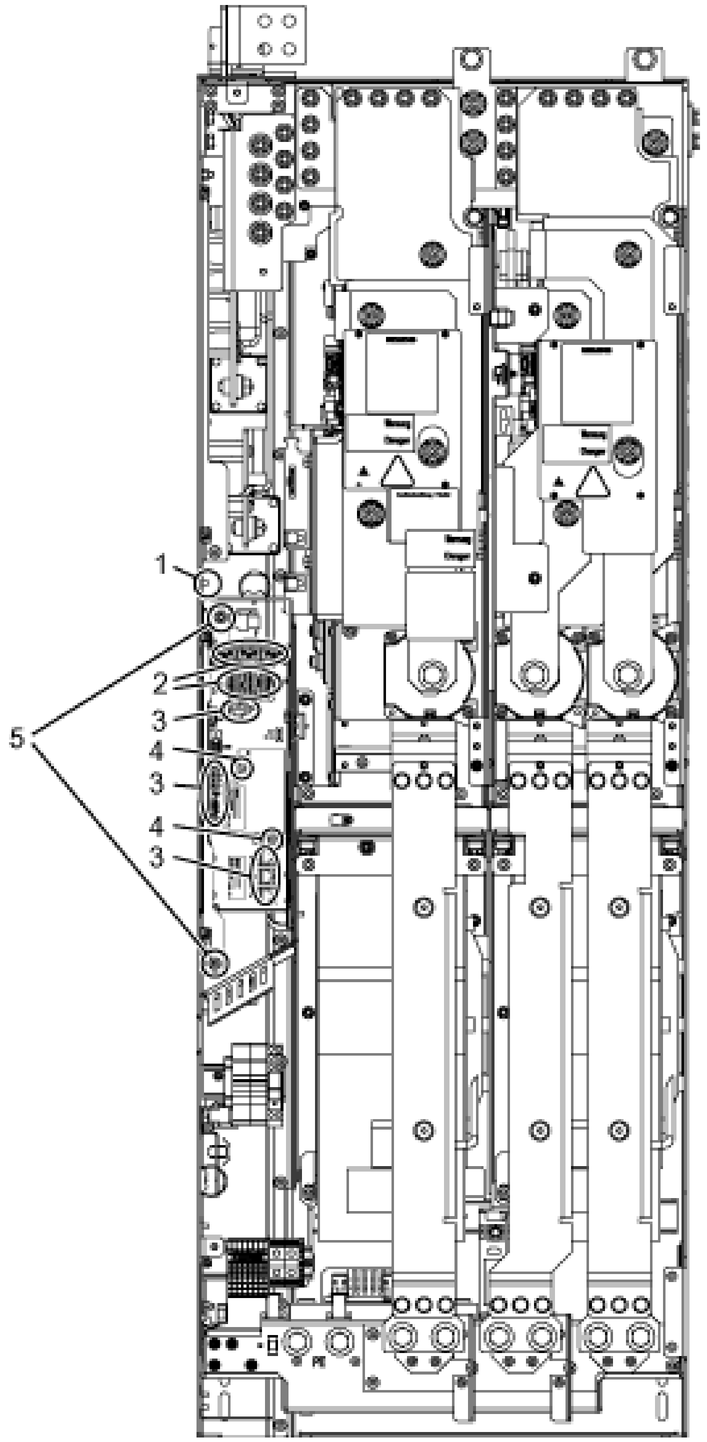


Figure 8-15 Replacing the Control Interface Module, Motor Module, frame size HX

Note

These instructions apply only to order numbers 6SL3320–1Txxx–xAA3.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 / –X46 (6 plugs).
4. Take out the retaining screws for the IPD card (2 screws) and remove the IPD card from connector –X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (2 screws).

When removing the Control Interface Module, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.15 Replacing the Control Interface Board, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the Control Interface Board

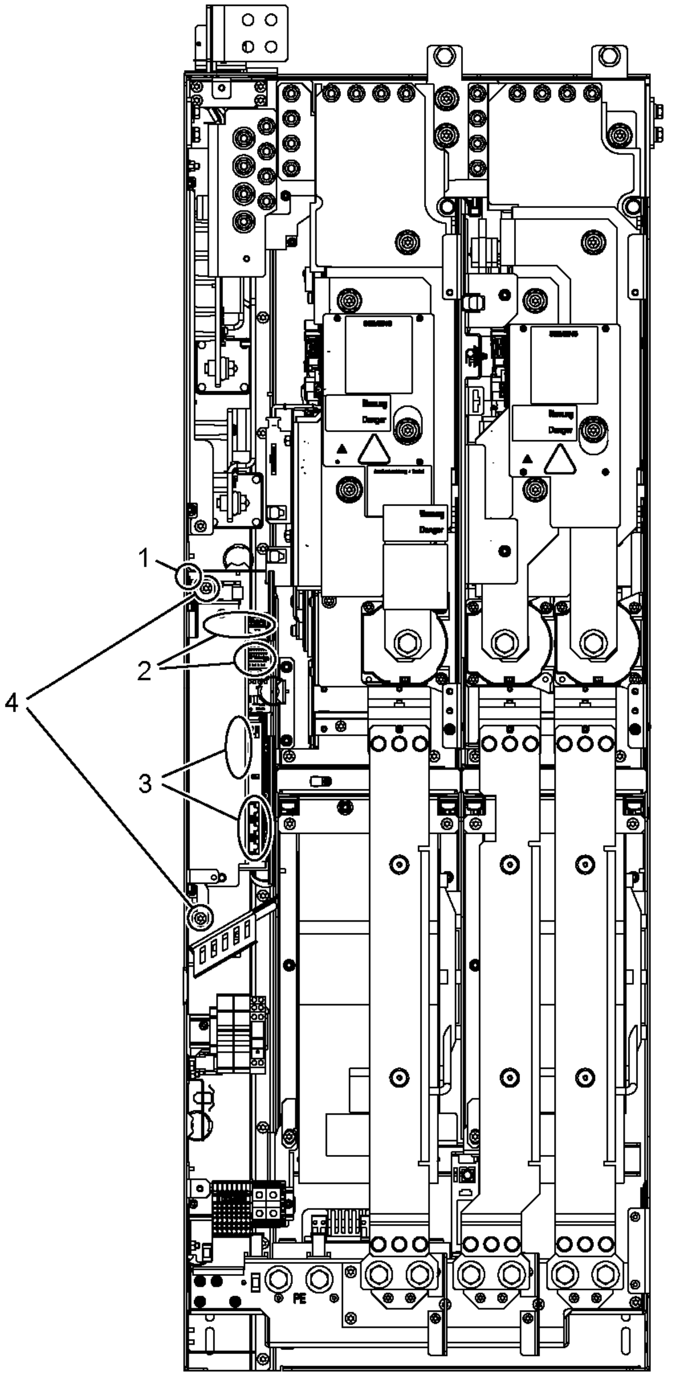


Figure 8-16 Replacing the Control Interface Board, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Note

These instructions apply only to Motor Modules with order numbers 6SL3320–1Txxx–xAA0.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
4. Remove the retaining screws for the slide-in electronics unit (2 screws).

When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

The Control Interface Board can then be removed from the slide-in electronics unit.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.16 Replacing the Control Interface Module, Motor Module, frame size JX

Replacing the Control Interface Module

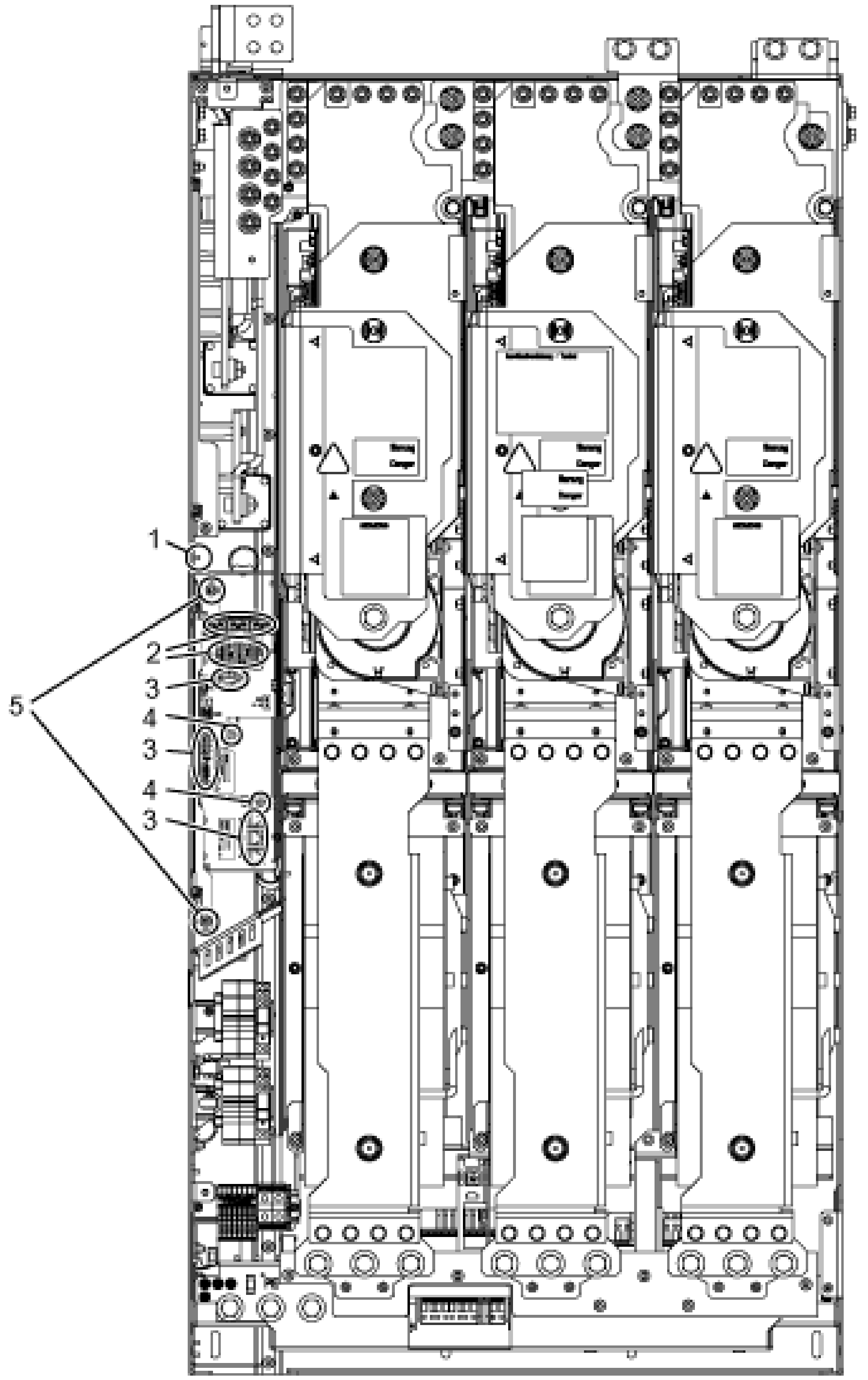


Figure 8-17 Replacing the Control Interface Module, Motor Module, frame size JX

Note

These instructions apply only to order numbers 6SL3320–1Txxx–xAA3.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 / –X46 (6 plugs).
4. Take out the retaining screws for the IPD card (2 screws) and remove the IPD card from connector –X45 on the Control Interface Module.
5. Remove the retaining screws for the Control Interface Module (2 screws).

When removing the Control Interface Module, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.17 Replacing the Control Interface Board, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the Control Interface Board

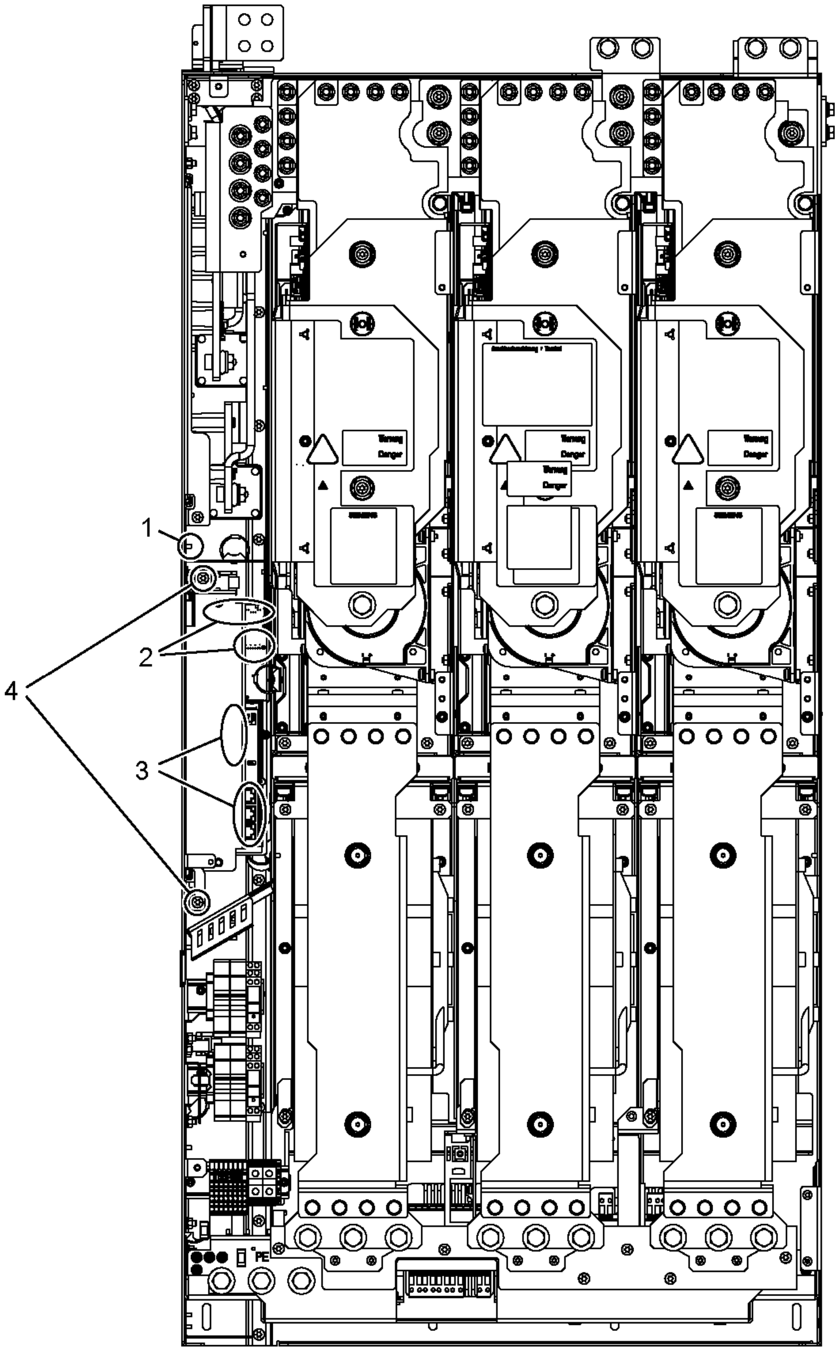


Figure 8-18 Replacing the Control Interface Board, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Note

These instructions apply only to Motor Modules with order numbers 6SL3320–1Txxx–xAA0.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the mount for the CU320 (1 nut).
2. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
3. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
4. Remove the retaining screws for the slide-in electronics unit (2 screws).

When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

The Control Interface Board can then be removed from the slide-in electronics unit.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.18 Replacing the Control Interface Board, Basic Line Module, frame size FB

Replacing the Control Interface Board

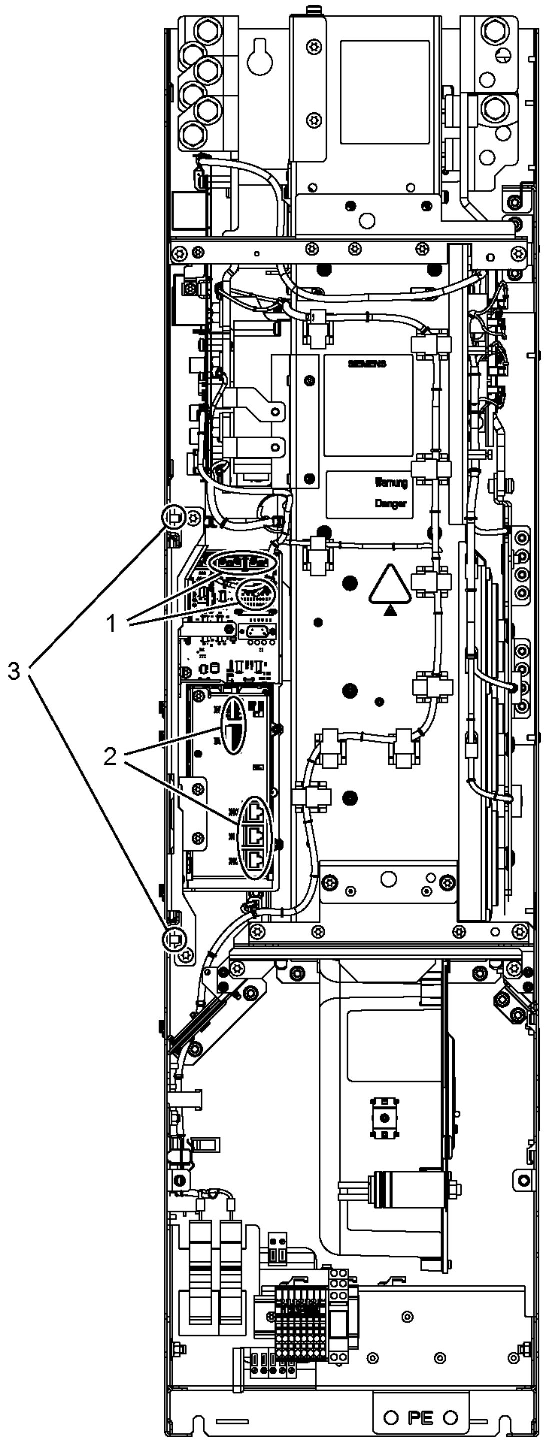


Figure 8-19 Replacing the Control Interface Board, Basic Line Module, frame size FB

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
2. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
3. Remove the retaining screws for the slide-in electronics unit (2 screws).

When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

The Control Interface Board can then be removed from the slide-in electronics unit.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.19 Replacing the Control Interface Board, Basic Line Module, frame size GB

Replacing the Control Interface Board

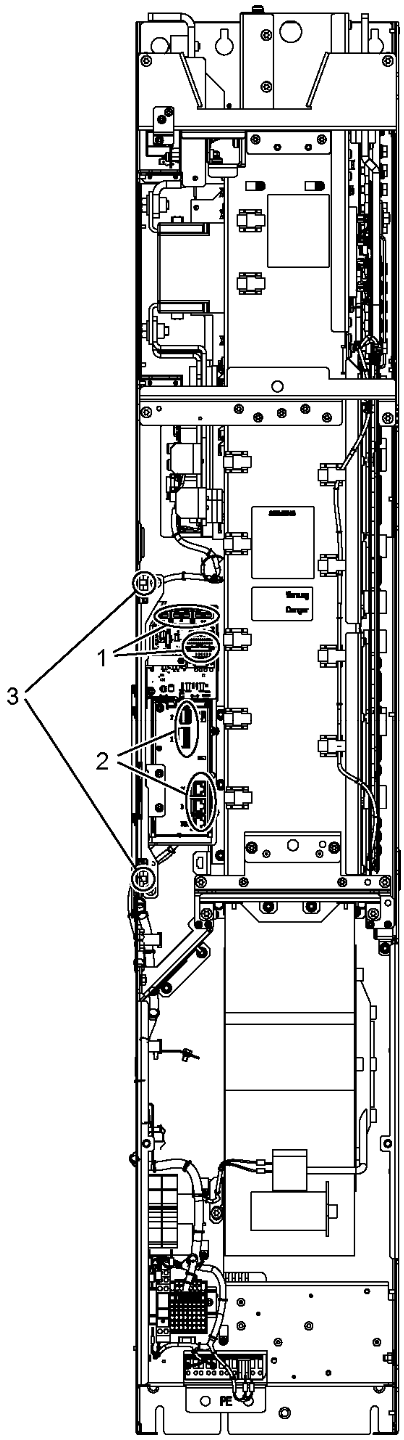


Figure 8-20 Replacing the Control Interface Board, Basic Line Module, frame size GB

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Disconnect the plug-in connections for the fiber-optic cables and signal cables (5 plugs).
2. Remove the DRIVE-CLiQ cables and connections on –X41 / –X42 (5 plugs).
3. Remove the retaining screws for the slide-in electronics unit (2 screws).

When removing the slide-in electronics unit, you have to disconnect 5 further plugs one after the other (2 at the top, 3 below).

CAUTION
When removing the unit, ensure that you do not damage any signal cables.

The Control Interface Board can then be removed from the slide-in electronics unit.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The fiber-optic cable plugs must be remounted at their original slot. Fiber-optic cables and sockets are accordingly labeled for correct assignment (U11, U21, U31).

8.4.20 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame sizes FX, GX

Replacing the fan

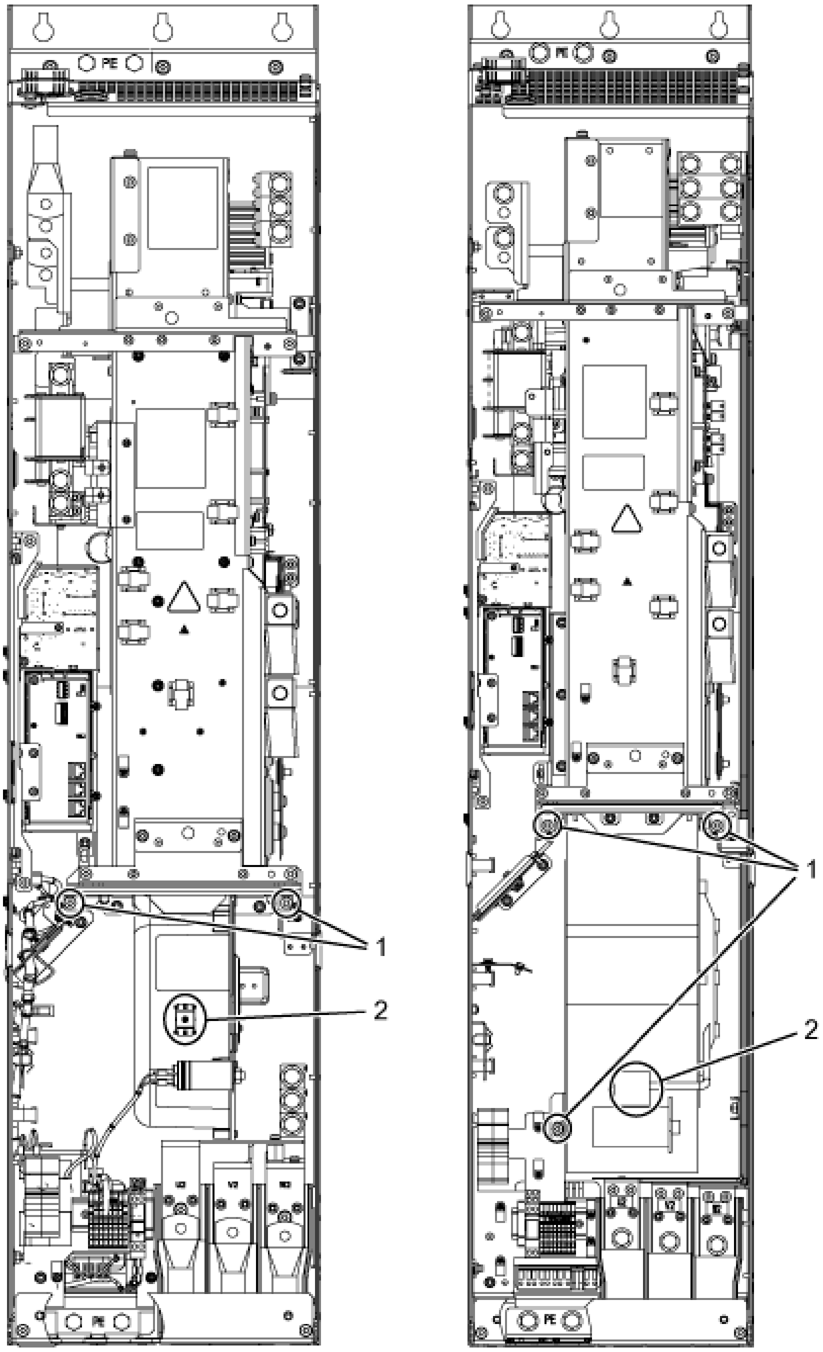


Figure 8-21 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame sizes FX, GX

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the front cover

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the retaining screws for the fan

   (2 for FX; 3 for GX).
2. Disconnect the supply cables (1 x "L", 1X "N").

You can now carefully remove the fan.

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.21 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size HX

Replacing the fan (left-hand power block)

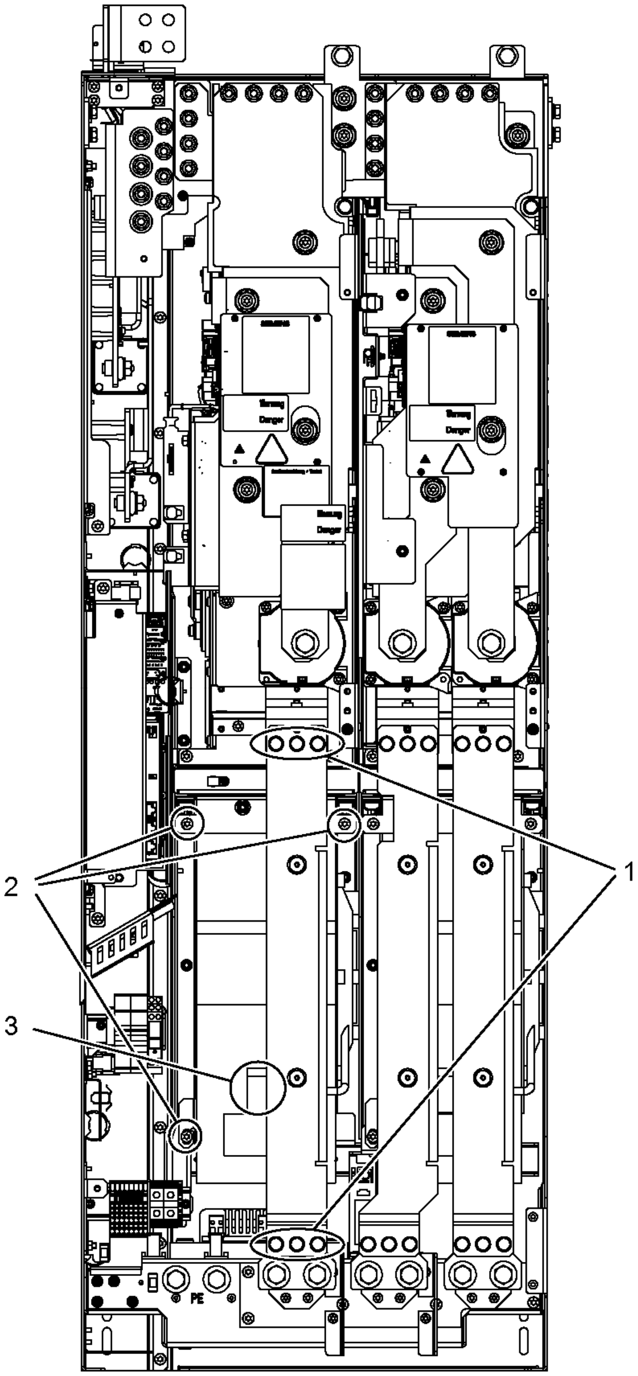


Figure 8-22 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size HX - left power block

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the busbar (6 screws).
2. Remove the retaining screws for the fan (3 screws).
3. Disconnect the supply cables (1 x "L", 1 x "N").

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

Replacing the fan (right-hand power block)

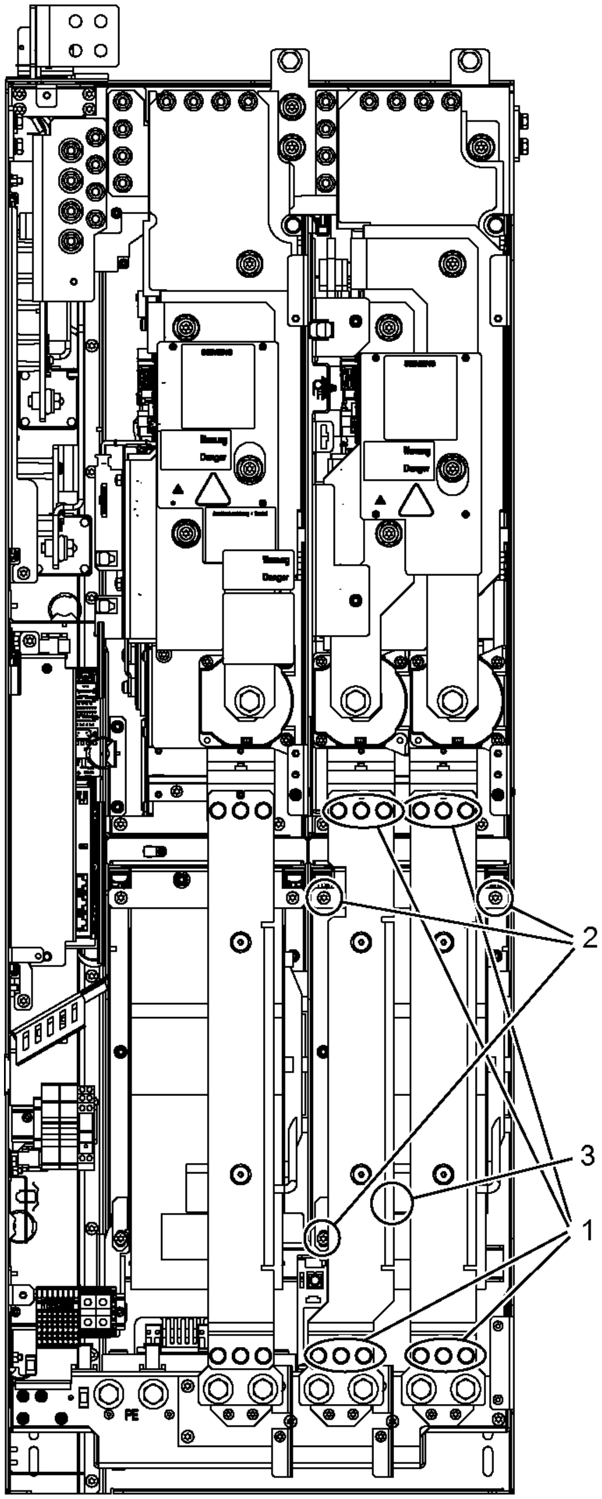


Figure 8-23 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size HX - right power block

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the busbars (12 screws).
2. Remove the retaining screws for the fan (3 screws).
3. Disconnect the supply cables (1 x "L", 1 x "N").

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.22 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Replacing the fan

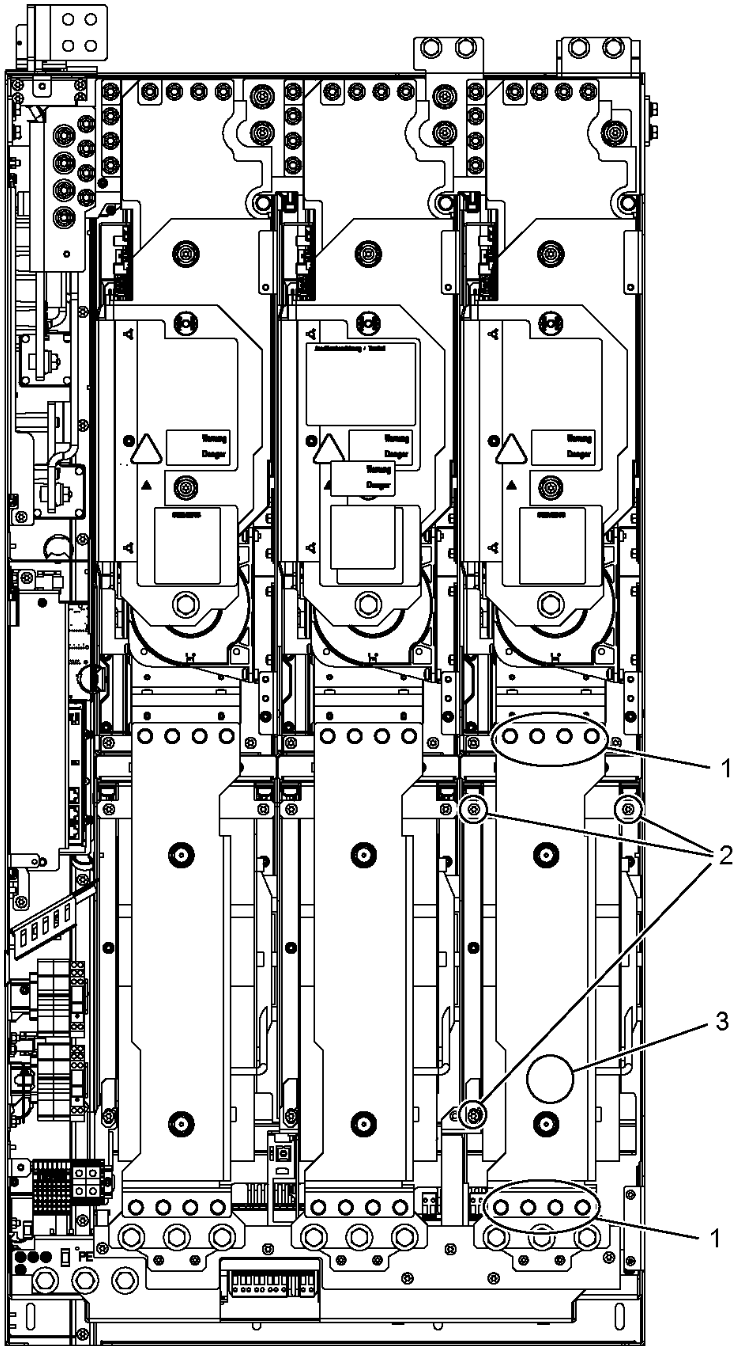


Figure 8-24 Replacing the fan, Smart Line Module, Active Line Module, and Motor Module, frame size JX

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the busbar (8 screws).
2. Remove the retaining screws for the fan (3 screws).
3. Disconnect the supply cables (1 x "L", 1 x "N").

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.23 Replacing the fan, Active Interface Module, frame size FI

Replacing the fan

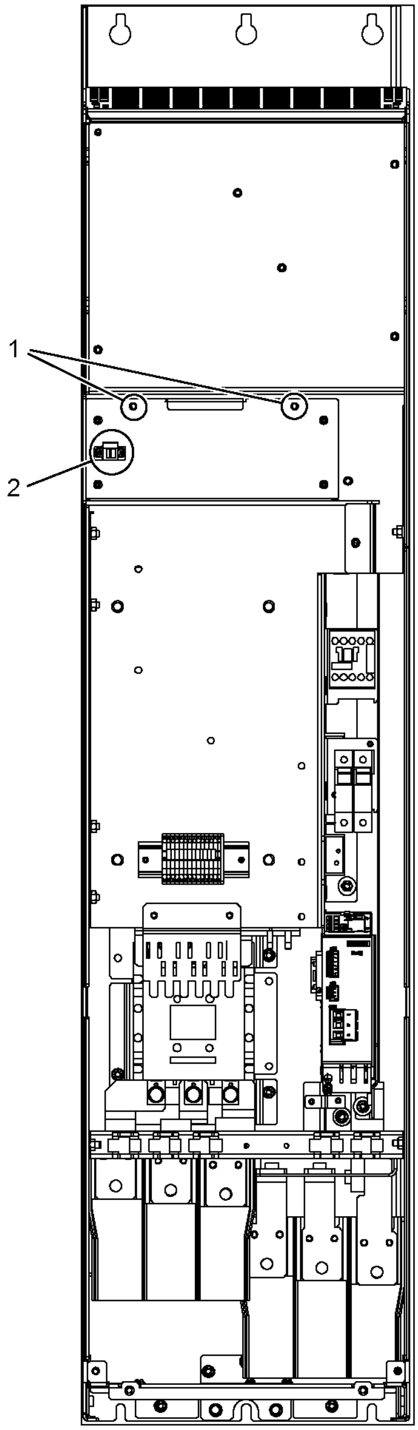


Figure 8-25 Replacing the fan, Active Interface Module, frame size FI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the retaining screws for the fan unit (2 screws).
2. Unplug connector –X630.

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.24 Replacing the fan, Active Interface Module, frame size GI

Replacing the fan

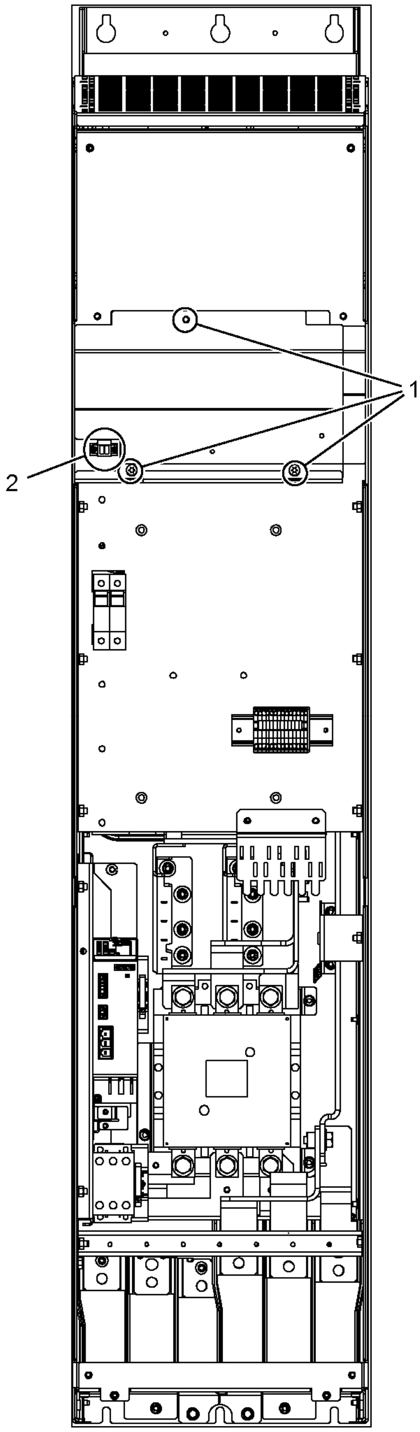


Figure 8-26 Replacing the fan, Active Interface Module, frame size GI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the retaining screws for the fan unit (3 screws).
2. Unplug connector –X630.

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.25 Replacing the fan, Active Interface Module, frame size HI

Replacing the fan

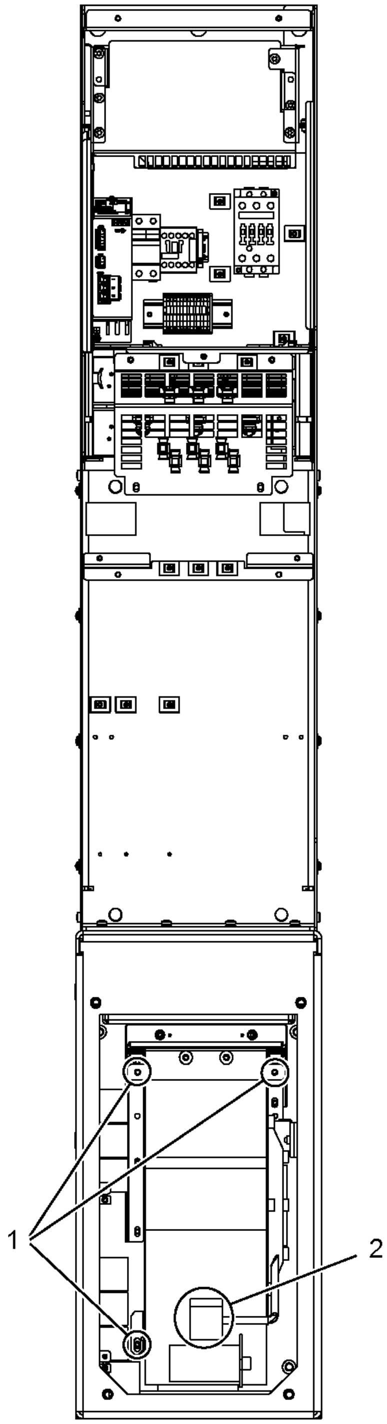


Figure 8-27 Replacing the fan, Active Interface Module, frame size HI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the retaining screws for the fan unit (3 screws).
2. Disconnect the supply cables (1 x "L", 1 x "N").

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.26 Replacing the fan, Active Interface Module, frame size JI

Replacing the fan

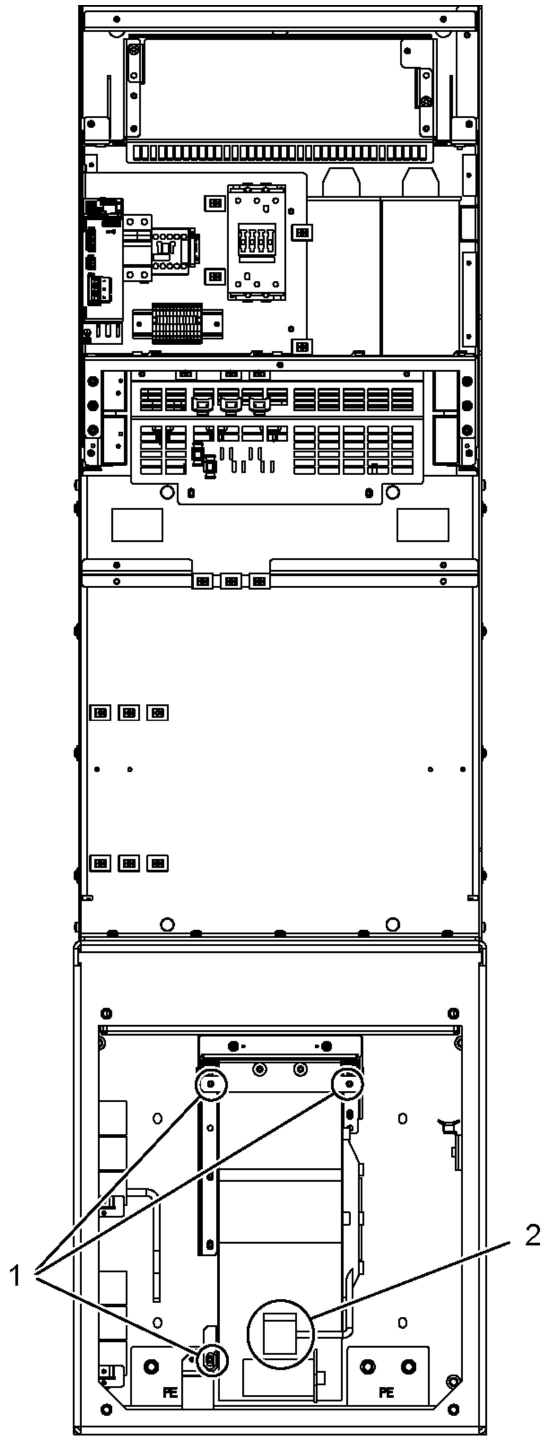


Figure 8-28 Replacing the fan, Active Interface Module, frame size JI

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the retaining screws for the fan unit (3 screws).
2. Disconnect the supply cables (1 x "L", 1 x "N").

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.27 Replacing the fan, Basic Line Module, frame sizes FB, GB

Replacing the fan

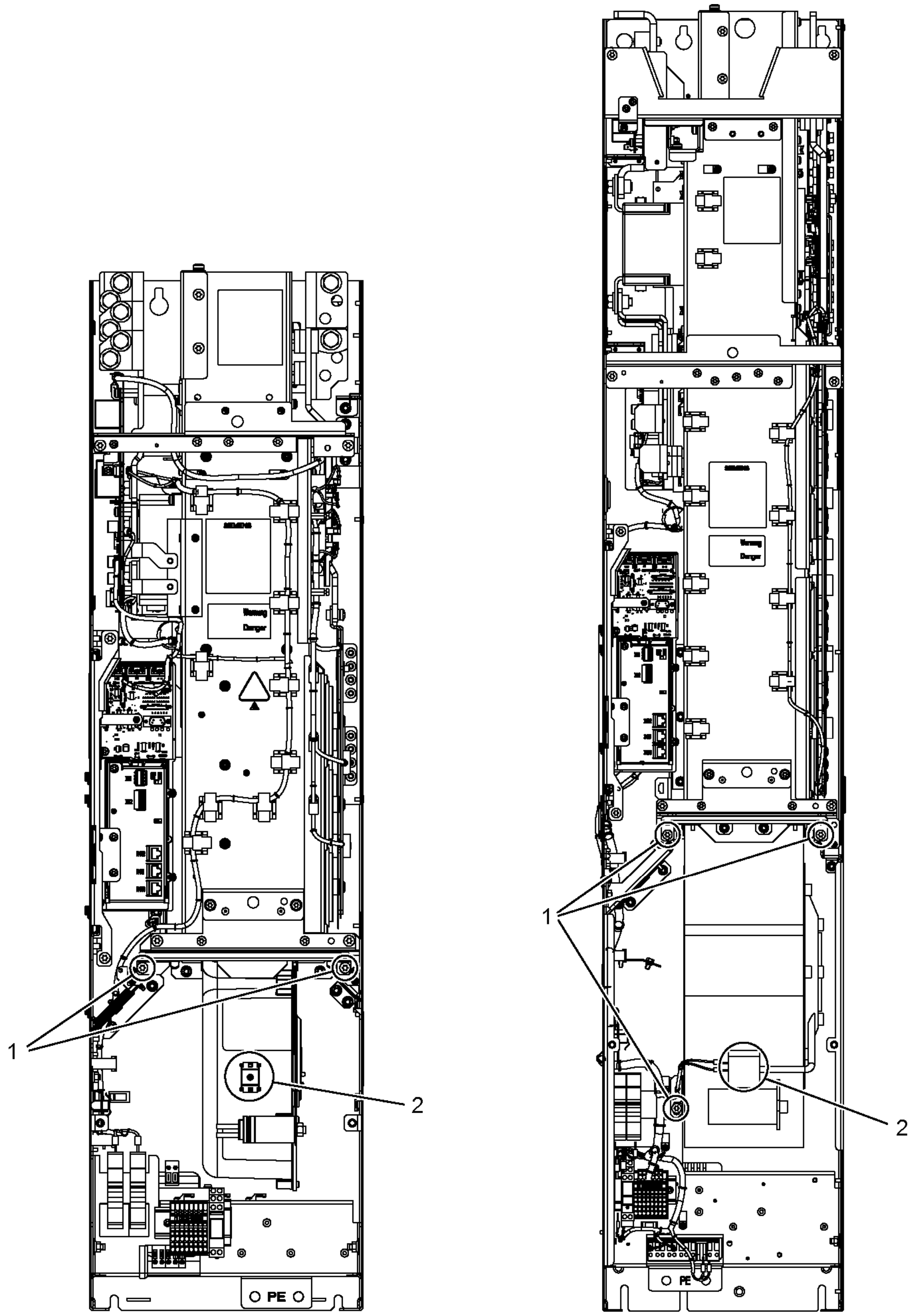


Figure 8-29 Replacing the fan, Basic Line Module, frame sizes FB, GB

Description

The average service life of the device fans is 50,000 hours. In practice, however, the service life depends on other variables (e.g., ambient temperature, degree of cabinet protection, etc.) and, therefore, may deviate from this value.

The fans must be replaced in good time to ensure that the device is available.

Preparatory steps

- Disconnect the drive line-up from the power supply
- Allow unimpeded access.
- Remove the protective cover.

Removal

The removal steps are numbered in accordance with the figure.

1. Remove the retaining screws for the fan

   (2 screws for frame size FB, 3 screws for frame size GB)
2. Disconnect the supply cables (1 x "L", 1X "N").

CAUTION
When removing the fan, ensure that the cables are not damaged.

Installation steps

For installation, carry out the above steps in reverse order.

CAUTION
The tightening torques specified in the table "Tightening torques for connecting current-conducting parts" must be observed. Carefully establish the plug-in connections and then ensure that they are secure. The screw connections for the protective covers must only be tightened by hand.

8.4.28 Replacing the fan fuses (-F10/-F11)

The order numbers for replacement fan fuses can be found in the spare parts list.

⚠ WARNING
Make sure that the cause of the fault is found before the fuse is replaced.

8.5 Forming the DC link capacitors

Description

If the Basic Line Module, Smart Line Module, Active Line Module, and Motor Module have not been used for more than two years, the DC link capacitors must be reformed. If this is not carried out, the units could be damaged after the DC link voltage is applied under load.

If the cabinet is commissioned within two years of its date of manufacture, the DC link capacitors do not need to be re-formed. The date of manufacture can be taken from the serial number on the rating plate.

Note

It is important that the storage period is calculated from the date of manufacture and not from the date that the equipment was shipped.

Rating plate

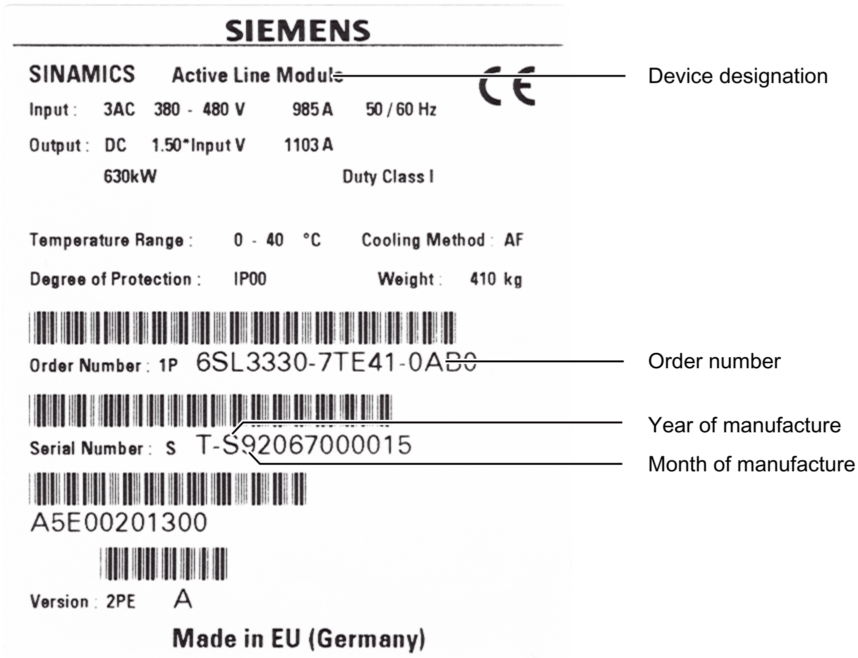


Figure 8-30 Rating plate using an Active Line Module as example

Date of manufacture

The date of manufacture can be determined as follows:

Table 8- 2 Production year and month

Character	Year of manufacture		Character	Month of manufacture
S	2004		1 to 9	January to September
T	2005		O	October
U	2006		N	November
V	2007		D	December
W	2008			
X	2009			

Procedure in the event of repair or replacement

A replacement Line Module or Motor Module or the corresponding replacement power block has to be re-formed after being in storage for a period of more than two years.

The DC link capacitors are re-formed by applying the rated voltage without load for at least 30 minutes.
To do this, the DC link must be precharged (i.e. the Line Modules switched on), while the controller for the existing Motor Modules must not be enabled for the specified length of time.

Procedure for re-forming outside the drive line-up

Replacement power units which have to be held ready for immediate use in the event of repair or replacement can also be re-formed individually and outside the drive line-up.

For this, the equipment must be connected to the forming circuits described in the following.

Components for the forming circuit (recommendation)

- 1 fuse switch 3-phase 400 V / 10 A or 690 V / 10 A
- 3 incandescent lamps 230 V / 100 W for line voltage 3-phase 380 to 480 V AC
- 6 incandescent lamps 230 V / 100 W for line voltage 3-phase 500 to 690 V AC, where 2 incandescent lamps must be connected in series in each supply phase.
- Various small components, such as lamp sockets, cable 1.5 mm^2, etc.

CAUTION

At a line voltage of 3-phase 500 to 690 V AC, the two lamp sockets connected in series must be insulated and protected from touch, because the insulation of the sockets is not designed for this high voltage.

Forming circuit for Line Modules

Note

Voltage must be supplied to Line Modules via a connected Motor Module and the associated DC link.

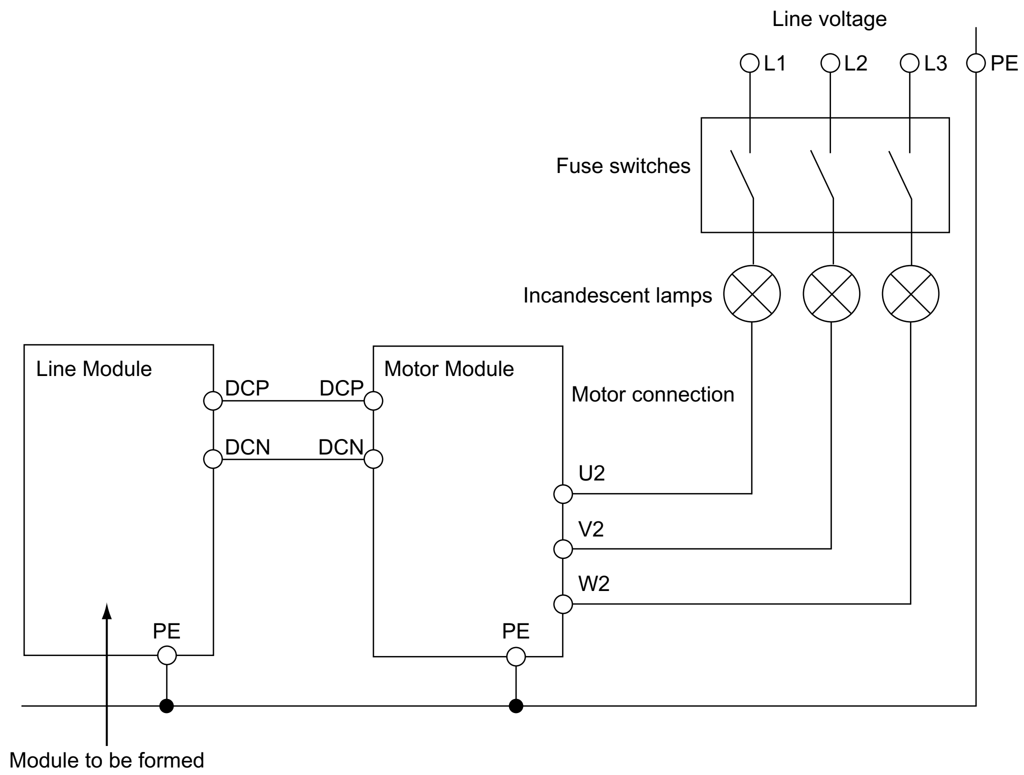


Figure 8-31 Forming circuit for Line Modules

Forming circuit for Motor Modules

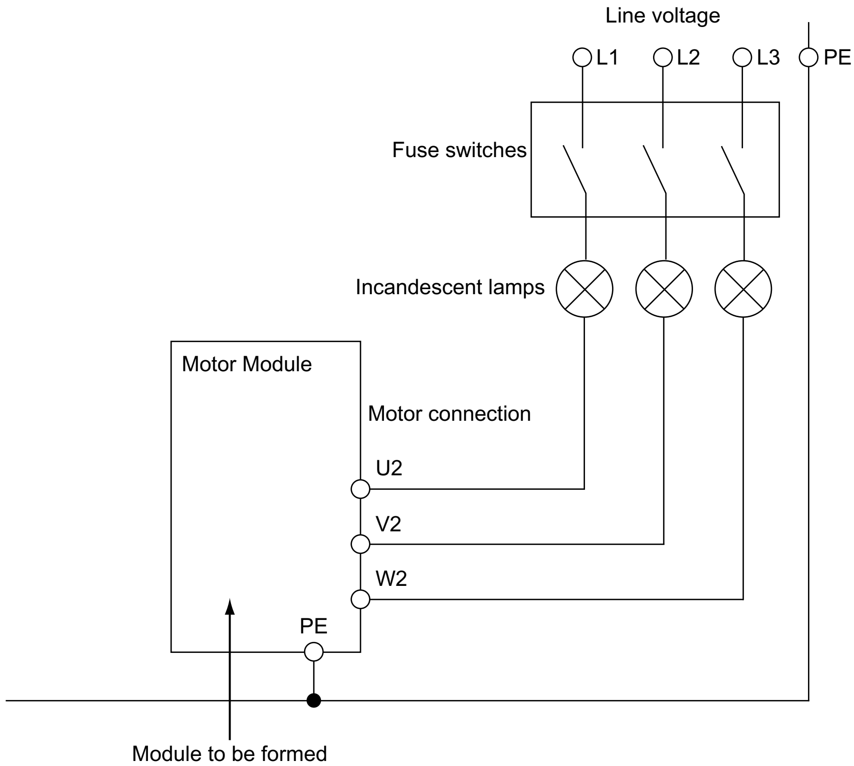


Figure 8-32 Forming circuit for Motor Modules

Procedure

- The unit being formed must not receive a power-on command (e.g. from the keyboard, BOP20 or terminal block).
- Connect the appropriate forming circuit.
- During the forming process, the incandescent lamps must become less bright or go completely dark. If the incandescent lamps continue to be brightly lit, a fault has occurred in the drive unit or in the wiring.

Maintaining the operational readiness of individual power blocks for servicing

It is recommended that during the planned downtimes, the power blocks positioned on the line side are replaced in order to guarantee the correct functioning of the power blocks during servicing.

List of abbreviations

A

A.1 List of abbreviations

Table A- 1 List of abbreviations

Abbreviation	Meaning, German	Meaning, English
A		
A...	Warnung	Alarm
AC	Wechselstrom	Alternating Current
ADC	Analog-Digital-Konverter	Analog Digital Converter
AI	Analogeingang	Analog Input
AO	Analogausgang	Analog Output
AOP	Advanced Operator Panel	Advanced Operator Panel
ASCII	Amerikanische Code-Norm für den Informationsaustausch	American Standard Code for Information Interchange
B		
BB	Betriebsbedingung	Operating condition
BERO	Firmenname für einen Näherungsschalter	Tradename for a type of proximity switch
BI	Binektoreingang	Binector Input
BIA	Berufsgenossenschaftliches Institut für Arbeitssicherheit	Berufsgenossenschaftliches Institut für Arbeitssicherheit (German Institute for Occupational Safety)
BICO	Binektor-Konnektor-Technologie	Binector Connector Technology
BOP	Basic Operator Panel	Basic Operator Panel
C		
C	Kapazität	Capacity
CAN	Serielles Bussystem	Controller Area Network
CBC	Kommunikationsbaugruppe CAN	Communication Board CAN
CBP	Kommunikationsbaugruppe PROFIBUS	Communication Board PROFIBUS
CD	Compact Disc	Compact Disc
CDS	Befehlsdatensatz	Command Data Set
CI	Konnektoreingang	Connector Input
CIB	Control Interface Board	Control Interface Board
CNC	Computerunterstützte numerische Steuerung	Computer Numerical Control
CO	Konnektorausgang	Connector Output
CO/BO	Konnektor-/Binektorausgang	Connector/Binector Output
COM	Mittelkontakt eines Wechselkontaktes	Medium contact of a change-over contact
CP	Kommunikationsprozessor	Communications Processor
CPU	Zentralbaugruppe	Central Processing Unit
CRC	Checksummenprüfung	Cyclic Redundancy Check
CT	Konstantes Drehmoment	Constant Torque

Abbreviation	Meaning, German	Meaning, English
CU	Control Unit	Control Unit
D		
DAC	Digital-Analog-Konverter	Digital Analog Converter
DC	Gleichstrom	Direct Current
DCN	Gleichstrom negativ	Direct current negative
DCNA	Gleichstrom negativ Zusatzanschluss	Direct current negative auxiliary
DCP	Gleichstrom positiv	Direct current positive
DCPA	Gleichstrom negativ Zusatzanschluss	Direct current positive auxiliary
DDS	Antriebsdatensatz	Drive Data Set
DI	Digitaleingang	Digital Input
DI / DO	Digitaleingang/-ausgang bidirektional	Bidirectional Digital Input/Output
DMC	DRIVE-CLiQ Module Cabinet (Hub)	DRIVE-CLiQ Module Cabinet (Hub)
DO	Digitalausgang	Digital Output
DO	Antriebsobjekt	Drive Object
DPRAM	Speicher mit beidseitigem Zugriff	Dual-Port Random Access Memory
DRAM	Dynamischer Speicher	Dynamic Random Access Memory
DRIVE-CLiQ	Drive Component Link with IQ	Drive Component Link with IQ
DSC	Dynamic Servo Control	Dynamic Servo Control
E		
EDS	Geberdatensatz	Encoder Data Set
ESD	Elektrostatisch gefährdete Baugruppen	Electrostatic Sensitive Devices (ESD)
EMV	Elektromagnetische Verträglichkeit	Electromagnetic Compatibility (EMC)
EN	Europäische Norm	European Standard
EnDat	Geber-Schnittstelle	Encoder-Data-Interface
EP	Impulsfreigabe	Enable Pulses
ES	Engineering System	Engineering System
F		
F ...	Störung	Fault
FAQ	Häufig gestellte Fragen	Frequently Asked Questions
FCC	Function Control Chart	Function Control Chart
FCC	Flussstromregelung	Flux Current Control
FEPROM	Schreib- und Lesespeicher nichtflüchtig	Flash-EPROM
FG	Funktionsgenerator	Function Generator
FI	Fehlerstrom-Schutzschalter	Earth Leakage Circuit-Breaker (ELCB)
Float	Gleitkommazahl	Floating point
FP	Funktionsplan	Function diagram
FW	Firmware	Firmware
G		
GCP	Global-Control-Telegramm (Broadcast-Telegramm)	Global Control Telegram (broadcast telegram)
GSD	Gerätestammdatei: beschreibt die Merkmale eines PROFIBUS-Slaves	Device master file: describes the features of a PROFIBUS slave

Abbreviation	Meaning, German	Meaning, English
H		
HLG	Hochlaufgeber	Ramp-function generator
HMI	Mensch-Maschine-Schnittstelle	Human Machine Interface
HTL	Hochpegellogik	High Threshold Logic
HW	Hardware	Hardware
I		
i. V.	in Vorbereitung: diese Eigenschaft steht zur Zeit nicht zur Verfügung	in preparation: this feature is currently not available
IBN	Inbetriebnahme	Commissioning
I/O	Eingang/Ausgang	Input/Output
ID	Identifizierung	Identifier
IEC	Internationale Norm in der Elektrotechnik	International Electrotechnical Commission
IGBT	Bipolartransistor mit isolierter Steuerelektrode	Insulated Gate Bipolar Transistor
IT	Drehstromversorgungsnetz ungeerdet	three-phase supply network, ungrounded
J		
JOG	Tippen	Jogging
K		
KDV	Kreuzweiser Datenvergleich	Data cross-checking
KIP	Kinetische Pufferung	Kinetic buffering
KTY	Spezieller Temperatursensor	Special temperature sensor
L		
L	Inductance	Inductance
LED	Leuchtdiode	Light Emitting Diode
LSB	Niederwertigstes Bit	Least Significant Bit
M		
M	Masse	reference potential, zero potential
MB	Megabyte	Megabyte
MCC	Motion Control Chart	Motion Control Chart
MDS	Motordatensatz	Motor Data Set
MLFB	Machine-readable product designation	machine-readable product designation
MMC	Mensch Maschine Kommunikation	Man-Machine Communication
MSB	Höchstwertigstes Bit	Most Significant Bit
MSCY_C1	Zyklische Kommunikation zwischen Master (Klasse 1) und Slave	Master Slave Cycle Class 1
N		
NC	Öffner	Normally Closed (contact)
NC	Numerische Steuerung	Numerical Control
NEMA	Normengremium in USA (United States of America)	National Electrical Manufacturers Association
NM	Nullmarke	Zero Mark
NO	Schließer	Normally Open (contact)

Abbreviation	Meaning, German	Meaning, English
O		
OEM	Original Equipment Manufacturer	Original Equipment Manufacturer
OLP	Busstecker für Lichtleiter	Optical Link Plug
OMI	Option Module Interface	Option Module Interface
P		
p ...	Einstellparameter	Adjustable parameter
PDS	Leistungsteildatensatz	Power Module Data Set
PE	Schutzerde	Protective Earth
PELV	Schutzkleinspannung	Protective Extra Low Voltage
PG	Programmiergerät	Programming terminal
PI	Proportional Integral	Proportional Integral
PLC	Speicherprogrammierbare Steuerung (SPS)	Programmable Logic Controller (PLC)
PLL	Baustein zur Synchronisierung	Phase Locked Loop
PNO	PROFIBUS Nutzerorganisation	PROFIBUS user organization
PRBS	Weißes Rauschen	Pseudo Random Binary Signal
PROFIBUS	Serieller Datenbus	Process Field Bus
PS	Stromversorgung	Power Supply
PTC	Positiver Temperaturkoeffizient	Positive Temperature Coefficient
PTP	Punkt zu Punkt	Point To Point
PWM	Pulsweitenmodulation	Pulse Width Modulation
PZD	PROFIBUS Prozessdaten	PROFIBUS Process data
Q		
R		
r...	Beobachtungsparameter (nur lesbar)	Display Parameter (read only)
RAM	Speicher zum lesen und schreiben	Random Access Memory
RCD	Fehlerstrom-Schutzschalter	Residual Current Device
RJ45	Norm. Beschreibt eine 8-polige Steckverbindung mit Twisted-Pair Ethernet.	Standard. Describes an 8-pole plug connector with twisted pair Ethernet.
RO	Nur lesbar	Read Only
RS232	Serielle Schnittstelle	Serial Interface
RS485	Norm. Beschreibt die Physik einer digitalen seriellen Schnittstelle.	Standard. Describes the physical characteristics of a digital serial interface.
S		
S1	Dauerbetrieb	Continuous operation
S3	Aussetzbetrieb	periodic duty
SBC	Sichere Bremsenansteuerung	Safe Brake Control
SGE	Sicherheitsgerichtetes Eingangssignal	Safe input signal
SH	Sicherer Halt	Safe Standstill
SI	Safety Integrated	Safety Integrated
SIL	Sicherheitsintegritätsgrad	Safety Integrity Level
SLVC	Geberlose Vektorregelung	Sensorless Vector Control
SM	Sensor Module	Sensor Module
SMC	Sensor Module Cabinet	Sensor Module Cabinet

Abbreviation	Meaning, German	Meaning, English
SME	Sensor Module External	Sensor Module External
SPS	Speicherprogrammierbare Steuerung	Programmable Logic Controller (PLC)
STW	PROFIBUS Steuerwort	PROFIBUS control word
T		
TB	Terminal Board	Terminal Board
TIA	Totally Integrated Automation	Totally Integrated Automation
TM	Terminal Module	Terminal Module
TN	Drehstromversorgungsnetz geerdet	Three-phase supply network, grounded
TT	Drehstromversorgungsnetz geerdet	Three-phase supply network, grounded
TTL	Transistor-Transistor-Logik	Transistor-transistor logic
U		
UL	Underwriters Laboratories Inc.	Underwriters Laboratories Inc.
V		
VC	Vektorregelung	Vector Control
Vdc	Zwischenkreisspannung	DC link voltage
VDE	Verband Deutscher Elektrotechniker	Association of German Electrical Engineers
VDI	Verein Deutscher Ingenieure	Association of German Engineers
VSM	Voltage Sensing Module	Voltage Sensing Module
VT	Variables Drehmoment	Variable Torque
W		
WZM	Werkzeugmaschine	Machine tool
X		
XML	Erweiterbare Auszeichnungssprache (Standardsprache für Web-Publishing und Dokumentenmanagement)	Extensible Markup Language
Y		
Z		
ZK	Zwischenkreis	DC Link
ZSW	PROFIBUS Zustandswort	PROFIBUS status word

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I

L

M

O

P

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