SEW EURODRIVE

Operating Instructions

Application Inverters

MOVIDRIVE® technology

Edition 08/2024

31975542/EN

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1 General information

1.1 Structure of the safety notes

1.1.1 Meaning of signal words

The following table shows the graduation and meaning of the signal words in the safety notes:

Signal word	Meaning	Consequences if not observed
⚠ **DANGER**	Imminent danger	Death or severe injuries
⚠ **WARNING**	Possibly dangerous situation	Death or severe injuries
⚠ **CAUTION**	Possibly dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.1.2 Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of automatic restart

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2 Safety notes

2.1 Target group

Specialist for mechanical work

Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product, and who possess the following qualifications:

- Qualifications in the field of mechanics in accordance with the national regulations
- Familiarity with this documentation

Specialist for electrotechnical work

Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product, and who possess the following qualifications:

- Qualifications in the field of electrical engineering in accordance with the national regulations
- Familiarity with this documentation

Additional qualifications

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.

The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transport, storage, installation, operation and waste disposal may only be carried out by persons who are trained and instructed appropriately. These instructions must enable the persons to carry out the required activities and work steps safely and in accordance with regulations.

2.2 Designated use

The product is intended for control cabinet installation in electrical systems or machines.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply. Observe EN 60204-1 (Safety of machinery - electrical equipment of machines). The product meets the requirements stipulated in the Low Voltage Directive 2014/35/EU.

The standards given in the declaration of conformity apply to the product.

The systems can be mobile or stationary.

Only connect ohmic/inductive loads.

The product can be used to operate the following motors in industrial and commercial systems:

- AC asynchronous motors
- AC synchronous motors

Technical data and information on the connection conditions are provided on the nameplate and in chapter "Technical data" in the documentation. Always comply with the data and conditions.

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Unintended or improper use of the product may result in severe injury to persons and damage to property.

2.2.1 Lifting applications

To avoid danger of fatal injury due to falling hoists, observe the following points when using the product in lifting applications:

- Use mechanical protection devices.
- Perform a hoist startup.

Application in ELSM® control mode

When the inverter is operated in ELSM® control mode, using it in lifting applications and inclining tracks is not permitted.

2.2.2 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive areas.
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation.
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1.
- Use at an elevation of more than 3800 m above sea level.

In addition, observe the restrictions of use in chapter "General technical data".

2.3 Functional safety technology

The product includes the STO safety subfunction. As an option, additional safety subfunctions can be available for the product.

The safety subfunctions are deactivated in the delivery state. The product may not perform any safety function without higher-level safety systems.

Observe the product manual of the device for use of the STO safety subfunction or other safety subfunctions.

2.4 Transport

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product or the packaging is damaged, do not assemble, install, connect, or start up the product. If the packaging is damaged, the product itself may also be damaged.

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- Only place the product lying on the heat sink during transport.
- Always use all attachment points if available. The attachment points are designed to carry only the mass of the product. Do not apply any additional loads.

If necessary, use suitable, adequately dimensioned transport aids.

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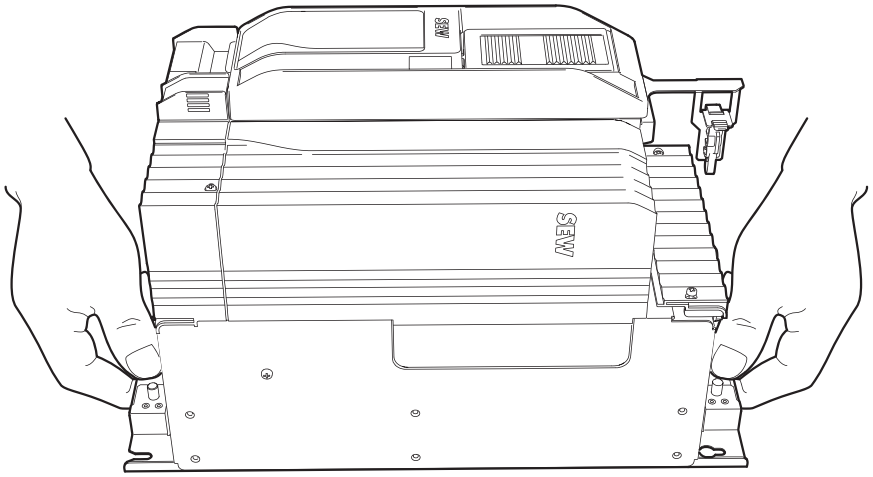
Observe the notes on the climatic conditions in accordance with chapter "Technical data" in the corresponding product manual.

2.4.1 Transport information - size 5

Observe the following information:

- Hold inverters of size 5 by the handling points provided on the rear panel of the housing.



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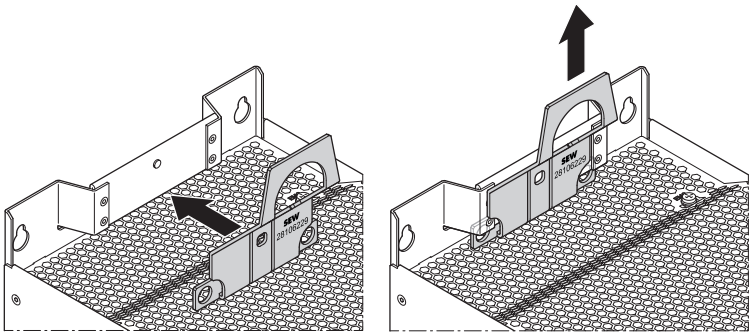
2.4.2 Transport information - size 6

Observe the following information:

- Hook in the lifting eye at the top of the housing.
- Attach the lifting eye to lifting devices using suitable slings.



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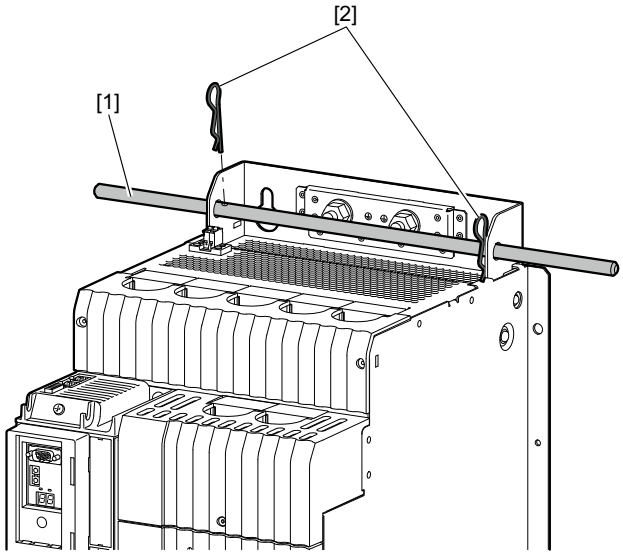
2.4.3 Transport information - size 7

Observe the following information:

- Transport the inverter using the carrying bar [1] included in the scope of delivery.
- Secure the carrying bar against axial displacement using both split pins [2].



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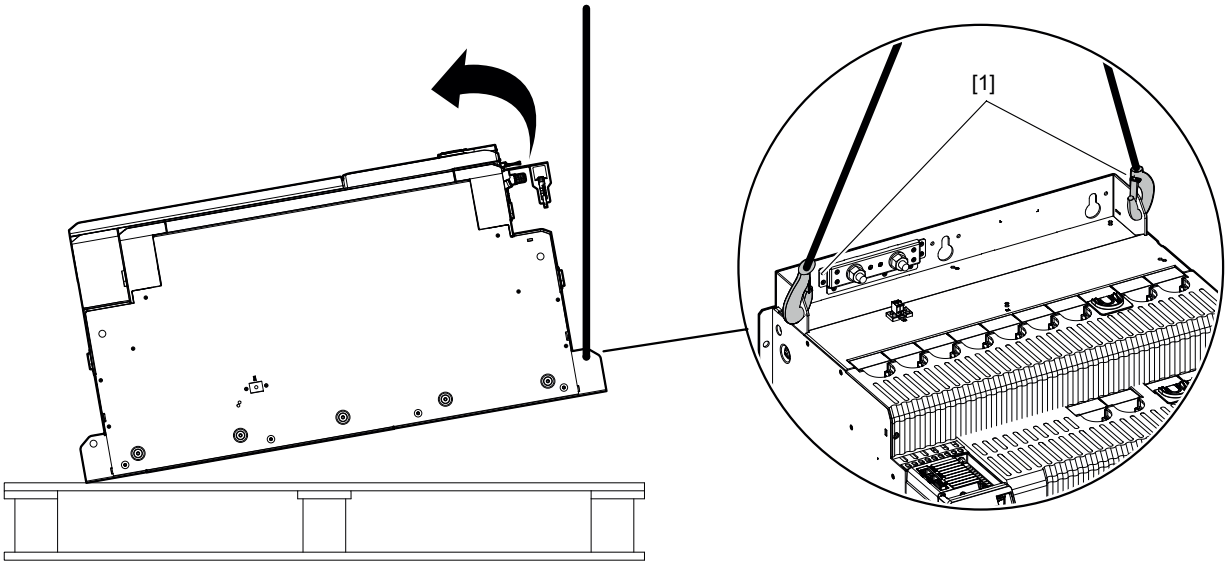
2.4.4 Transport information - size 8

Observe the following information:

- Only transport size 8 inverters lying on their rear panel on the transport pallet.
- Only set up size 8 inverters from the transport pallet using a suitable lifting device. Use the recesses [1] provided on the housing for this purpose.
- Only place size 8 inverters on the transport pallet lying on their rear panel.



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2.5 Creating a safe working environment

Before you work on the product, ensure a safe working environment. Observe the following basic safety note:

2.5.1 Performing work on the product safely

Defective or damaged product

Never install defective or damaged products. Observe the following information to avoid injuries or damage:

- Before installation, check the product for external damage and replace a damaged product.

Hot surfaces

The surfaces of the product can become very hot during operation. Observe the following information to avoid burns:

- Let the product and its accessories cool down before touching it.
- Do not touch any surfaces of the product during operation, except for the control elements.
- Also observe the labels and hazard symbols on the product.

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Falling load

Observe the following information to avoid death or severe injury due to falling loads:

- Do not stand under the load.
- Secure the area where loads can fall down.
- Use personal protective equipment (such as helmet and safety shoes).
- Use a suitable lifting tool (chain hoist, forklift) and transport protection.

Rotating parts

When working on the product, there may be a risk of exposed rotating parts and uncontrolled movement of the components. Observe the following information to avoid body parts getting crushed or pulled in:

- Switch off the product before you start working on it.
- Observe all technical data of the product.
- Do not reach into the hazard zone.
- Follow the 5 safety rules in chapter: "Performing electrical work safely" (→ 🗎 11).

Sharp edges

Observe the following information to avoid cuts and malfunctions caused by sharp or non-deburred cutting edges:

- Wear safety gloves.

2.5.2 Performing electrical work safely

Observe the following information to perform electrical work safely:

Electrical work may only be performed by a qualified electrician or an electronically instructed person under the supervision of an electrician.

The fact that the operation LED and other display elements are no longer illuminated does not indicate that the product has been disconnected from the supply system and no longer carries any voltage.

Dangerous voltage

Observe the 5 safety rules in the specified sequence when working on electrical components, unless there are important reasons to deviate from them (observe the specifications of DIN EN 50110-1 (VDE 0115-1)):

- Disconnect.
- Secure the device against a restart.
- Check that no voltage is applied.
- Ground and short-circuit.
- Cover or cordon off neighboring live parts.

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Dangerous voltage

When the system is switched on, dangerous voltages are present at all power connections as well as any cables and terminals that are connected. This is also the case even if the product is inhibited. Observe the following information to avoid the risk of electric shock:

- Do not touch any exposed live parts (e.g. male contacts, plug connectors, terminals).
- Secure all open live components with a touch guard.
- Before applying the supply voltage, make sure that all required covers are mounted.

Danger due to electric arc

An electric arc may occur when plug-in connections are disconnected or connected while voltage is applied (e.g. connection between drive and inverter). In order to avoid damaging electrical components, observe the following information:

- Do not disconnect power connections during operation.
- Do not connect power connections during operation.
- Ensure that the product is de-energized before disconnecting and connecting the plug-in connections.

Damage to property due to damaged or loose cables

To avoid damaging electrical components (e.g. cables and plug-in connections), observe the following information:

- Do not insert plug-in connections if cables are subjected to tensile stress.
- Do not kink cables when connecting plug-in connections.
- Replace loose or defective plug-in connections.
- Make sure that cables are not pinched or crushed.
- Do not run cables near or along a sharp edge.

Dangerous voltage due to charged capacitors

Voltage from charged capacitors can still be present in live components or power connections after disconnecting from the supply voltage. Observe the following information:

- Observe the following waiting period after disconnecting the supply voltage and before performing any electrical work: **10 minutes**.
- Ensure that the unit is de-energized.
- Also observe the labels and hazard symbols on the product.

2.6 Installation/assembly

Ensure that the product is installed and cooled in accordance with the regulations in the documentation.

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Protect the product from excessive mechanical strain. The product and its mounted components must not protrude into the path of persons or vehicles. Ensure that no components are deformed or no insulation spaces are modified, particularly during transportation. Electrical components must not be mechanically damaged or destroyed.

2.7 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with IEC 61800-5-1. The connected signal circuits must meet requirements according to SELV (**S**afety **E**xtra **L**ow **V**oltage) or PELV (**P**rotective **E**xtra **L**ow **V**oltage) to ensure protective separation. The installation must meet the requirements for protective separation.

In order to avoid exceeding the permitted contact voltages in SELV or PELV power circuits in the event of a fault, continuous equipotential bonding is required in the vicinity of these power circuits. If this is not possible, other preventive measures must be taken. These preventive measures are described in IEC 61800-5-1.

2.8 Electrical installation

Ensure that all of the required covers are correctly attached after the electrical installation.

Make sure that preventive measures and protection devices comply with the applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

2.8.1 Stationary application

The necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	Ground connection

2.8.2 Regenerative operation

The drive is operated as a generator due to the kinetic energy of the system/machine. Before opening the connection box, secure the output shaft against rotation.

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2.9 Startup/operation

Observe the safety notes in chapters "Startup" and "Operation" in this documentation.

Make sure the connection boxes are closed and screwed before connecting the supply voltage.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts as well as hot surfaces during operation.

Additional preventive measures may be required for applications with increased hazard potential. Be sure to check the effectiveness of the protection devices after every modification.

In the event of deviations from normal operation, switch off the product. Possible deviations are increased temperatures, noise, or vibration, for example. Determine the cause. Contact SEW-EURODRIVE if necessary.

When the device is switched on, dangerous voltages are present at all power connections as well as at any connected cables and terminals. This also applies even when the product is inhibited and the motor is at standstill.

Risk of burns due to arcing: Do not disconnect power connections during operation. Do not connect power connections during operation.

If you disconnect the product from the voltage supply, do not touch any live components or power connections because capacitors might still be charged. Observe the following minimum switch-off time:

10 minutes.

Observe the corresponding information signs on the product.

The fact that the operation LED and other display elements are no longer illuminated does not indicate that the product has been disconnected from the supply system and no longer carries any voltage.

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, first disconnect the product from the supply system and then start troubleshooting.

Risk of burns: The surface temperature of the product can exceed 60 °C during operation. Do not touch the product during operation. Let the product cool down before touching it.

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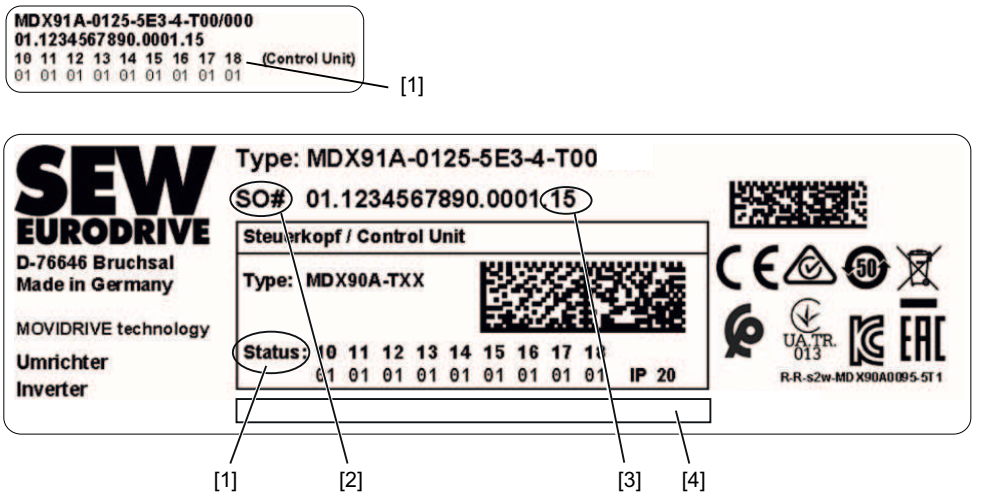
3 Device structure

3.1 Nameplates

3.1.1 Example of system nameplate



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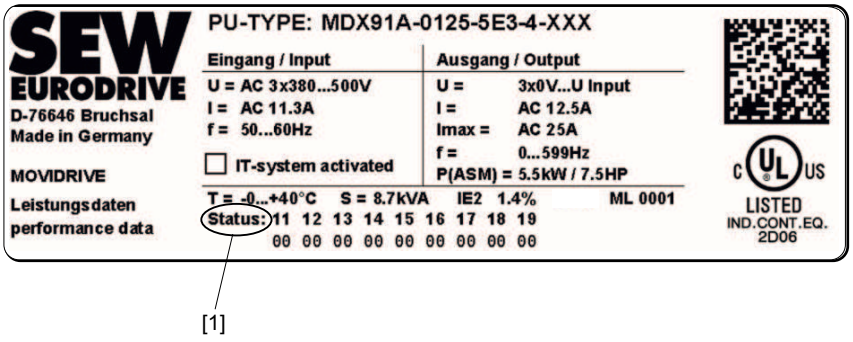
[1] Device status

[2] Serial number

[3] Year of manufacture as part of the serial number. Example: 15 → year of manufacture 2015

[4] Free text line, see product manual > chapter "Product description" > "Technologies" > "Free text on nameplate"

3.1.2 Example of a performance data nameplate



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[1] Device status

3.1.3 Product label

	Product label with QR code in accordance with IEC 61406. The QR code can be scanned. You will be redirected to the Digital Services of SEW-EURODRIVE. There, you have access to product-specific data, documents, and further services. **In the "Documentation" > "Data and documents" area, the product manual of the device with further information is available.**

3.2 Type designation

Example: MDX90A-0125-5E3-T00	
MD	**Product family** MOVIDRIVE®
X	**Device type** X = Single-axis inverter
90	**Series** 90 = Without DC 24 V switched-mode power supply 91 = With DC 24 V switched-mode power supply
A	**Version** A = Version status of the device series
0125	**Performance class** 0125 = Nominal output current, e.g. 0125 = 12.5 A
5	**Connection voltage** 1 = Special voltage, see device-specific technical data 2 = AC 200 – 240 V 5 = AC 380 – 500 V
E	**Power section variant EMC** 0 = Interference suppression integrated E = EMC filter limit value category C2 according to EN 61800-3
3	**Connection type** 3 = 3-phase connection type
T	**Device variant** 0 = Not relevant T = MOVIDRIVE® technology: Control via fieldbus L = Inverter with POWERLINK CiA402
0	**Technology level** 0 = Standard design

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Example: MDX90A-0125-5E3-T00	
0	**Application level** 0 = Standard/MOVIKIT® Velocity Drive 1 = MOVIKIT® Positioning Drive 2 = Customized solution
	Options /L = Design with painted printed circuit boards /P = Parameters ex-works The following list is an example: /CES11A = Multi-encoder card /CES12A = multi-encoder card with incremental encoder simulation /CID21A, /CIO21A = Input/output cards /CFE21A = EtherNet/IP™ and Modbus TCP /CFN21A = PROFINET /CFP21A = PROFIBUS /CFL21A = POWERLINK /CS..A = MOVISAFE® CS..A safety option

3.3 Markings

3.3.1 Basic device

Mark	Definition
CE	The CE marking indicates compliance with the following European directives: • Low Voltage Directive 2014/35/EU[1)] • EMC Directive 2014/30/EU • Machinery Directive 2006/42/EC • Directive 2011/65/EU for limiting the use of certain hazardous substances in electrical and electronic equipment • Ecodesign Regulation 2019/1781
	The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU.
EAC	The EAC mark indicates compliance with the requirements of the technical regulations of the Customs Union (Eurasian Economic Union), Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia.
	The RCM mark indicates compliance with the technical regulations of the Australian Communications and Media Authority (ACMA).
	The China RoHS mark indicates compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging.

Mark	Definition
	The NM mark states compliance with the following Moroccan directives[2]: • Low Voltage Directive no. 2573-14 (July 16, 2015) • EMC Directive N° 2574-14 (July 16, 2015)
	The UA.TR mark declares conformity with the technical regulations of Ukraine.
	The KC mark declares compliance with §3 of Article 58-2 for the Korean Radio Wave Act.
	The UKCA mark indicates compliance with British guidelines.
	The UL and cUL mark indicates UL approval. cUL is equally eligible for approval by the CSA.

1) For products with functional safety, the requirements from the Low Voltage Directive are fulfilled by the Machinery Directive.
2) The selectable approvals UKCA (Great Britain) and NM (Morocco) are mutually exclusive.

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4 Mechanical installation

4.1 Installation notes

According to the degree of protection, the inverter is intended exclusively for installation in a control cabinet.

Note the following points during installation:

- Only install the device on a level, low-vibration, and torsionally rigid support structure.
- Observe the weight of the unit and the permissible tightening torques of the fasteners.
- Check the validity of the degree of protection using the information in the operating instructions and the data on the nameplate.
- Make sure that the cooling air supply is unobstructed; warm exhaust air from other units must not influence the cooling.

4.2 Installation requirements

Check that the following conditions have been met:

- The device is undamaged (no damage caused by transport or storage).
- The ambient temperature corresponds to the operating instructions and nameplate.
- Observe the ambient conditions stated in the product manual > chapter "Technical data".

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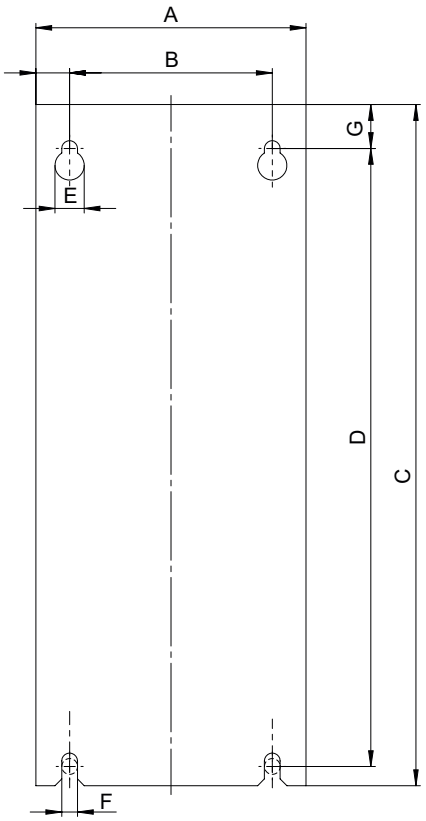
4.3 Preparing the control cabinet back panel

Proceed as follows:

1. Drill the holes according to the following drilling diagram.
2. Cut the internal thread in the holes according to the screw size used.



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Inverter	Dimensions of the device base plate in mm						
	A	B	C	D	E	F	G
Size 1	95	50	350	325	12	6	18
Size 2	105	50	350	325	12	6	18
Size 3	105	80	350	325	12	6	18
Size 4	135	80	350	325	12	6	18
Size 5	196	160	471	440	13	7	18
Size 6	240	200	544	510	13	7	18
Size 7	320	220	990	950	23	11	25
Size 8	518	450	990	950	23	11	25

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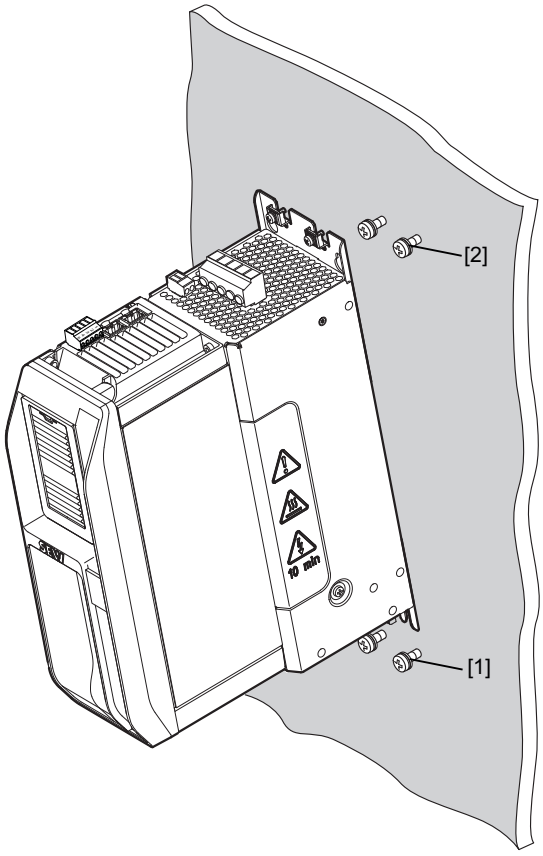
4.4 Installing inverter sizes 1 – 8

Proceed as follows:



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The retaining screws [1] and [2] are screwed into the prepared tapped holes in the mounting plate in the control cabinet but are not tightened.

1. Place the inverter with the slotted holes in the device base plate onto the retaining screws [1] from the top.
2. Push the inverter backwards to insert the retaining screws [2] into the upper holes in the device base plate.
3. Lower the inverter.
4. Tighten the retaining screws [1] and [2].

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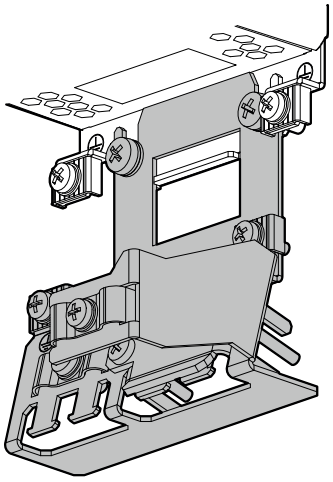
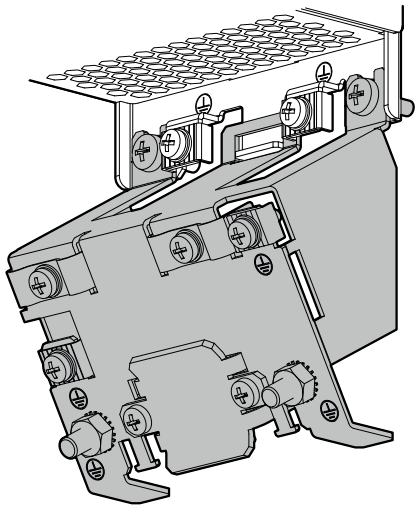
4.5 Installing the shield plate for the power section

A set of shield terminals is supplied as standard for the power section sizes 1 – 4. The shield terminals for the power section provide you with a way of installing the shield for the motor, brake and braking resistor cables. The shield terminals are not yet installed on the unit. Install the shield terminal on the power section together with the unit's retaining screws. Insert the shield terminal as follows:

- **Sizes 1 – 2**



- **Sizes 3 – 4**



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- **Sizes 5 – 8**

  No shield terminals for the power section are supplied with these sizes. Use commercially available shield terminals to install the shielding of the motor, brake and braking resistor cables. Apply the shielding as closely as possible to the inverter.

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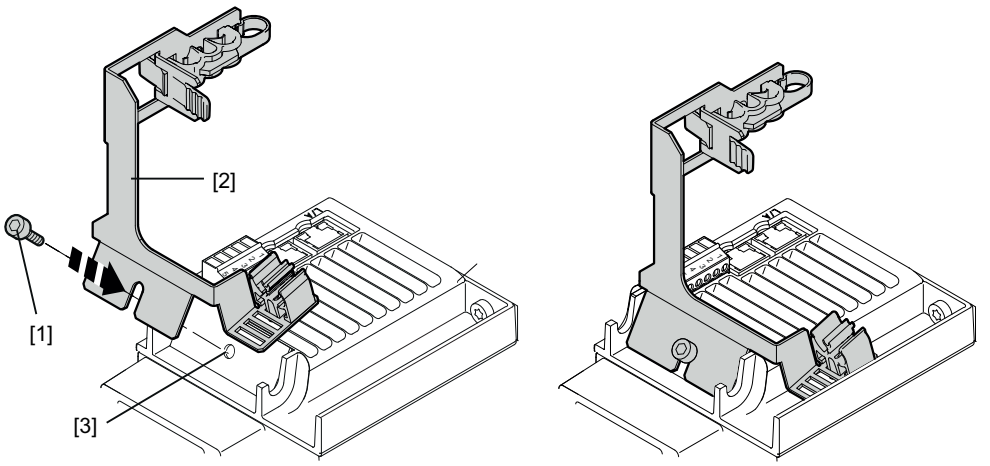
4.6 Installing the shield plate for signal cables

4.6.1 Installing the top shield plate

Proceed as follows:

1. Insert the shield plate [2] so that you can fasten it to the device housing [3] with the screw [1].



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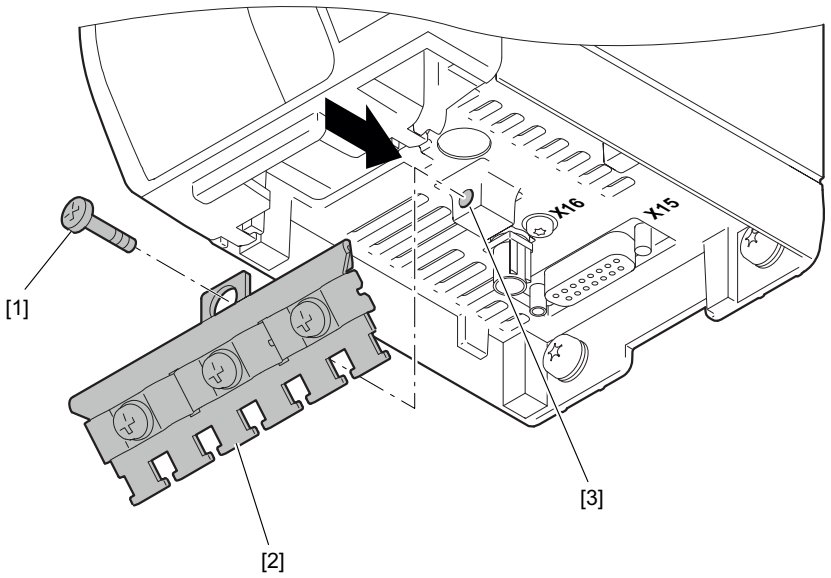
4.6.2 Installing the bottom shield plate

Proceed as follows:

1. Insert the shield plate [2] so that you can fasten it with the screw [1] in the position [3] shown in the figure.



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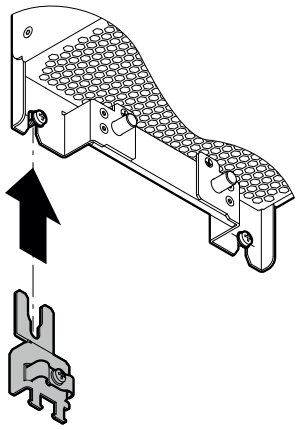
4.6.3 Installing the shield plate for the encoder

Proceed as follows:

A shield terminal is supplied as standard for the encoder from size 5 and larger. The shield terminal is not yet installed on the unit.

1. Loosen one of the lower retaining screws securing the inverter to the control cabinet back panel, but do not unscrew it completely.
2. Install the shield plate as shown.



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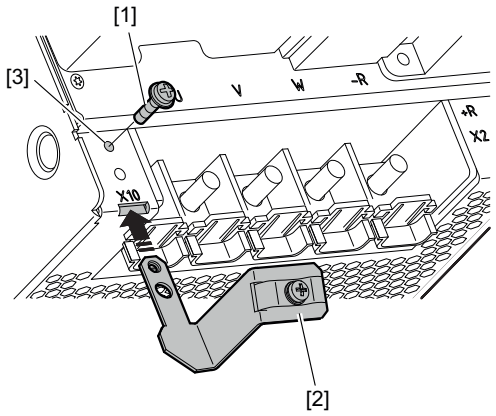
3. Retighten the retaining screws to secure the inverter to the control cabinet back panel.

4.6.4 Installing the shield plate for MOVILINK® DDI

Proceed as follows:

A shield plate is supplied as standard for MOVILINK® DDI from size 5 and larger. The shield plate is not yet installed on the unit.

1. Insert the shield plate [2] so that you can fasten it with the screw [1] in the position [3] shown.



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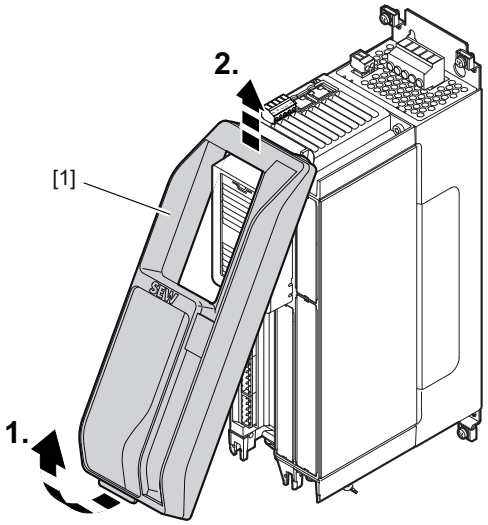
4.7 Removing and attaching the safety cover

Proceed as follows:

The inverter is equipped with a safety cover [1].

Removing the safety cover



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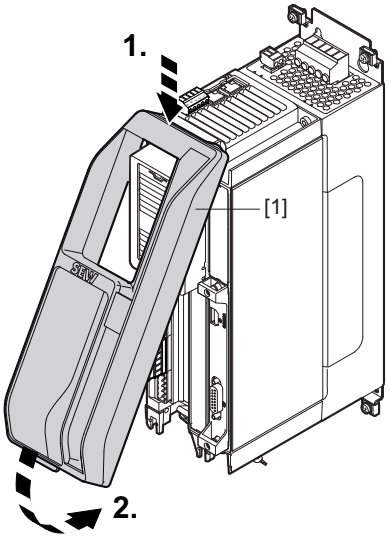
1. The safety cover [1] has a latching mechanism at the bottom. Pull the lower part of the safety cover away from the inverter to unlatch it.
2. Pivot the safety cover forward and lift it up and out of the mounting.

Installing the safety cover



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3. Place the safety cover [1] into the upper recess and move it towards the inverter until it clicks into place.
4. Always attach the safety cover [1] after having carried out installation work.

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4.8 Removing and reinstalling the touch guards

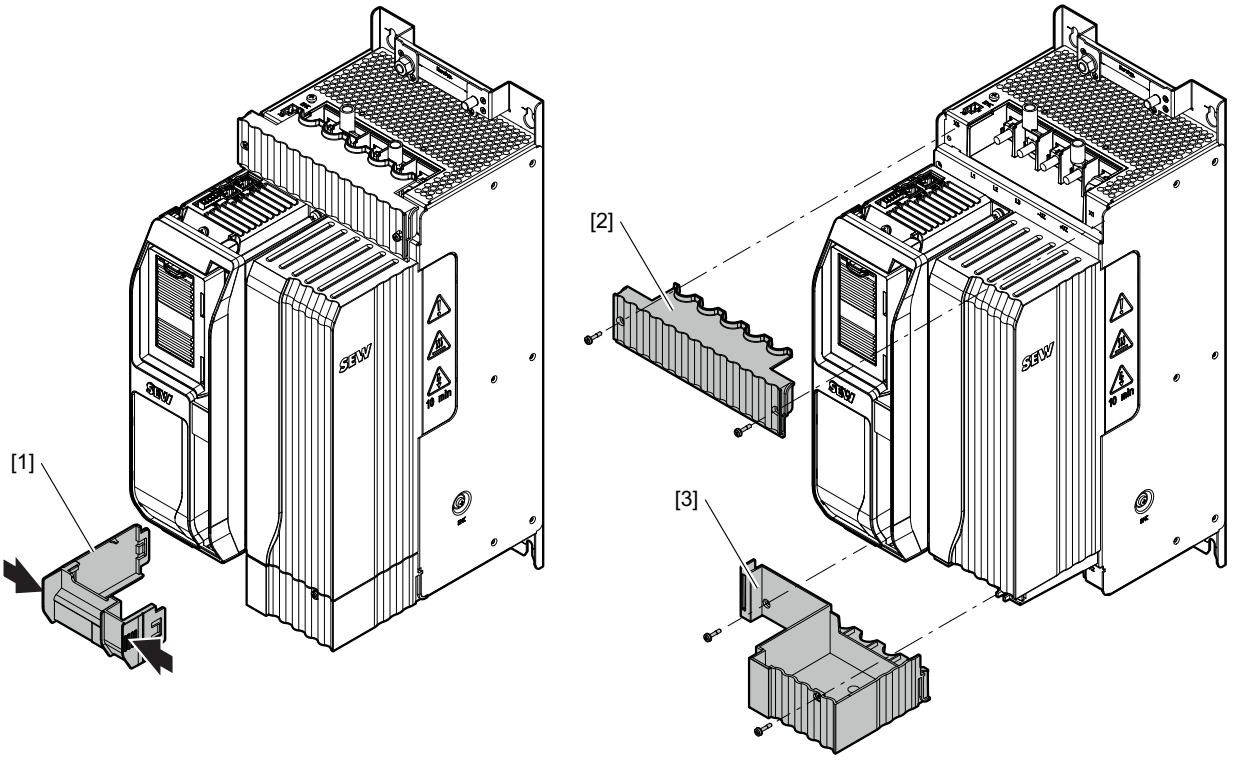
For inverters of size 5 and higher, touch guards must be removed for the line and DC link connection and the connection of the motor and braking resistor, and then reinstalled afterward.

When removing the touch guards, first remove the cover. When mounting the touch guards, attach the cover afterwards. Otherwise, the touch guards can be disassembled and assembled in any order.

Note the "permitted tightening torques" (→ 🗎 40).

4.8.1 Size 5

The following figure shows an example of the touch guards of the inverter:



42739197451

[1] Cover
[2] Touch guard for connection of supply system and DC link
[3] Touch guard for connection of motor and braking resistor

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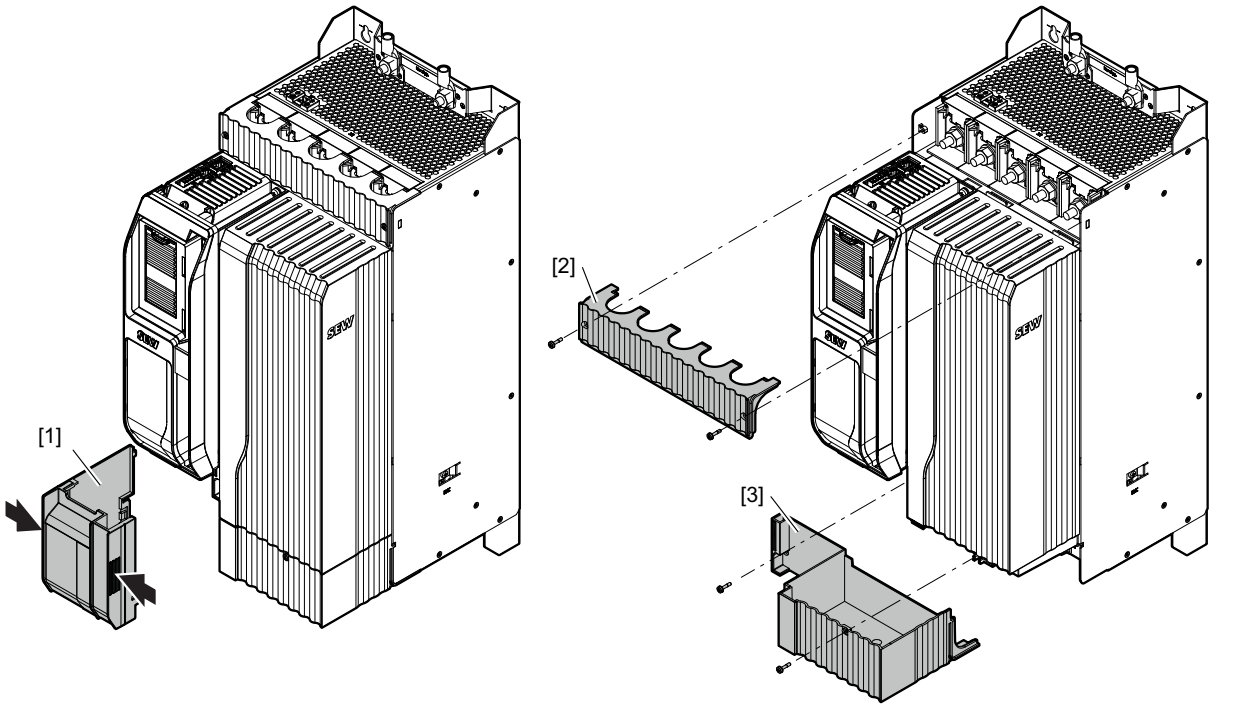
4.8.2 Size 6

The following figure shows an example of the touch guards of the inverter:



42739199883

[1] Cover
[2] Touch guard for connection of supply system and DC link
[3] Touch guard for connection of motor and braking resistor

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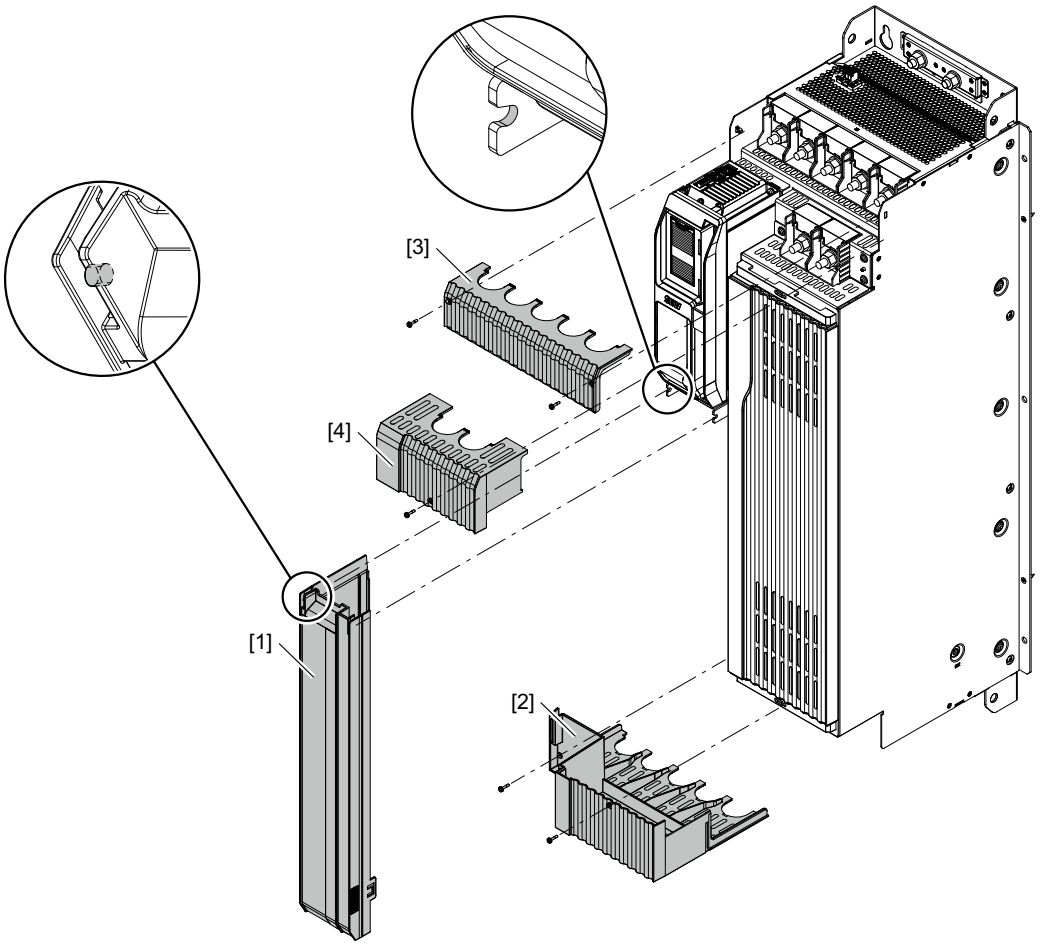
4.8.3 Size 7

The following figure shows an example of the touch guards of the inverter:



42739202315

[1] Cover
[2] Touch guard for connection of motor and braking resistor
[3] Touch guard for connection of supply system and DC link
[4] Touch guard for connection of DC link before DC link choke

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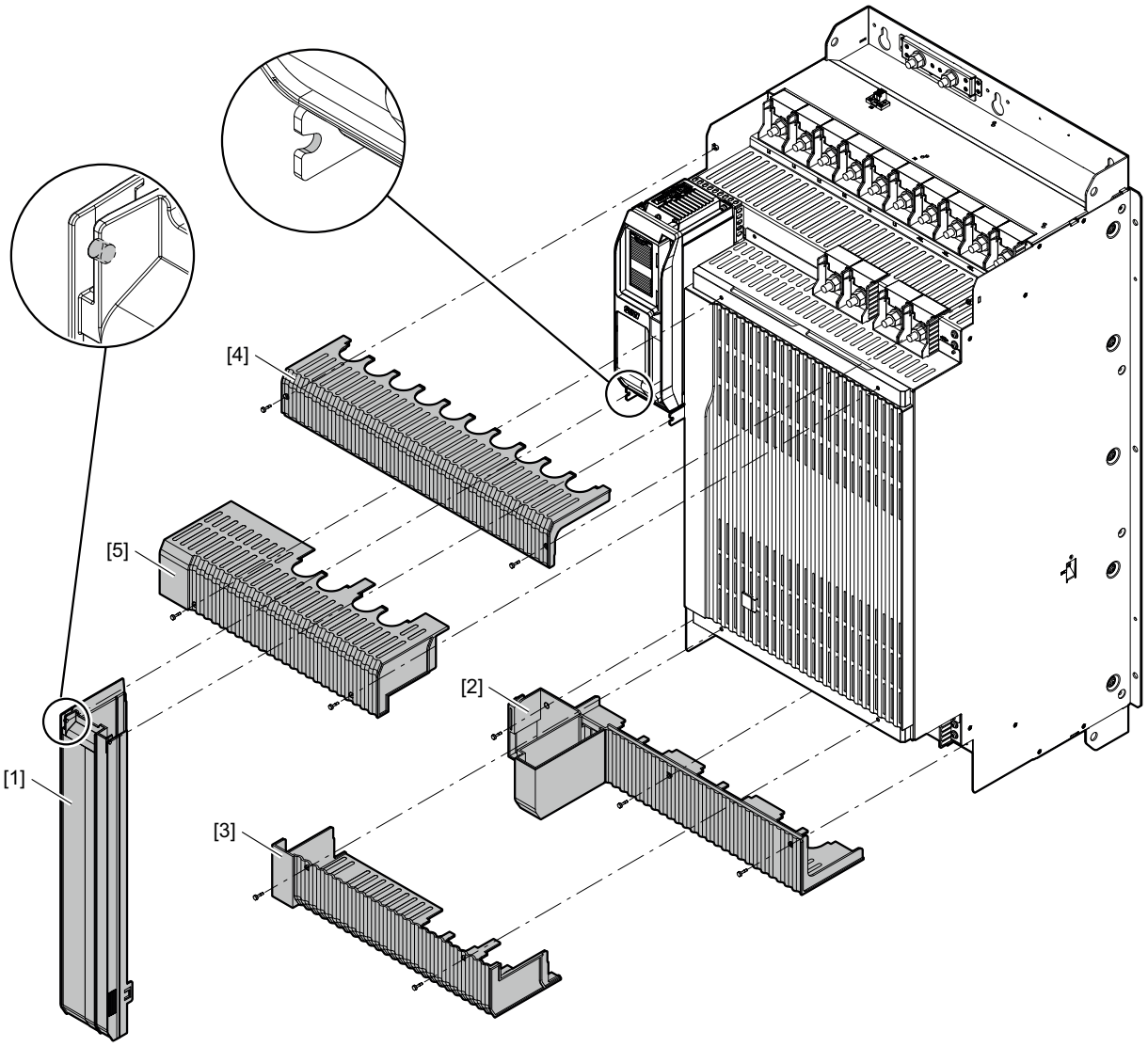
4.8.4 Size 8

The following figure shows an example of the touch guards of the inverter:



42739204747

[1] Cover
[2] Touch guard for connection of motor and braking resistor, part 1
[3] Touch guard for connection of motor and braking resistor, part 2
[4] Touch guard for connection of supply system and DC link
[5] Touch guard for connection of DC link before DC link choke

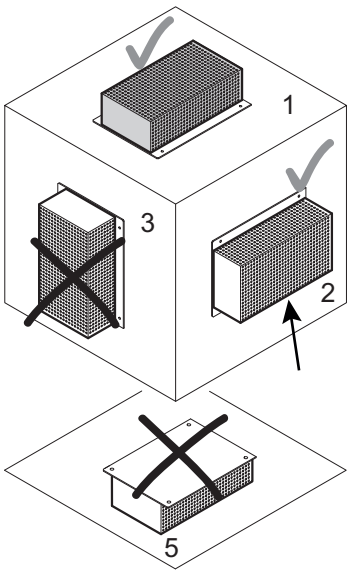
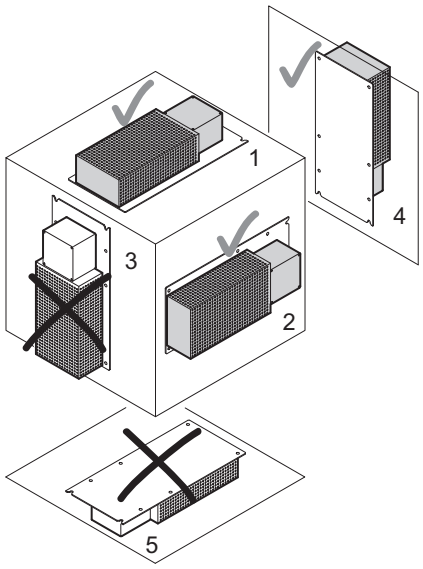
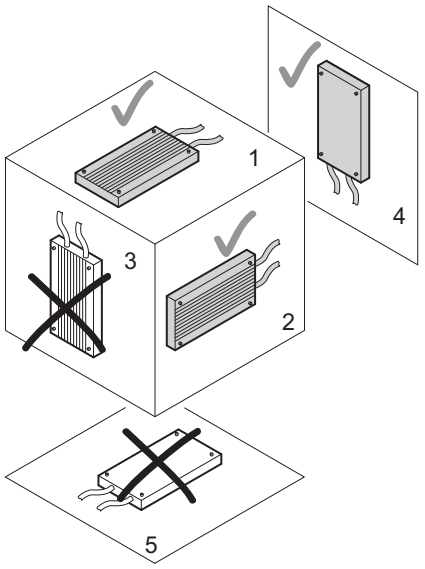
4.9 Installing braking resistors

The surfaces of the braking resistors will reach temperatures of up to 250 °C when the braking resistors are loaded with the nominal power. The installation location of the braking resistor must be designed according to the high temperatures. For this reason, the braking resistors are usually mounted outside the control cabinet. Non-permissible installation might lead to heat build-up in the braking resistor due to reduced convection. A tripping temperature contact or an overheated braking resistor can lead to a system standstill.

The following minimum clearances must be observed for convection cooling depending on the continuous braking power and the mounting position:

Continuous braking power at 100% cdf	Mounting position	Lateral distance or distance between resistors in mm	Downward distance in mm	Upward distance in mm
Up to 1 kW	horizontal[1)]	200	0	350
	vertical[2)]	150	250	300
Up to 10 kW	horizontal[3)]	300	0	650
	vertical[2)]	250	350	600
Up to 22 kW	horizontal[3)]	400	0	750
	vertical[2)]	350	400	700
Up to 44 kW	horizontal[3)]	500	0	850
	vertical[2)]	Not permitted	Not permitted	Not permitted

1) Corresponds to mounting position 1, 2, 5, 6.
2) Corresponds to mounting position 3, 4.
3) Corresponds to mounting position 1, 2, 5 and 6.

Permitted mounting positions		
Grid resistor, frame resistor	**Wire resistor**	**Flat type resistor**
		

Braking resistors BW003-420-T and BW1.0-170 may only be used in position 1.

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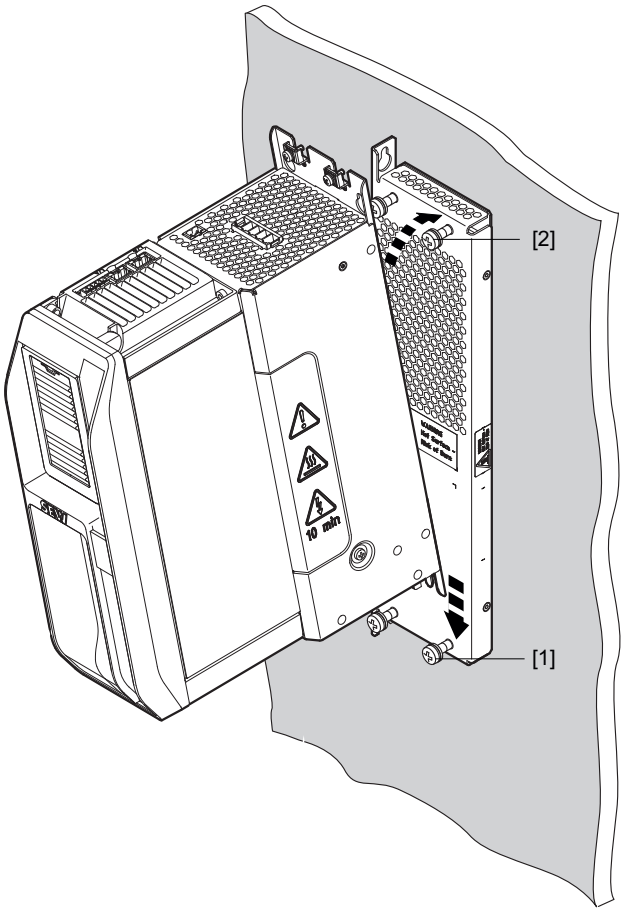
4.9.1 Installing submounting resistor BW120-001, BW100-002/M

Size 1 and 2 inverters can be installed in the control cabinet together with a braking resistor. The braking resistor is located on the rear panel of the inverter and therefore has the same mounting hole pattern as the inverter.

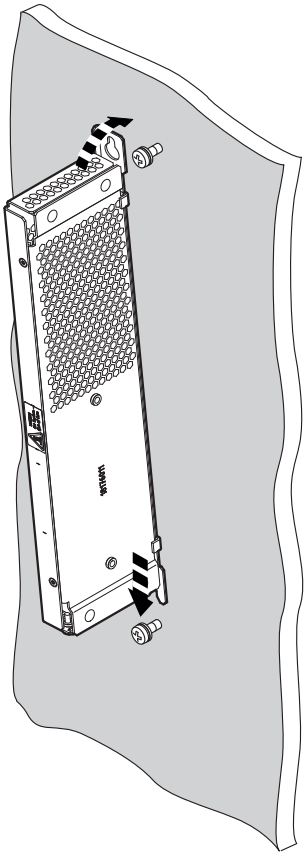
Note that the retaining screws [1] and [2] must be 20 cm longer for installation with a braking resistor.



20363406219

1. Place the braking resistor at the desired position in the control cabinet as shown in the figure, and screw in the 4 retaining screws [1] and [2] without tightening them.
2. Place the inverter with the slotted holes in the device base plate onto the retaining screws [1] from the top.
3. Push the inverter backwards to insert the retaining screws [2] into the upper holes in the device base plate.
4. Lower the inverter.
5. Install the shield plate; see the chapter "Control cabinet installation".
6. Tighten the retaining screws [1] and [2].

The submounting resistor can be installed next to an inverter, see the following figure. The hole distance of the submounting braking resistor must be larger than the hole distance of the inverter.



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5 Electrical installation

5.1 Installation planning considering EMC aspects

The information in this chapter will help you to optimize the system with regard to electromagnetic compatibility, or to eliminate any existing EMC interference.

The notes in this chapter are not legal regulations, but rather recommendations for improving the electromagnetic compatibility of your plant.

For further notes on EMC-compliant installation, refer to the publication Drive Engineering – Practical Implementation edition "EMC in Drive Engineering – Basic Theoretical Principles – EMC-Compliant Installation in Practice".

Compliance with limit classes C1 and C2 has been tested in a CE-typical drive system. SEW-EURODRIVE can provide detailed information on request.

5.1.1 Arranging and routing installation components

You must always apply the **relevant standards**.

5.1.2 Control cabinet

Use control cabinets with electrically conductive (galvanized) mounting plates. If several mounting plates are used, connect them in such a way that they are conductive over a large area. EMC-compliant installation of the inverter is only possible with a mounting plate that is conductive over a large area.

5.1.3 Equipotential bonding

Regardless of the PE connection, it is essential that **low-impedance, HF-compatible equipotential bonding** is provided (see also EN 60204-1):

- Mount the line filter and inverter on a shared mounting plate. Make sure they are connected over as large an area as possible and with good conductivity.
- Make sure that there is a suitable equipotential bonding between the system, the control cabinet, the machine structure, the cable ducts, and the gearmotor:
  - Use the mounting plate as the star point with regard to the HF equipotential bonding.
  - Connect the PE busbar to the mounting plate in an HF-compatible manner.
  - Connect the sheet metal cable ducts to the control cabinet in an HF-compatible manner.
  - Connect the cable ducts to the mounting plate in the control cabinet using a high frequency litz wire.
  - Connect the parts of the sheet metal cable ducts together in an HF-compatible manner.
  - Connect the sheet metal cable ducts to the gearmotor in an HF-compatible manner.
- Ensure that shielded cables are connected in an HF-compatible manner, e.g. by using grounding clamps or EMC screw fittings, so that the braided shield has a large connection surface.
- Do not use the cable shield of signal cables for the equipotential bonding.

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5.1.4 Cable installation

Observe the following information:

- Route the power cables, such as the motor cable and the brake cable, separately from the supply system cable and the control cables.
- Route all cables as closely to the reference potential as possible, e.g. the mounting plate.
- Keep all cables as short as possible. Avoid spare loops.

5.1.5 Cable connection

Supply system cable

Observe the following information:

- The supply system cable can be connected to the line choke and/or line filter using single conductors or using unshielded cables. If necessary, shielded cables may improve EMC.
- Limit the length of the connection lead between the line filter and the unit to the absolute minimum needed.
- As a rule, do not lay filtered and unfiltered cables together.
- Route incoming and outgoing line filter cables separately.

Braking resistor

Observe the following information:

- To connect braking resistors, use two closely twisted conductors or a shielded power cable.
- In the case of shielded cables, apply the braided shield over the entire circumference over a large area.
- For the shield connection, use the designated shield plates on the axis module, if provided. In all other cases, use commercially available shield terminals to install the shielding of the motor, brake, and braking resistor cables. Apply the shielding as closely as possible to the unit.

Power connection of motor and brake

Observe the following information:

- SEW-EURODRIVE recommends using pre-fabricated motor and brake cables. When using unshielded motor cables, SEW-EURODRIVE recommends using output filters HF.. or output chokes HD...
- Apply the braided shield of all cables over the entire circumference over a large area at both ends.
- For the shield connection, use the designated shield plates on the inverter side (if provided). In all other cases, use commercially available shield terminals to install the shielding of the motor and brake cables. Apply the shielding as closely as possible to the inverter.
- If the motor cable and brake cable are combined in a shared cable, the cable must have an inner shield separating the brake cables from the motor cores. The cables also possess an overall shield. If the brake cable is routed separately, SEW-EURODRIVE recommends using a shielded brake cable.

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- SEW-EURODRIVE recommends using prefabricated cables from SEW-EURODRIVE (self-assembled or also prefabricated).
- In the event of exceptionally high EMC requirements, an additional connection point for the shield is recommended. To limit the emitted interference, the motor shield can additionally be grounded to the control cabinet outlet using commercial installation materials (grounding clamps or EMC screw fittings).

Control cable

You may connect the control cables (e.g. digital inputs and others) using unshielded single conductors. Shielded cables increase the EMC. Use the designated shield plates to connect the shield.

For routing outside of the control cabinet, you must use shielded cables.

Encoder

SEW-EURODRIVE recommends using prefabricated encoder cables.

The shield of prefabricated cables from SEW-EURODRIVE is connected via the connector. SEW-EURODRIVE offers the option of additionally mounting the shield using a shield plate supplied.

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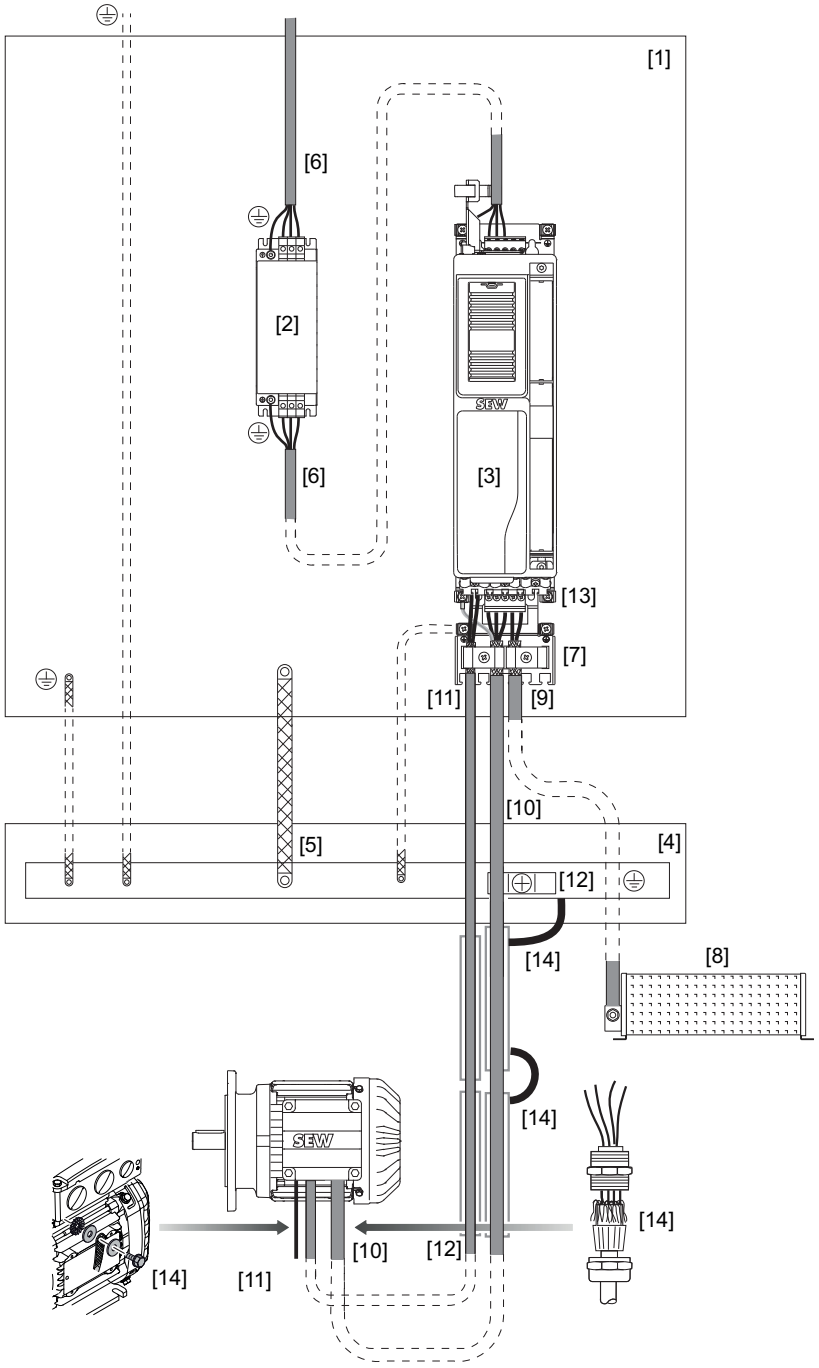
5.1.6 Installation example



9007218763260299

[1] Galvanized mounting plate
[2] Line filter
[3] Inverter
[4] PE busbar
[5] HF connection of PE busbar/mounting plate
[6] Supply system cable
[7] Power shield plate (depending on size)
[8] Braking resistor
[9] Braking resistor cable
[10] Motor line
[11] Brake cable
[12] Grounding clamp
[13] Electronics shield plate
[14] HF connection

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5.2 Installation instructions

5.2.1 General information

Observe the following information:

- Provide for suitable measures to prevent the motor from starting up unintentionally. Take additional safety measures depending on the application to prevent possible injuries to people and damage to machinery.
- Only use closed cable lugs or conductor end sleeves for to prevent litz strands from emerging.
- To avoid mechanical vibrations, fasten connected cables by suitable means, e.g. by fixing them on the shield plate or a clamp on the mounting plate of the control cabinet.
- Disconnect the following electrical connections only in a de-energized state: Motor, supply system, braking resistor, brake, encoder, energy storage unit, discharge unit.

5.2.2 Permitted voltage systems

Information regarding voltage supply systems	Information regarding permissibility
TN and TT systems – voltage systems with directly grounded star point.	Use is possible without restrictions.
IT systems – voltage systems with non-grounded star point.	Use is only permitted adhering to specific measures. The measures are described in chapter "Use in IT systems".
Voltage systems with grounded outer conductor.	Use only for nominal line voltages up to max. 240 V.

Use in IT systems

INFORMATION

EMC limit values

The EMC limit values for interference emission are not specified for voltage supply systems without grounded star point (IT systems). The efficiency of line filters is severely limited.

To ensure IT system capability, the terminal screw shown must be removed from the inverter.

When converting to an IT network, mark this on the nameplate in the "IT system activated" box provided for this purpose.

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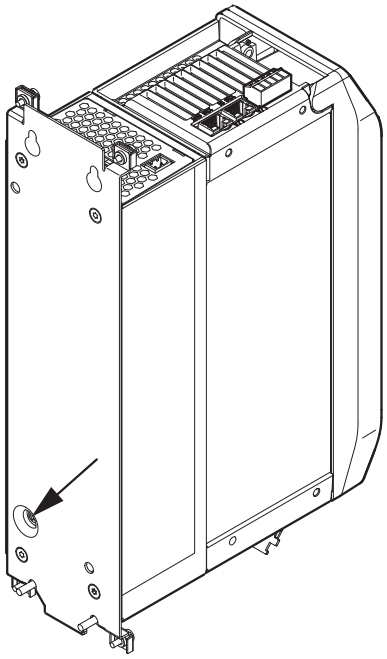
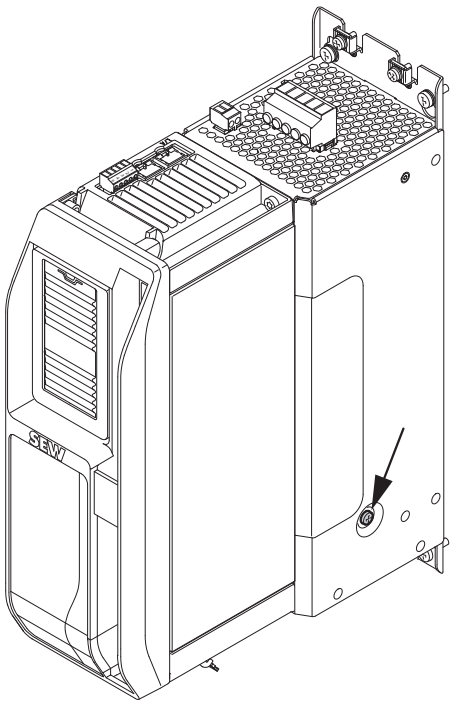
Inverter	Position of the terminal screw
Sizes 1, 2	On the back of the inverter:  15144351755
Sizes 3, 4, 6, 7	On the right side of the inverter:  9007214280971403

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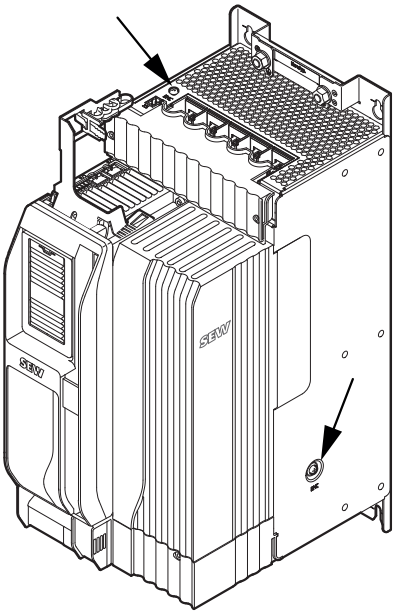
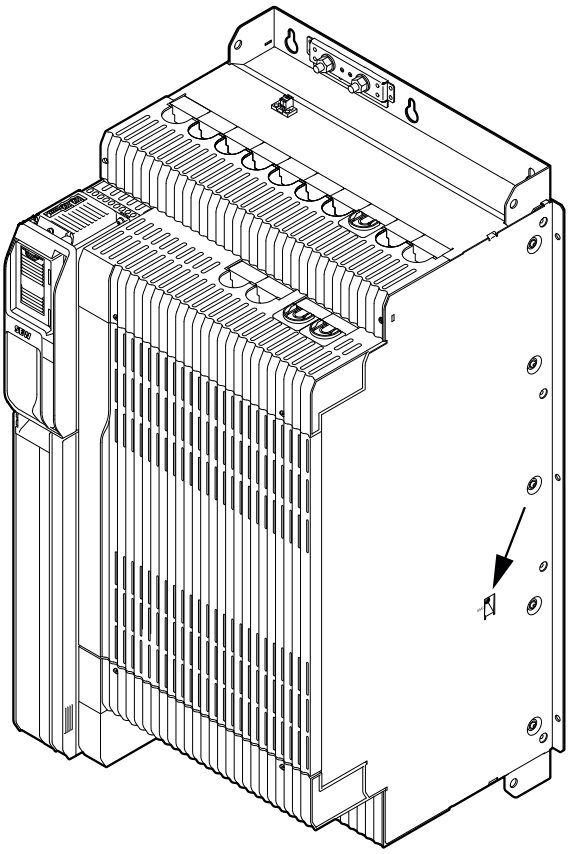
Inverter	Position of the terminal screw
Size 5	One screw on the top, another screw on the right side of the inverter:  *21425923467*
Size 8	On the right side of the inverter:  *39033493131*

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5.2.3 Permitted terminal tightening torques

1. **NOTICE!** Failure to adhere to prescribed tightening torques. Damage to the device. Connect the power cables with the specified tightening torques.

Connection		Tightening torques in Nm							
		Sizes							
		1	2	3	4	5	6	7	8
Supply system	X1	0.5 – 0.6			1.7 – 1.8	8.5 – 9.5	10 – 15	31	
Motor and braking resistor	X2	0.5 – 0.6			1.7 – 1.8	8.5 – 9.5	10 – 15	31	
Terminal screw for TN/IT systems	EMC	1 – 1.2							
PE connection	–	1.2 – 1.5		M4: 1.2 – 1.5 or M6: 2.5 – 3	2.5 – 3	6 – 10	10 – 15	31	
Fastening the cards	–	0.6 – 0.8							

5.2.4 Permitted terminal cable cross sections

Single conductor, without conductor end sleeve, rigid and flexible

Inverter	Terminal	Terminal type	Stripping length in mm	Cable cross section in mm²			
				Rigid		Flexible	
				Minimum	Maximum	Minimum	Maximum
Control unit							
All sizes	X20	Spring terminal	10	0.2	2.5	0.2	2.5
	X21		10	0.2	2.5	0.2	2.5
	X22		10	0.2	2.5	0.2	2.5
	X6		10	0.2	1.5	0.2	1.5
Power section							
All sizes	X5	Spring terminal	10	0.2	2.5	0.2	2.5
Sizes 1 – 4	X10		10	0.2	1.5	0.2	1.5
Sizes 5 – 8	X10		10	0.2	2.5	0.2	2.5
Sizes 1 – 3	X1/X2	Screw terminal[1)]	10	0.2	10	0.2	6
Size 4	X1/X2		12	0.75	16	0.75	16

1) SEW-EURODRIVE recommends using conductor end sleeves for installation with screw terminals and flexible cable.

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Single conductor, flexible, with conductor end sleeve, with or without plastic collar

Inverter	Terminal	Terminal type	Stripping length in mm	Cable cross section in mm²			
				Plastic collar			
				with		without	
				Minimum	Maximum	Minimum	Maximum
Control unit							
All sizes	X20	Spring terminal	10	0.25	2.5	0.25	2.5
	X21		10	0.25	2.5	0.25	2.5
	X22		10	0.25	2.5	0.25	2.5
	X6		10	0.25	0.75	0.25	1.5
Power section							
All sizes	X5	Spring terminal	10	0.25	2.5	0.25	2.5
Sizes 1 – 4	X10		10	0.25	0.75	0.25	1.5
Sizes 5 – 8	X10		10	0.25	2.5	0.25	2.5
Sizes 1 – 3	X1/X2	Screw terminal[1)]	10	0.25	4	0.25	6
Size 4	X1/X2		12	0.5	10	0.5	16

1) SEW-EURODRIVE recommends using conductor end sleeves for installation with screw terminals and flexible cable

Double conductor, flexible, with conductor end sleeve, with or without plastic collar

Inverter	Terminal	Terminal type	Stripping length in mm	Double conductor, same cross section in mm², twin conductor end sleeve			
				Plastic collar			
				with		without	
				Minimum	Maximum	Minimum	Maximum
Control unit							
All sizes	X20	Spring terminal	10	0.5	1.5	–	–
	X21		10	0.5	1.5	–	–
	X22		10	0.5	1.5	–	–
	X6		–	–	–	–	–
Power section							
All sizes	X5	Spring terminal	10	0.5	1.5	–	–
Sizes 1 – 4	X10		10	–	–	–	–
Sizes 5 – 8	X10		10	0.5	2.5	–	–
Sizes 1 – 3	X1/X2	Screw terminal[1)]	10	0.25	2.5	0.25	1.5
Size 4	X1/X2		12	0.5	6	0.5	4

"**–**" Not permitted

1) SEW-EURODRIVE recommends using conductor end sleeves for installation with screw terminals and flexible cable

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5.2.5 Selecting the residual current device

The inverter can cause a direct current in the PE conductor.

Proceed as follows to select the residual current device:

1. If using a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.
2. ⚠ **WARNING!** No protection against electric shock if an incorrect type of residual current device is used. Severe or fatal injuries.
   If a residual current device (residual current device RCD or residual current monitor RCM) is provided, use an all-current-sensitive RCD or RCM of type B.
3. If a residual current device is required, select the residual current device according to the requirements for protecting persons, fire protection or system protection. Observe the tripping characteristic, the deceleration and the rated tripping current of the residual current device during selection.
4. During project planning, note that leakage currents which are as low as possible occur in the system for operational reasons.
5. If the operational leakage currents are too high, you can distribute the current supply among several RCDs.

5.2.6 Using the line contactor

Proceed as follows:

1. Always place the line contactor before the line filter and line choke (if present).
2. Use at least one contactor of utilization category AC-3 (EN 60947-4-1) as a line contactor.
3. **NOTICE!** Failing to observe the minimum switch-off time of the line contactor can cause material damage. Irreparable damage to the inverter or unforeseen malfunctions.
   After switching off the voltage supply, keep it switched off for at least 10 s.
   ⇨ Do not switch the voltage supply on or off **more often than once per minute**.
4. Do not use the line contactor for jog mode, but only for switching on and off.

The following table provides an overview of when a line contactor is required. Observe the notes on the required protective measures for the braking resistor used in the product manual > chapter "Protection against thermal overload of the braking resistor" (→ 🗎 63).

Inverter	Braking resistor	Protective element/ preventive measure	Line contactor required?
Sizes 1 – 3	No BW..	–	No
	BW.. Flat design	–	No
	BW.. as PTC	–	No
	BW..	External overload relay	Yes
	BW..-T	External overload relay	Yes

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Inverter	Braking resistor	Protective element/ preventive measure	Line contactor required?
From size 4	No BW..	–	No
	BW.. Flat design	–	No
	BW.. as PTC	–	No
	BW..	External overload relay	No
	BW..-T	Temperature contact evaluation	No

If a braking resistor is connected to the inverter from size 4 without using a line contactor, an external DC 24 V voltage supply must be provided on the inverter.

5.2.7 Information regarding PE connection

A leakage current > 3.5 mA may be generated when operating the inverter. To avoid shock currents according to EN 61800-5-1, observe the following cable cross sections:

- Supply system cable < 10 mm^2:

  Route a second PE conductor with the cable cross section of the supply system cable in parallel to the protective earth via separate terminals or use a copper protective earth conductor with a cable cross section of 10 mm^2.
- Supply system cable 10 mm^2 to 16 mm^2:

  Route a copper protective earth conductor with the cable cross section of the supply system cable.
- Supply system cable 16 mm^2 to 35 mm^2:

  Route a copper PE conductor with a cable cross section of 16 mm^2.
- Supply system cable > 35 mm^2:

  Route a copper protective earth conductor with half the cross section of the supply system cable.
- If an earth leakage circuit breaker is used for protection against direct and indirect contact, it must be universal current sensitive (RCD type B).

5.2.8 Installation with protective separation

The inverter meets all requirements for protective separation of power and electronics connections according to EN 61800-5-1. The connected signal circuits, including the DC 24 V voltage supply, have to meet the requirements according to SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) to ensure protective separation. The installation must meet the requirements for protective separation.

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5.2.9 Protection devices

Observe the following information:

- The units come equipped with integrated protection devices against overload and short circuit.
- The power contactor of the supply system cable must be realized through external overload devices.
- The relevant standards must be observed concerning the cable cross section, the voltage drop, and the type of routing that is used.

5.3 UL-compliant installation

INFORMATION

Due to UL requirements, the following chapter is always printed in English and in some cases in French, regardless of the language of this documentation.

⚠ CAUTION

- Use only tested units with a limited output voltage (V_{max} = DC 30 V) and limited output current (I_{max} = 8 A) as an external DC 24 V voltage source.

- UL certification does not apply to operation in voltage supply systems with a non-grounded star point (IT systems).

5.3.1 Field wiring power terminals

- Use 60/75 °C copper wire only.
- Tighten terminals to in-lbs (Nm) as follows:

<table>
<tr><th colspan="2" rowspan="3">Connection</th><th colspan="8">Tightening torque in-lbs (Nm)</th></tr>
<tr><th colspan="8">Frame size</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>Line connection</td><td>X1</td><td colspan="3" rowspan="2">4.4 – 5.3</td><td rowspan="2">15.0 – 15.9</td><td rowspan="3">75.2 – 84.1</td><td rowspan="3">88.5 – 132.8</td><td colspan="2" rowspan="3">123.9 – 177.0</td></tr>
<tr><td>Motor and braking resistor terminal</td><td>X2</td></tr>
<tr><td>PE connection</td><td>–</td><td colspan="2">10.6 – 13.3</td><td>M4: 10.6 – 13.3
or
M6: 22.1 – 26.6</td><td>22.1 – 26.6</td></tr>
<tr><td>Terminal screw for TN/IT systems</td><td>EMC</td><td colspan="8">8.9 – 10.6</td></tr>
<tr><td>Fastening of cards</td><td>–</td><td colspan="8">5.3 – 7.1</td></tr>
</table>

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5.3.2 Short circuit current rating

Suitable for use on a circuit capable of delivering not more than

- 5000/10 000 rms symmetrical amperes when protected by circuit breakers and type E combination motor controllers as described in the tables below.
- 65 000 rms symmetrical amperes when protected by fuses, circuit breakers and type E combination motor controllers as described in the tables below.

Max. voltage is limited to 240 V (230 V units only) or 500 V (400 V units only).

5.3.3 Branch circuit protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes (US) or Canadian Electrical Code, Part 1 (CA).

WARNING - The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

ATTENTION - LE DÉCLENCHEMENT DU DISPOSITIF DE PROTECTION DU CIRCUIT DE DÉRIVATION PEUT ÊTRE DÛ À UNE COUPURE QUI RÉSULTE D'UN COURANT DE DÉFAUT. POUR LIMITER LE RISQUE D'INCENDIE OU DE CHOC ÉLECTRIQUE, EXAMINER LES PIÈCES PORTEUSES DE COURANT ET LES AUTRES ÉLÉMENTS DU CONTRÔLEUR ET LES REMPLACER S'ILS SONT ENDOMMAGÉS. EN CAS DE GRILLAGE DE L'ÉLÉMENT TRAVERSÉ PAR LE COURANT DANS UN RELAIS DE SURCHARGE, LE RELAIS TOUT ENTIER DOIT ÊTRE REMPLACÉ.

For maximum branch circuit protection see tables below.

Three-phase 380 – 500 V voltage range (SCCR: 5 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0020-5.3-4-.. (1)	–	50 A/500 V	3RV2011-1CA10, 2.5 A
MDX9.A-0025-5.3-4-.. (1)	–	50 A/500 V	3RV2011-1CA10, 2.5 A
MDX9.A-0032-5.3-4-.. (1)	–	50 A/500 V	3RV2011-1EA10, 4 A
MDX9.A-0040-5.3-4-.. (1)	–	50 A/500 V	3RV2011-1EA10, 4 A
MDX9.A-0055-5.3-4-.. (2)	–	50 A/500 V	3RV2011-1GA10, 6.3 A
MDX9.A-0070-5.3-4-.. (2)	–	50 A/500 V	3RV2011-1HA10, 8 A
MDX9.A-0095-5.3-4-.. (2)	–	50 A/500 V	3RV2011-1JA10, 10 A
MDX9.A-0125-5.3-4-.. (3)	–	50 A/500 V	3RV2011-4AA10, 16 A
MDX9.A-0160-5.3-4-.. (3)	–	50 A/500 V	3RV2011-4AA10, 16 A
MDX9.A-0240-5.3-4-.. (4)	–	60 A/500 V	3RV2021-4DA10, 25 A
MDX9.A-0320-5.3-4-.. (4)	–	60 A/500 V	3RV2031-4EA10, 32 A
MDX9.A-0460-5.3-4-.. (5)	–	125 A/500 V	3RV2031-4VA10, 45 A
MDX9.A-0620-5.3-4-.. (5)	–	125 A/500 V	3RV2041-4JA10, 63 A
MDX9.A-0750-5.3-4-.. (5)	–	125 A/500 V	3RV2041-4KA10, 75 A

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Three-phase 380 – 500 V voltage range (SCCR: 10 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0910-5.3-4-.. (6)	–	225 A/500 V	3RV2041-4YA10, 93 A
MDX9.A-1130-5.3-4-.. (6)	–	225 A/500 V	–
MDX9.A-1490-5.3-4-.. (6)	–	225 A/500 V	–

Three-phase 380 – 500 V voltage range (SCCR: 65 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0020-5.3-4-.. (1)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1CA10, 2.5 A
MDX9.A-0025-5.3-4-.. (1)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1CA10, 2.5 A
MDX9.A-0032-5.3-4-.. (1)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1EA10, 4 A
MDX9.A-0040-5.3-4-.. (1)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1EA10, 4 A
MDX9.A-0055-5.3-4-.. (2)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1GA10, 6.3 A
MDX9.A-0070-5.3-4-.. (2)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1HA10, 8 A
MDX9.A-0095-5.3-4-.. (2)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-1JA10, 10 A
MDX9.A-0125-5.3-4-.. (3)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-4AA10, 16 A
MDX9.A-0160-5.3-4-.. (3)	50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/500 V	3RV2011-4AA10, 16 A

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Three-phase 380 – 500 V voltage range (SCCR: 65 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0240-5.3-4-.. (4)	60 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	60 A/500 V	3RV2021-4DA10, 25 A
MDX9.A-0320-5.3-4-.. (4)	60 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	60 A/500 V	3RV2031-4EA10, 32 A
MDX9.A-0460-5.3-4-.. (5)	125 A/600 V Class: J, K-1, RK1, T	125 A/500 V	3RV2031-4VA10, 45 A
MDX9.A-0620-5.3-4-.. (5)	125 A/600 V Class: J, K-1, RK1, T	125 A/500 V	3RV2041-4JA10, 63 A
MDX9.A-0750-5.3-4-.. (5)	125 A/600 V Class: J, K-1, RK1, T	125 A/500 V	3RV2041-4KA10, 75 A
MDX9.A-0910-5.3-4-.. (6)	225 A/600 V Class: J, T	225 A/500 V	3RV2041-4YA10, 93 A
MDX9.A-1130-5.3-4-.. (6)	225 A/600 V Class: J, T	225 A/500 V	–
MDX9.A-1490-5.3-4-.. (6)	225 A/600 V Class: J, T	225 A/500 V	–
MDX9.A-1770-5.3-4-.. (7)	225 A/600 V Class: J, T	225 A/500 V	–
MDX9.A-2200-5.3-4-.. (7)	600 A/600 V Class: J, K-1, L, RK1, T	600 A/500 V	–
MDX9.A-2500-5.3-4-.. (7)	600 A/600 V Class: J, K-1, L, RK1, T	600 A/500 V	–
MDX9.A-3000-5.3-4-.. (7)	600 A/600 V Class: J, K-1, L, RK1, T	600 A/500 V	–
MDX9.A-3800-5.3-4-.. (8)	800 A/600 V Class: T	800 A/500 V	–
MDX9.A-4700-5.3-4-.. (8)	800 A/600 V Class: T	800 A/500 V	–
MDX9.A-5880-5.3-4-.. (8)	800 A/600 V Class: T	800 A/500 V	–

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Three-phase 200 – 240 V voltage range (SCCR: 5 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0070-2.3-4-.. (2)	–	50 A/240 V	3RV2011-1HA10, 8 A
MDX9.A-0093-2.3-4-.. (2)	–	50 A/240 V	3RV2011-1JA10, 10 A
MDX9.A-0140-2.3-4-.. (3)	–	50 A/240 V	3RV2011-4AA10, 16 A
MDX9.A-0213-2.3-4-.. (4)	–	60 A/240 V	3RV2021-4DA10, 25 A
MDX9.A-0290-2.3-4-.. (4)	–	60 A/240 V	3RV2031-4EA10, 32 A
MDX9.A-0420-2.3-4-.. (5)	–	125 A/240 V	3RV2031-4VA10, 45 A
MDX9.A-0570-2.3-4-.. (5)	–	125 A/240 V	3RV2041-4JA10, 63 A
MDX9.A-0840-2.3-4-.. (6)	–	225 A/240 V	3RV2041-4YA10, 93 A
MDX9.A-1080-2.3-4-.. (6)	–	225 A/240 V	3RV2041-4YA10, 93 A

Three-phase 200 – 240 V voltage range (SCCR: 65 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0070-2.3-4-.. (2)	50 A/240 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/240 V	3RV2011-1HA10, 8 A
MDX9.A-0093-2.3-4-.. (2)	50 A/240 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/240 V	3RV2011-1JA10, 10 A
MDX9.A-0140-2.3-4-.. (3)	50 A/240 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	50 A/240 V	3RV2011-4AA10, 16 A
MDX9.A-0213-2.3-4-.. (4)	60 A/240 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	60 A/240 V	3RV2021-4DA10, 25 A
MDX9.A-0290-2.3-4-.. (4)	60 A/240 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T	60 A/240 V	3RV2031-4EA10, 32 A
MDX9.A-0420-2.3-4-.. (5)	125 A/240 V Class: J, K-1, RK1, T	125 A/240 V	3RV2031-4VA10, 45 A
MDX9.A-0570-2.3-4-.. (5)	125 A/240 V Class: J, K-1, RK1, T	125 A/240 V	3RV2041-4JA10, 63 A

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Three-phase 200 – 240 V voltage range (SCCR: 65 kA)			
Model (frame size)	**Non-semiconductor fuses (currents are maximum values)**	**Inverse-time circuit breaker (currents are maximum, voltages minimum values)**	**Type E combination motor controller, mfd by Siemens, type Sirius (rated 480 V/277 V)**
MDX9.A-0840-2.3-4-.. (6)	225 A/240 V Class: J, T	225 A/240 V	3RV2041-4YA10, 93 A
MDX9.A-1080-2.3-4-.. (6)	225 A/240 V Class: J, T	225 A/240 V	3RV2041-4YA10, 93 A

5.3.4 Motor overload protection

The units are provided with load and speed-sensitive overload protection and thermal memory retention upon shutdown or power loss.

The trip current is adjusted to 150% of the rated motor current.

5.3.5 Surrounding air temperature rating

For surrounding air temperature rating, refer to chapter "General technical data".

5.3.6 Derating

For derating, refer to chapter "Selecting an inverter" of the product manual.

5.3.7 Other ratings

Type rating	Open type
Pollution degree	2
Max. altitude	2000 m

5.3.8 Wiring diagrams

For wiring diagrams, refer to chapter "Wiring diagrams".

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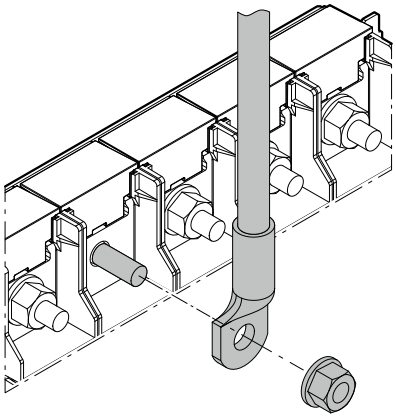
5.4 Connection to power terminals

Note that for inverters from size 5 upwards, degree of protection IP20 is only achieved if the terminal studs (for connecting the supply system, motor, braking resistor, and DC link) are protected against contact with plastic covers. The plastic covers can be ordered optionally, see chapter "Fitting plastic covers for degree of protection IP20" (→ 🗎 51) and chapter "Standard accessories" in the product manual.

5.4.1 Designing the connection with 1 cable

Proceed as follows:

1. Attach the heat shrink tubing at the ring lug.
2. Connect the cables. If the device is connected using one cable, the plastic cover in the connection block must not be removed.



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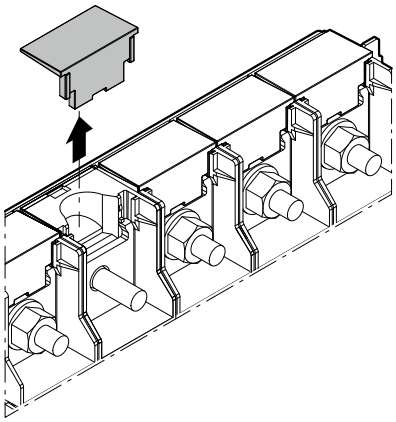
5.4.2 Designing the connection with 2 cables

Proceed as follows:

1. Attach a heat shrink tubing at the ring lugs.
2. Remove the plastic covers in the connection block.



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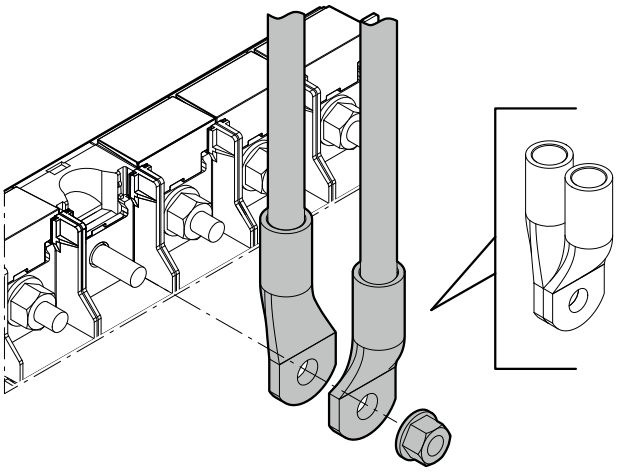
3. Connect the two cables.



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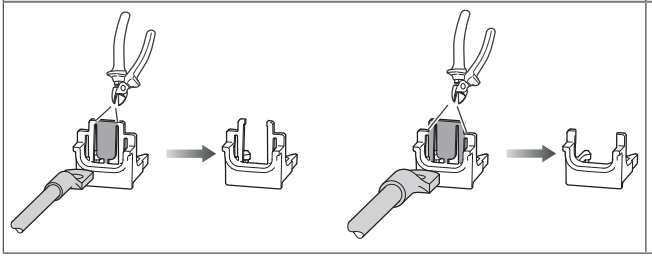
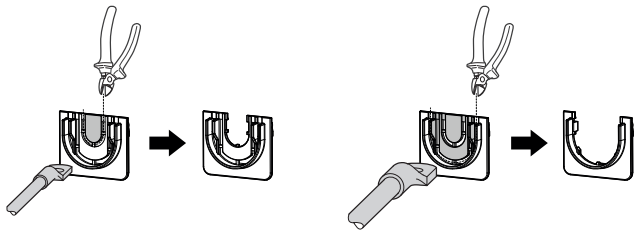
5.4.3 Fitting plastic covers for degree of protection IP20

Proceed as follows:

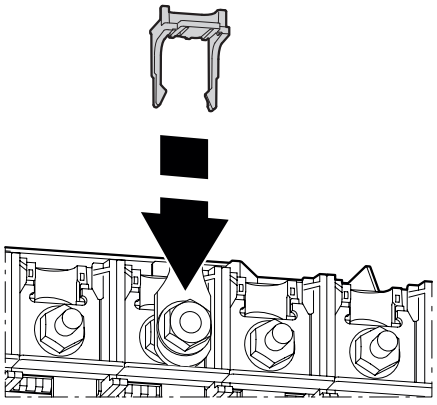
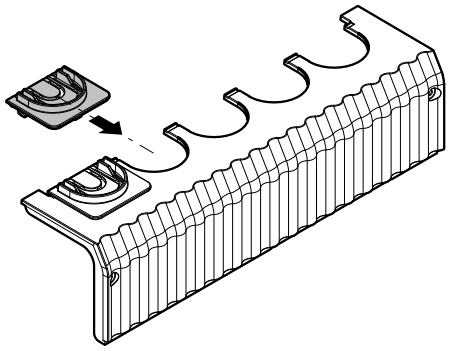
✓ The plastic covers can be ordered as options.

✓ The ring lug is insulated with heat shrink tubing.

1. The plastic covers must be broken out in different ways depending on the cross section used.

Size 5	Sizes 6 – 8
	

2. Fit the plastic covers at the individual connections.

Size 5	Sizes 6 – 8
	

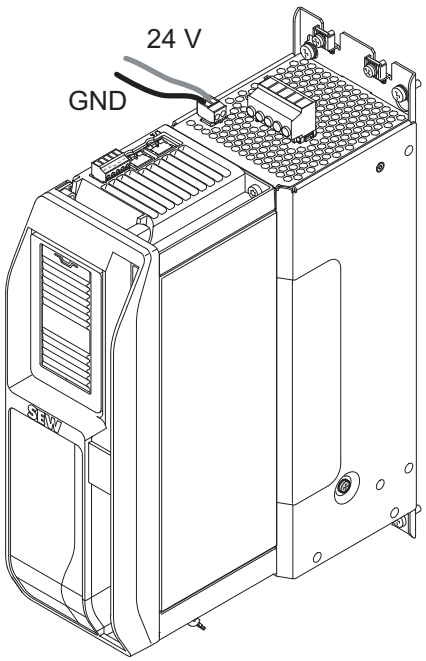
5.5 24 V supply voltage

The MDX90A.. inverter requires an external 24 V voltage supply for the electronics.

The MDX91A.. inverter has an internal 24 V voltage supply of 80 W that can also be supported externally.

The maximum cable cross section is 2.5 mm^2. The maximum permitted length of the 24 V supply cable is 30 m.

Whether an external 24 V supply is required for MDX91A-.. depends on the load, e.g. the encoder supply and the outputs.



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Select the cross section of the supply cable according to the power demand of the devices to be supplied.

5.6 Line fuses

Motor circuit breakers, miniature circuit breakers and fuses are used for fusing the supply system cable. In case of a fault, these components additionally protect against short-circuits.

Observe the following information:

- Use the following components:

Input fuses	Prerequisite
Motor circuit breaker	Nominal voltage of the motor circuit breaker greater than nominal line voltage. Nominal current of the motor circuit breaker must be set 10% above the nominal line current.
Miniature circuit breaker with characteristics B, C, D	Nominal miniature circuit breaker voltage ≥ nominal line voltage
	Nominal current of the miniature circuit breaker must be 10% higher than the nominal line current.

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Input fuses	Prerequisite
Fuses in utilization categories gL, gG	Fusing voltage ≥ nominal line voltage

- Install safety devices at the beginning of the supply system cable for line protection. For further information, refer to chapter "Wiring diagrams" (→ 🗎 74).
- Dimension the safety equipment according to the cable cross section.
- The PE impedance must comply with the normative specifications.
- Adhere to country- and system-specific regulations regarding the fusing.

5.7 Brake chopper output

Observe the following information:

- Do not connect capacitive or inductive loads.
- Only connect ohmic loads (braking resistors).
- Connect the braking resistor to the connections +R and -R.
- Note that the maximum permissible cable length between the braking resistor and inverter is 100 m.
- Use a shielded cable or twisted single conductors.

5.8 Temperature evaluation

⚠ WARNING

Dangerous voltages at the terminals of the inverter/power supply module when connecting an unsuitable temperature sensor.

Death or severe injuries due to electric shock.

- To avoid violating the requirements for protective separation, only connect temperature sensors with protective separation to the motor winding to the temperature evaluation.

The temperature sensor can be connected as follows:

- via the encoder cable, which contains the cables of the temperature sensor
- via connections TF1 and GND on terminal X10
- via MOVILINK® DDI to X16

Observe the following additional notes for group and multi-motor drives:

- Preferably use bimetallic temperature switches TH.
- The series connection of the TH contacts (normally closed) is not subject to any restriction if joint monitoring is provided.
- If the TF temperature sensors are available in motors, the temperature sensors of up to 3 motors can be connected in series.

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5.9 Brake control output

Observe the following information:

- If the brake connection and the motor connection are combined in one power cable, the brake cable must be shielded separately. The shielding of the power cable and the brake cable must be connected to the motor and inverter over a large area.
- SEW-EURODRIVE recommends also using a shielded brake cable for separate brake cable routing.
- Note the different project planning criteria to determine the length of brake cable and motor cable.
- Connect the brakes and/or brake control units to terminal strip X10 (DB0/DB00 and GND).

5.10 Inputs/outputs

Observe the following information:

- The digital inputs and outputs are referenced to GND. GND is connected to PE. Incorrectly applied voltages can damage the digital inputs and digital outputs. Do not apply external voltage to the digital outputs.
- Cables outside the control cabinet must be shielded.
- When connecting the shielding, ensure equipotential bonding.
- The cable length must not exceed 30 m.
- Connect the digital inputs and outputs to the appropriate connections.

5.11 System bus and module bus cabling

For connecting the EtherCAT®/SBus^{PLUS} system bus or module bus, SEW-EURODRIVE recommends using only prefabricated cables from SEW-EURODRIVE. The RJ45 connectors of the system bus and module bus cables and the sockets in the inverters have been checked for mechanical stability and contact reliability by SEW-EURODRIVE. If you use other cables and connectors, SEW-EURODRIVE makes no statement about the quality of the plug-in connection.

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5.11.1 System bus cable

To establish the EtherCAT®/SBus^{PLUS} system bus communication between automation components, use the 4-pole system bus cable.

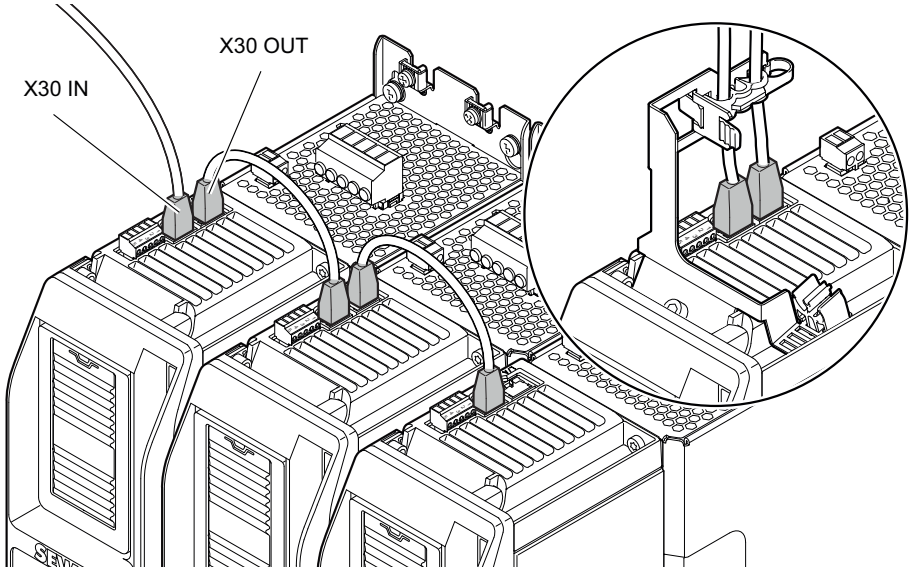
Some of the automation components are:

- MOVI-C® CONTROLLER
- Inverter
- PC with MOVISUITE® engineering software
- MOVI-PLC® I/O system
- Additional EtherCAT® stations on the EtherCAT®/SBus^{PLUS}

Connecting the system bus cable

Proceed as follows:

The connectors of the system bus cables are red.



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1. **NOTICE!** Use of the wrong cables. Damage to the inverter.
   If the 8-pin system bus cables are used, malfunctions or failures may occur at the connected devices. Only use the 4-pole system bus cables.
2. Connect the system bus cables between the individual automation components.
3. Connect the connectors to the bus input X30 IN.
4. Connect the connectors to the bus output X30 OUT.
5. Fix the system bus cables to the shield plate.

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5.11.2 Module bus cable

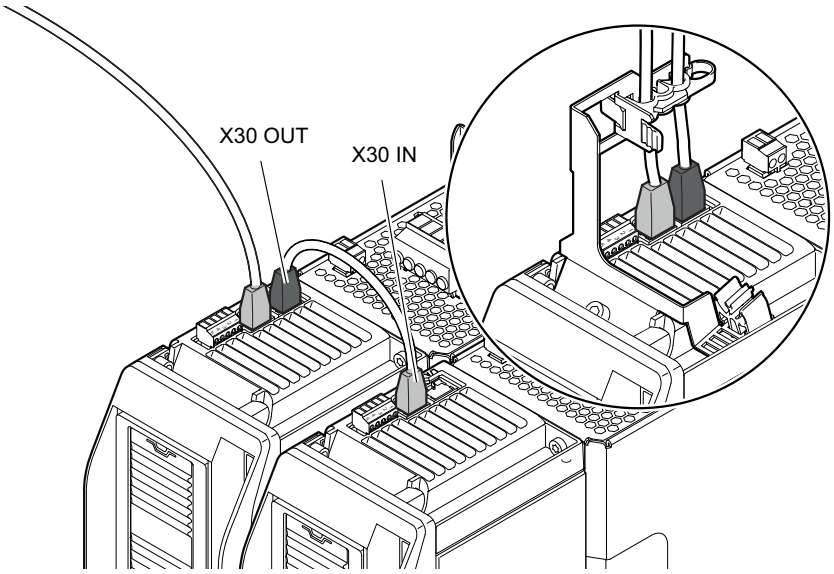
When connecting the DC links of two MOVIDRIVE® system or MOVIDRIVE® technology inverters in circuit type B, it is necessary to connect the two inverters via the module bus to exchange internal device information. The inverters are connected with a module bus cable. In addition, the system bus communication takes place via the module bus cable.

The module bus cable is not included in the scope of delivery of the inverter and must be ordered separately. For more information, refer to the manual "MOVIDRIVE® system/technology DC link connection".

Connecting the module bus cable

Proceed as follows:

The connectors of the module bus cables are red and black.



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1. Connect the module bus cables between the inverters.
2. Connect the black connectors to the bus output X30 OUT.
3. Connect the red connectors to the bus input X30 IN.
4. Fix the module bus cables to the shield plate.

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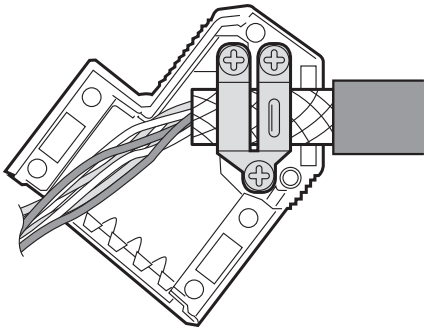
5.12 Encoders

Observe the following notes before installation:

- SEW-EURODRIVE offers prefabricated cables for connecting encoders. SEW-EURODRIVE recommends to use these prefabricated cables.
- Make sure that self-assembled cables fulfilled the following requirements:
  - Cross section of voltage supply cable:
    - At least 0.25 mm^2 for cable lengths up to 50 m
    - At least 0.5 mm^2 for cable lengths from 50 m up to 100 m
  - Cross section of the signal wire:
    - At least 0.25 mm^2
  - Capacitance per unit length:
    - Maximum 70 pF/m – core/core
    - Maximum 120 pF/m – core/shield
  - The cable must be shielded.
  - Differential signals must be routed via twisted wires e.g., Data+ and Data-. Use shielded cables with twisted pair cores.
- Connect the shield over a wide area at both ends:
  - At the encoder in the cable gland or in the encoder plug
  - At the inverter in the housing of the D-sub plug



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- Route the encoder cable separately from the power cables.
- To ensure a flawless shield connection, you must use an EMC screw fitting for the cable entry of the signal cable.
- For drives with plug-in connection, connect the shield in the encoder connector.
- The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the specifications of the encoder manufacturer. Information on the maximum cable lengths can be found in the TD of the corresponding encoder interface.

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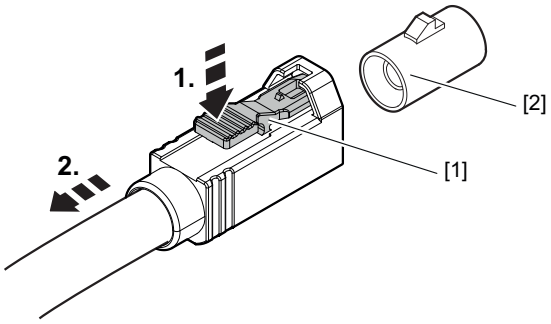
5.13 MOVILINK® DDI

5.13.1 Disconnecting the MOVILINK® DDI connector

Proceed as follows:



9007238074952075

1. Before disconnecting the MOVILINK® DDI connector, make sure that the 24 V voltage supply is switched off or standby mode is activated.
2. Press the interlocking [1] on the connector and disconnect the MOVILINK® DDI connector from the connection for digital motor integration X16 [2].

5.13.2 Connection when using a hybrid cable

Observe the following information:

- Use the shield plates provided for the shield support (if present).
- Apply the shielding of the hybrid cable over the entire circumference over a large area.
- Keep the distance or cable length between the shield connection and the connection for the cable conductors as short as possible.
- To avoid communication errors, the exposed length of the coaxial cable must not exceed 50 cm. For more information, refer to the addendum to the "Digital Motor Integration MOVILINK® DDI Toolset 1" operating instructions.

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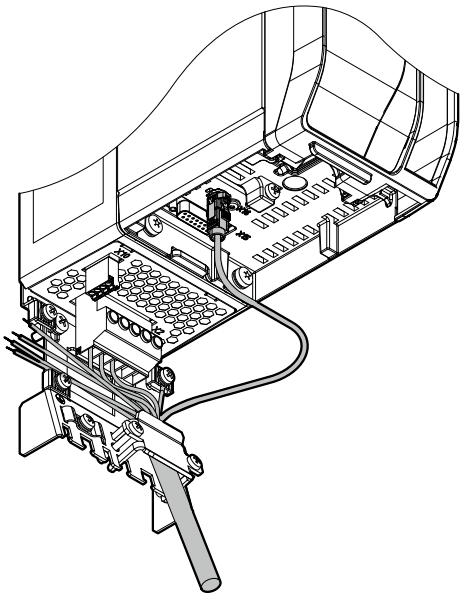
Connection example size 1 – 4 (using size 1 as an example)

The following figure shows an example of the connection when using a hybrid cable for the inverters of sizes 1 – 4:



9007238074947211

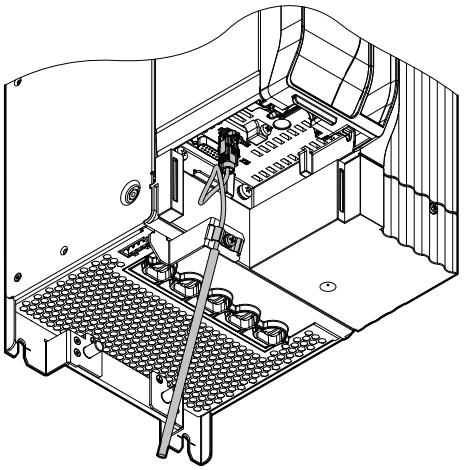
5.13.3 Connection when power and coaxial cables are routed separately

Observe the following information:

- Connect the shield of the outer cable jacket of the coaxial cable to the terminal provided for this purpose on the basic unit.
- To avoid communication errors, the exposed length of the coaxial cable must not exceed 50 cm. For more information, refer to the addendum to the "Digital Motor Integration MOVILINK® DDI Toolset 1" operating instructions.

Connection example size 5

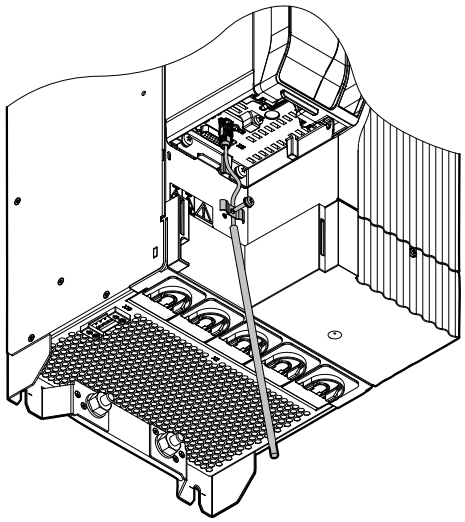
The following figure shows an example of the connection with separate routing of power and coaxial cables for the inverters of size 5:



9007238074949643

Connection example size 6

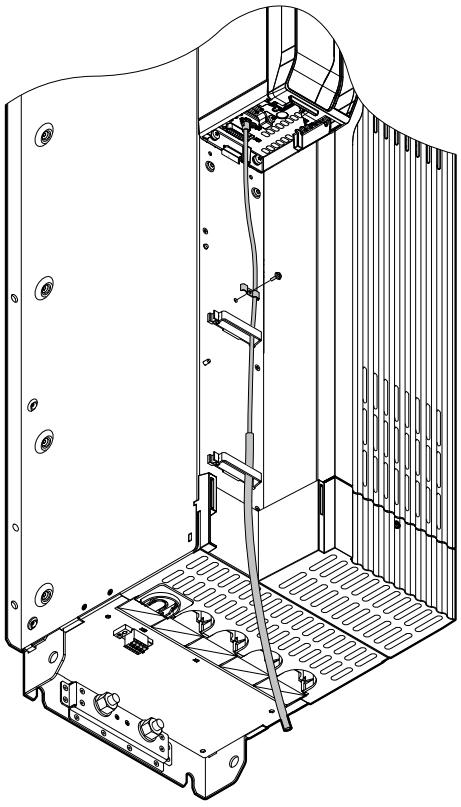
The following figure shows an example of the connection with separate routing of power and coaxial cables for the inverters of size 6:



9007238074954507

Connection example size 7 – 8 (using size 7 as an example)

The following figure shows an example of the connection with separate routing of power and coaxial cables for the inverters of sizes 7 – 8:



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Route the coaxial cable in such a way that it passes through the two tabs. Connect the shield of the coaxial cable to the terminal provided for this purpose.

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5.13.4 Permitted number of connection or cable disconnection points

When using a hybrid cable or a solo coaxial cable on the MOVILINK® DDI interface, a maximum of 4 connection or cable disconnection points are permitted. The connection points that are implemented directly on the inverter or in the drive by means of FAKRA connectors are not included in the count. Communication errors can occur if there are more than 4 connection or cable disconnection points.

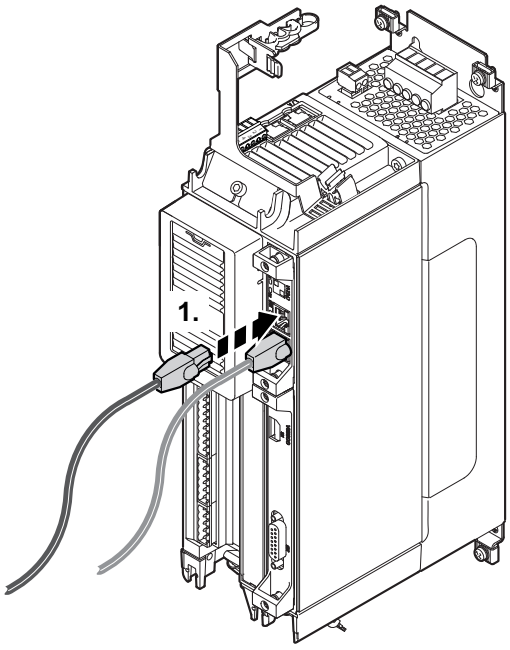
Examples

- Cable from inverter to motor with M23 connector KD1: 1 plugging position
- Cable from inverter to motor with M23 connector KD1 and 1 extension cable M23 at both sides: 2 plugging positions
- Cable from inverter to motor with M23 connector KD (hybrid cable gland without plug connector): 0 plugging positions

5.14 Fieldbus cables and cable routing

Proceed as follows when routing the fieldbus cables:

1. Remove the safety cover; see the chapter "Removing and attaching the safety cover" (→ 🗎 25).
2. Connect both the cables to the connections X40 and X41 on the card.



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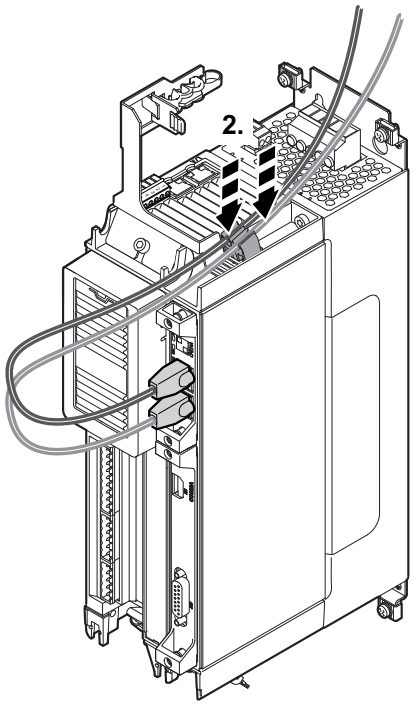
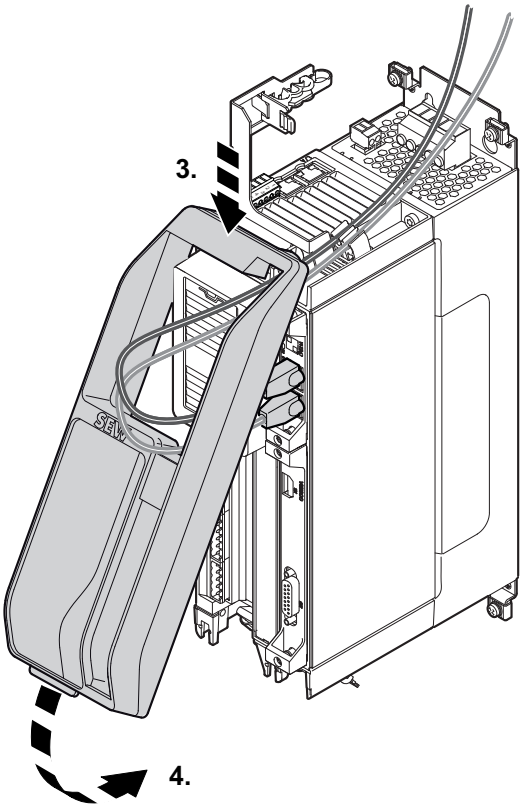
3. Route the cables as shown and press both the cables into the clips.



26077416971

4. Attach the safety cover again.



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5.15 BW.. braking resistors

5.15.1 Protection against thermal overload of the braking resistor

INFORMATION

A PTC braking resistor becomes highly resistive in the event of an overload.

INFORMATION

Flatpack resistors have internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. The configuration guidelines and the documented assignments of the drive inverter and braking resistor must be adhered to.

Parallel connection of braking resistors

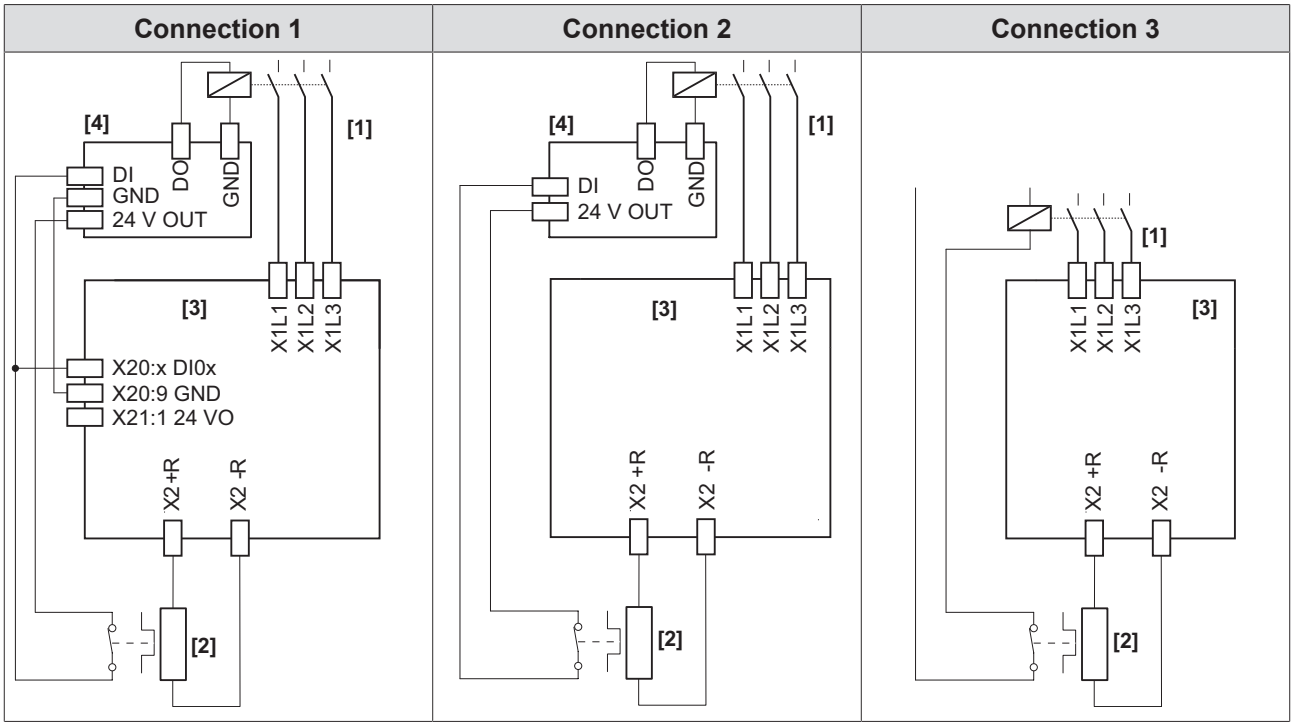
It is permitted to connect several identical braking resistors in parallel. The following applies:

- Connect the power connections of the resistors in parallel to +R and -R.
- Each braking resistor requires separate protection against thermal overload.
- Connect the signal contacts (NC contacts) of the protection devices in series.
- When connecting resistors in parallel, pay attention to R_{BRmin}.

Internal temperature switch -T

Inverters of size 1 – 3

If a BW...-T braking resistor with internal temperature switch is used with these inverters, then 3 connections are possible:



[1] Line contactor [2] Braking resistor [3] Inverter [4] PLC

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Note that the reference potential GND of the digital inputs on the controller must be the same as the reference potential of the inverter when connection 1 is used.

- **Connection 1**

  The digital input of the inverter connected to the signal contact of the internal temperature switch must be parameterized to the function "External braking resistor fault".

  – If the thermal circuit breaker trips, the signal is evaluated in the inverter and the PLC.
  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.
  – If the thermal circuit breaker trips, the inverter switches to "Output stage inhibit".

- **Connection 2**

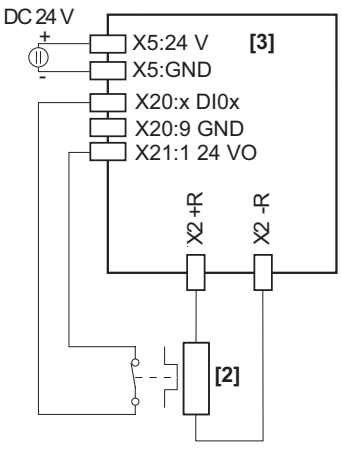
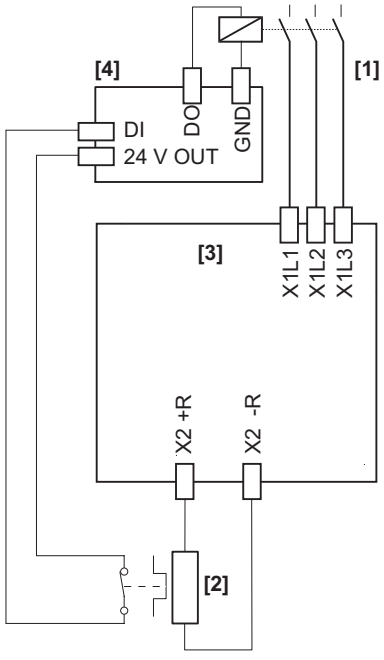
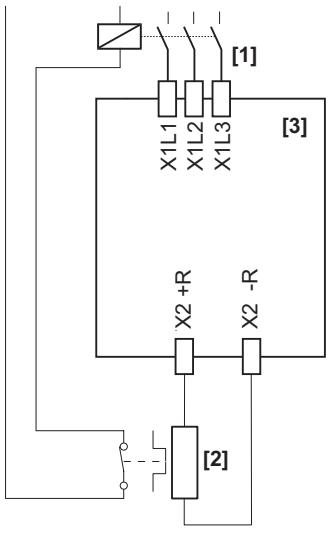
  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.
  – If the thermal circuit breaker trips, there is no direct response in the inverter.
  – With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

- **Connection 3**

  – If the thermal circuit breaker trips, the signal directly affects the line contactor.
  – A response by the PLC is not required.
  – If the thermal circuit breaker trips, there is no direct response in the inverter.

Inverters of size 4 and larger

If a BW...-T braking resistor with internal temperature switch is used with these inverters, then 3 connections are possible:

Connection 1	Connection 2	Connection 3
		

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[1] Line contactor [2] Braking resistor [3] Inverter [4] PLC

INFORMATION

When using connection variant 1 (connection of braking resistor without line contactor), the inverter must be supplied with external DC 24 V.

- **Connection 1**

  The digital input of the inverter connected to the signal contact of the internal temperature switch must be parameterized to the function "External braking resistor fault".

  – If the thermal circuit breaker trips, the signal is evaluated in the inverter.
  – A response by the PLC is not required.
  – It is not necessary to disconnect the line connection using an external switching device.
  – If an internal short circuit in the brake chopper is detected by the inverter, the inverter interrupts the energy supply by inhibiting the rectifier.
  – If the thermal circuit breaker trips, the inverter switches all axis modules to "Output stage inhibit".

- **Connection 2**

  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.
  – If the thermal circuit breaker trips, there is no direct response in the inverter.
  – With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

- **Connection 3**

  – If the thermal circuit breaker trips, the signal directly affects the line contactor.
  – A response by the PLC is not required.
  – If the thermal circuit breaker trips, there is no direct response in the inverter.

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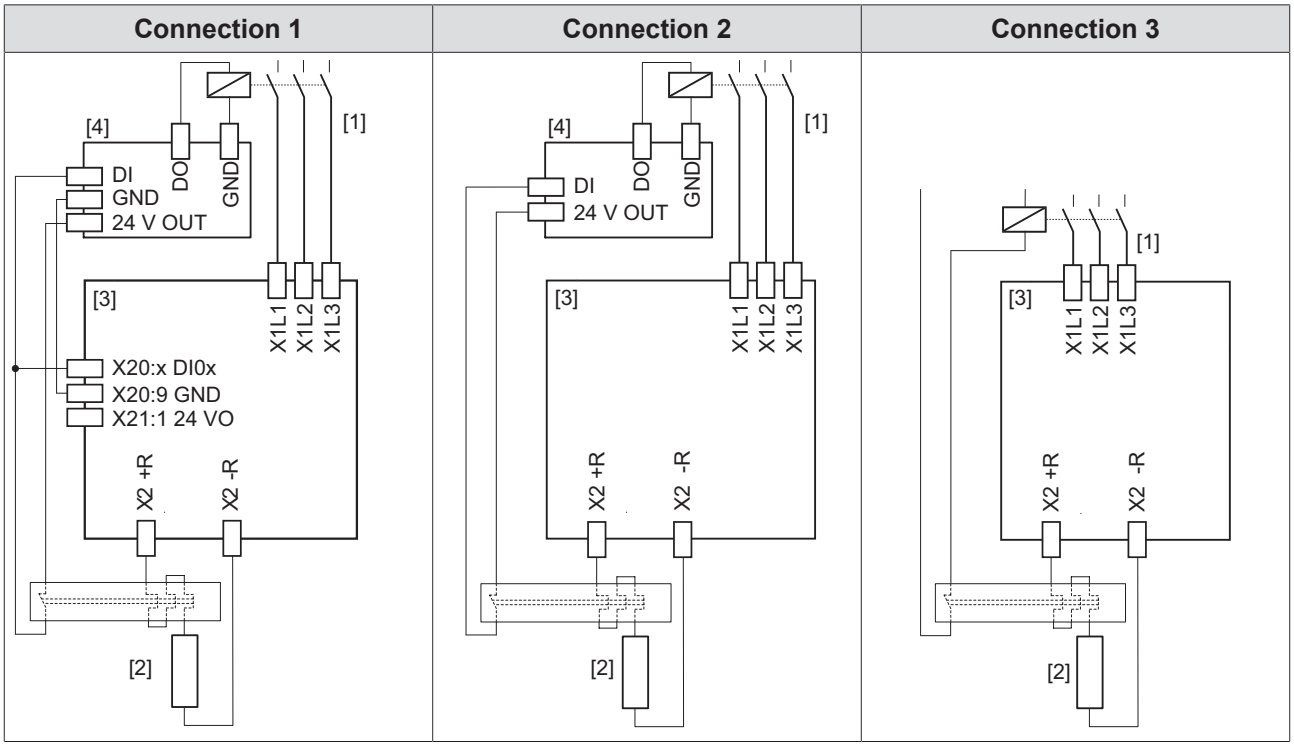
External bimetallic relay

Inverters of size 1 – 3

If an external bimetallic relay is used with the inverter, there are 3 possible connections:



[1] Line contactor [2] Braking resistor [3] Inverter [4] PLC

Note that the reference potential GND of the digital inputs on the controller must be the same as the reference potential of the inverter when connection 1 is used.

- **Connection 1**

  The digital input of the inverter connected to the signal contact of the external bimetallic relay must be parameterized to the function "External braking resistor fault".

  – If the thermal circuit breaker trips, the signal is evaluated in the inverter and the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, the inverter switches to "Output stage inhibit".

- **Connection 2**

  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, there is no direct response in the inverter.

  – With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

- **Connection 3**

  – If the thermal circuit breaker trips, the signal directly affects the line contactor.

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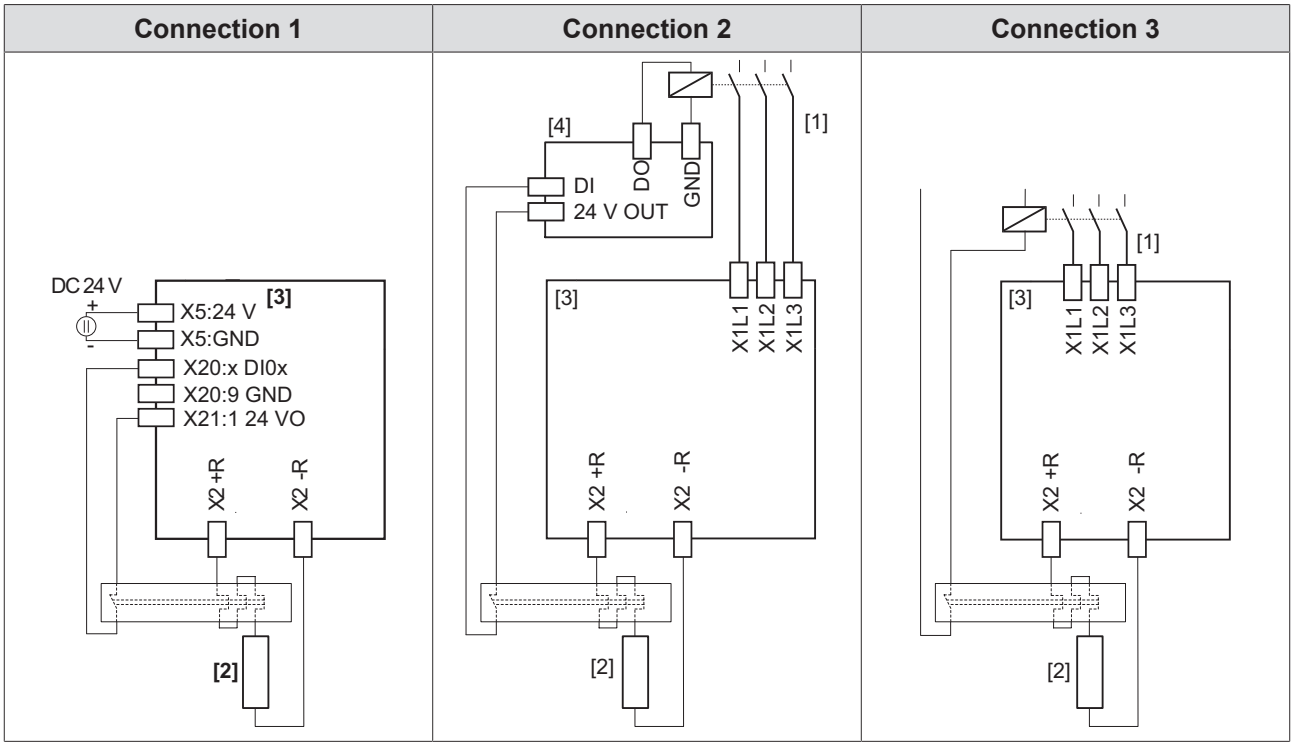
– A response by the PLC is not required.
– If the thermal circuit breaker trips, there is no direct response in the inverter.

Inverters of size 4 and larger

If an external bimetallic relay is used with the inverter, there are 3 possible connections:



[1] Line contactor [2] Braking resistor [3] Inverter [4] PLC

INFORMATION

When using connection variant 1 (connection of braking resistor without line contactor), the inverter must be supplied with external DC 24 V.

- **Connection 1**

  The digital input of the inverter connected to the signal contact of the external bimetallic relay must be parameterized to the function "External braking resistor fault".

  – If the thermal circuit breaker trips, the signal is evaluated in the inverter.
  – A response by the PLC is not required.
  – It is not necessary to disconnect the line connection using an external switching device.
  – If the thermal circuit breaker trips, the inverter switches to the operating state "Output stage inhibit".
  – If an internal short circuit in the brake chopper is detected by the inverter, the inverter interrupts the energy supply by inhibiting the rectifier.

- **Connection 2**

  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.

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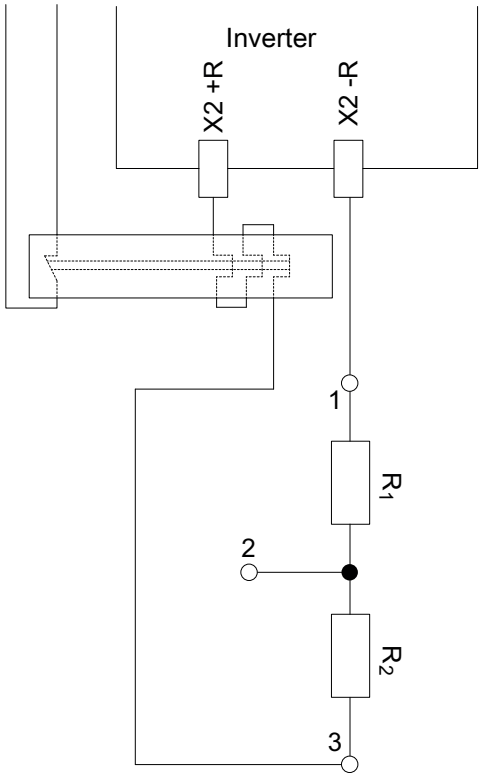
- If the thermal circuit breaker trips, the PLC must interrupt the power supply.
- If the thermal circuit breaker trips, there is no direct response in the inverter.
- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

• **Connection 3**

- If the thermal circuit breaker trips, the signal directly affects the line contactor.
- A response by the PLC is not required.
- If the thermal circuit breaker trips, there is no direct response in the inverter.

5.15.2 Connection of the braking resistor with center tap

The following figure shows a braking resistor with center tap:



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5.16 Terminal assignment

INFORMATION

Reference potentials inside the unit.

The device-internal reference potential is designated as GND in the following table.

All reference potentials GND are internally connected to PE.

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INFORMATION

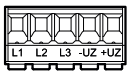
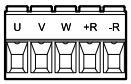
The assignment "Reserved" means that no cable may be connected to this connection.

INFORMATION

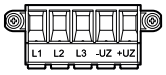
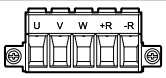
The technical data for the power and control electronics connections is provided in the product manual > chapter "Technical data".

5.16.1 Basic device

Sizes 1 – 3

Terminal	Contact	Function	
	X1:L1	L1	Connection for supply system
	X1:L2	L2	
	X1:L3	L3	
	X1:-U_Z	-U_Z	DC link connection
	X1:+U_Z	+U_Z	
	⏚	PE	Protective earth connection
	X2:U	U	Motor connection
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	Protective earth connection

Size 4

Terminal	Contact	Function	
	X1:L1	L1	Connection for supply system
	X1:L2	L2	
	X1:L3	L3	
	X1:-U_Z	-U_Z	DC link connection
	X1:+U_Z	+U_Z	
	⏚	PE	Protective earth connection
	X2:U	U	Motor connection
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	Protective earth connection

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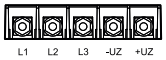
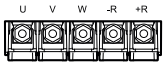
Sizes 5 – 8

INFORMATION

Size 8 is not yet available.

Terminal	Contact	Function	
	X1:L1	L1	Connection for supply system
	X1:L2	L2	
	X1:L3	L3	
	X1:-U_Z	-U_Z	DC link connection
	X1:+U_Z	+U_Z	
	⏚	PE	Protective earth connection
	X2:U	U	Motor connection
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	Protective earth connection

Sizes 7 – 8

INFORMATION

Size 8 is not yet available.

Terminal	Contact	Function	
	-U_Z*	-U_Z	Connection in front of DC link choke
	+U_Z*	+U_Z	

Sizes 1 – 8

INFORMATION

Size 8 is not yet available.

Terminal	Contact	Function	
	X5:24V	V_i24 V	DC 24 V supply voltage
	X5:GND	GND	Reference potential

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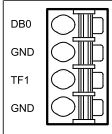
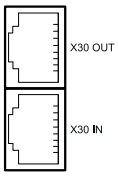
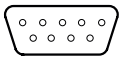
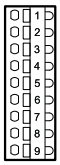
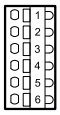
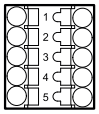
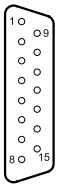
Terminal	Contact	Function	
	X10:DB0 X10:DB00	DB00	Brake control
	X10:GND	GND	Reference potential
	X10:TF1	TF1	Sensor input for temperature evaluation of the motor
	X10:GND	GND	Reference potential

Terminal	Contact	Function
	X30 OUT X30 IN	EtherCAT®/SBus^{PLUS} system bus
	X32	SEW-EURODRIVE Service interface Interface for keypad

Terminal	Contact	Function	
	X20:1	DI00	Digital input 1, with fixed assignment "Output stage enable"
	X20:2	DI01	Digital input 2, fixed setpoints – positive direction of rotation
	X20:3	DI02	Digital input 3, fixed setpoints – negative direction of rotation
	X20:4	DI03	Digital input 4, fixed speed setpoint bit 0
	X20:5	DI04	Digital input 5, fixed speed setpoint bit 1
	X20:6	DI05	Digital input 6, fault reset
	X20:7	Reserved	–
	X20:8	Reserved	–
	X20:9	GND	Reference potential
	X21:1	+24V	DC 24 V voltage output
	X21:2	DO00	Digital output 1, operational
	X21:3	DO01	Digital output 2, output stage enable
	X21:4	DO02	Digital output 3, error
	X21:5	DO03	Digital output 4, STO active
	X21:6	GND	Reference potential
	X22:1	DOR-C	Shared relay contact
	X22:2	DOR-NO	NO contact
	X22:3	DOR-NC	NC contact
	X22:4	Reserved	–
	X22:5	GND	GND

Terminal	Contact	Function	
	X6:1	F_STO_P1	DC +24 V input F_STO_P1
	X6:2	F_STO_M	DC 0 V input F_STO_M
	X6:3	F_STO_P2	DC +24 V input F_STO_P2
	X6:4	GND	Reference potential
	X6:5	24 V STO_OUT	U_{out} = DC 24 V supply of F_STO_P1 and F_STO_P2

X15: Resolver

Terminal	Contact	Function	
	X15:1	sin+	Signal track sine+
	X15:2	cos+	Signal track cosine+
	X15:3	Reserved	–
	X15:4	Reserved	–
	X15:5	Reference+	Resolver excitation+
	X15:6	Temperature sensor-	Reference potential temperature sensor TF/TH/KTY-/PK
	X15:7	Reserved	–
	X15:8	Reserved	–
	X15:9	sin-	Signal track sine-
	X15:10	cos-	Signal track cosine-
	X15:11	Reserved	–
	X15:12	Reserved	–
	X15:13	Reference	Resolver excitation-
	X15:14	Temperature sensor+	Temperature sensor TF/TH/KTY+/PK
	X15:15	Reserved	–

X16: MOVILINK® DDI interface

Terminal	Contact	Function	
	X16	Coaxial connection	MOVILINK® DDI

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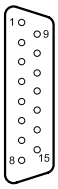
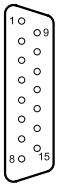
X15: TTL, HTL and sin/cos encoder

Terminal	Contact	Function	
	X15:1	A / cos+	Signal track A / cosine+
	X15:2	B / sin+	Signal track B / sine+
	X15:3	C	Signal track C
	X15:4	DATA+[1)]	Signal cable for electronic nameplate
	X15:5	Reserved	–
	X15:6	Temperature sensor-	Reference potential temperature sensor TF/TH/KTY-/PK
	X15:7	Reserved	–
	X15:8	GND	Reference potential encoder supply
	X15:9	$\overline{A}$ / cos-	Signal track $\overline{A}$ / cosine-
	X15:10	$\overline{B}$ / sin-	Signal track $\overline{B}$ / sine-
	X15:11	$\overline{C}$	Signal track $\overline{C}$
	X15:12	DATA-[1)]	Signal cable for electronic nameplate
	X15:13	V_{S24VG}	24 V encoder supply
	X15:14	Temperature sensor+	Temperature sensor TF/TH/KTY+/PK
	X15:15	V_{S12VG}	12 V encoder supply

1) For encoders from SEW-EURODRIVE with electronic nameplate.

X15: HIPERFACE® encoder and SEW-EURODRIVE encoder with RS485 interface

Terminal	Contact	Function	
	X15:1	cos+	Cosine+
	X15:2	sin+	Sine+
	X15:3	Reserved	–
	X15:4	DATA+	Signal cable+
	X15:5	Reserved	–
	X15:6	Temperature sensor-	Reference potential temperature sensor TF/TH/KTY-/PK
	X15:7	Reserved	–
	X15:8	GND	Reference potential encoder supply
	X15:9	cos-	Cosine-
	X15:10	sin-	Sine-
	X15:11	Reserved	–
	X15:12	DATA-	Signal cable-
	X15:13	V_{S24VG}	24 V encoder supply
	X15:14	Temperature sensor+	Temperature sensor TF/TH/KTY+/PK
	X15:15	V_{S12VG}	12 V encoder supply

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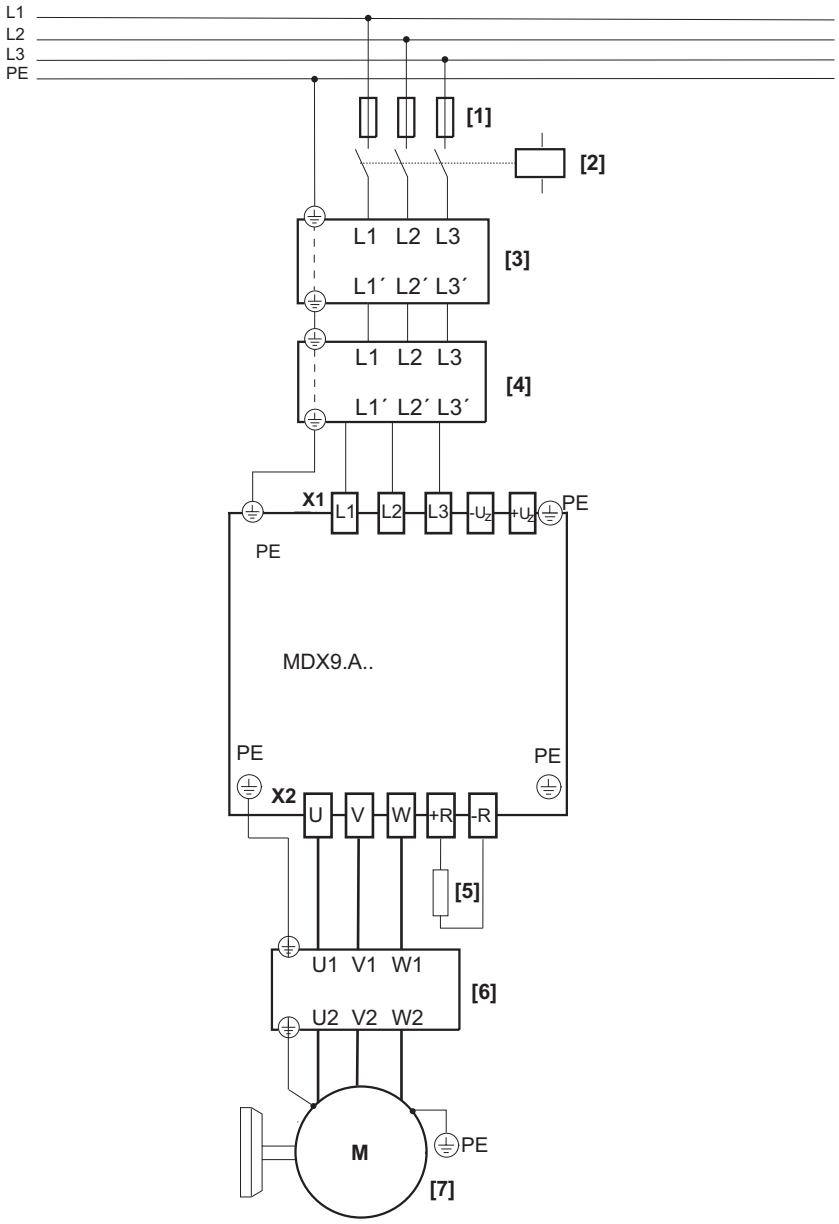
5.17 Wiring diagrams

5.17.1 Power connection

Power connection with line contactor

The following figure shows an example of the wiring of the power connections with line contactor, line choke, line filter and output choke and/or output filter:



72057607916833419

[1] Fuses
[2] Line contactor
[3] Line choke (optional)
[4] Line filter (optional)
[5] Braking resistor (optional)
[6] Output choke and/or output filter (both optional)
[7] Motor

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Power connection without line contactor

NOTICE

Operation without line contactor

If the required measures are not taken, operation of an inverter with connected braking resistor without line contactor may result in severe damage to property.

- Required measures as well as the inverters that can be operated without a line contactor can be found in the chapter "Using the line contactor" (→ 🗎 42).

INFORMATION

Line connection without line contactor

In the event of a line connection without line contactor, the temperature evaluation of the braking resistor must be ensured via a digital input on the inverter.

- Parameterize the connected digital input to monitor the braking resistor temperature evaluation.

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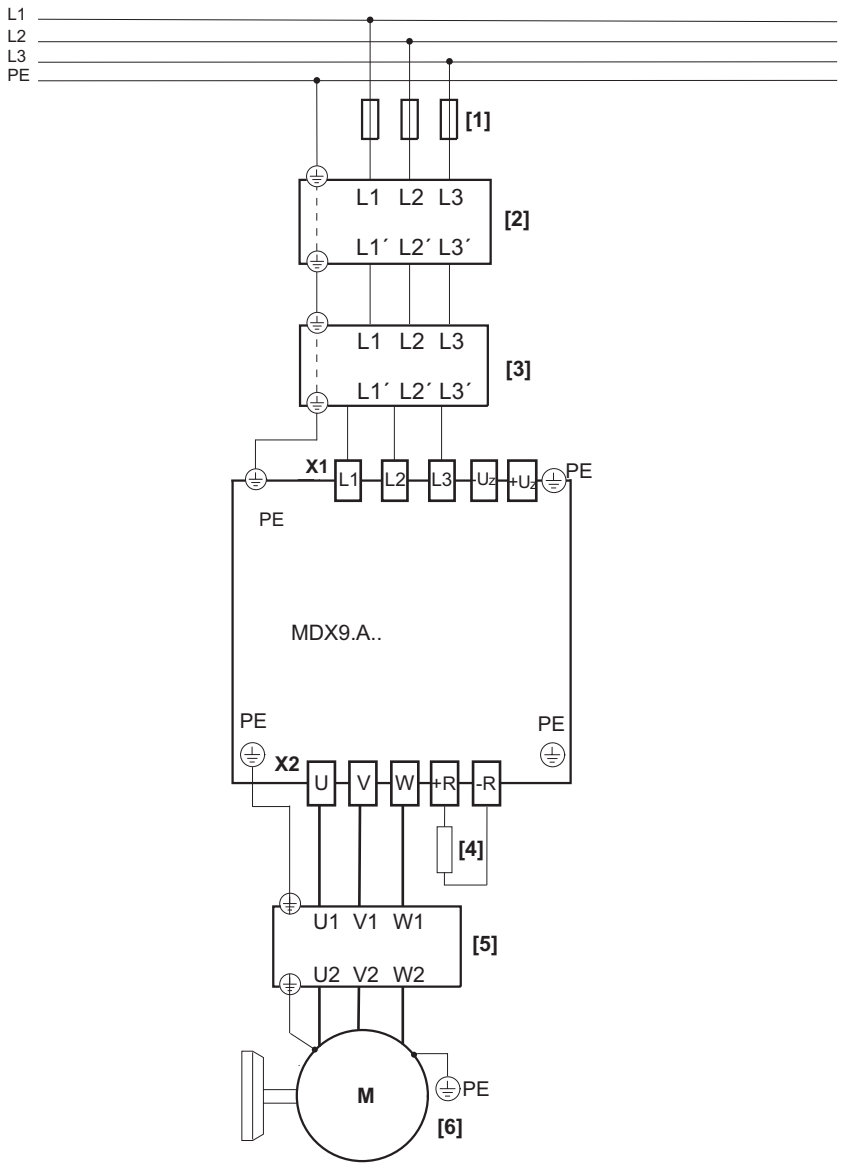
The following figure shows an example of the wiring of the power connections without line contactor, with line choke, line filter and output choke and/or output filter:



54043209407696267

[1] Fuses
[2] Line choke (optional)
[3] Line filter (optional)
[4] Braking resistor (optional)
[5] Output choke and/or output filter (both optional)
[6] Motor

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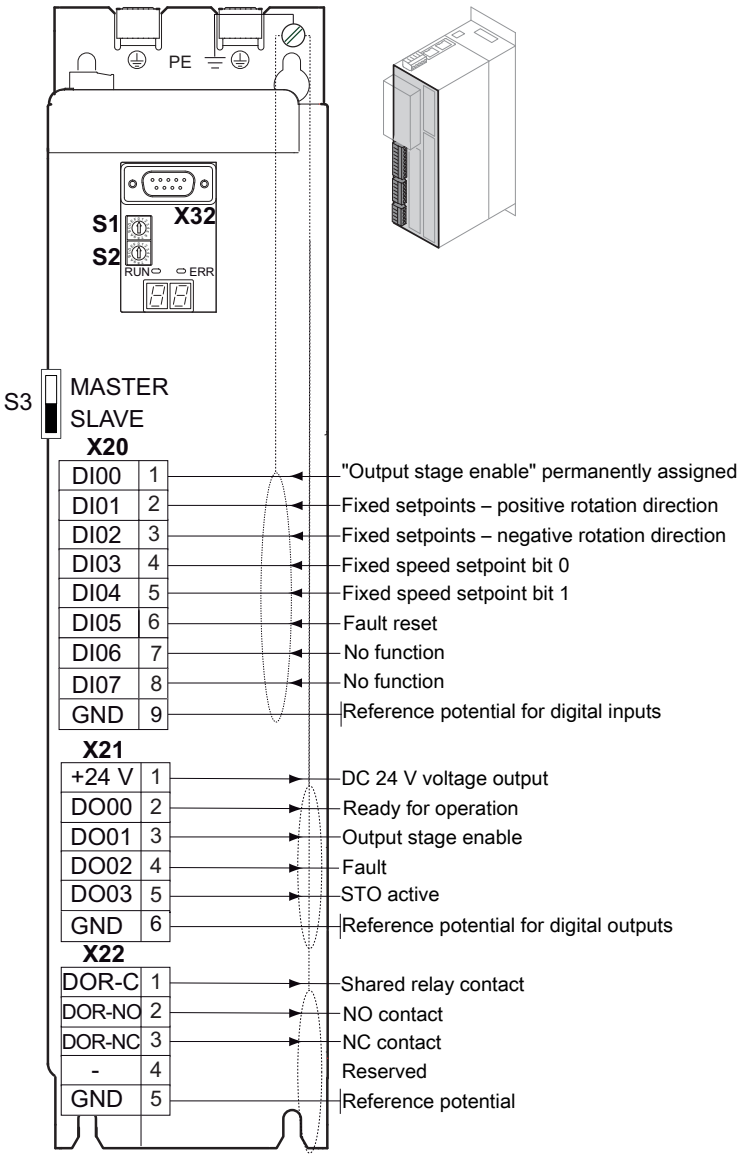
5.17.2 Electronics connection

Control electronics, front

For the assignment of the signal terminals and connections, refer to chapter "Terminal assignment" > "Basic device" (→ 🗎 69).

The assignment of the digital inputs and outputs shown here is the factory setting.

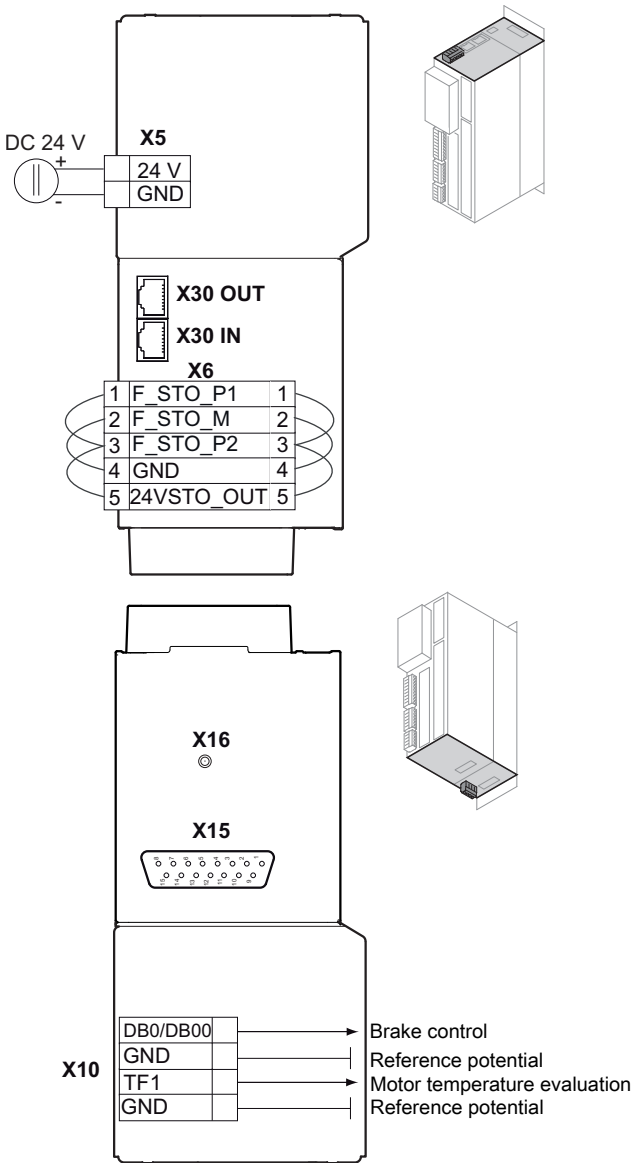


18014424112917771

S3 Module bus operating mode
X20 Digital inputs
X21 Digital outputs
X22 Isolated relay contact

Control electronics, top and bottom

For the assignment of the signal terminals and connections, refer to chapter "Terminal assignment" > "Basic device" (→ 🗎 69).



9007223162791691

X5 24 V supply voltage
X6 Connection for Safe Torque Off (STO)
With installed CS.A card, the cable bridges are removed at the factory.
If no CS.A card is installed upon delivery, the cable bridges are installed at the factory.
X10 Connection of brake control and motor temperature monitoring
X15 Motor encoder connection
X16 Connection of MOVILINK® DDI digital motor integration
X30 SBus^{PLUS}/EtherCAT® system bus

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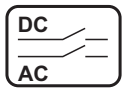
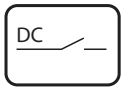
5.17.3 Brake control connection

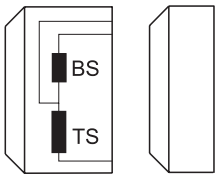
Key



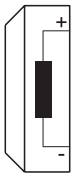
Cut-off in the DC and AC circuit
(rapid application of the brake)



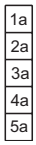
Cut-off in the DC circuit



Brake
BS = Accelerator coil
TS = Coil section



DC brake with one brake coil



Auxiliary terminal strip in terminal box

Control cabinet limit

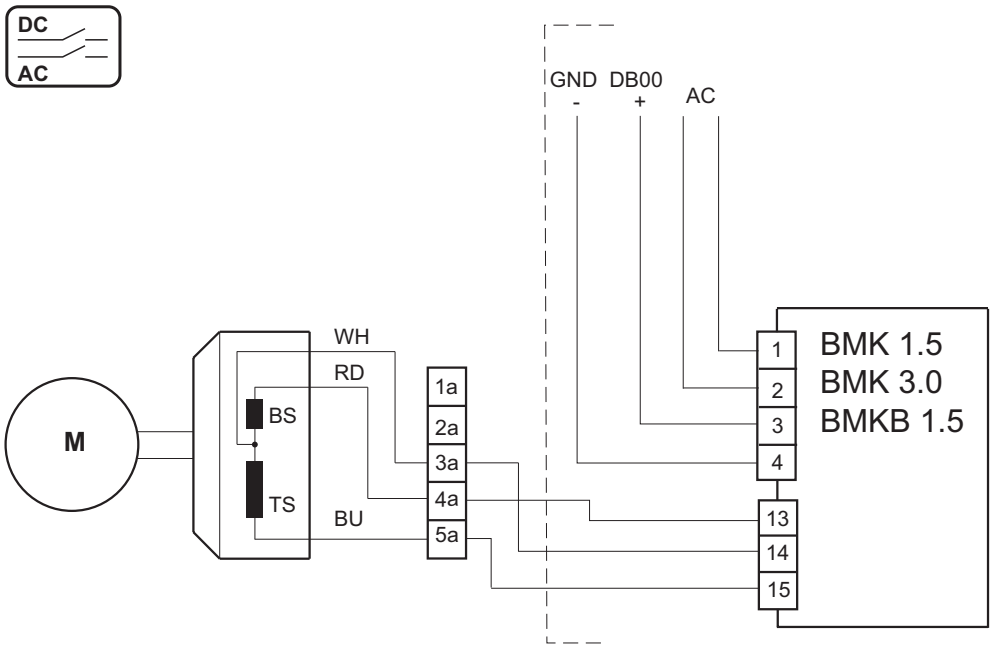
WH	White
RD	Red
BU	Blue
M	Motor

INFORMATION

The selection of the brake control and the shown connection diagrams only represent one of the many possibilities. Observe the catalogs and operating instructions of the motors for more information and installation notes.

BMK. brake control

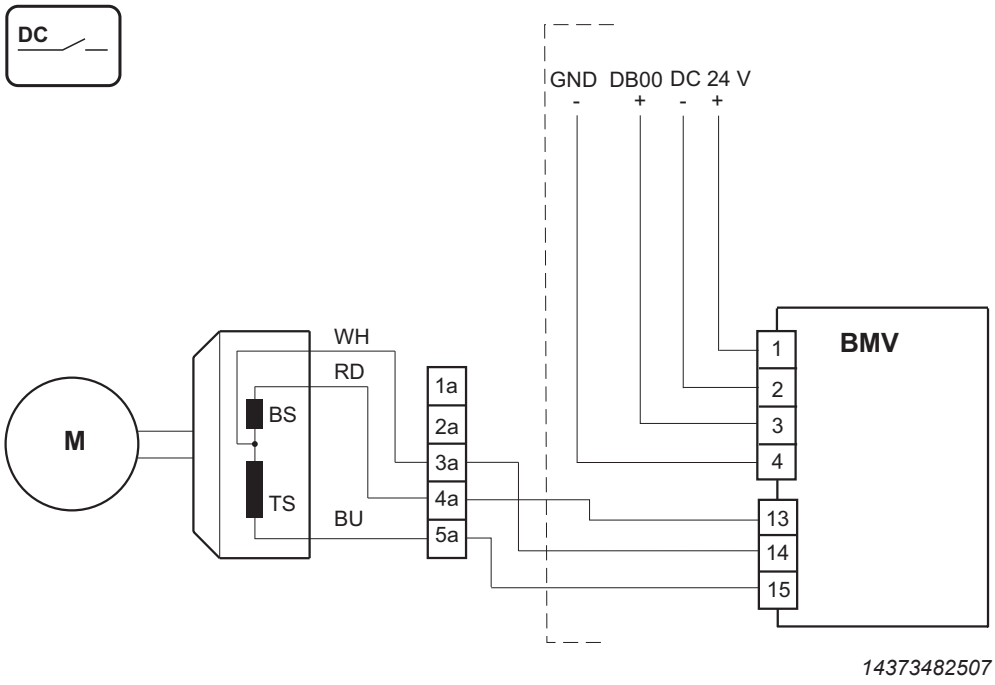
The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



9007213579236747

BMV brake control – 2 coils

The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



14373482507

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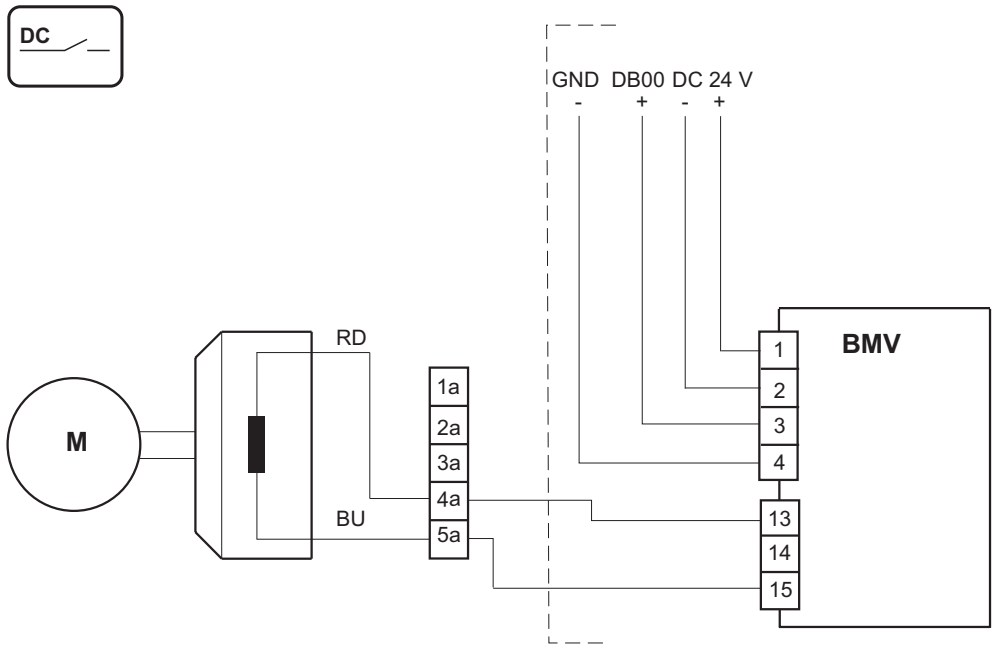
BMV brake control – 1 coil

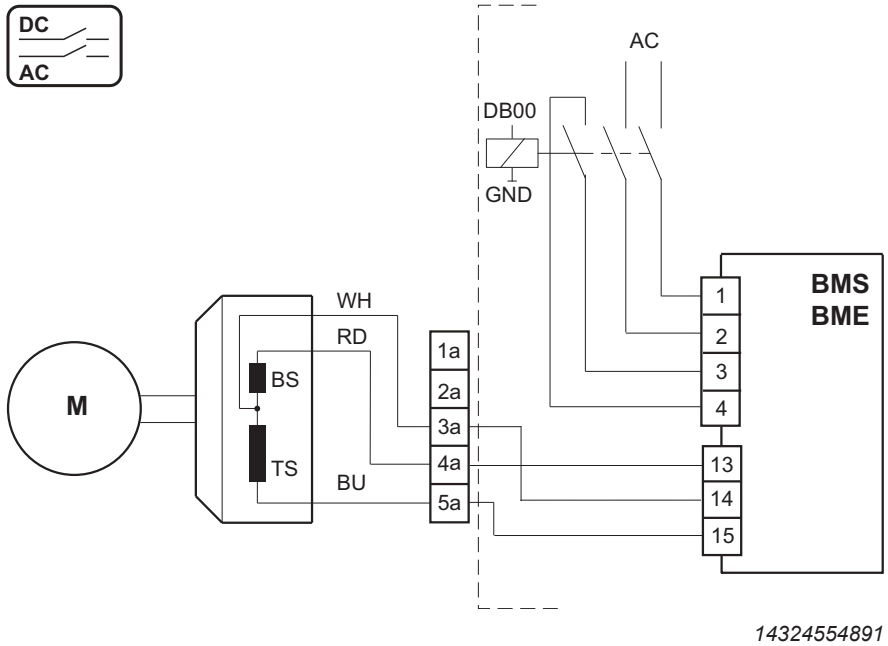
The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



14373494923

BMS, BME brake control

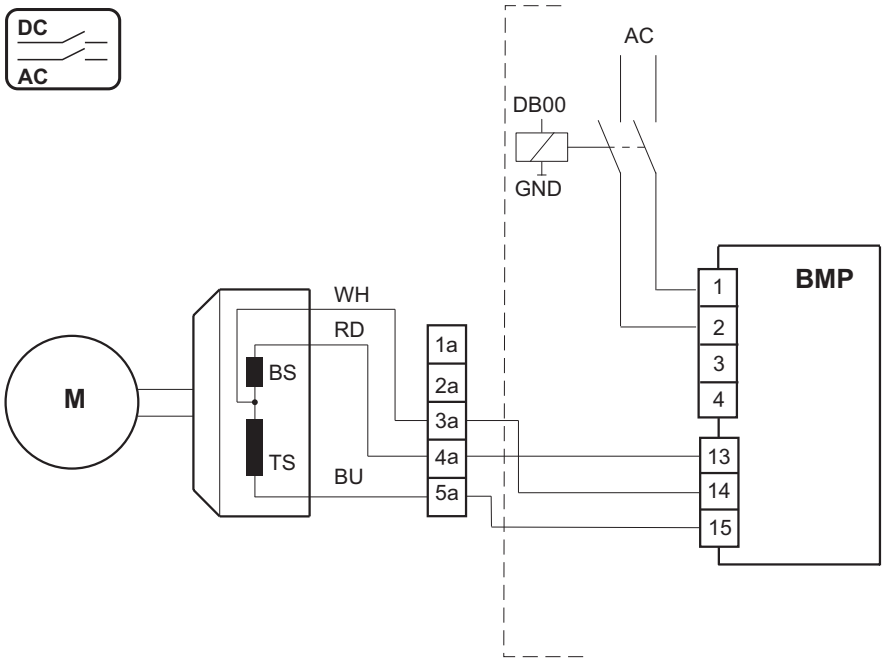
The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



14324554891

BMP brake control

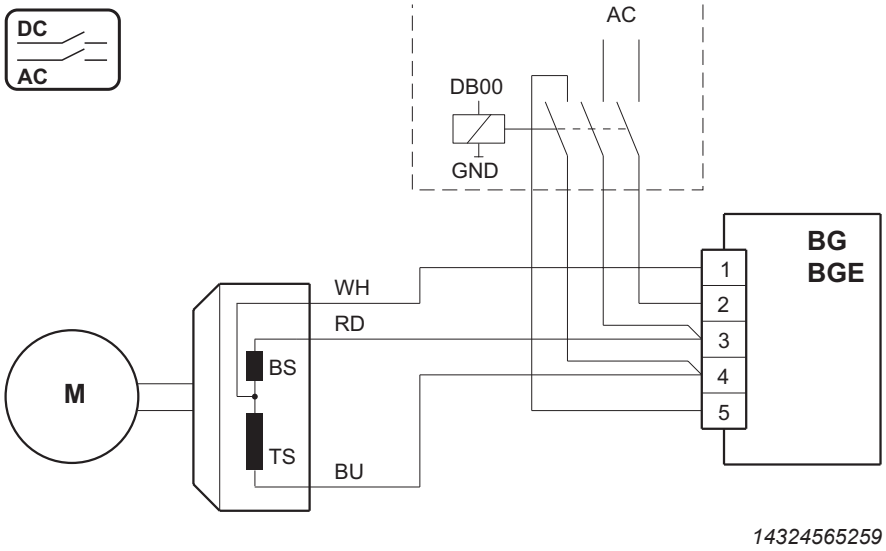
The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



14324544523

BG, BGE brake control

The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



14324565259

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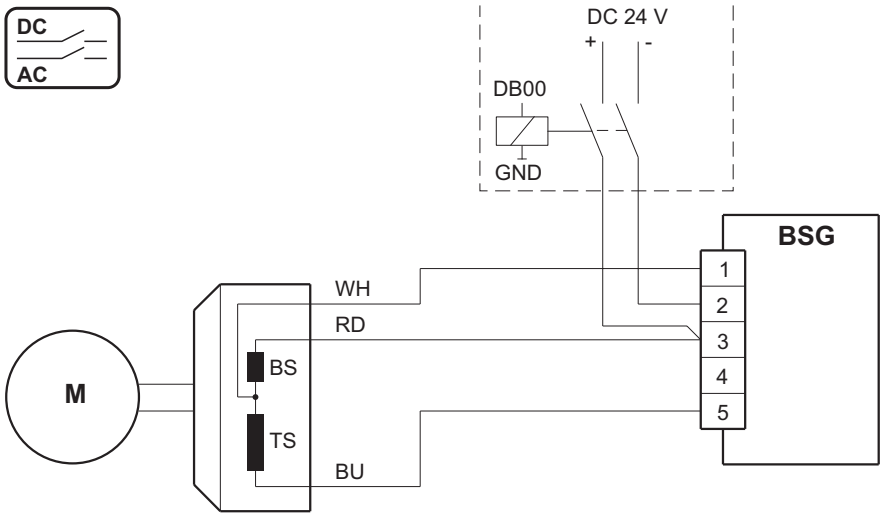
BSG brake control

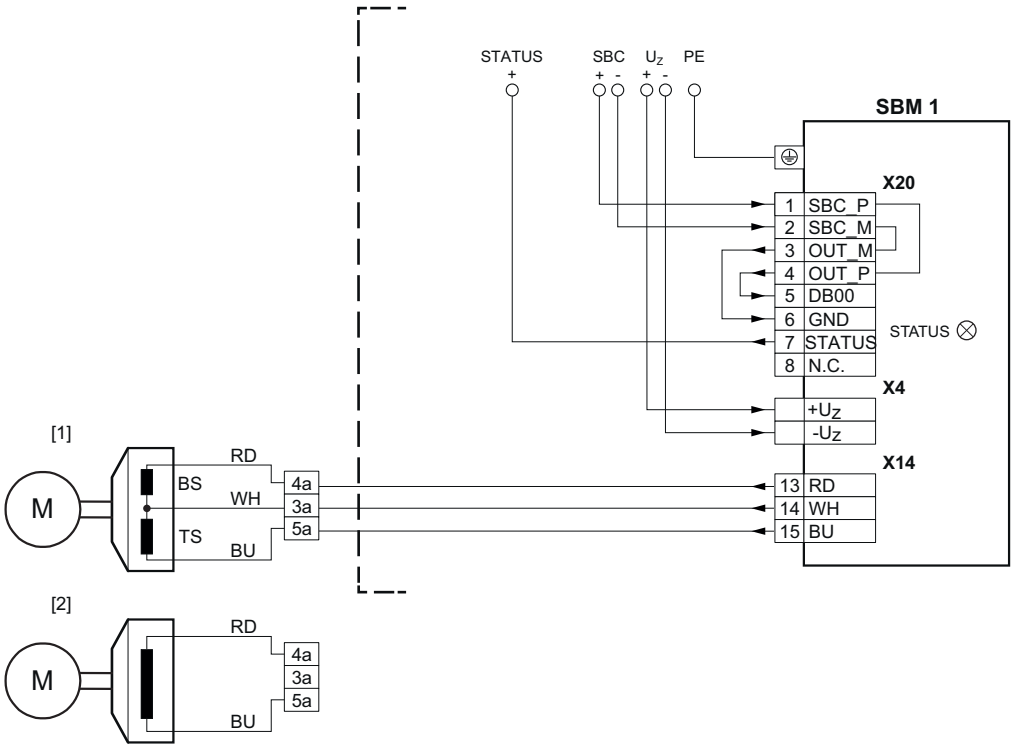
The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



14324597131

SBM brake control with 1 control cable

The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



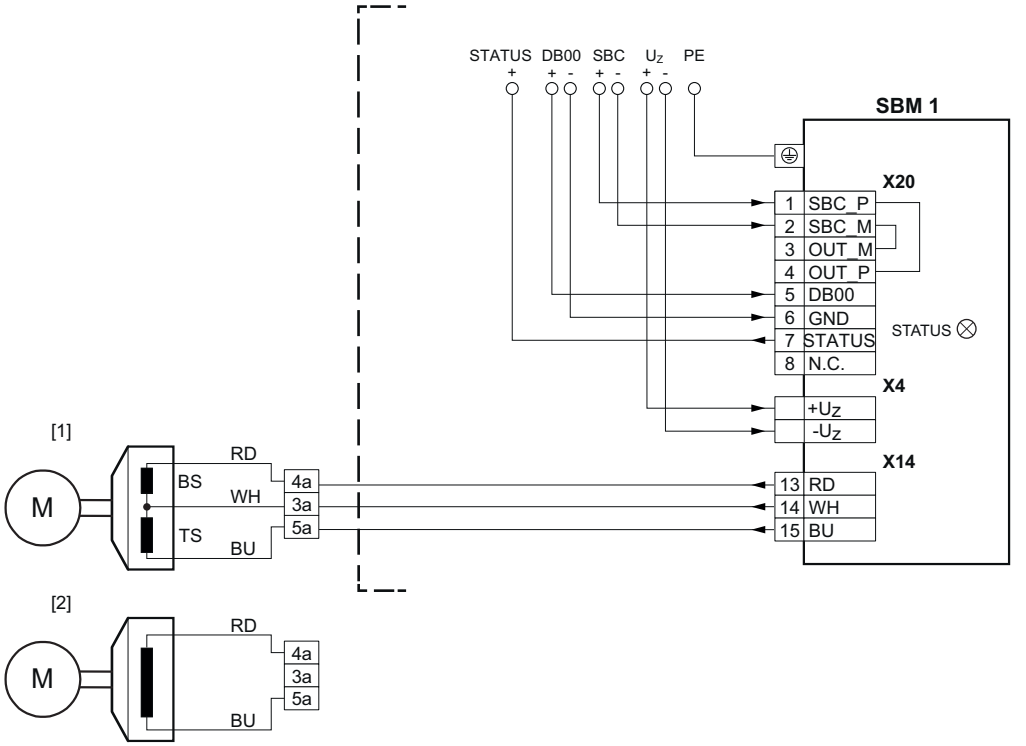
9007232120094731

[1] Connection of the brake with 3-wire technology (standard)

[2] Connection of the brake with 2-wire technology (optional). In this case, there is no connection from terminal X14:14 of the brake module to terminal 3a of the auxiliary terminal strip.

SBM brake control with 2 control cables

The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



9007232118783115

[1] Connection of the brake with 3-wire technology (standard)

[2] Connection of the brake with 2-wire technology (optional). In this case, there is no connection from terminal X14:14 of the brake module to terminal 3a of the auxiliary terminal strip.

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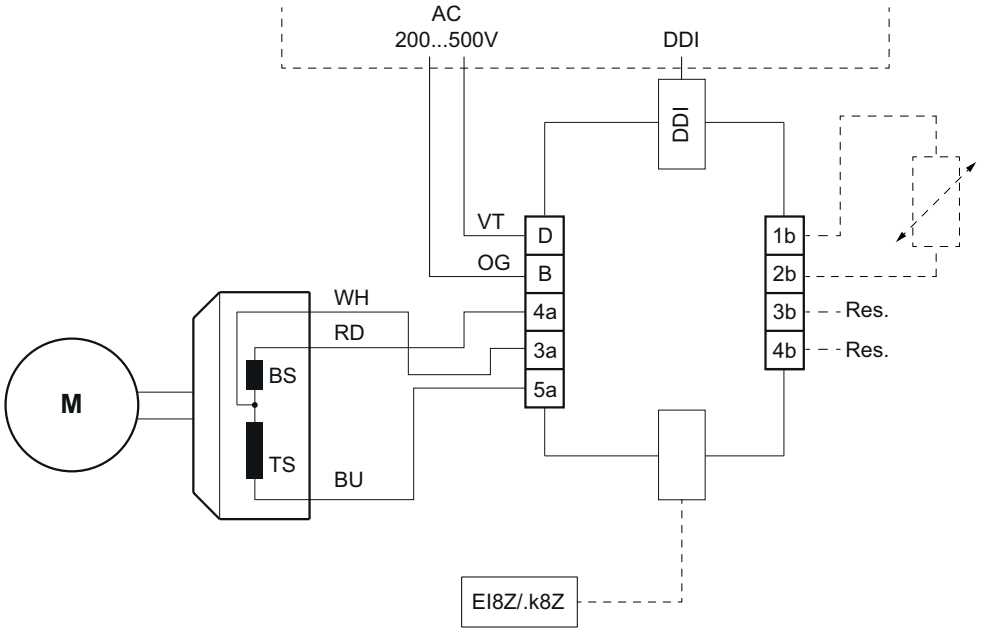
BG1Z brake control

The meaning of the symbols can be found in chapter "Key" (→ 🗎 79).



5.18 PC connection

Observe the information in the product manual > chapter "Electrical installation" > "PC connection" including the sub-chapters.

6 Startup

6.1 Startup information

Perform the following steps before startup:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages. Severe or fatal injuries.
   De-energize the device. Observe the 5 safety rules in chapter "Performing electrical work safely". Then wait at least 10 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injury.
   Let the device and its accessories cool down before touching it.
3. **NOTICE!** Failing to observe the minimum switch-off time of the line contactor can cause material damage. Irreparable damage to the inverter or unforeseen malfunctions.
   After switching off the voltage supply, keep it switched off for at least 10 s.
   ⇨ Do not switch the voltage supply on or off at the line contactor more than once per minute.
4. Install the protective covers of the system according to the instructions. This will avoid injuries.
   ⇨ Never start the device if the protective covers are not installed.
5. Product variants with a customer-specific parameter set ex works (.../P...) can start up automatically.

6.1.1 Lifting applications

Perform the following additional steps before starting up the lifting applications:

1. ⚠ **WARNING!** Danger from falling hoist. Severe or fatal injuries.
   Observe the following information.
   ⇨ Do not use the device alone as a safety device for the lifting application.
   ⇨ Use additional monitoring systems or mechanical protection devices as a safety device.
2. ⚠ **WARNING!** Danger from falling hoist. Severe or fatal injuries.
   Do not use the "Release brake/deactivateDynaStop® with FCB01" function in lifting devices or applications with loads that may potentially fall down. Disable the function as follows:
   ⇨ Disable the function using the parameter *Release brake/deactivate DynaStop® with FCB01 – Enable* = **"0"** (Path: *Functions* > *Drive functions* > *FCB01 Output stage inhibit*).
3. **INFORMATION** The use of a drive in a lifting application is not permitted in conjunction with the ELSM® control mode.

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4. In the MOVISUITE® engineering software, configure the parameters according to the lifting application requirements and its safety assessment.
   ⇨ In the case of drives with a brake, set the parameter *Apply brake in STO state (8501.3)* = "1" (Yes), path: *Functions* > *Drive functions* > *FCB01 output stage inhibit*, see chapter "Mechanical brake in conjunction with STO".
5. Check the setting of the *Hoist preload* parameter in the MOVISUITE® engineering software, path: *Drive train* > *Controller* > *Motor behavior*. Set the parameter in accordance with the lifting application requirements. More information about the possible settings "Off", "Save" and "Initialization value" can be found in the online help of the parameter.

INFORMATION

Lifting application without encoder

Design the control in such a way that a direction of rotation reversal is only possible in an idle state (with the brake applied).

If the direction of rotation is to be changed without being in an idle state, use a drive with an encoder.

- It is not advisable to use the U/f operating mode in a hoist.

6.2 Startup requirements

The following prerequisites are required for startup:

- You have installed the inverter correctly both mechanically and electrically.
- You have configured the inverter and connected drives correctly.
- You have taken suitable measures to ensure that the drives do not start up unintentionally.
- Safety precautions rule out hazards to people and machinery.

You can perform startup in the following ways:

- using a keypad
- using the MOVISUITE® engineering software

6.2.1 Required hardware for startup with MOVISUITE®

- USM21A interface adapter, serial interface cable RJ10 ↔ D-sub 9

  or
- CBG11A, CBG21A or CBG22A keypad, USB cable A ↔ Mini B

  or
- Ethernet cable and access via EtherCAT®/Ethernet/PROFINET

Part number	Scope of delivery
28231449	• USM21A interface adapter • Serial interface cable with 2 RJ10 connectors • USB cable (A-B)
18123864	• Serial interface cable RJ10 ↔ D-sub 9

6.3 Startup with "ex works parameters"

SEW-EURODRIVE offers the ordering of products with customer-specific parameter settings in the delivery state. This option is known as "ex works parameters". Startup procedures and processes can be optimized in the best possible way using this option. Products with a customer-specific parameter set are marked with .../P... in the type designation.

6.4 Startup of third-party motors

Asynchronous motors

The nameplate data of the motor must be entered during startup:

- Nominal motor speed
- Rated motor frequency
- Nominal motor voltage
- Nominal motor current
- Power factor (cos φ)
- Nominal motor power

The parameters required for startup are calculated based on the nameplate data and the motor is taken into operation. A prerequisite is that the inverter is connected with the MOVISUITE® engineering software.

SEW-EURODRIVE also recommends carrying out a parameter measurement with FCB25 for better control characteristics. These determine the equivalent wiring diagram of the motor. The duration of the measurement depends on the motor parameters. In the case of asynchronous motors, the measurement is carried out in an idle state. If a brake is present, it remains closed.

Synchronous motors

The nameplate data of the motor must be entered during the startup of synchronous motors:

- Nominal motor speed
- Rated motor frequency or number of poles
- Nominal motor voltage
- Nominal motor torque
- Maximum torque at the motor shaft
- Maximum motor current
- Optional:
  - Phase inductance
  - Internal voltage

In the case of synchronous motors without an encoder, a parameter measurement must then be carried out with FCB25. In the case of synchronous motors with an encoder, SEW-EURODRIVE recommends carrying out the parameter measurement. The brake is released (if present) during the measurement to align the rotor electrically. Make sure that the rotor can turn freely. For this reason, the motor must be separated from the gear unit or system. The duration of the measurement is limited to a few seconds.

In the case of synchronous motors with an encoder, the encoder offset must also be set after the above-mentioned startup procedure. This commutation takes place using the "Rotor position identification" function (FCB18). The rotor turns during the rotor position identification. Make sure that the rotor can turn freely. For this reason, the motor must be separated from the gear unit or system.

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6.5 Startup with MOVISUITE® engineering software

The inverters are started up using the MOVISUITE® engineering software from SEW-EURODRIVE.

The motor is started up in drive train 1 or drive train 2.

When using a motor from SEW-EURODRIVE, select the motor type from the catalog.

When using a third-party motor, enter the corresponding nominal motor data. SEW-EURODRIVE recommends performing a motor parameter measurement using the FCB 25 for third-party motors.

The engineering software can be operated intuitively and is not described further in this document.

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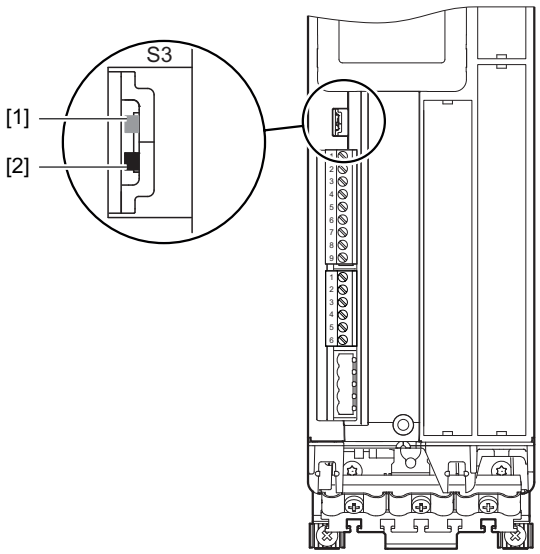
6.6 Setting the "module bus" operating mode

If 2 inverters are connected via a DC link connection, they require the information whether they are "module bus master" or "module bus slave" in the network.

This is set using switch S3 "Module bus operating mode". For further information, refer to the "DC link connection" manual.

If the inverters are not connected to each other via a DC link connection, always set switch "S3" to switch position "Master".



9007214942710923

[1] "Master" switch setting

[2] "Slave" switch setting

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6.7 Setting the EtherCAT® ID

It is not strictly necessary to set one of the EtherCAT® IDs. The slaves are automatically addressed by the master by default. The EtherCAT® ID must only be set on the inverter if the use of EtherCAT® IDs has been preset in the hardware configuration of the master.

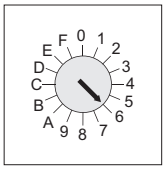
An EtherCAT® ID can be permanently assigned to the inverter with the EtherCAT® interface using hexadecimal switches S1 and S2. With these switches, you can set a decimal EtherCAT® ID between 1 and 255 in hexadecimal notation.

This ID serves as a unique identification tag of the respective EtherCAT® slave for the EtherCAT® master. The EtherCAT® ID is not an EtherCAT® address. The EtherCAT® ID is always assigned by the EtherCAT® master.

In the delivery state of the inverter, the ID is set to 0 by default (S1 = 0 and S2 = 0).

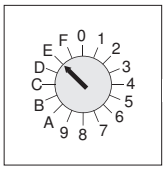
Required ID, decimal	ID, hexadecimal	Setting S1 (× 10)	Setting S2 (× 1)
3	03	0	3
18	12	1	2
25	19	1	9
100	64	6	4
110	6E	6	E
255	FF	F	F

S1 EtherCAT® ID (× 10)



6

S2 EtherCAT® ID (× 1)



E

The EtherCAT® ID "110" is set as an example in the illustration above.

6.8 Startup with the CBG21A keypad

You can start up the following motors with the CBG21A keypad:

- Asynchronous motors:
  - with encoder/without encoder
  - with or without brake
  - with or without motor sensor (TF, TH, KY and PK)
- Synchronous motors:
  - with encoder/without encoder
  - with or without brake
  - with or without motor sensor (TF, TH, KY and PK)
- Direct selection of the SEW-EURODRIVE motors

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You can carry out the startup of other motors with the MOVISUITE® engineering software.

Further information can be found in the product manual > chapter "Startup" > "Startup with the CBG21A keypad", including the sub-chapters.

6.9 Startup of motors with the MOVILINK® DDI interface

If an inverter has the MOVILINK® DDI interface and is connected to a motor that also has this interface, the motor is started up automatically via its electronic nameplate. The process is started by switching on the inverter. This function is only supported if the inverter is in the delivery state.

The status of the inverter is "AC" (Auto Configuration) during the data transfer from the electronic nameplate. You can obtain more information from the SEW-EURODRIVE hotline.

6.10 Control options

The following description requires the use of the MOVISUITE® engineering software.

Depending on the version of the inverter, it is controlled via the digital inputs/analog inputs or via fieldbus.

In principle, the user is free to configure the respective interface individually or use the standard interface of SEW-EURODRIVE. Various MOVIKIT® software modules are available for this purpose.

The MOVIKIT® software modules have the following advantages:

- Application-specific functionalities
- Standard interface of SEW-EURODRIVE
- Automated parameterization of the interface
- MOVIKIT®-specific diagnostics and manual operation

6.10.1 Control via terminals

Analog setpoints and fixed setpoints can be used for control via terminals. If no MOVIKIT® has been loaded ex-works, the source is set to "No source" under "Setpoints/basic setting" and the inverter can be controlled via terminals. The following default setting/factory setting applies here:

- **Digital inputs**
  - DI00: Output stage enable
  - DI01: FCB05 – Fixed setpoint, positive direction of rotation
  - DI02: FCB05 – Fixed setpoint, negative direction of rotation
  - DI03: Fixed speed setpoint bit 0
  - DI04: Fixed speed setpoint bit 1
  - DI05: Error reset
  - DI06: no function
- **Digital outputs**
  - DB00: Brake output (fixed function)
  - DOR: No function

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– D00: Ready
– D01: Output stage enabled
– D02: Error
– D03: STO active

6.10.2 Control via fieldbus

For control via fieldbus, the source must be set to "Standard fieldbus system" under "Setpoints/basic setting".

- Process output data (controller → device)

  Setpoint and profile value interconnections can be individually linked to the corresponding process output data.

  In addition, the control words used must be documented and the link to the process output data must be established.

- Process input data (device → controller)

  The data sources for the process input data can be linked under "Actual values/PI data".

  In addition, the status words used must be documented and the link to the process input data must be established.

6.10.3 Control via MOVIKIT® software module

The MOVIKIT® software modules have fixed defined interfaces.

When using the MOVISUITE® engineering software, the MOVIKIT® software modules can be selected and added via the software catalog.

For further information on using and operating the MOVIKIT® software modules, refer to the corresponding documentation.

6.11 Application-related startup

The applications are started up with specific settings using the MOVISUITE® engineering software.

Pay attention to the information in the product manual > chapter "Startup" > "Application-related startup", including the sub-chapters.

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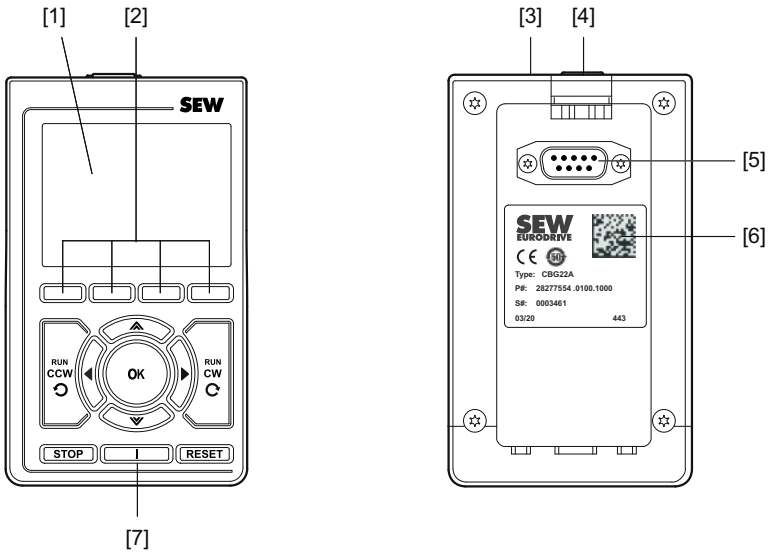
7 Operation

7.1 CBG22A keypad

The following figure shows the CBG22A keypad (front and rear):

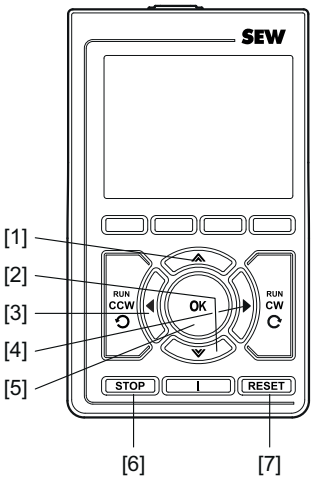


34005940491

[1] Color display
[2] Function keys (function according to bottom line on color display)
[3] USB 2.0 Mini B interface, female (PC connection)
[4] Locking element
[5] D-sub interface, 9-pin, female
[6] Nameplate
[7] Info key (for information about the selected menu)

Keys

The following figure shows the required keys of the CBG22A keypad:



[1] Key 1 "▲"
[2] Key 2 "▼"
[3] Key 3 "◀"
[4] Key 4 "▶"
[5] Key 5 "OK"
[6] Key 6 "STOP"
[7] Key 7 "RESET"

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8 Service

8.1 Resetting fault messages

⚠ WARNING

Removing the source of the malfunction or performing a reset can result in an automatic restart of the connected drives.

Severe or fatal injuries.

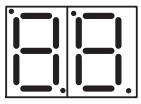
- Prevent the system from performing an unintentional startup.

Acknowledge the fault message by:

- Switching the device off and on again.
- Via the controller/PLC: Send "Reset command".

8.2 Description of the 7-segment display

8.2.1 Description



- The two 7-segment displays indicate the operating state of the inverter.

8.2.2 Operating displays of the 7-segment display

Displays during the boot procedure			
Display	**Description**	**State**	**Remark/action**
b0 b1 b2 b3 br	Device passes through several states when loading the firmware (boot) in order to become ready for operation.	• Status: Not ready • Output stage is inhibited. • Communication is not possible.	• Wait until the boot procedure is complete. • Device stays in this state: Device defective.

Displays of different device states			
Display	**Description**	**State**	**Remark/action**
.	Energy-saving mode		Energy-saving mode active.
00	DC link voltage missing.	• Status: Not ready • Output stage is inhibited. • Communication is possible.	Check the supply system.
C0 flashing	Module bus is not ready.	–	Check the module bus connection.
C1 flashing	Startup state	–	Startup state is active.

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Displays of different device states			
Display	**Description**	**State**	**Remark/action**
C2 flashing	STO active	• Status: Not ready • Output stage is inhibited. • Communication is possible.	The Safe Torque Off function is active.
C3 flashing	Synchronization with the bus not OK. Process data processing is not ready.		• Check the bus connection. • Check the synchronization setting at the device and controller. • Check the process data settings at the device and controller.
C4 flashing	Encoder evaluation is not ready.		• Encoders are being initialized. • Device stays in this state: - no encoder selected. - "Source actual speed" or "Actual position" parameter shows an encoder that does not exist.
C5 flashing	Motor management not ready.	–	–
C6 flashing	Internal device supply incomplete.	–	–
C7 flashing	Power section not ready.	–	–
C8 flashing	External device not ready.	–	–
C9 flashing	Data flexibilization layer not ready.	–	–
Cd flashing	Parameter download running.	–	–
CA	MOVILINK® DDI not ready	–	Determination of the cause via the MOVISUITE® engineering software under Status/Digital Motor Integration.

Displays during initialization processes (parameters will be reset to default values)			
Display	**Description**	**State**	**Remark/action**
d0 flashing	Basic initialization	• Status: Not ready • Output stage is inhibited. • Communication is possible.	Waiting for initialization to finish.
d1 flashing	Initialization at delivery state		

Displays in normal operation			
Display	**Description**	**State**	**Remark/action**
01	Output stage inhibit	Output stage is inhibited.	The drive is not controlled by the output stage. The brake is applied; without the brake, the motor coasts to a halt. FCB 01 can be selected from various sources.

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Displays in normal operation			
Display	**Description**	**State**	**Remark/action**
AC	Auto Configuration	Data is transferred to the inverter via the MOVILINK® DDI interface.	Motor is started up via the MOVILINK® DDI interface.
02	Default stop	For further information, refer to the FCB description.	Drive function (FCB) "Default stop" active if no other FCB is selected and the system is ready.
04	Manual operation		Manual mode active
05	Speed control		Speed control with internal ramp generator
06	Interpolated speed control		Speed control with setpoints cyclically via bus. The ramp generator is located externally; for example, in a higher-level controller.
07	Torque control		Torque control
08	Interpolated torque control		Torque control with setpoints cyclically via bus
09	Positioning control		Positioning mode with internal ramp generator
10	Interpolated positioning control		Positioning mode with setpoints cyclically via bus. The ramp generator is located externally; for example, in a higher-level controller.
12	Reference travel		The drive performs a reference travel.
13	Stop at application limitation		Deceleration at the application limit. FCB 13 is also active if no other FCB is selected than the default FCB 02.
14	Emergency stop		Deceleration at the emergency stop limit
18	Rotor position identification		Encoder commutation with synchronous motors.
19	Position hold control		Position control on current position
20	Jog		Jog mode active
21	Brake test		Brake is tested by applying a torque when the brake is applied.
25	Motor parameter measurement		Motor parameter measurement active
26	Stop at user limits	For further information, refer to the FCB description.	Serves to stop at user limits.

8.2.3 Fault displays of the 7-segment display

The inverter detects any faults that occur and displays them as fault code. Each fault is clearly defined by its fault code and the associated attributes:

- Fault response

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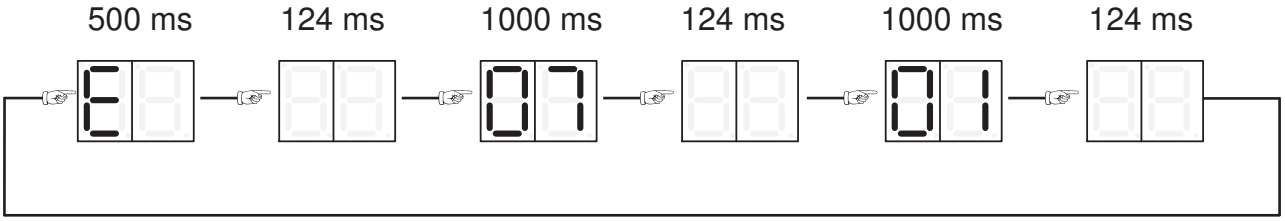
- The final status after executing the fault response
- Type of reset response

The fault codes are displayed as flashing numerical values in the inverter display. The fault code appears in the following display sequence:



9007211336799115

In the example shown, a two-digit fault code with subfault is displayed (error 07.01).

8.3 Description of the LED displays

The positions of the LEDs can be found in the product manual > chapter "Device structure" > "Inverter".

8.3.1 LEDs, general

"RUN" LED

LED	Meaning
Off	"INIT" state The interface is in the "INIT" state.
Green **Flashing**	"PRE_OPERATIONAL" state Mailbox communication is possible. Process data communication is not possible.
Green **Flashing once**	"SAFE_OPERATIONAL" state Mailbox and process data communication is possible. Safety-related output signals are not output.
Green **Illuminated**	"OPERATIONAL Mode" state Mailbox and process data communication is possible.

"ERR" LED

LED	Meaning
Off	No error The interface is in operating state.
Red **Flickering**	Boot error A BOOT error has occurred. "INIT" state has not been reached. However the "Change" parameter is set to "0x01:change/error".

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LED	Meaning
Red **Flashing**	Invalid configuration A general configuration error has occurred.
Red **Flashing once**	Unprompted state change The slave application has changed the state automatically. The "Change" parameter is set to "0x01:change/error".
Red **Flashing twice**	Application watchdog timeout A watchdog timeout error has occurred in the application.
Red **Illuminated**	PDI[1] Watchdog Timeout A PDI watchdog timeout error has occurred.

1) PDI = Process Data Interface

"LNK/ACT" LED

LED	Meaning
Off	No link available. No physical connection to a neighboring device was detected.
Green **Illuminated**	Link available, no bus activity. A physical connection to a neighboring device was detected. No data is being exchanged via the Ethernet port.
Green **Flickering**	Link available, bus activity. A physical connection to a neighboring device was detected. Data is being exchanged via the Ethernet port.

8.3.2 Option card LEDs

PROFINET CFN21A fieldbus card

"BF" LED

This LED indicates the status of the PROFINET interface. The state includes communication link, bus error and process data configuration.

Status	Possible cause	Measure
Off	Error-free operating state. The PROFINET device is exchanging data with the PROFINET controller (Data Exchange state).	–

Status	Possible cause	Measure
Red **Permanently lit**	Connection to the PROFINET controller has failed. Bus communication has been interrupted.	Check the PROFINET connection of the PROFINET device. Check all the cables in the PROFINET network.
	The PROFINET controller is not in operation.	Check the PROFINET controller.
	The PROFINET device does not detect a PROFINET baud rate.	Check the configuration of the PROFINET controller.
Yellow **Permanently lit**	There is a connection to the PROFINET controller, but the configuration of the PROFINET network is faulty. The following errors may have occurred: • A hardware module was selected that does not support the PROFINET interface. • The standard process data and the safe process data have been assigned mixed to the PROFINET device.	Check the configuration of the PROFINET controller.

"US1" LED

This LED indicates the status of the PROFINET interface. The state includes the start-up, normal operation, error mode and energy-saving operation operating modes.

Status	Possible cause	Measure
Yellow, flashing Cyclic duration factor: 250 ms Switch-off time: 250 ms	The PROFINET interface is just starting up after a reset.	–
Green **Permanently lit**	The PROFINET interface is operating without errors.	–
Green, flashing Cyclic duration factor: 500 ms Switch-off time: 3000 ms	The PROFINET interface is in energy-saving mode (PROFIenergy mode).	–
Red **Permanently lit**	The PROFINET interface has detected a fault. **Information:** A timeout of the PROFINET connection is not an internal error.	Switch the device off and back on again. If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

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"LNK/ACT" LED

Status	Meaning
All LEDs **Green** **Permanently lit**	A physical connection to another Ethernet node was detected. Currently, no data is being exchanged via the Ethernet port.
All LEDs **Flashing green** Cyclic duration factor: 500 ms Switch-off time: 500 ms	The flashing test has been activated to localize the Ethernet nodes visually.
All LEDs **Off**	No physical connection to further Ethernet nodes was detected.
LED at the respective Ethernet port **Green/yellow, flashing**	Data is being sent or received via the Ethernet port.

EtherNet/IP™ and Modbus TCP CFE21A fieldbus card

"NS" LED

LED	Meaning	Measure
– **Off**	Device is switched off. No DC 24 V supply.	• Check the DC 24 V voltage supply. • Switch on the device again.
	The IP address is not set.	• Set the IP address.
Green **Flashing**	The connection to the Ethernet master has failed. The device does not detect a connection to the Ethernet master (bus error).	• Check the Ethernet connection of the device. • Check all Ethernet connections.
Green **Illuminated**	The IP address is set. The Ethernet connection has been established.	–
Red **Flashing**	Timeout delay of the controlling connection has expired. The state is reset by restarting communication.	• Check the fieldbus connection. • Check the master/scanner. • Check all Ethernet connections.
Red **Illuminated**	Conflict detected in IP address assignment.	• Check whether there is another device with the same IP address in the network. • Change the IP address of the device. • Check the DHCP settings for IP address assignment of the DHCP server (only when using a DHCP server).

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LED	Meaning	Measure
Red/green **Flashing**	The device performs an LED test. This state may only be active for a short time during startup.	–
	The device has received the designated target unit network ID (TUNID). The LED will keep flashing until the device has received the APPLY_TUNID service and the validation is successfully completed.	

"MS" LED

LED	Meaning	Measure
– **Off**	No power supply or DC 24 V supply.	• Check the voltage supply.
Green **Flashing**	The device has not been configured yet.	• Configure the device. • Check the DHCP server connection (only if DHCP is activated and in persistent status).
Green **Illuminated**	Device OK.	–
Red **Flashing**	A correctable fault has occurred on the device.	• Check whether there is another device with the same IP address in the network. • Change the IP address of the device. • Check the DHCP settings for IP address assignment of the DHCP server (only when using a DHCP server).
Red **Illuminated**	A fault that cannot be corrected has occurred on the device.	• Switch on the device again. • Reset the device to the factory settings. • If this fault occurs repeatedly, replace the device or contact SEW-EURODRIVE Service.
Red/green **Flashing**	The device performs an LED test. This state may only be active for a short time during startup.	–
	The device is waiting for a target unit network ID (TUNID).	Assign a target unit network ID (TUNID) to the device.
	Device parameter setting is required.	Check the parameterization of the CSB51A/CSL51A safety option.

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"LNK/ACT" LED

Status	Meaning
All LEDs **Green** **Permanently lit**	A physical connection to another Ethernet node was detected. Currently, no data is being exchanged via the Ethernet port.
All LEDs **Flashing green** Cyclic duration factor: 500 ms Switch-off time: 500 ms	The flashing test has been activated to localize the Ethernet nodes visually.
All LEDs **Off**	No physical connection to further Ethernet nodes was detected.
LED at the respective Ethernet port **Green/yellow, flashing**	Data is being sent or received via the Ethernet port.

CFL21A POWERLINK fieldbus card

"BS" LED

LED	Meaning
Off	"INIT" state The interface is in "INIT" state.
Green **Flickering**	"BASIC ETHERNET Mode" state None of the SoA, SoC, PReq, or PRes message types detected.
Green **Flashing once**	"PRE_OPERATIONAL_1Mode" state Only acyclic communication is possible.
Green **Flashing twice**	"PRE_OPERATIONAL_2Mode" state Acyclic and cyclic communication are possible. Process data not valid.
Green **Flashing three times**	"READY_TO_OPERATE_Mode" state
Green **Flashing**	"STOPPED_Mode" state
Green **Illuminated**	"OPERATIONAL Mode" state

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"BE" LED

LED	Meaning	Measure
Off	Transition to "OPERATIONAL_Mode" state	–
	Software reset of the NMT state machine (start basic node initialization)	–
	Transition to "BASIC_ETHERNET_Mode" state after a timeout of the SoC, PReq, PRes, and SoA message types.	–
Red **Illuminated**	POWERLINK cycle time exceeded.	Check/adjust the network.
	The number of managing nodes (MN) in the POWERLINK network is > 1.	Check/adjust the network. Configure only 1 managing node.
	Invalid Ethernet frame format, such as incorrect Ethernet CRC (redundancy checksum)	Check/adjust the network.
	Loss of frame	Check/adjust the network.
	Frame collision	Check/adjust the network.
	Invalid IP address	Set a valid IP address.

"LNK/ACT" LED

Status	Meaning
All LEDs **Green** **Permanently lit**	A physical connection to another Ethernet node was detected. Currently, no data is being exchanged via the Ethernet port.
All LEDs **Flashing green** Cyclic duration factor: 500 ms Switch-off time: 500 ms	The flashing test has been activated to localize the Ethernet nodes visually.
All LEDs **Off**	No physical connection to further Ethernet nodes was detected.
LED at the respective Ethernet port **Green/yellow, flashing**	Data is being sent or received via the Ethernet port.

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PROFIBUS CFP21A fieldbus card

"BF" LED

The "BF" LED indicates communication errors on the PROFIBUS interface.

		Measure
Off	Error-free operating state. The device is exchanging data with the PROFIBUS master (data exchange state).	–
Red **Illuminated**	• The PROFINET master is not in operation. • The connection to the PROFIBUS Master has failed. • The device does not detect a PROFIBUS baud rate. • Bus communication has been interrupted.	• Check the PROFIBUS connection of the device. • Check all the cables in the PROFIBUS network. • Check the configuration of the PROFIBUS master.
Red **Flashing with 2 Hz**	• The device detects the PROFIBUS baud rate but is not addressed by the PROFIBUS master. • The device was not configured in the PROFIBUS master or configured incorrectly.	• Check the PROFIBUS address set in the device and in the engineering tool of the PROFIBUS master. • Check the configuration of the PROFIBUS master. • Check whether you are using the appropriate device description file ().

"RUN" LED

The "RUN" LED indicates whether the bus electronics is functioning properly.

		Measure
Green	The PROFIBUS hardware is OK. The bus electronics is fault-free.	–
Red **Illuminated**	The hardware of the bus electronics is faulty.	Switch the device off and back on again. If the fault occurs repeatedly, contact SEW-EURODRIVE Service.
Red **Flashing with 2 Hz**	The PROFIBUS address is set to 0 or to a value greater than 125.	• Check the PROFIBUS address that is set in the device. • Perform a reset of the device.

8.4 Device replacement

Device replacement is only possible when using an identical replacement device. Deviating device configurations lead to error E25.06 and can be acknowledged with parameter acceptance. The device can then be used without further startup.

If a device needs to be replaced, the following procedures apply.

8.4.1 Exclusive use of the CMM.. memory module

If the inverter is equipped with a CMM.. memory module, the parameter and configuration settings are stored on the memory module. By plugging the memory module into another inverter, this data is available so that the inverter is immediately ready for operation for the specific application.

Device replacement with a different replacement device

If a different inverter (voltage, current and variant) is used when a device is replaced, error message "25.70 NV memory initialization" is displayed. You can acknowledge this fault by opening the "Fault reset with parameter acceptance" menu item, and you must ensure that the information that was provided via the previous options (e.g. encoder signals via encoder option) reach the inverter through different means or are deselected.

Alternatives for device replacement

Alternatively, the device can be reset to the delivery state. A new startup is then required.

Removing the memory module during operation

If a memory module is removed during operation, the following error message is displayed: "33.13 System initialization: Memory module removed". This fault state can be acknowledged by performing a fault reset if no CS..A safety option is being used. If a CS..A safety option is being used, pay attention to the information in the product manual > chapter "Service – Functional safety".

8.4.2 Using a CBG.. keypad

When using a keypad, the parameter and configuration settings can be stored on the keypad. By plugging the keypad into another inverter and activating data transmission, data is transferred to the inverter. After the transmission is complete, the inverter is immediately ready for operation for the specific application.

8.4.3 Using a MOVI-C® CONTROLLER

The "Update configuration" function can be started using the MOVISUITE® engineering software at any time, but usually after completed startup of the devices and the controller.

Using this function, all parameter and configuration settings of the devices and the controller are saved on the memory card of the controller and are provided with a checksum.

When the controller is switched on, the data on the memory card and the data on the connected device are compared in a test to see if they match. In case a defective device has been replaced previously, the controller recognizes that the data on the memory card does not match the data of the new device. In this case, the controller loads the data of the memory card to the device.

In addition, changes in the device that have not been saved using the "Update configuration" function are overwritten. The process is performed automatically.

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MOVI-C® CONTROLLER with CMM.. memory module in the inverter

If the data management (axis data set recovery) of the MOVI-C® CONTROLLER is used, the parameter and configuration settings of the controller are always transferred to the inverter.

The data is on the memory card of the MOVI-C® CONTROLLER. If the data management of the MOVI-C® CONTROLLER is not active, the memory source can be set in index 8431.20 (memory source) as follows:

- 0 - Any

  The parameter and configuration settings are written both to the internal device memory of the inverter and to the CMM.. memory module. Thus, the data is synchronized on both storage media.
- 1 - Internal memory

  The inverter reads or writes the parameter and configuration settings to the internal device memory of the inverter.
- 2 - Replaceable memory module

  The inverter reads or writes the parameter and configuration settings to the CMM.. memory module.

8.5 Shutdown

⚠ WARNING

Electric shock due to capacitors that have not been fully discharged.

Severe or fatal injuries.

- Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

To shut down the device, de-energize the device using appropriate measures.

⚠ WARNING

Risk of burns due to hot surfaces.

Severe injuries.

- Let the devices cool down before touching them.

8.6 Waste disposal

Dispose of the product and all parts separately in accordance with their material structure and the national regulations. Put the product through a recycling process or contact a specialist waste disposal company. If possible, divide the product into the following categories:

- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper

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- Electronic parts
- Plastics

The following materials are hazardous to health and the environment. These materials must be collected and disposed of separately:

- Oil and grease

  Collect used oil and grease separately according to type. Ensure that the used oil is not mixed with solvent. Dispose of used oil and grease correctly.
- Screens
- Capacitors

Waste disposal according to WEEE Directive 2012/19/EU

This product and its accessories may fall within the scope of the country-specific application of the WEEE Directive. Dispose of the product and its accessories according to the national regulations of your country.

For further information, contact the responsible SEW-EURODRIVE branch or an authorized partner of SEW-EURODRIVE.

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9 Inspection and maintenance

The device is maintenance-free. SEW-EURODRIVE does not stipulate any regular inspection work. However, it is recommended that you check the following components regularly:

- **Connection cables:**

  If cables become damaged or fatigued, replace them immediately.
- **Cooling fins:**

  Remove any deposits to ensure sufficient cooling.

INFORMATION

Only SEW-EURODRIVE may repair the inverters.

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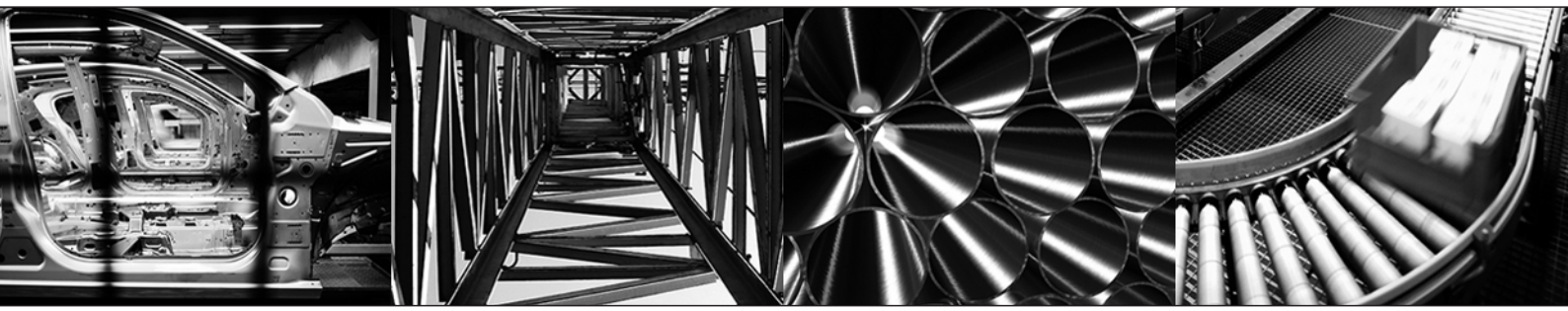

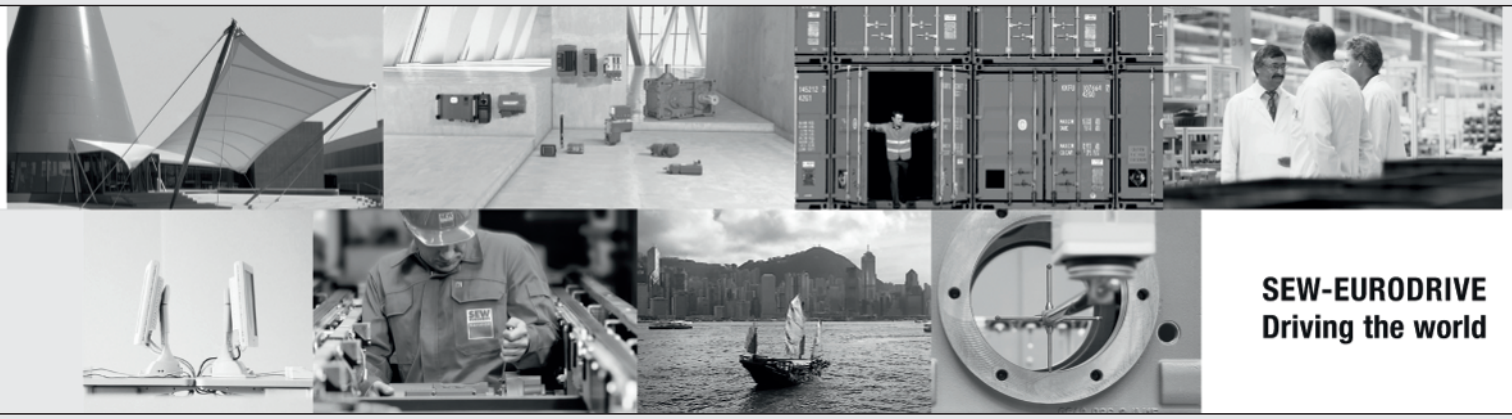

SEW-EURODRIVE
Driving the world

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