

SINAMICS G130

Braking Module / braking resistor

Operating Instructions · 05/2010

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SINAMICS G130 Braking Module / braking resistor

Operating Instructions

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Control version V4.3 SP2

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.
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WARNING
--

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

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

Proper use of Siemens products

Note the following:

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

Trademarks

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Disclaimer of Liability

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

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Safety information

1

1.1 Warnings



WARNING

Hazardous voltages are present when electrical equipment is in operation. Severe personal injury or substantial material damage may result if these warnings are not observed.

Only qualified personnel are permitted to work on or around the equipment. This personnel must be thoroughly familiar with all the warnings and maintenance procedures described in these operating instructions.

The successful and safe operation of this device is dependent on correct transport, proper storage and installation, as well as careful operation and maintenance.

National safety guidelines must be observed.



DANGER

Five safety rules

When carrying out any kind of work on electrical devices, the "five safety rules" defined in EN 50110 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.

NOTICE

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

1.2 Safety and operating instructions



DANGER

This equipment is used in industrial high-voltage installations. During operation, this equipment contains rotating and live, bare parts. For this reason, they could cause severe injury or significant material damage if the required covers are removed, if they are used or operated incorrectly, or have not been properly maintained.
When the machines are used in non-industrial areas, the installation location must be protected against unauthorized access (protective fencing, appropriate signs).

Prerequisites

Those responsible for protecting the plant must ensure the following:

- The basic planning work for the plant and the transport, assembly, installation, commissioning, maintenance, and repair work is carried out by qualified personnel and/or checked by experts responsible.
- The operating manual and machine documentation are always available.
- The technical specifications regarding the applicable installation, connection, environmental, and operating conditions are always observed.
- The plant-specific assembly and safety guidelines are observed and personal protection equipment is used.
- Unqualified personnel are forbidden from using these machines and working near them.

This operating manual is intended for qualified personnel and only contain information and notes relating to the intended purpose of the machines.

The operating manual and machine documentation are written in different languages as specified in the delivery contracts.

Note

We recommend engaging the support and services of your local Siemens service center for all planning, installation, commissioning and maintenance work.

1.3 Components that can be destroyed by electrostatic discharge (ESD)

CAUTION

The board contains components that can be destroyed by electrostatic discharge. These components can be easily destroyed if not handled properly. If you do have to use electronic boards, however, please observe the following:

- You should only touch electronic boards if absolutely necessary.
- When you touch boards, however, your body must be electrically discharged beforehand.
- Boards must not come into contact with highly insulating materials (such as plastic parts, insulated desktops, articles of clothing manufactured from man-made fibers).
- Boards must only be placed on conductive surfaces.
- Boards and components should only be stored and transported in conductive packaging (such as metalized plastic boxes or metal containers).
- If the packaging material is not conductive, the boards must be wrapped with a conductive packaging material (such as conductive foam rubber or household aluminum foil).

The necessary ESD protective measures are clearly illustrated in the following diagram:

- a = conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD wristband
- f = cabinet ground connection
- g = contact with conductive flooring

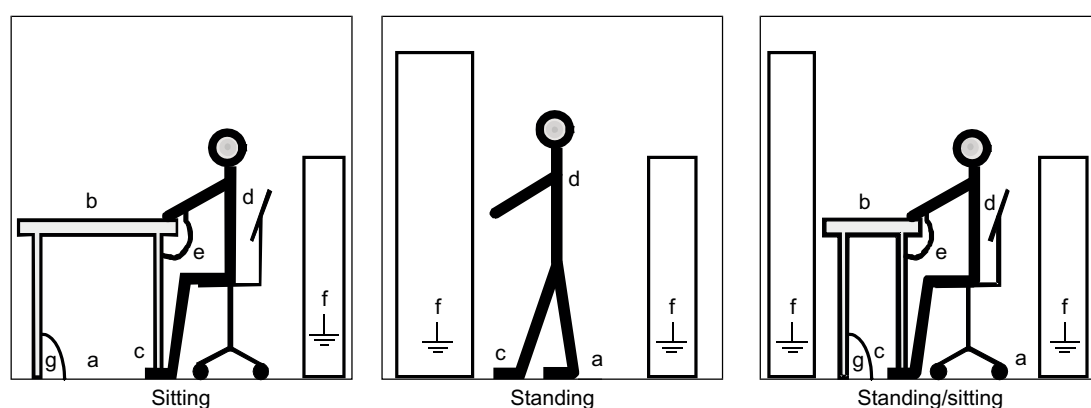


Figure 1-1 ESD protective measures

General

2.1 Braking Module

Description

A Braking Module (and an external braking resistor) is required in certain cases when the drive is to be braked or brought to a standstill (e.g., EMERGENCY STOP category 1). The Braking Module contains the power electronics and the associated Control Unit. The supply voltage for the electronics is drawn from the DC link.

During operation, the DC link energy is converted to heat loss in an external braking resistor.

The Braking Module functions independently of the converter closed-loop controller. In the case of Power Modules with frame sizes HX and JX, it is possible to operate several Braking Modules in parallel in order to enhance performance. In this case, each Braking Module must be fitted with its own braking resistor.

Structure

The Braking Module is inserted in a slot inside the Power Module, the fan of which ensures forced cooling. The Braking Module is connected to the DC link by means of the busbar sets and flexible cables, which are supplied as standard.

Assignment of Braking Module and Power Module

Table 2- 1 Assignment of Braking Module and Power Module

Power Module	Rated Power Module output	Suitable Braking Module	Rated power output of the Braking Module	Suitable brake resistance
Line voltage 380 – 480 V 3 AC				
6SL3310-1GE32-1AAx	110 kW	6SL3300-1AE31-3AA0	25 kW	6SL3000-1BE31-3AA0
6SL3310-1GE32-6AAx	132 kW	6SL3300-1AE31-3AA0	25 kW	6SL3000-1BE31-3AA0
6SL3310-1GE33-1AAx	160 kW	6SL3300-1AE32-5AA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE33-8AAx	200 kW	6SL3300-1AE32-5AA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE35-0AAx	250 kW	6SL3300-1AE32-5AA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE36-1AAx	315 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE37-5AAx	400 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE38-4AAx	450 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
6SL3310-1GE41-0AAx	560 kW	6SL3300-1AE32-5BA0	50 kW	6SL3000-1BE32-5AA0
Line voltage 500 – 600 V 3 AC				
6SL3310-1GF31-8AAx	110 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF32-2AAx	132 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF32-6AAx	160 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF33-3AAx	200 kW	6SL3300-1AF32-5AA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF34-1AAx	250 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF34-7AAx	315 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF35-8AAx	400 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF37-4AAx	450 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
6SL3310-1GF38-1AAx	560 kW	6SL3300-1AF32-5BA0	50 kW	6SL3000-1BF32-5AA0
Line voltage 660 – 690 V 3 AC				
6SL3310-1GH28-5AAx	75 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-0AAx	90 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-2AAx	110 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-5AAx	132 kW	6SL3300-1AH31-3AA0	25 kW	6SL3000-1BH31-3AA0
6SL3310-1GH31-8AAx	160 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH32-2AAx	200 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH32-6AAx	250 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH33-3AAx	315 kW	6SL3300-1AH32-5AA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH34-1AAx	400 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH34-7AAx	450 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH35-8AAx	560 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH37-4AAx	710 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0
6SL3310-1GH38-1AAx	800 kW	6SL3300-1AH32-5BA0	50 kW	6SL3000-1BH32-5AA0

2.2 Braking resistor

Description

In converters with no regenerative feedback capability, the energy that occurs in the drive train under regenerative conditions is fed back to the DC link where it is reduced via braking resistors.

The braking resistor is connected to the Braking Module. The distance between the Braking Module and braking resistor must not exceed 100 m. This enables the resulting heat loss to be dissipated outside the switchgear room.

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

To boost performance, Braking Modules and braking resistors can be connected in parallel. In this case, the Braking Modules are installed in the discharged air ducts of the Power Module. Depending on the size of the Power Module, overall up to 3 slots are available:

- Frame size FX: 1
- Frame size GX: 1
- Frame size HX: 2
- Frame size JX: 3

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.

Mechanical installation

3.1 General



WARNING

To ensure that the devices operate safely and reliably, they must be properly installed and commissioned by qualified personnel, taking into account the warnings provided in these operating instructions.

In particular, the general and national installation and safety guidelines for high-voltage installations (e.g. VDE – the Union of German Technical Engineers) as well as the guidelines relating to the proper use of tools and personal protective equipment must be observed.

Death, serious injury, or substantial material damage can result if these factors are not taken into account.

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 3- 1 Tightening torques for connecting current-carrying parts

Screw	Torque
M6	6 Nm
M8	13 Nm
M10	25 Nm
M12	50 Nm

3.2 Braking Modules: overview

Braking Module for frame size FX

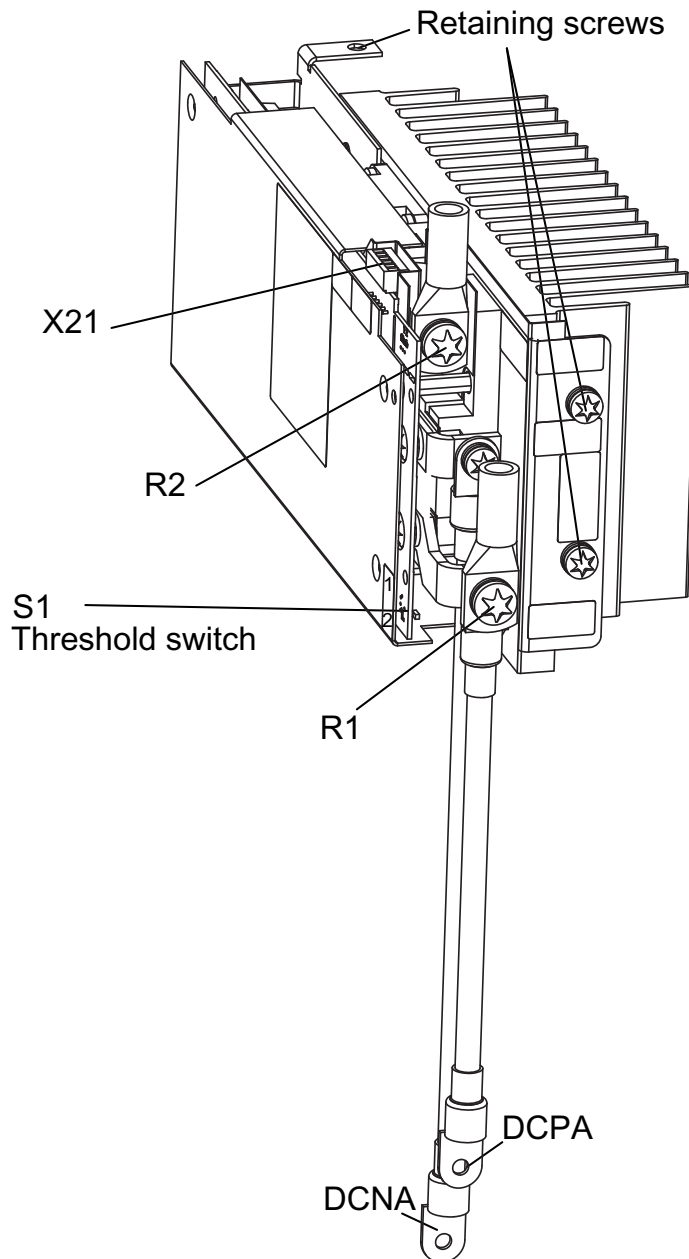


Figure 3-1 Braking Module for Power Module, frame size FX

Note

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

Braking Module for frame size GX

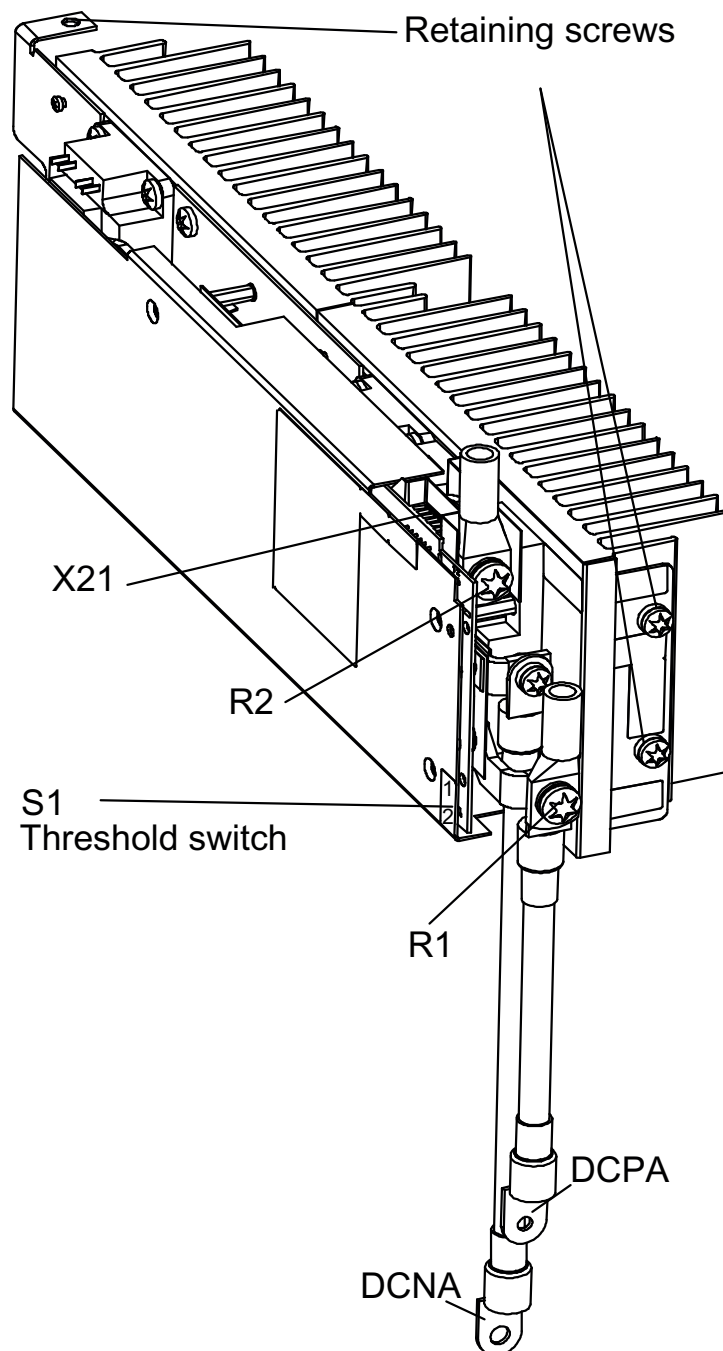


Figure 3-2 Braking Module for Power Module, (frame size GX)

Note

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

Braking Module for frame size HX/JX

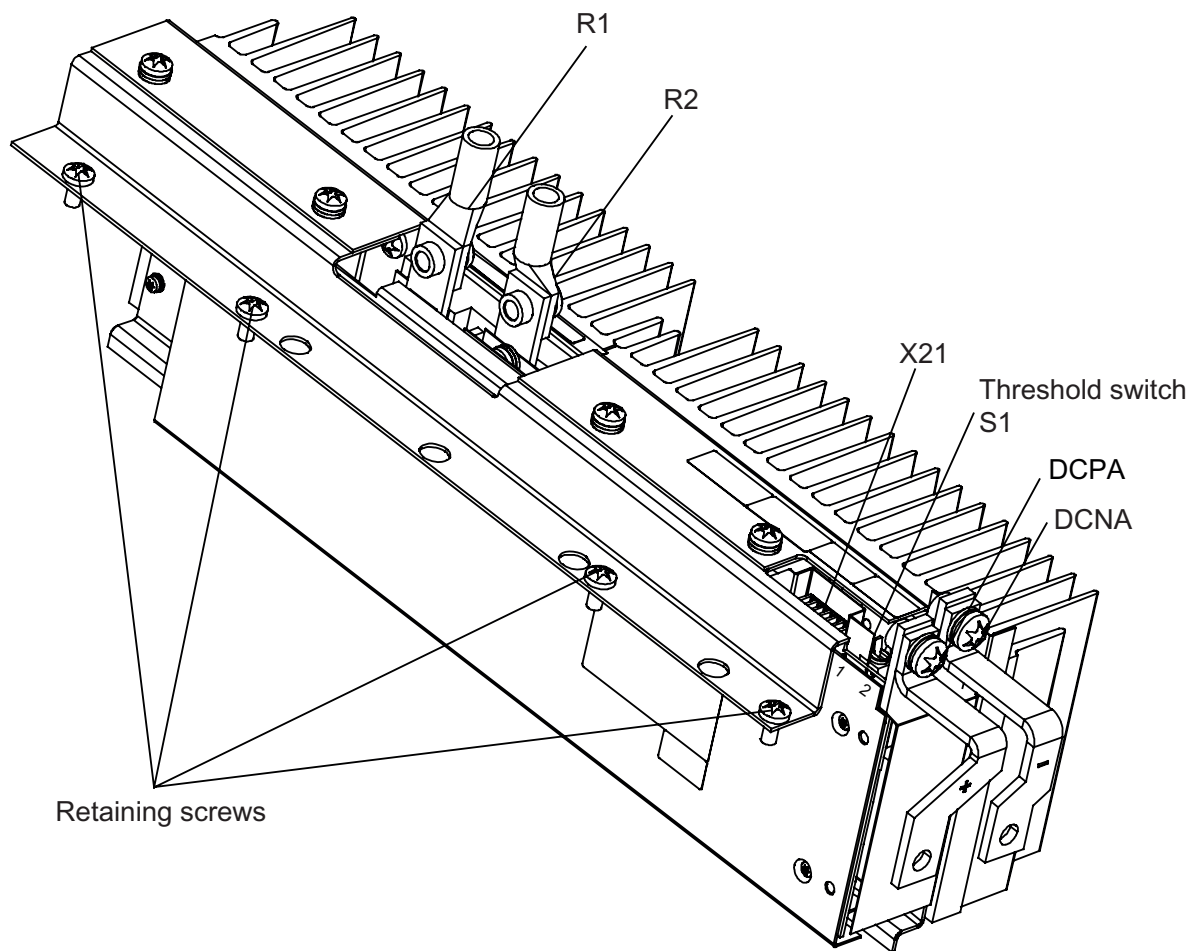


Figure 3-3 Braking Module for Power Module, frame size HX/JX

3.3 Installing the Braking Module

3.3.1 Installing the Braking Module in a Power Module, frame size FX

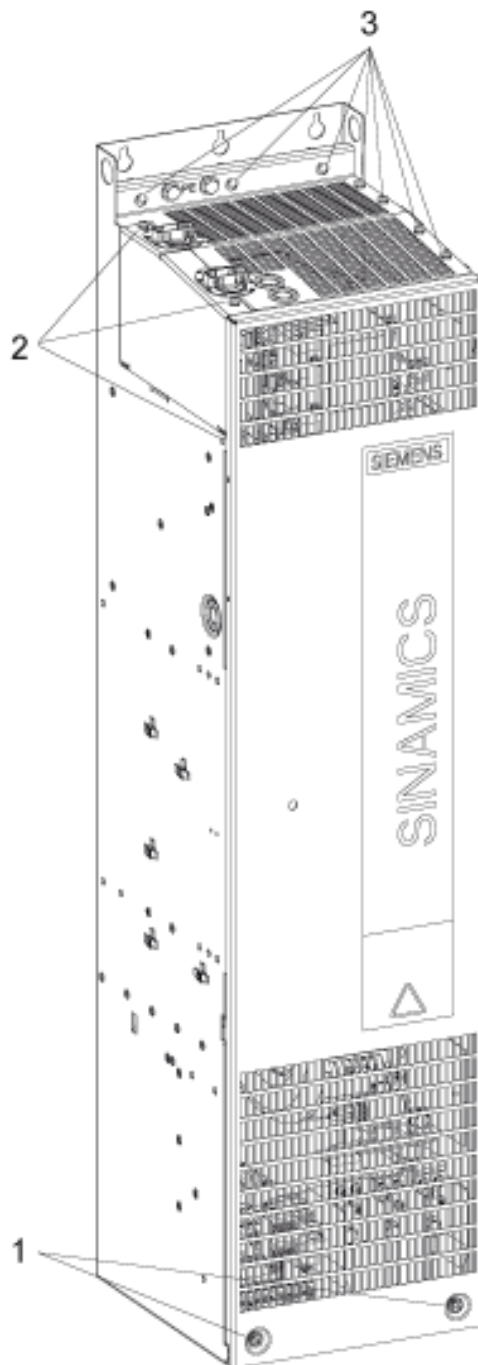


Figure 3-4 Installing the Braking Module in a Power Module, frame size FX – steps 1 - 3

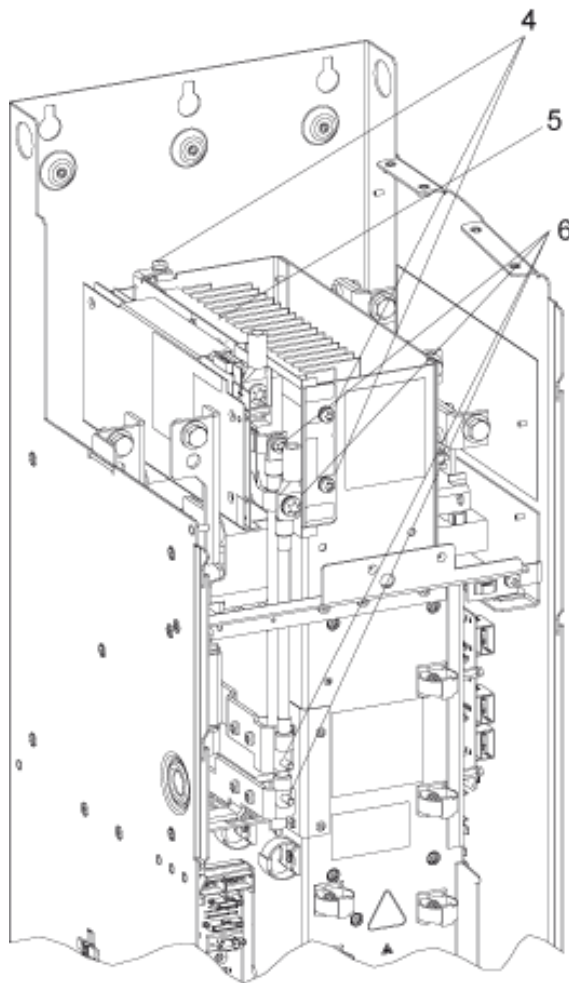


Figure 3-5 Installing the Braking Module in a Power Module, frame size FX – steps 4 - 6

Installing the Braking Module

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

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.
Unscrew the 1 x M6 nut on the left-hand side and remove the front cover.
3. Unscrew the 4 screws from the upper cover plate.
Unscrew the 3 screws from the rear cut-out sections and remove the rear cover.
4. Unscrew the 3 screws for the blanking plate and 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

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

3.3.2 Installing the Braking Module in a Power Module frame size GX

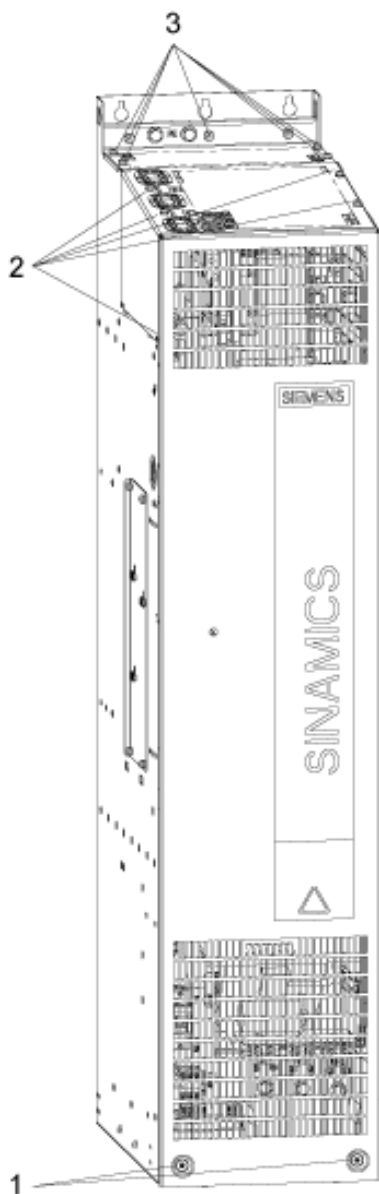


Figure 3-6 Installing the Braking Module in a Power Module frame size GX – steps 1 - 3

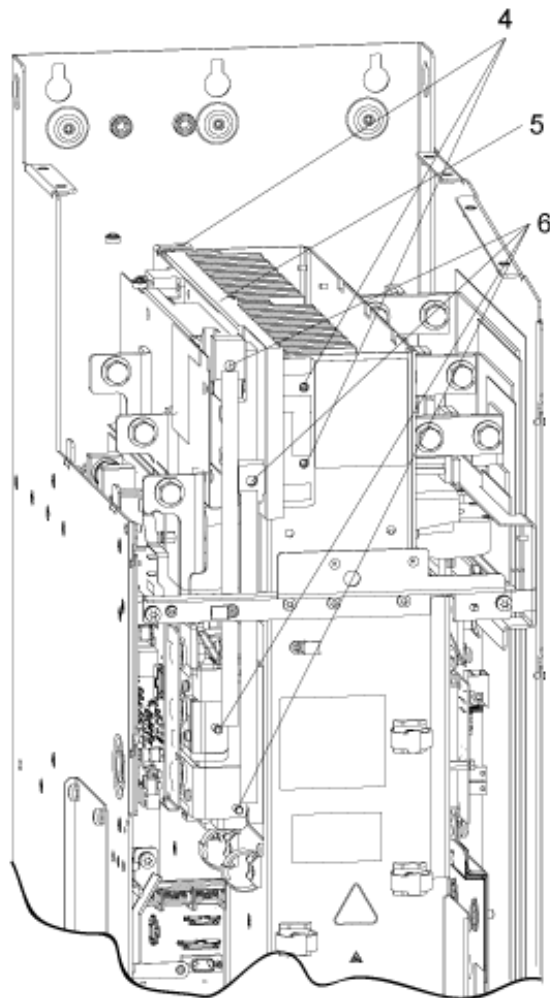


Figure 3-7 Installing the Braking Module in a Power Module frame size GX – steps 4 - 6

Installing the Braking Module

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

1. Unscrew the 2 M6 screws from the front cover and lift off the cover.
2. Unscrew the 4 screws from the upper cover plate.
Unscrew the 1 x M6 nut on the left-hand side and remove the front cover.
3. Unscrew the 4 screws from the upper cover plate.
Unscrew the 3 screws from the rear cut-out sections and remove the rear cover.
4. Unscrew the 3 screws for the blanking plate and 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
You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

3.3.3 Installing the Braking Module in a Power Module frame size HX

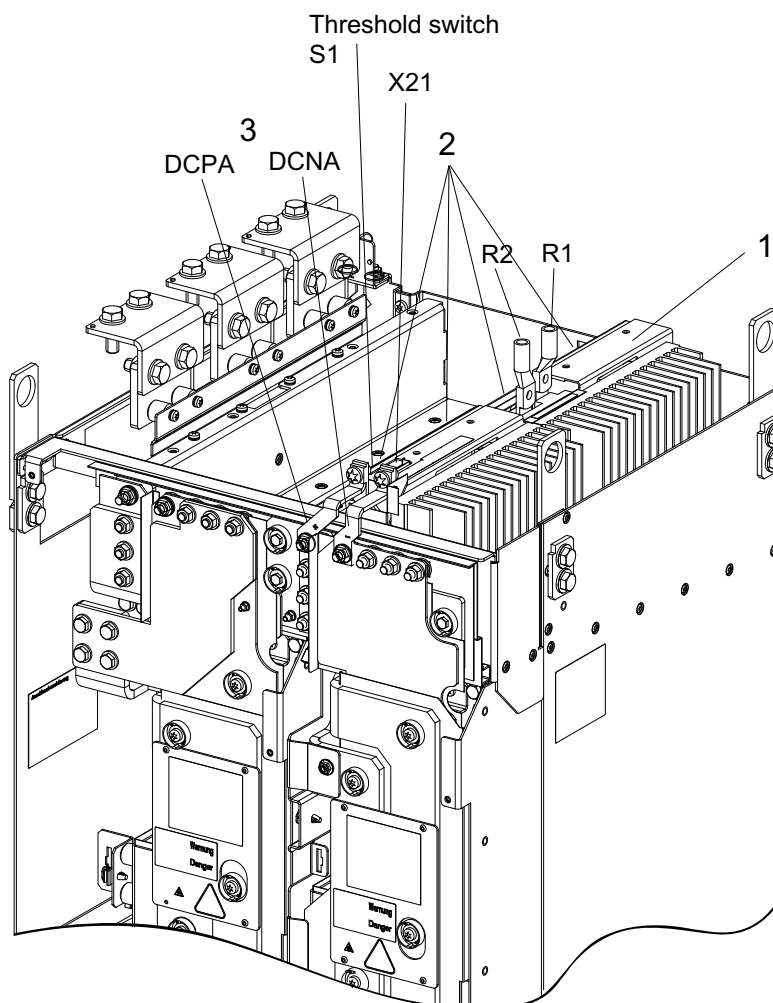


Figure 3-8 Installing the Braking Module in a Power Module frame size HX

Installing the Braking Module

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

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

CAUTION

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

3.3.4 Installing the Braking Module in a Power Module frame size JX

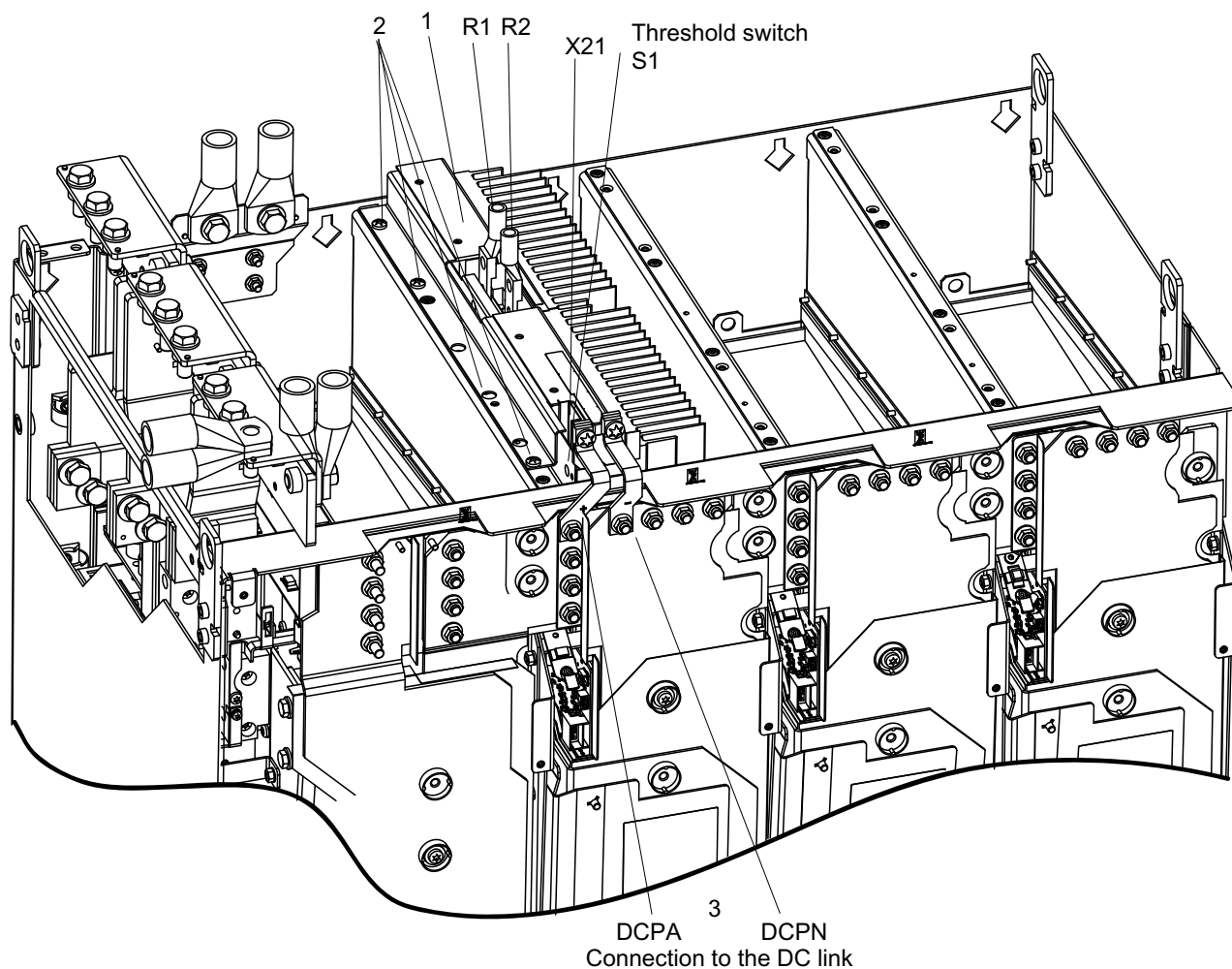


Figure 3-9 Installing the Braking Module in a Power Module frame size JX

Installing the Braking Module

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

CAUTION

You must observe the tightening torques. Information on this can be found in the table in the "Mechanical installation" section

3.4 Installing the braking resistor

The braking resistor should not be installed in the vicinity of the converter. The following points must be taken into account:

- The braking resistors are only suitable for floor mounting.
- The maximum cable length between the Braking Module and braking resistor is 100 m.
- Sufficient space must be available for dissipating the energy converted by the braking resistor.
- A sufficient distance from flammable objects must be maintained.
- 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 must be provided to protect the braking resistor from precipitation (in accordance with degree of protection IP20).

CAUTION

A ventilation clearance of 200 mm must be maintained on all sides of the braking resistor (with ventilation grilles).

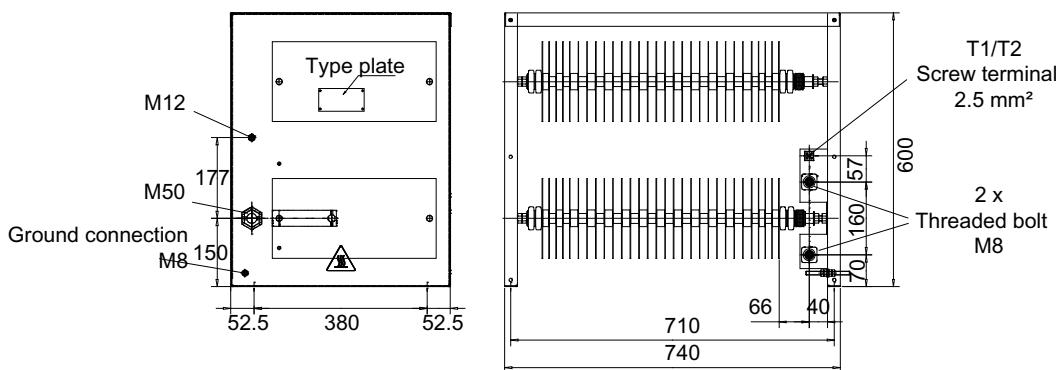


Figure 3-10 Dimension drawing for braking resistor (25 kW)

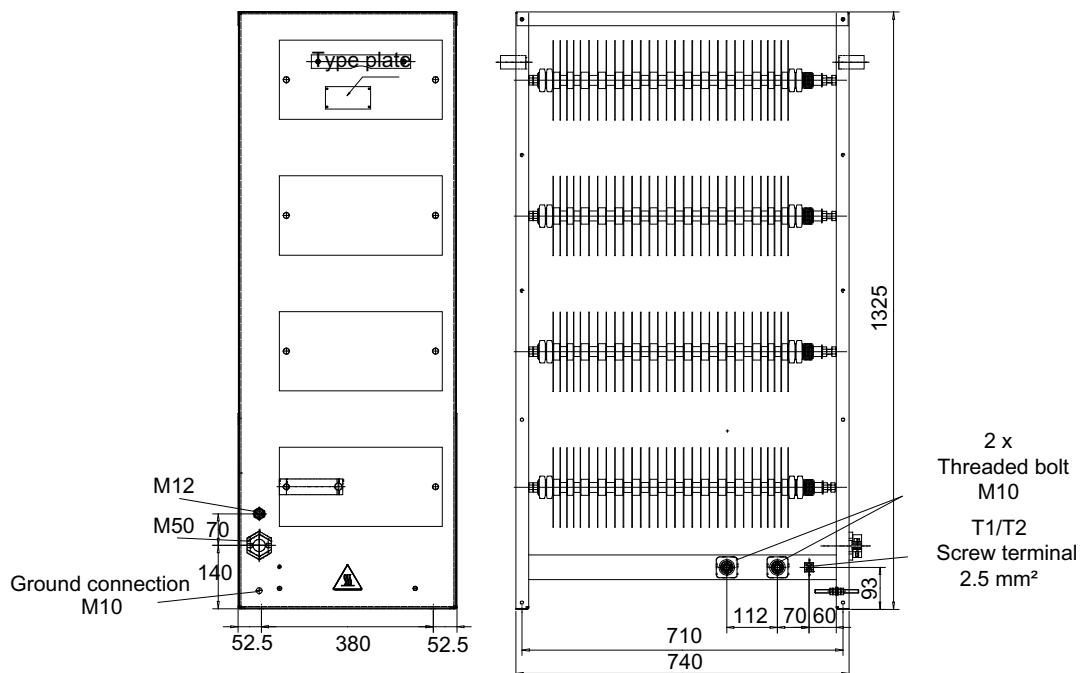


Figure 3-11 Dimension drawing for braking resistor (50 kW)



WARNING

The built-in units are operated with high voltages.
All connection procedures 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.

The operator is responsible for ensuring that the motor, converter, and other devices are installed and connected in accordance with the recognized technical rules in the country of installation and applicable regional guidelines. Special attention should be paid to cable dimensioning, fuses, grounding, shutdown, disconnection, and overcurrent protection.

If an item of protective gear trips in a branch circuit, a leakage current may have been disconnected. To reduce the risk of fire or an electric shock, the current-carrying parts and other components in the cabinet unit should be inspected and damaged parts replaced.
When an item of protective gear trips, the cause of the trip must be identified and rectified.

4.1 Connecting the Braking Module

Interface overview

The Braking Module has the following interfaces:

- DC link connection via flexible cables or a fixed busbar
- Braking resistor connection via flexible cables or a fixed busbar
- 1 digital input (inhibit Braking Module with high signal/acknowledge error with negative edge high -> low)
- 1 digital output (Braking Module defective)
- PE/protective conductor connection

Connection overview

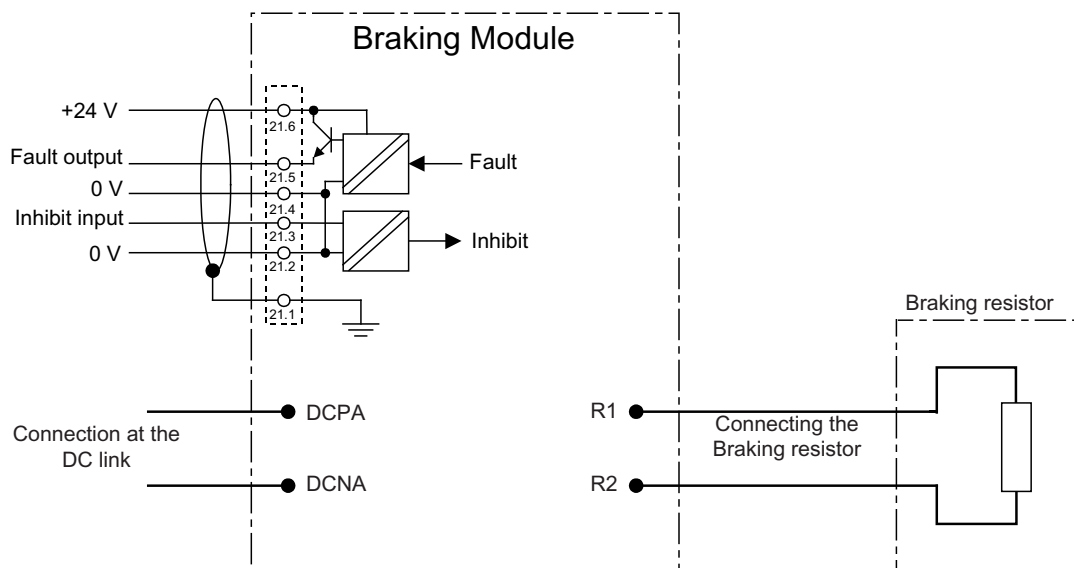


Figure 4-1 Connection overview for the Braking Module

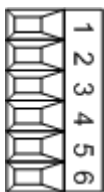
Braking resistor connection

Table 4- 1 Braking resistor connection

Terminal	Designation
R1	Braking resistor connection R+
R2	Braking resistor connection R-
Recommended connection cross-sections: For 25/125 kW: 35 mm ² , for 50/250 kW: 50 mm ²	

Digital inputs/outputs X21

Table 4- 2 Terminal block X21

	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 (induced current consumption): 10 mA at 24 V DC
Max. connectable cross-section 1.5 mm ²			

¹⁾ DI: digital input; DO: Digital output

Note

When the Braking Module is installed, the individual terminals on its X21 terminal block are positioned as follows: terminal "1" is at the rear, terminal "6" at the front.

Note

Applying a high signal to terminal X21.3 inhibits the Braking Module. With a falling edge, pending fault codes are acknowledged.

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 Power Module is switched off and the DC link capacitors are discharged.

4.1 Connecting the Braking Module

Table 4- 3 Response thresholds of the Braking Modules

Rated voltage	Response threshold	Switch position	Comment
380 V – 480 V 3 AC	673 V	1	774 V is the delivery condition setting. With line voltages of between 380 V and 400 V, 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 delivery condition setting. With a line voltage of 500 V, 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 delivery condition setting. With a line voltage of 660 V, 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 threshold switches of the Braking Modules are positioned on the panel as follows:

- Braking Modules for frame sizes FX and GX: position "1" is up; position "2" is down
- Braking Modules for frame sizes HX and JX: position "1" is back; position "2" is 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).

4.2 Connecting the braking resistor

WARNING

The Braking Module must only be connected when the Power Module has been disconnected from the power supply and the DC link capacitors have been discharged.

CAUTION

The cables for the braking resistor must be routed to prevent short-circuiting and ground faults in accordance with IEC 61800-5-2:2007, Table D.1.

This can be accomplished, for example, by:

- Eliminating the risk of mechanical damage to the cables
- Using cables with double insulation
- Maintaining adequate clearance, using spacers, for example
- Routing the cables in separate cable ducts or tubes

CAUTION

The length of the connecting cables between the Braking Module and external braking resistor must not exceed 100 m.

Recommended connection 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 4- 4 Thermostatic switch connection

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

Max. connectable cross-section: 2.5 mm²

Integration of the thermostatic switch as release for switch-off via OFF2

The thermostatic switch must be connected to a free digital input of the SINAMICS G130 so that the converter is safely disconnected from the power supply if the braking resistor overheats. A digital input on the TM31 terminal module, on the TB30 Terminal Board or on the Control Unit can be used for this

Subsequently the digital input must be used as release for a switch-off with OFF2. External fault 2). The interconnection can be made with the STARTER or via the AOP30.

4.3 Disabling the Vdc-max controller

The Vdc-max controller must be switched off (p1240 = 0) when a brake chopper is used.

Maintenance and servicing

Maintenance and servicing are not carried out for the Braking Module and braking resistor. If a fault occurs, the Braking Module and/or braking resistor must be replaced.

Technical specifications

General technical specifications

Table 6- 1 General technical specifications

Product standard	EN 61800-5-1		
Ambient conditions	Storage	Transport	During operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative humidity (non-condensing), corresponds to class:	5 ... 95 % 1K4 to EN 60721-3-1	5 ... 95 % at 40 °C 2K3 to EN 60721-3-2	5 ... 95 % 3K3 to EN 60721-3-3
Mechanical stability	Storage	Transport	During operation
Vibrational load: - Displacement - Acceleration	1.5 mm at 5 ... 9 Hz 5 m/s ² at >9 ... 200 Hz	3.5 mm at 5 ... 9 Hz 10 m/s ² at >9 ... 200 Hz	0.075 mm at 10 ... 58 Hz 10 m/s ² at >58 ... 200 Hz
Shock load: - Acceleration	40 m/s ² at 22 ms	100 m/s ² at 11 ms	100 m/s ² at 11 ms

Detailed technical specifications for the Braking Module

Table 6- 2 Technical specifications of Braking Module, 380 V – 480 V 3 AC

Braking Module 6SL3300-	1AE31-3AA0	1AE32-5AA0	1AE32-5BA0
P _{DB} power (rated power)	25 kW	50 kW	50 kW
P ₁₅ 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)	774 V (673 V)	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		
Version in acc. with:	UL and IEC	UL and IEC	UL and IEC
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. connection cross-section R1/R2	35 mm²	50 mm²	50 mm²
Suitable for installation in a Power Module with frame size	FX	GX	HX/JX
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Table 6- 3 Technical specifications of Braking Module, 500 V – 600 V 3 AC

Braking Module 6SL3300-	1AF32-5AA0	1AF32-5BA0
P _{DB} power (rated power)	50 kW	50 kW
P ₁₅ power	250 kW	250 kW
P ₂₀ power	200 kW	200 kW
P ₄₀ power	100 kW	100 kW
Variable response thresholds	967 V (841 V)	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	
Version in acc. with:	UL and IEC	UL and IEC
R1/R2 connection	M8 screw	M8 screw
Max. connection cross-section R1/R2	50 mm²	50 mm²
Suitable for installation in a Power Module with frame size	GX	HX/JX
Weight, approx.	7.3 kg	7.5 kg

Table 6- 4 Technical specifications of Braking Module, 660 V – 690 V 3 AC

Braking Module 6SL3300-	1AH31-3AA0	1AH32-5AA0	1AH32-5BA0
P _{DB} power (rated power)	25 kW	50 kW	50 kW
P ₁₅ 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	1,153 V (1,070 V)	1,153 V (1,070 V)	1,153 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		
Version in acc. with:	IEC	IEC	IEC
R1/R2 connection	M8 screw	M8 screw	M8 screw
Max. connection cross-section R1/R2	35 mm²	50 mm²	50 mm²
Suitable for installation in a Power Module with frame size	FX	GX	HX/JX
Weight, approx.	3.6 kg	7.3 kg	7.5 kg

Detailed technical specifications for the braking resistor

Table 6- 5 Technical specifications of braking resistor, 380 V – 480 V 3 AC

Braking resistor	6SL3000-1BE31-3AA0	6SL3000-1BE32-5AA0
P _{DB} power (rated power)	25 kW	50 kW
P ₁₅ power	125 kW	250 kW
P ₂₀ power	100 kW	200 kW
P ₄₀ power	50 kW	100 kW
Resistance	4,4 Ω (± 7.5%)	2.2 Ω (± 7.5%)
Maximum current	189 A	378 A
Max. connectable cross-section	50 mm ²	70 mm ²
Cable entry	Via M50 cable gland	Via M50 cable gland
Power connection	Via M8 bolt-type screw terminal	Via M10 bolt-type screw terminal
Degree of protection	IP20	IP20
Width x height x depth	740 x 605 x 485 mm	810 x 1325 x 485 mm
Weight, approx.	50 kg	120 kg

Table 6- 6 Technical specifications of braking resistor, 500 V – 600 V 3 AC

Braking resistor	6SL3000-1BF31-3AA0	6SL3000-1BF32-5AA0
P _{DB} power (rated power)	25 kW	50 kW
P ₁₅ power	125 kW	250 kW
P ₂₀ power	100 kW	200 kW
P ₄₀ power	50 kW	100 kW
Resistance	6.8 Ω (±7.5%)	3.4 Ω (± 7.5%)
Maximum current	153 A	306 A
Max. connectable cross-section	50 mm ²	70 mm ²
Cable entry	Via M50 cable gland	Via M50 cable gland
Power connection	Via M8 bolt-type screw terminal	Via M10 bolt-type screw terminal
Degree of protection	IP20	IP20
Width x height x depth	740 x 605 x 485 mm	810 x 1325 x 485 mm
Weight, approx.	50 kg	120 kg

Table 6- 7 Technical specifications of braking resistor, 660 V – 690 V 3 AC

Braking resistor	6SL3000-1BH31-3AA0	6SL3000-1BH32-5AA0
P _{DB} power (rated power)	25 kW	50 kW
P ₁₅ power	125 kW	250 kW
P ₂₀ power	100 kW	200 kW
P ₄₀ power	50 kW	100 kW
Resistance	9.8 Ω (±7.5%)	4.9 Ω (± 7.5%)
Maximum current	127 A	255 A
Max. connectable cross-section	50 mm ²	70 mm ²
Cable entry	Via M50 cable gland	Via M50 cable gland
Power connection	Via M8 bolt-type screw terminal	Via M10 bolt-type screw terminal
Degree of protection	IP20	IP20
Width x height x depth	740 x 605 x 485 mm	810 x 1325 x 485 mm
Weight, approx.	50 kg	120 kg

Duty cycle

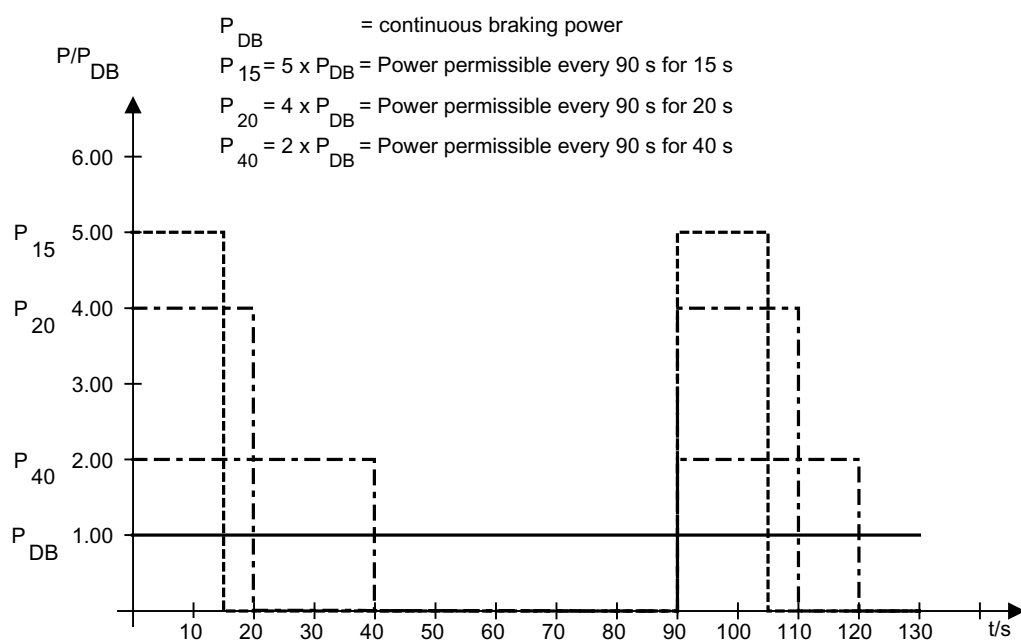


Figure 6-1 Duty cycles for braking resistors

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