Compact Operating Instructions

Application Inverter
MOVIDRIVE® system

Table of contents

1 General information

1.1 Scope of this documentation

This documentation comprises the general safety notes and selected information on the inverter.

- Please note that this documentation does not replace the detailed operating instructions.
- Read the detailed operating instructions before you start working with the inverter.
- Observe the information, instructions and notes in the detailed operating instructions. This is essential for fault-free operation of the device and fulfillment of any rights to claim under guarantee.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ DANGER	Imminent hazard	Severe or fatal injuries
⚠ WARNING	Possible dangerous situation	Severe or fatal injuries
⚠ CAUTION	Possible 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.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

• Measure(s) to prevent the hazard.

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

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD!** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

2.3 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 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 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.

2.4 Network security and access protection

A bus system makes it possible to adapt electronic drive technology components to the particulars of the machinery within wide limits. There is a risk that a change of parameters that cannot be detected externally may result in unexpected but not uncontrolled system behavior and may have a negative impact on operational safety, system availability, or data security.

Ensure that unauthorized access is prevented, especially with respect to Ethernet-based networked systems and engineering interfaces.

Use IT-specific safety standards to increase access protection to the ports. For a port overview, refer to the respective technical data of the device in use.

2.5   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.

Do not connect any other loads to the product. Never connect capacitive loads to the product.

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

• AC asynchronous motors with squirrel-cage rotor
• Permanent-field 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.

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

2.5.1   Hoist 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.

Application in ELSM® control mode

When the inverter is operated in ELSM® control mode, using it in lifting applications is not permitted. In this control mode only applications of horizontal materials handling are permitted.

2.5.2   Restrictions under the European WEEE Directive 2012/19/EU

Options and accessories from SEW-EURODRIVE may only be used in combination with products from SEW-EURODRIVE.

2.6   Functional safety technology

The product must not perform any safety functions without a higher-level safety system unless explicitly allowed by the documentation.

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2.7 Transport

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

Observe the following notes when transporting the device:

• Ensure that the product is not subject to mechanical impact.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the information on climatic conditions in chapter "Technical data" of the documentation.

2.8 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in this documentation.

Protect the product from excessive mechanical strain. Ensure that elements are not deformed or insulation spaces are maintained, particularly during transportation. Electric components must not be mechanically damaged or destroyed.

Observe the notes in the chapter "Mechanical installation".

2.8.1 Restrictions of use

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

• Use in potentially explosive atmospheres

• 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

The product can be used at altitudes above 1000 m above sea level up to 3800 m above sea level under the following conditions:

• Taking the reduced continuous rated current into consideration, see the chapter "Technical data" of the documentation.

• Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. If the installation requires overvoltage category III according to EN 60664 you have to reduce the overvoltages on the system side from category III to II using additional external overvoltage protection.

• If a protective electrical separation is required, then implement this outside the product at altitudes of more than 2000 m above sea level (protective separation in accordance with EN 61800-5-1 and EN 60204-1).

2.9 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).

2.9.1 Required preventive measure

Make sure that the product is correctly attached to the ground connection.

2.9.2 Stationary application

Necessary preventive measure for the product:

Type of energy transfer	Preventive measure
Direct power supply	• Ground connection

2.9.3 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.

2.10 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 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 EN 61800-5-1.

2.11 Startup/operation

Observe the safety notes in chapters "Startup" (→ 🗎 53) and "Operation" (→ 🗎 55) 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.

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.

2.11.1 Energy storage unit

Products with a connected energy storage unit are not necessarily de-energized when they have been disconnected from the supply system. Usually, the energy storage unit stores sufficient energy to continue operation of the connected motors for a limited period of time. It is not sufficient to observe a minimum switch-off time.

Perform a shutdown as described in the documentation in the chapter "Service" > "Shutdown".

3 MOVIDRIVE® system type code

Example: MDX90A-0125-5E3-X-S00		
Product family	MD	MOVIDRIVE®
Device type	X	• X = Single-axis inverter
Series	90	• 90 = Without DC 24 V switched-mode power supply • 91 = With DC 24 V switched-mode power supply
Version	A	• A = Version status of the device series
Power class	0125	• 0125 = Nominal output current – e.g. 0125 = 12.5 A
Connection voltage	5	• 2 = AC 200 – 240 V • 5 = AC 380 – 500 V
Power section variant EMC	E	• 0 = Basic interference suppression integrated • E = EMC filter limit value category C2 in accordance with EN 61800-3
Connection type	3	• 3 = 3-phase connection type
Operating mode	X	• 4 = 4-quadrant operation • X = Not relevant
Device variant	S	• 0 = Not relevant • S = MOVIDRIVE® system: Control via MOVI-C® CONTROLLER • E = Inverter with CiA402 device profile
Technology level	0	• 0 = Standard design
Application level	00	• 0 = standard/MOVIKIT® Velocity Drive • 1 = MOVIKIT® Positioning Drive • 2 = Customized solution
Options		• /L = Design with coated printed circuit boards The following list serves as an example: • /CES1.A = Multi-encoder card • /CID21A, /CIO21A = Input/output cards • /CS..A = MOVISAFE® CS..A safety card

4   Installation

4.1   Special aspects when transporting the devices

> **NOTICE**
>
> Improper lifting and transportation of the inverter.
>
> Improper lifting and transportation of the inverter on the plastic parts or on the covers will cause damage.
>
> - Observe the following notes before lifting and transporting the inverter:
> - Hold inverters of size 5 by the handling points provided on the rear panel of the housing.
> - Transport inverters of sizes 6 – 7 using the supporting aids provided for this purpose.

4.1.1   Size 5

The rear panel of the housing of size 5 inverters is designed in such a way that you can grip them securely by hand to lift and transport the inverters without damaging them.
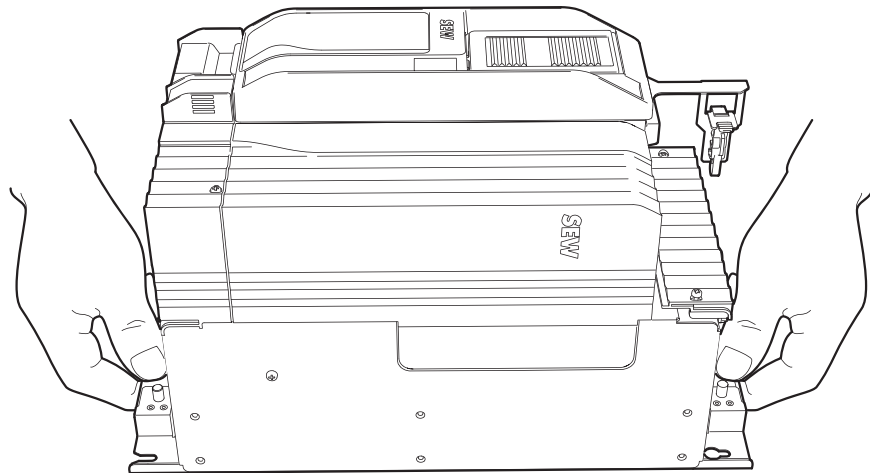
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4.1.2 Sizes 6 – 7

Due to their weight, the following inverters must be transported using a supporting aid:

- **Lifting eye** for size 6 inverters

  The lifting eye is attached to the top of the housing and can be attached to lifting devices using suitable lifting equipment.
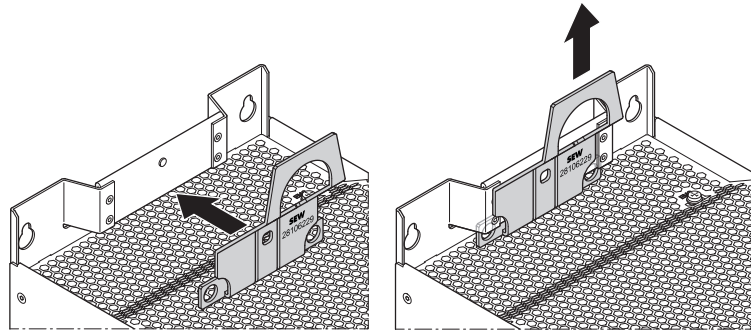
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- **Carrying bar** for size 7 inverters
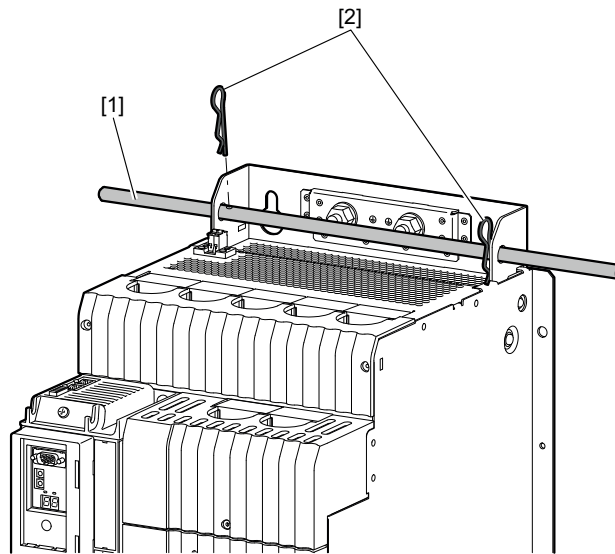
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If a crane is not available, you can push a carrying bar [1] through the rear panel to facilitate installation (included in the delivery). Secure the carrying bar against axial displacement using the two split pins [2].

4.2 Mechanical installation

⚠ CAUTION

Risk of injury to persons and damage to property.

Never install defective or damaged products.

- Before installing any products, check them for external damage. Replace any damaged products.

NOTICE

Risk of damage to property due to mounting surfaces with poor conductivity.

Inverter damage can occur.

- The mounting plate in the control cabinet must be conductive over a large area for the mounting surface of the inverter (metallically pure, good conductivity). An EMC-compliant installation of the inverter can only be achieved with a mounting plate that is conductive over a large area.

4.2.1 Minimum clearance and mounting position

When installing the inverters in the control cabinet, observe the following:

- To ensure unobstructed cooling, leave a minimum clearance of 100 mm above and below the inverter housings. Ensure that the air circulation in this clearance is not impaired by cables or other installation equipment.
- Make sure that the inverters are not within the area of the warm exhaust air of other devices.
- Install the inverters only vertically. Do not install them horizontally, tilted or upside down.
- Clearance at the side is not necessary. The units can be arranged directly next to one another.

INFORMATION

Special bending spaces are required according to EN 61800-5-1 for cables with a cross section of 10 mm^2 and larger. This means the clearance must be increased if required.

4.2.2   Bore patterns

Size	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
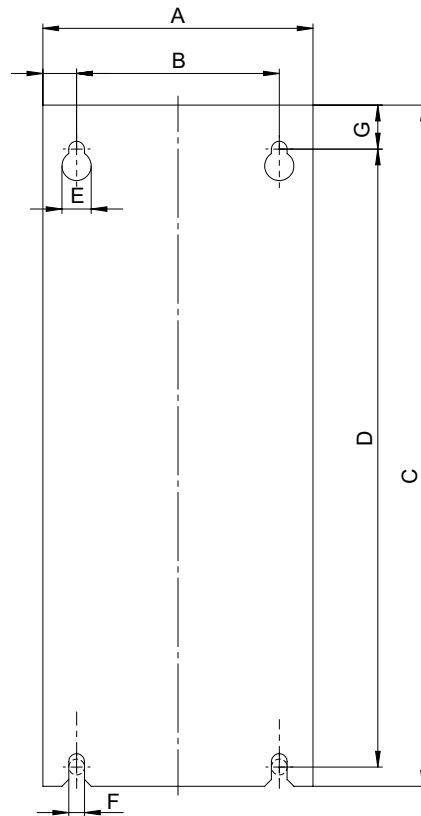
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4.3 Electrical installation

> ⚠ **DANGER**
>
> Dangerous voltage levels may still be present inside the device and at the terminal strips up to 10 minutes after the application inverter has been disconnected from the power supply.
>
> Severe or fatal injuries from electric shock.
>
> To prevent electric shocks:
>
> • Disconnect the application inverter from the power supply and wait 10 minutes before removing the protective covers.

> ⚠ **DANGER**
>
> A leakage current > 3.5 mA can occur during operation of the application inverter.
>
> Severe or fatal injuries from electric shock.
>
> To avoid dangerous shock currents in accordance with EN 61800-5-1, strictly observe the following:
>
> • 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 PE conductor with a cable cross-section of 10 mm^2.
> • Supply system cable 10 mm^2 – 16 mm^2:
>   – Route a copper PE conductor with the cable cross-section of the supply system cable.
> • Supply system cable 16 mm^2 – 35 mm^2:
>   – Route a copper protective earth 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 in isolated cases, it must be universal current-sensitive (RCD type B).

INFORMATION

Installation with protective separation.

The application inverter meets all requirements for protective separation of power and electronics connections in accordance with EN 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.

4.3.1 General information

- Take suitable measures to prevent the motor starting up inadvertently, for example by removing the electronics terminal block X20. 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 connection to the screws to prevent litz strands from emerging.

4.3.2 Permitted voltage systems

Information on voltage systems	Information on 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.

4.3.3 Line fuses, fuse types

Type class	Requirement
Fuses in utilization categories gL, gG	Fusing voltage ≥ nominal line voltage
Miniature circuit breaker with characteristics B, C, D	Nominal miniature circuit breaker voltage ≥ nominal line voltage
	Nominal currents of the miniature circuit breaker must be 10% higher than the nominal line current of the inverter

4.3.4 Special aspects for connecting power terminals

Note that for inverters from size 5 upwards, degree of protection IP20 is only achieved if the connection bolts (for connecting the grid, motor, braking resistor, and DC link) are protected against contact with plastic covers. The plastic covers can be ordered optionally, see chapter "Installation accessories".
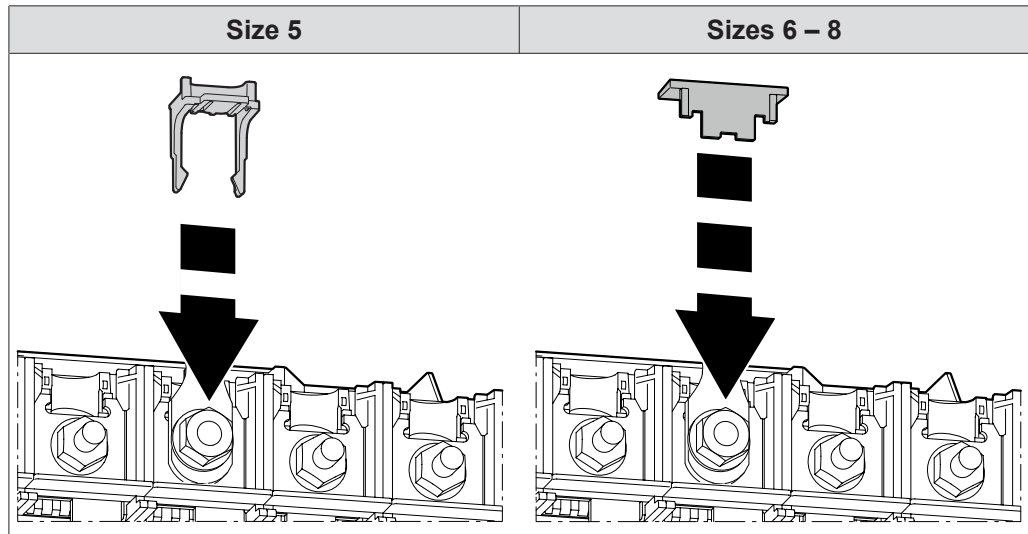
1. Connect the cables.
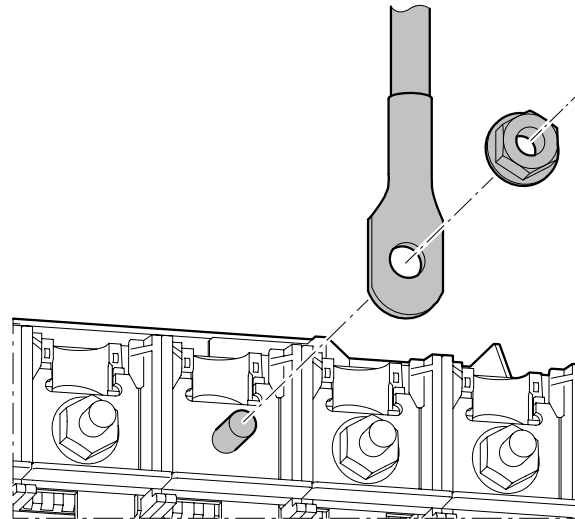
2. The plastic covers must be removed in different ways depending on the cross section used.
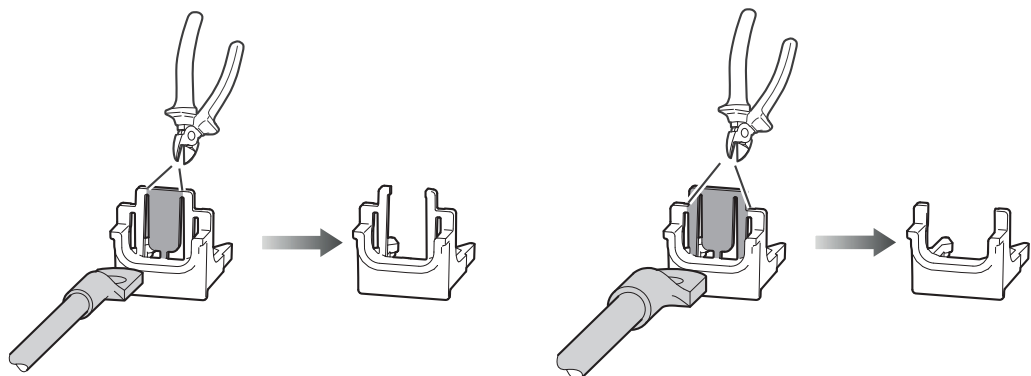
3. Attach the plastic covers at the individual connections.

Size 5	Sizes 6 – 8

4.3.5   Line connection

- The line contactor must always be located upstream of the line filter.
- Use only line contactors of utilization category AC-3 (EN 60947-4-1) or higher.
- Do not use the line contactor for jog mode, but only for switching the inverter on and off. The FCB 20 "Jog" must be used for jog mode.
- Observe the required dimensioning of the cable cross-section for UL-compliant installing.

For the terminal assignment for line connection of the various sizes, refer to chapter "Terminal assignment".

Observe a minimum switch-off time of 10 s for the inverter. Do not switch the power on more than once per minute.

> **NOTICE**
>
> Non-compliance with the minimum switch-on/switch-off times
>
> Inverter damage.
>
> - Observe a minimum switch-off time of 10 s before switching on the power supply again.
> - Do not switch on the supply system more than once per minute/every 2 minutes.

4.3.6   24 V supply voltage

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

The MDX9.A-... application inverter has an internal 24 V voltage supply (80 W) that can also be supported externally.

The maximum cable cross section is 2.5 mm^2. The maximally 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.
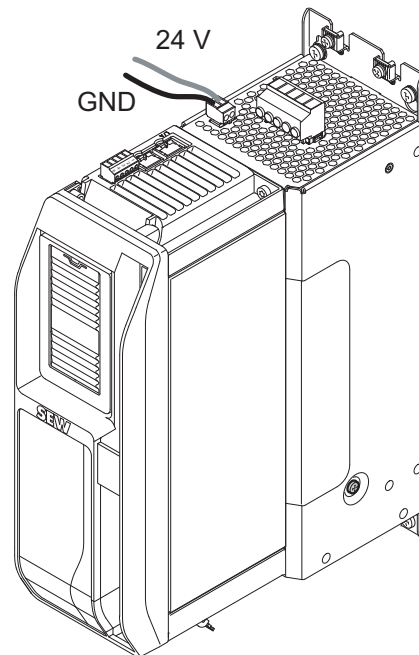
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Select the cross section of the supply cable according to the power demand of the devices to be supplied.

4.3.7 System bus EtherCAT®/SBus^PLUS

For connecting the EtherCAT®/SBus^PLUS system bus, SEW-EURODRIVE recommends using only prefabricated cables from SEW-EURODRIVE.

NOTICE

Use of wrong cables

Damage to the application inverter

Only 4-pole cables are permitted to be used as system bus cables [2]. If an 8-pole cable is used, malfunctions or failures may occur at the connected devices.

INFORMATION

The mounting plates on which the axis systems are mounted must have a sufficiently large ground connection, e.g. using a ground strap.

Correct cabling

The 4-pole system bus cable is used between automation components, see figure " ".

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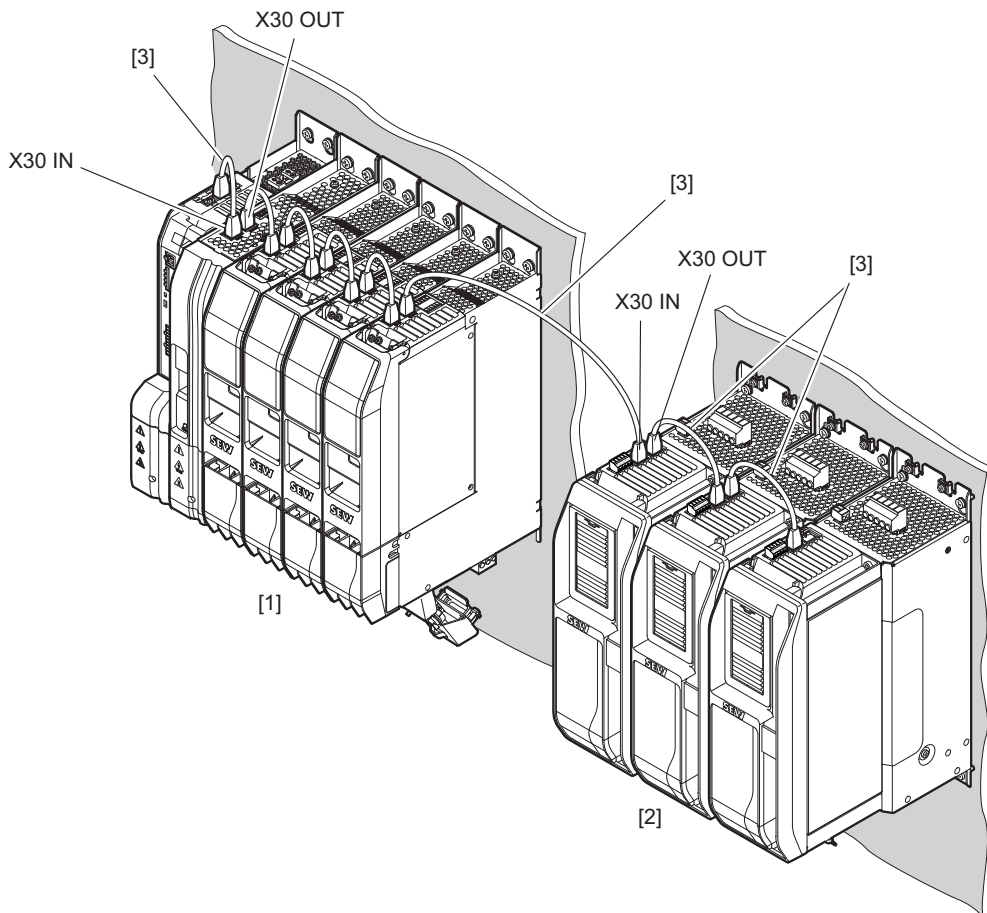
| [1] | MOVIDRIVE® modular | [2] | MOVIDRIVE® system | [3] | System bus cable |

4.4 BW.. braking resistors

The supply cables to the braking resistors carry a high pulsed DC voltage during operation.

⚠ DANGER

Dangerous pulsed DC voltage of up to 980 V.

Severe or fatal injuries from electric shock.

- Disconnect the inverter from the power supply and wait 10 minutes before working on a braking resistor or its supply cables.
- Never operate the inverter without touch guards and installed closing covers.

⚠ WARNING

The surfaces of the braking resistors will reach temperatures of up to 250 °C when the braking resistors are loaded with the nominal power.

Severe burns.

- Do not touch any braking resistor.
- Select a suitable installation location for the braking resistors such as the control cabinet roof.

4.4.1 Protection against thermal overload of the braking resistor

INFORMATION

PTC braking resistor

A PTC braking resistor goes to high resistance in the event of overload.

INFORMATION

Flat-type resistor

Flat-type 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:

- The power connections of the braking resistors must be connected to +R and -R in parallel.
- Each braking resistor requires a separate protection against thermal overload.
- The signal contacts (NC contacts) of the protection devices must be connected in series.

Internal temperature switch -T

Inverters of size 1 – 3

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

Connection 1	Connection 2	Connection 3

[1] Line contactor   [3] Inverter

[2] Braking resistor   [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 application inverter when connection 1 is used.

- Connection 1

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

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

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

  – If the thermal circuit breaker trips, the application 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 application 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.

    – This does not require a response by the PLC.

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

Inverters of size 4 and larger

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

Connection 1	Connection 2	Connection 3

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

• Connection 1

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

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

– This does not require a response by the PLC.

– It is not required to disconnect the supply system connection with an external switching device.

– If an internal short circuit in the brake chopper is detected by the application inverter, the application inverter interrupts the energy supply by inhibiting the rectifier.

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

INFORMATION

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

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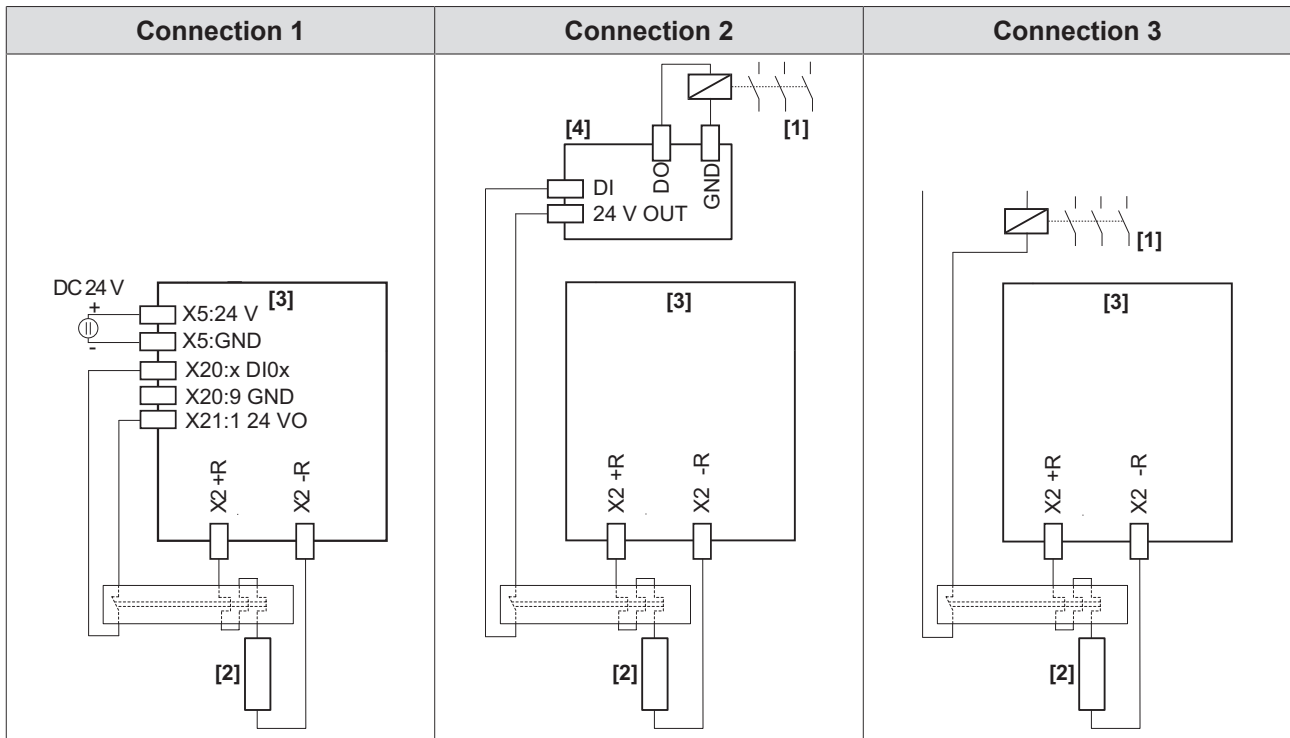
- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

- Connection 3

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

   - This does not require a response by the PLC.

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

External bimetallic relay

Inverters of size 1 – 3

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

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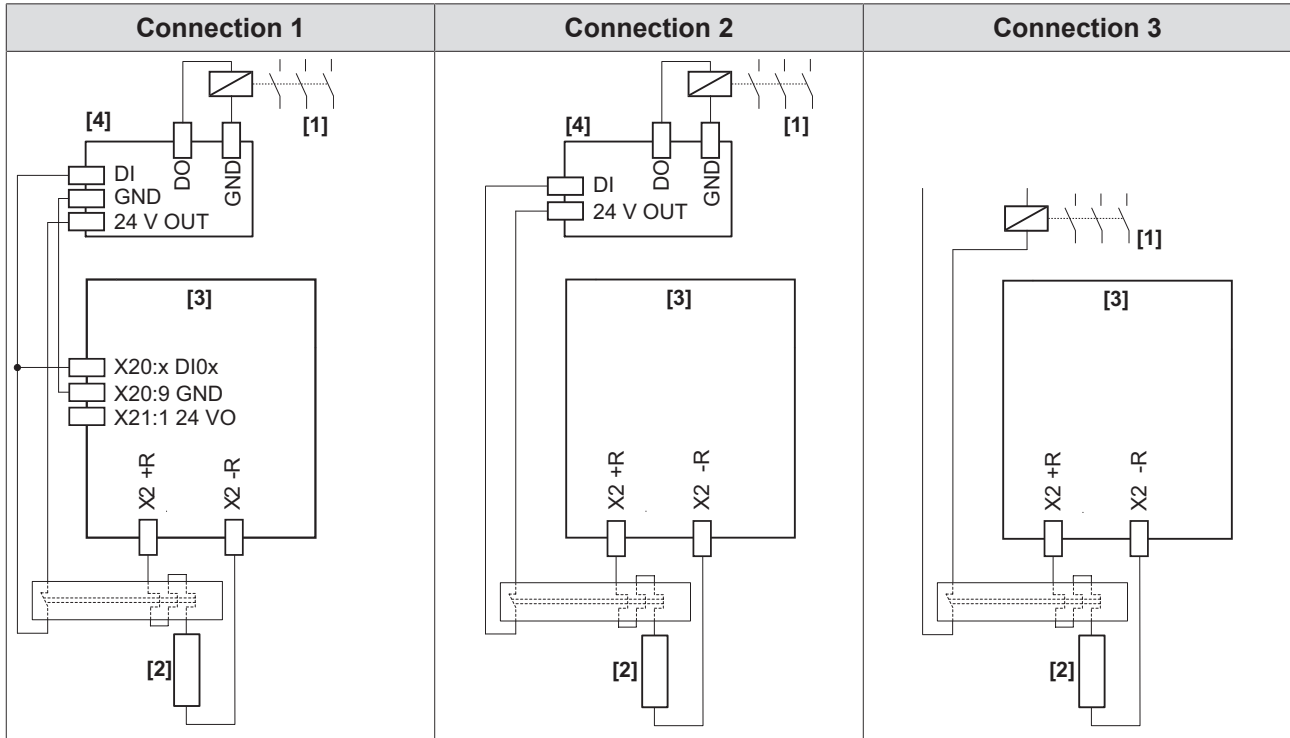
[1]   Line contactor
[2]   Braking resistor
[3]   Inverter
[4]   PLC

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

• Connection 1

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

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

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

  – If the thermal circuit breaker trips, the application 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 application inverter.

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– 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.

– This does not require a response by the PLC.

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

Inverters of size 4 and larger

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

Connection 1	Connection 2	Connection 3

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

• Connection 1

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

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

– This does not require a response by the PLC.

– It is not required to disconnect the supply system connection with an external switching device.

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

– If an internal short circuit in the brake chopper is detected by the application inverter, the application inverter interrupts the energy supply by inhibiting the rectifier.

INFORMATION

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

• 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 application 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.

– This does not require a response by the PLC.

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

4.5 Terminal assignment of basic unit

> ℹ️ **INFORMATION**
>
> Reference potentials inside the device.
>
> The device-internal reference potential is designated as GND in the following table.
>
> All reference potentials GND are internally connected to PE.
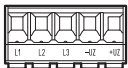
> ℹ️ **INFORMATION**
>
> The assignment "Reserved" means that no cable may be connected to this connection.
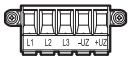
> ℹ️ **INFORMATION**
>
> The technical data for the power and control electronics connections is provided in chapter "Technical data".
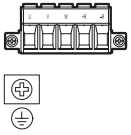
4.5.1 Sizes 1 – 3

Illustration	Terminal	Connection	Assignment
	X1:L1	L1	Line connection
	X1:L2	L2	
	X1:L3	L3	
	X1:-U$_z$	-U$_z$	DC link connection
	X1:+U$_z$	+U$_z$	
	⏚	PE	PE connection
	X2:U	U	Motor connection
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	PE connection

4.5.2 Size 4

Illustration	Terminal	Connection	Assignment
	X1:L1	L1	Line connection
	X1:L2	L2	
	X1:L3	L3	
	X1:-U$_z$	-U$_z$	DC link connection
	X1:+U$_z$	+U$_z$	
	⏚	PE	PE connection
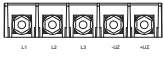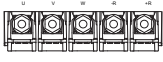
Illustration	Terminal	Connection	Assignment
	X2:U	U	Motor connection
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⊕	PE	PE connection

4.5.3 Sizes 5 – 8

INFORMATION

Size 8 is not yet available.

Illustration	Terminal	Connection	Assignment
	X1:L1	L1	Line connection
	X1:L2	L2	
	X1:L3	L3	
	X1:-U$_z$	-U$_z$	DC link connection
	X1:+U$_z$	+U$_z$	
	⊕	PE	PE connection
	X2:U	U	Motor connection
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⊕	PE	PE connection

4.5.4 Sizes 7 – 8

INFORMATION

Size 8 is not yet available.

Illustration	Terminal	Connection	Assignment
	-U$_z$*	-U$_z$	Connection in front of DC link choke
	+U$_z$*	+U$_z$	
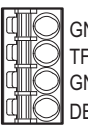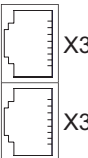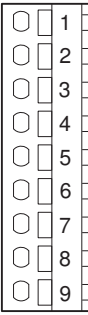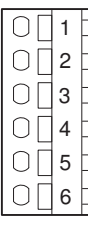
4.5.5 Sizes 1 – 8
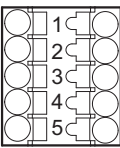
INFORMATION
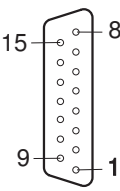
ℹ️ Size 8 is not yet available.

Illustration	Terminal	Connection	Assignment
24V / GND	X5:24 V	V₁24 V	DC 24 V supply voltage
	X5:GND	GND	Reference potential
GND / TF1 / GND / DBO	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
X30 OUT / X30 IN	X30 OUT		EtherCAT®/SBusPLUS system bus
	X30 IN		
	X31		SEW-EURODRIVE Service interface
1 2 3 4 5 6 7 8 9	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
1 2 3 4 5 6	X21:1	+24 V	DC 24 V voltage output
	X21:2	DO00	Digital output 1, operational
	X21:3	DO01	Digital output 2, output stage enable
	X21:4	DO02	Fault at digital output 3
	X21:5	DO03	Digital output 4, STO active
	X21:6	GND	Reference potential

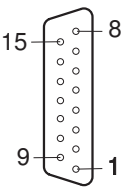| Illustration	Terminal	Connection	Assignment
	X6:1	F_STO_P1	DC +24 V input F_STO_P1
	X6:2	F_STO_M	DC 0 V input F_STO_M
	X6:3	F_STO_P2	DC +24 V input F_STO_P2
	X6:4	GND	Reference potential
	X6:5	24 V STO_OUT	U_{out} = DC 24 V supply of F_STO_P1 and F_STO_P2

4.5.6   X15: Motor encoder – resolver

Display	Terminal	Connection	Assignment
	X15:1	S2 (sin+)	Signal track
	X15:2	S1 (cos+)	Signal track
	X15:3	Reserved	-
	X15:4	Reserved	-
	X15:5	R1 (REF+)	Supply voltage of resolver
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	-
	X15:8	Reserved	-
	X15:9	S4 (sin-)	Signal track
	X15:10	S3 (cos-)	Signal track
	X15:11	Reserved	-
	X15:12	Reserved	-
	X15:13	R2 (REF-)	Supply voltage of resolver
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	Reserved	-
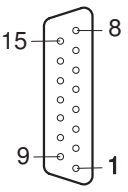
4.5.7   X15: Motor encoder – sin/cos encoder

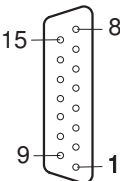| Display	Terminal	Connection	Assignment
	X15:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X15:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X15:3	C (K0)	Signal track C (K0)
	X15:4	DATA+[1]	Data cable for electronic nameplate
	X15:5	Reserved	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ (cos -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$)
	X15:10	$\overline{B}$ (sin-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$)
	X15:11	$\overline{C}$ ($\overline{K0}$)	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X15:12	DATA-[2]	Data cable for electronic nameplate
	X15:13	V_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

1) For encoders from SEW-EURODRIVE with electronic nameplate.
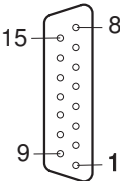
4.5.8   X15: Motor encoder – TTL encoder

Display	Terminal	Connection	Assignment
	X15:1	A (K1)	Signal track A (K1)
	X15:2	B (K2)	Signal track B (K2)
	X15:3	C (K0)	Signal track C (K0)
	X15:4	Reserved	–
	X15:5	Reserved	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ ($\overline{K1}$)	Negated signal track $\overline{A}$ ($\overline{K1}$)
	X15:10	$\overline{B}$ ($\overline{K2}$)	Negated signal track $\overline{B}$ ($\overline{K2}$)
	X15:11	$\overline{C}$ ($\overline{K0}$)	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X15:12	Reserved	–
	X15:13	V_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

4.5.9 X15: HIPERFACE® motor encoder, SEW-EURODRIVE encoder

Display	Terminal	Connection (RS485)	Assignment
	X15:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X15:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X15:3	Reserved	–
	X15:4	DATA+	Data line RS485
	X15:5	Reserved	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ (cos -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$)
	X15:10	$\overline{B}$ (sin-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$)
	X15:11	Reserved	–
	X15:12	DATA-	Signal cable
	X15:13	V_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

4.5.10 X15: SEW-EURODRIVE encoder with RS485 interface

Display	Terminal	Connection (RS485)	Assignment
	X15:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X15:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X15:3	Reserved	–
	X15:4	DATA+	Data line RS485
	X15:5	Reserved	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ (cos -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$)
	X15:10	$\overline{B}$ (sin-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$)
	X15:11	Reserved	–
	X15:12	DATA-	Signal cable
	X15:13	V_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

4.5.11 X16: MOVILINK® DDI interface

| Display	Terminal	Connection	Assignment
	X16	Coaxial connection	MOVILINK® DDI

4.6 Wiring diagrams

4.6.1 General information on the wiring diagrams

- For technical data of the power electronics and the control electronics, refer to chapter "Technical data".
- For the terminal assignment and connections, refer to chapter "Terminal assignment of basic unit" (→ 🖹 32).

4.6.2 Power connection

Wiring of the power connections with line contactor, line choke, line filter, and output choke
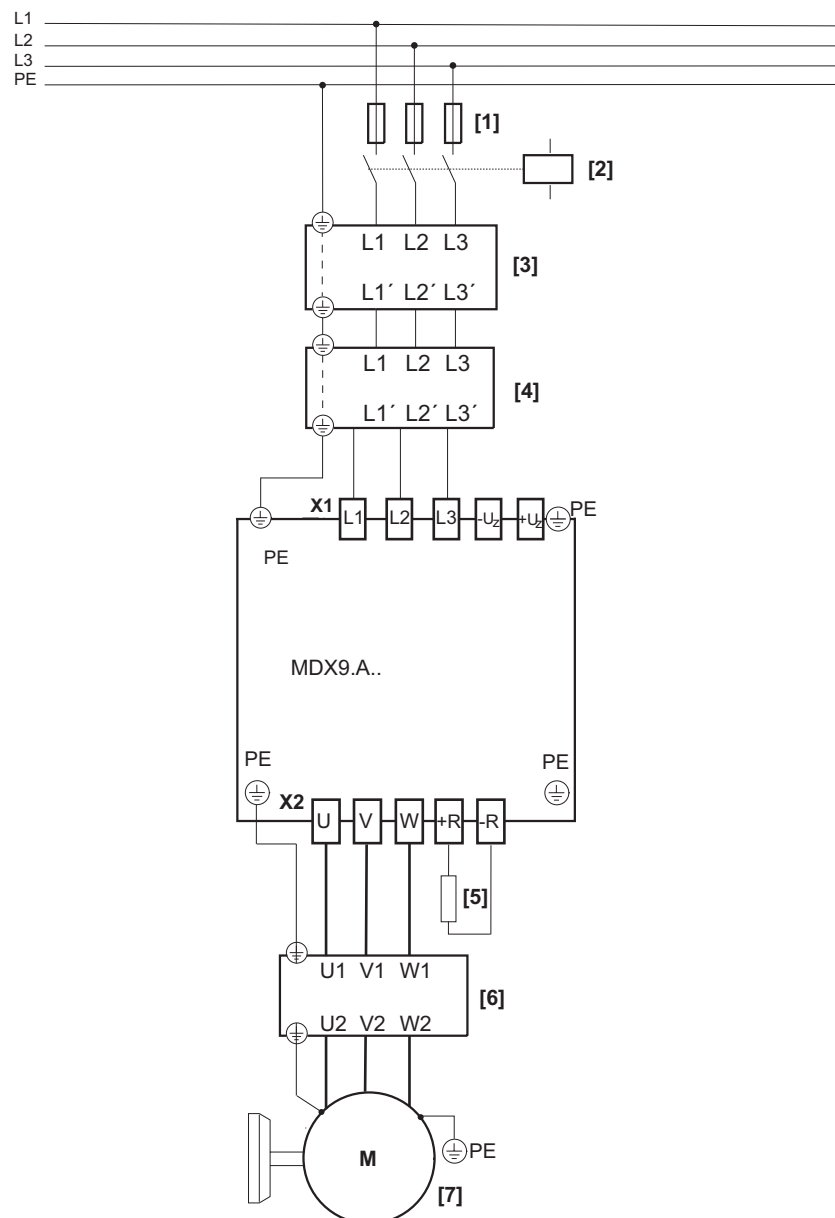
63050408662092427

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

Wiring of the power connections with line choke, line filter, output choke, without line contactor

Refer to the table in chapter "Line contactor" to find out which application inverters can be operated without a line contactor.

NOTICE

Operation without line contactor.

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

Refer to the chapter "Line contactor" for the necessary measures.

INFORMATION

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For line connection without line contactor, the temperature evaluation of the braking resistor must be ensured via a digital input on the application inverter. The connected digital input must be parameterized for monitoring the braking resistor temperature evaluation.

SEW EURODRIVE
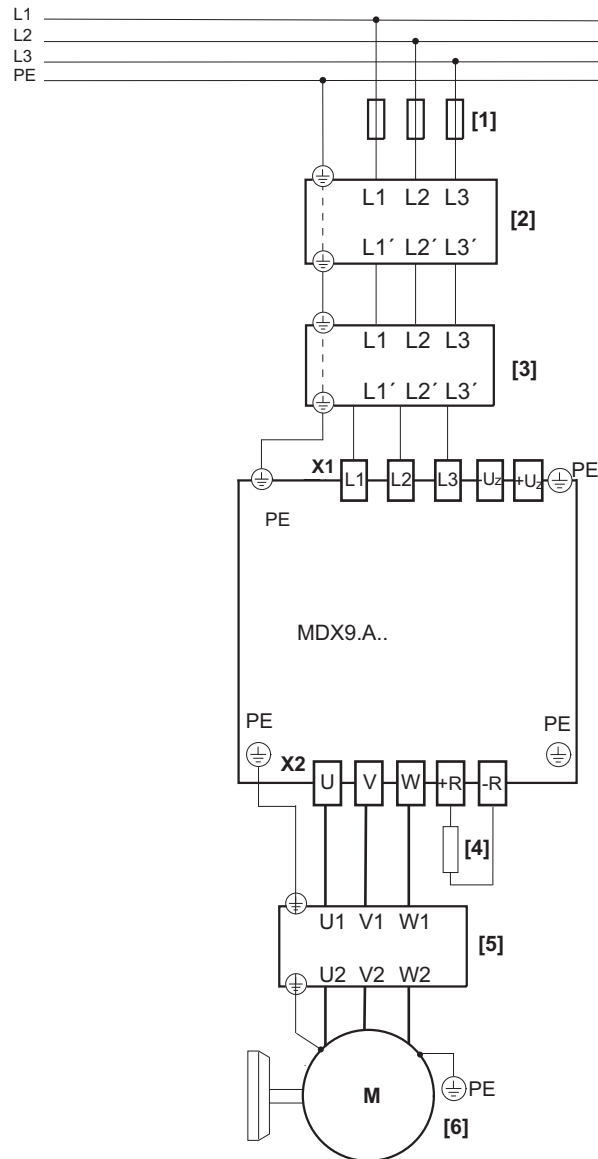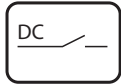
54043209407696267

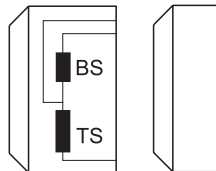|			
[1]	Fuses	[4]	Braking resistor (optional)
[2]	Line choke (optional)	[5]	Output choke and/or output filter (both optional)
[3]	Line filter (optional)	[6]	Motor

4.6.3 Brake control

Key:
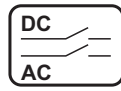
|	
	Cut-off in the DC and AC circuits (rapid brake application)
	Cut-off in the DC circuit
	Brake BS = Accelerator coil TS = Coil section
	DC brake with one brake coil
	Auxiliary terminal strip in terminal box
	Control cabinet limit
WH	White
RD	Red
BU	Blue
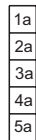
INFORMATION

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.
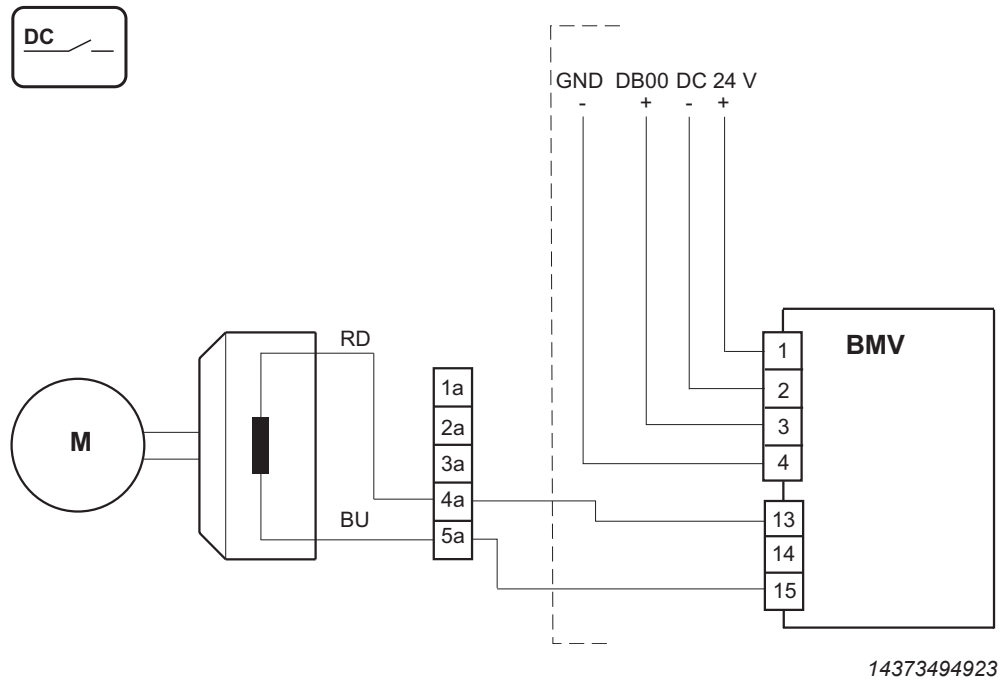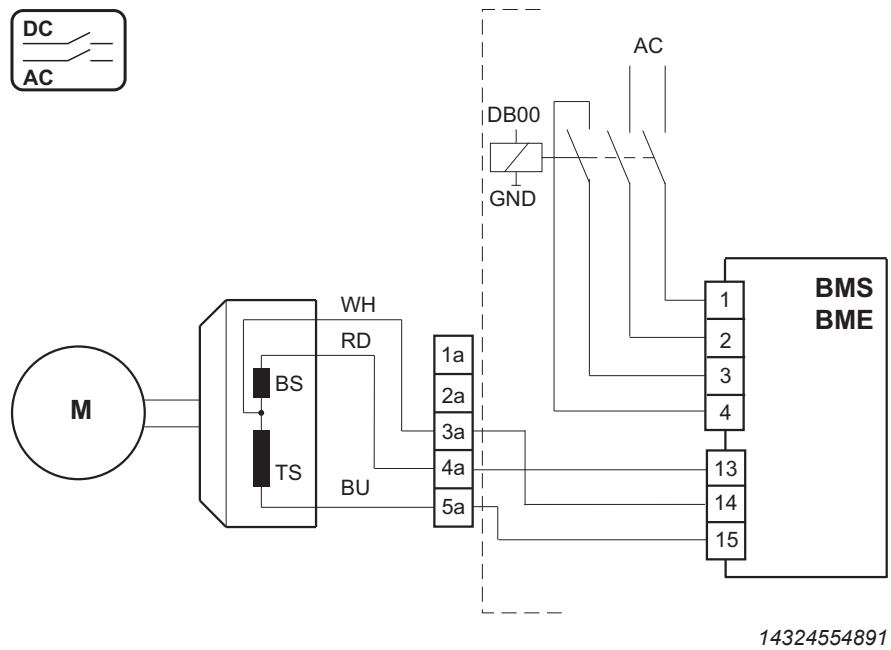
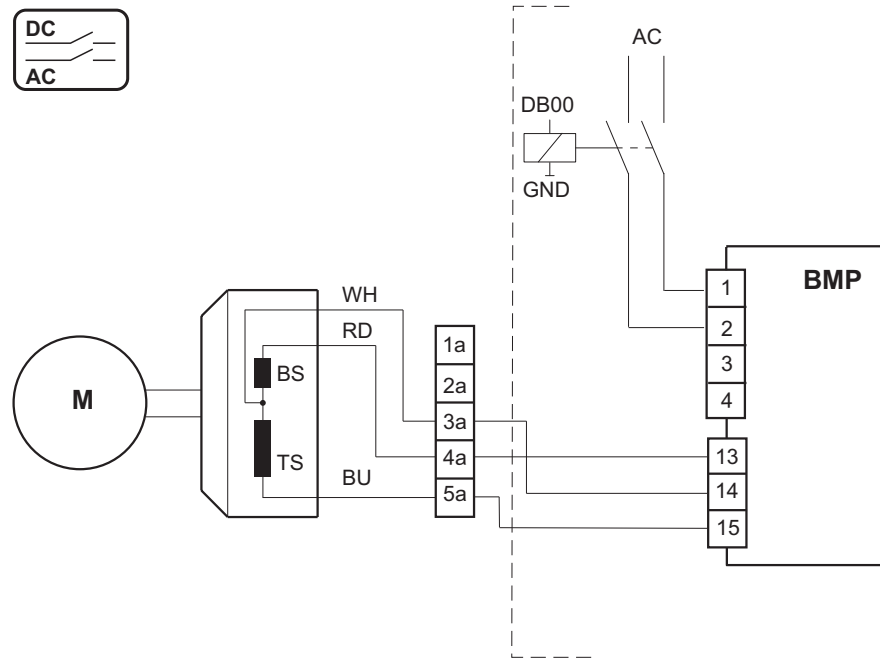**BMK. brake control**

14324495755
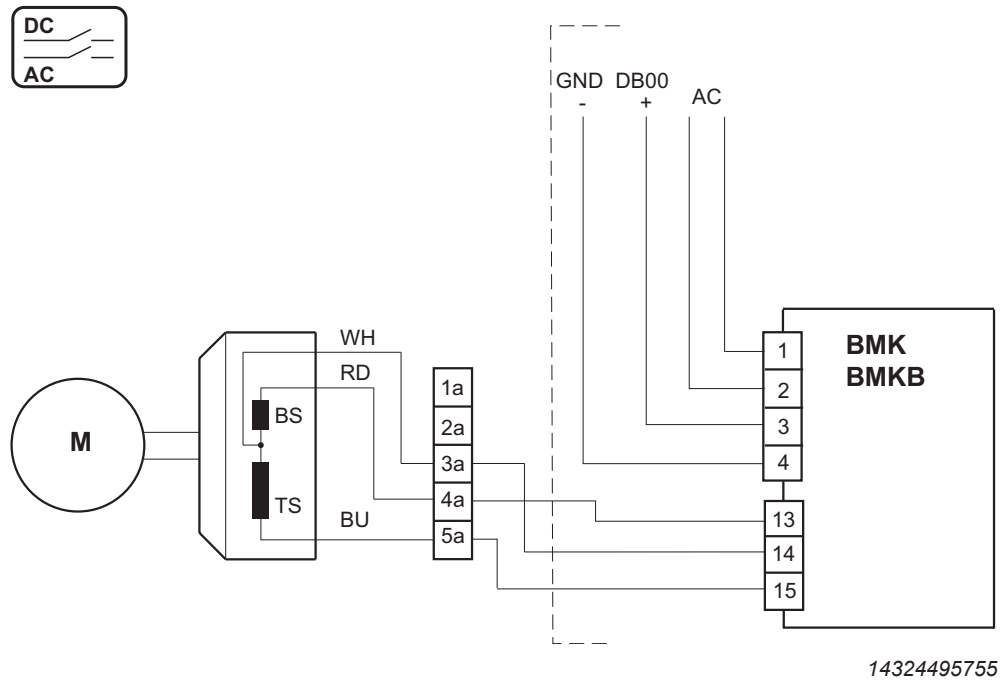
BMV brake control – 2 coils

14373482507
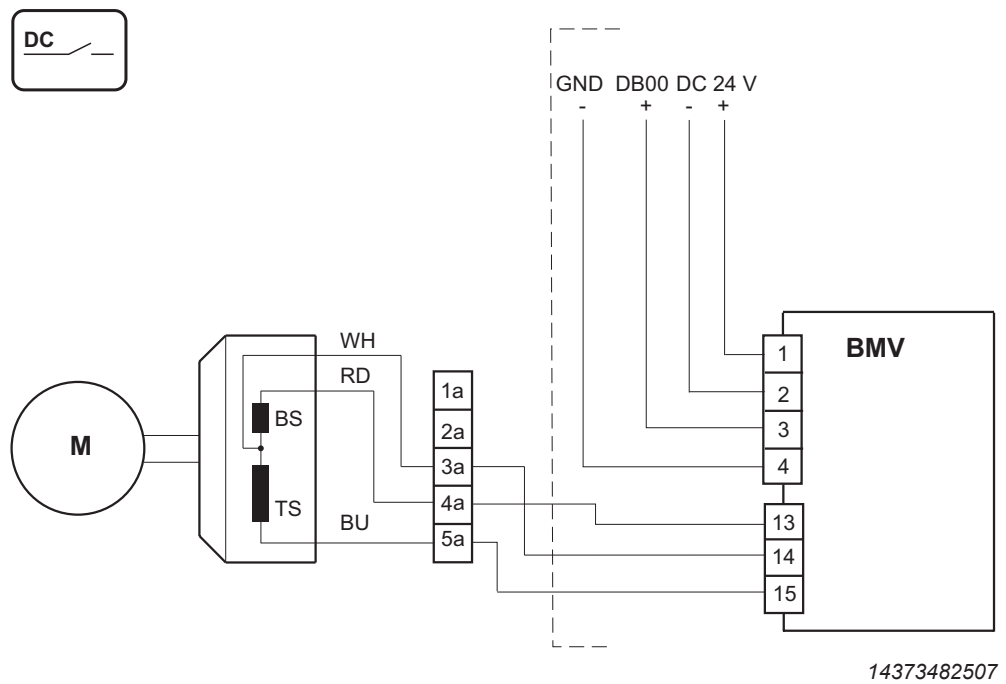
BMV brake control – 1 coil

14373494923

BMS, BME brake control

14324554891

BMP brake control

14324544523

BG, BGE brake control

14324565259

BSG brake control

14324597131
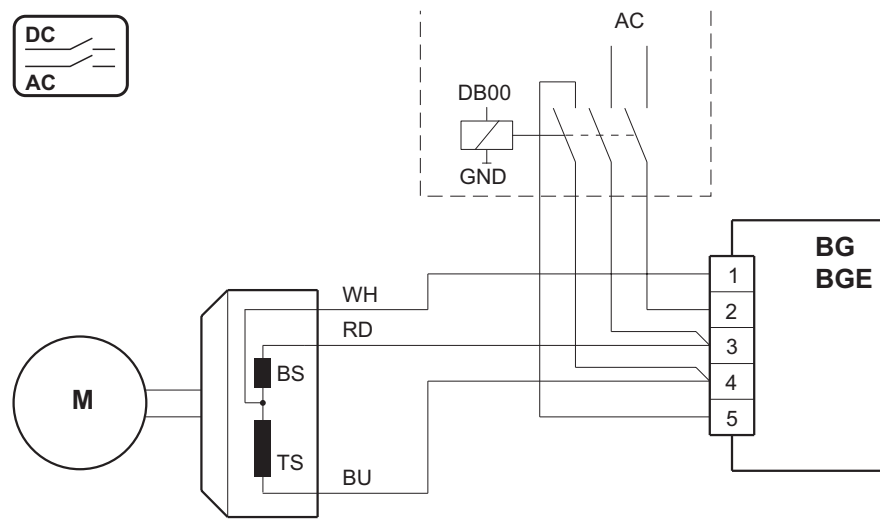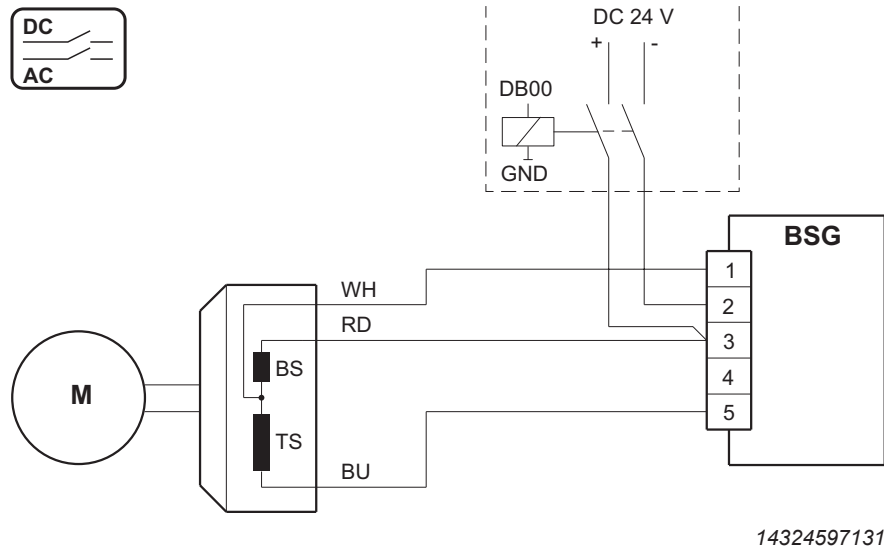
Brake control SBM with 1 control cable
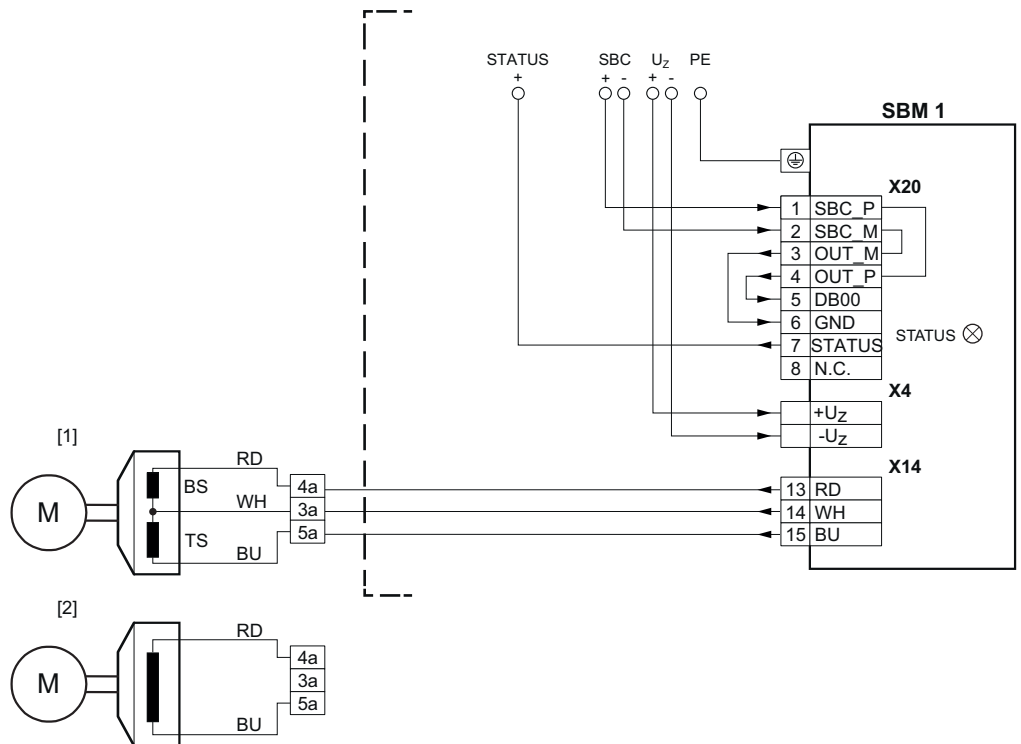
9007232120094731

[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.
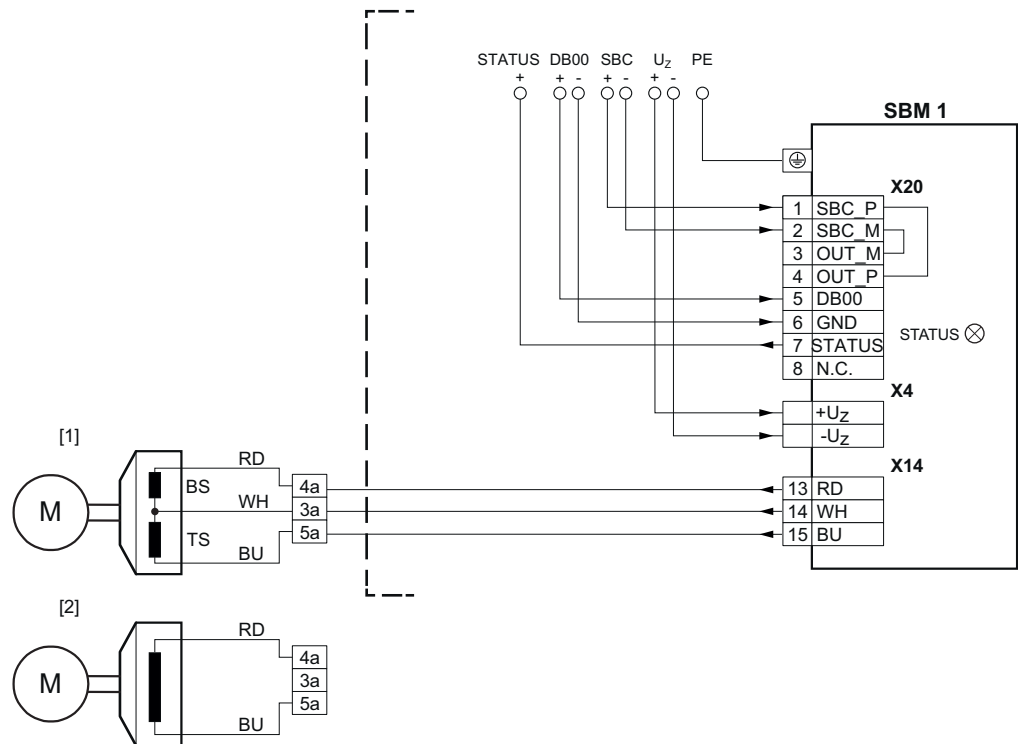
Brake control SBM with 2 control cables

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
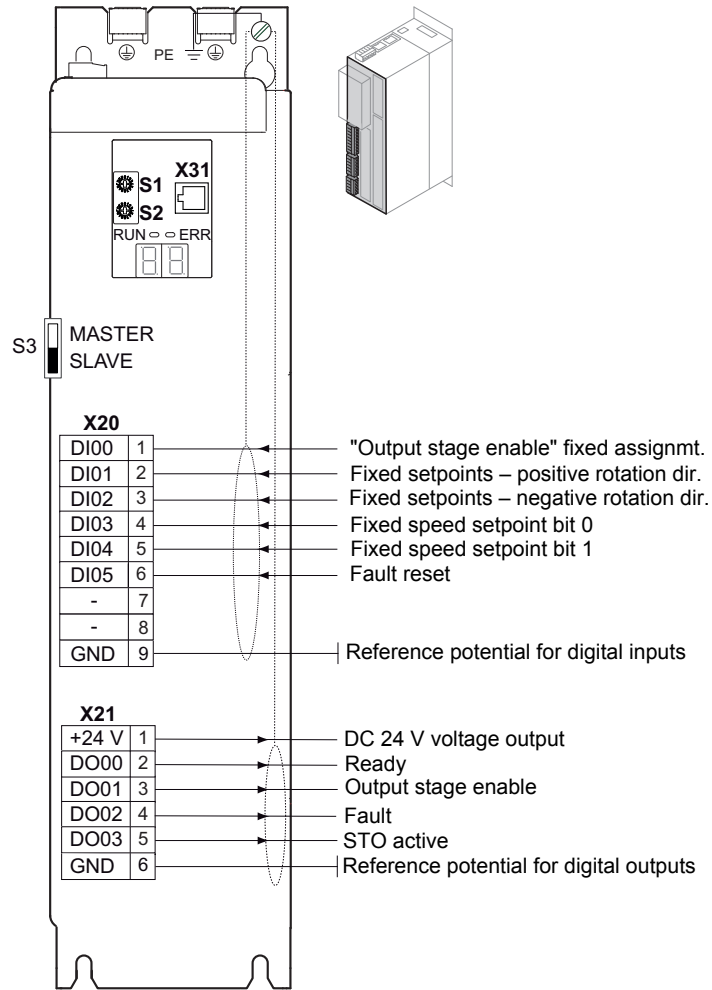   the auxiliary terminal strip.

4.6.4 Electronics connection

For the assignment of the signal terminals and connections, refer to chapter "Terminal assignment of basic unit" (→ 📄 32).
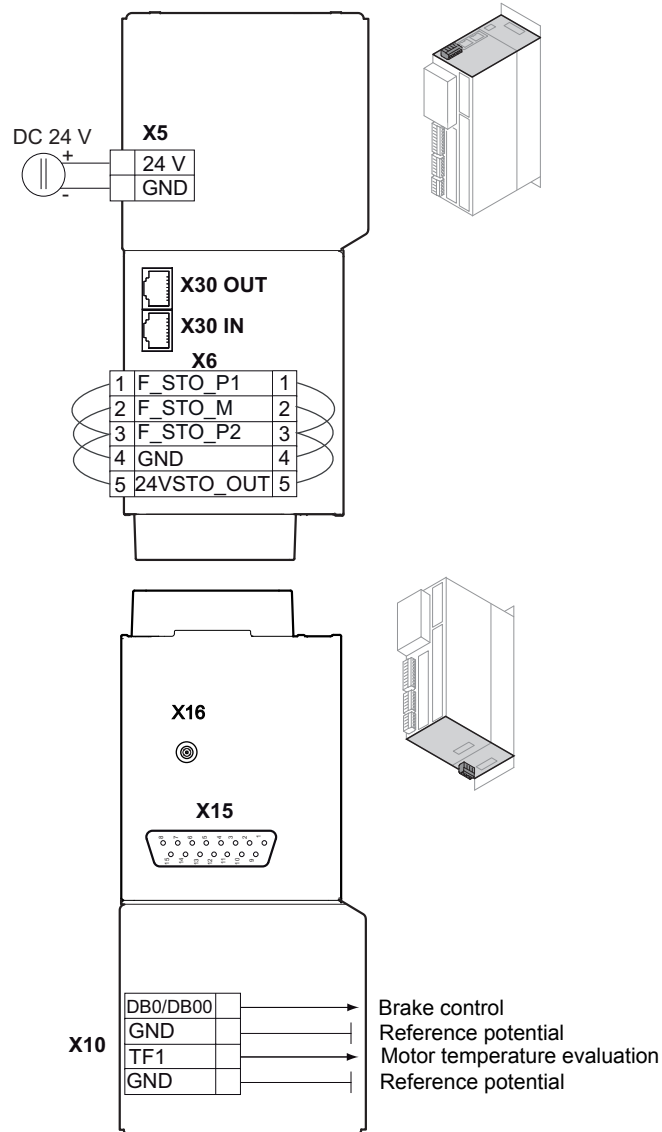
Wiring the control electronics

For the terminal assignment and connections, refer to chapter "Terminal assignment of basic unit" (→ 📄 32).

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

X20		
DI00	1	"Output stage enable" fixed assignmt.
DI01	2	Fixed setpoints – positive rotation dir.
DI02	3	Fixed setpoints – negative rotation dir.
DI03	4	Fixed speed setpoint bit 0
DI04	5	Fixed speed setpoint bit 1
DI05	6	Fault reset
-	7	
-	8	
GND	9	Reference potential for digital inputs

X21		
+24 V	1	DC 24 V voltage output
DO00	2	Ready
DO01	3	Output stage enable
DO02	4	Fault
DO03	5	STO active
GND	6	Reference potential for digital outputs

9007224861533707

S3 Module bus operating mode
X20 Digital inputs
X21 Digital outputs

SEW EURODRIVE

9007224861472267

X5 24 V supply voltage
X6 Connection for Safe Torque Off (STO).
     With installed CS,.A card, the cable jumpers are removed at the factory.
     If no CS..A card is installed upon delivery, the cable jumpers are installed at the factory.
X10 Brake control and motor temperature monitoring
X15 Motor encoder connection
X16 MOVILINK® DDI connection
X30 System bus

4.6.5 Connection diagram CIO21A and CID21A input/output card
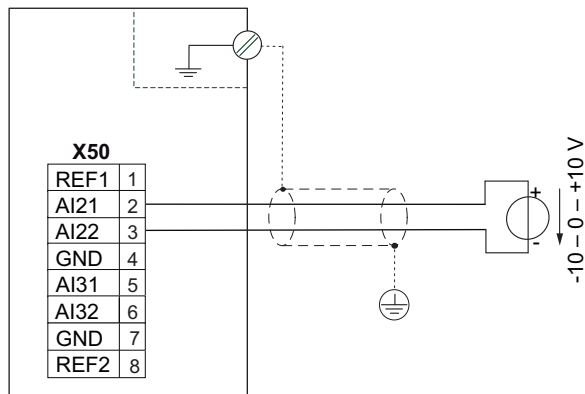
Digital inputs and outputs
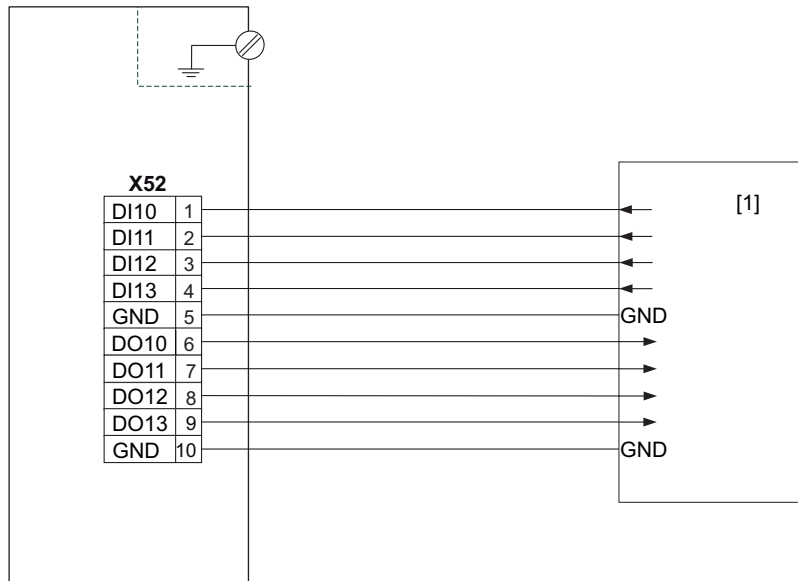
18014412829087243

[1]   Higher-level controller

Voltage input

9007213575393675

Connection to the terminals AI31 and AI32 is carried out analogously to the connection to the terminals AI21 and AI22 shown in the wiring diagrams.
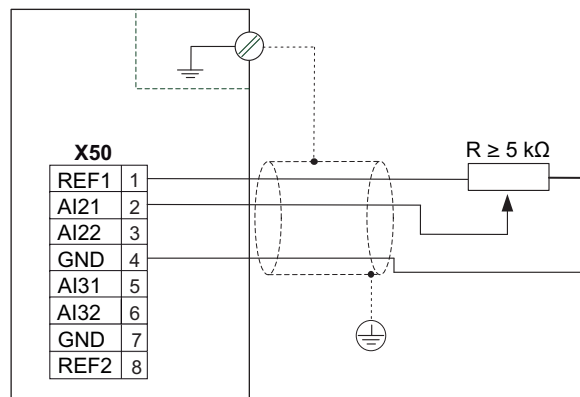
18014412830137099

Connection to the terminals REF2 and AI31 is carried out analogously to the connection to the terminals REF1 and AI21 shown in the wiring diagrams.

Current input

9007213575398539

Observe the switch position of "DIP switch S50" when activating the current input.

Voltage output

18014412830141963

Connection to the terminals AOV2 and GND is carried out analogously to the connection to the terminals AOV1 and GND shown in the wiring diagram.

Current output

18014412830272395
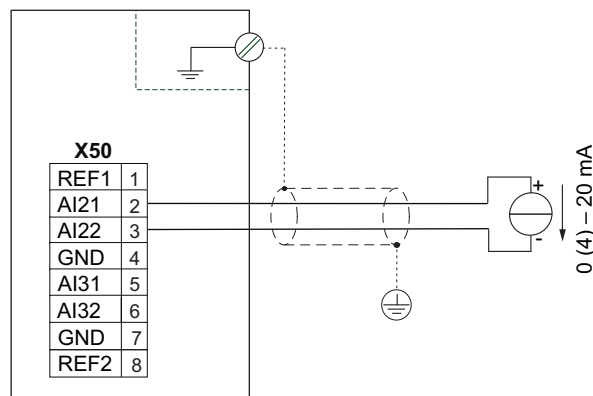
Connection to the terminals AOC2 and GND is carried out analogously to the connection to the terminals AOC1 and GND shown in the wiring diagram.
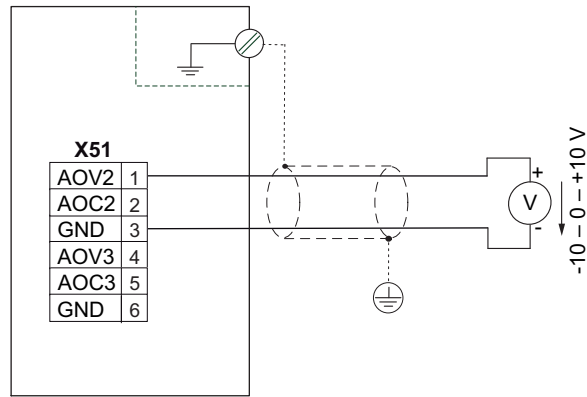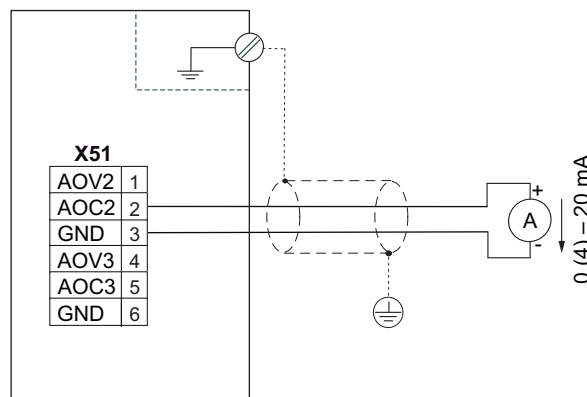
5 Startup

5.1 Setting the EtherCAT® ID

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

The ID serves as a unique device identification of the respective EtherCAT® slave for the EtherCAT® master. The EtherCAT® ID is not an EtherCAT® address.

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

Setting an EtherCAT® ID is not mandatory. The slaves are automatically addressed by the master by default.

The EtherCAT® ID must only be set at the application inverter if the use of EtherCAT® IDs was preset in the hardware configuration of the master.

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)
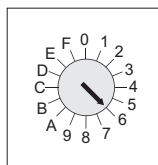
6

S2 EtherCAT® ID (×1)
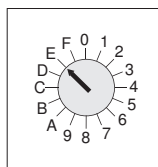
E

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

5.2 Startup requirements

The following requirements apply to startup:

- You have installed the application inverter correctly, both mechanically and electrically.
- You have configured the application inverter and connected drives correctly.
- Safety measures prevent accidental startup of the drive.
- Safety precautions prevent danger to persons or machines.

You can perform the startup in different ways:

- If you use a power-adjusted motor, you can dispense with startup (operation without startup), depending on the requirements.
- You can perform startup using the MOVISUITE® engineering software.

5.2.1 Required hardware

- USM21A interface adapter

  or

- EtherCAT® cable and access via the MOVI-C® CONTROLLER or directly via the integrated EtherCAT® interface of the inverter

Part number	Scope of delivery
28231449	• USM21A interface adapter • Serial interface cable with 2 × RJ10 connectors • USB cable (A-B)

6   Operation

6.1   General information

> ⚠ **DANGER**
>
> Dangerous voltages present at cables and motor terminals
>
> Severe or fatal injuries from electric shock.
>
> - Dangerous voltages are present at the output terminals and the cables and motor terminals connected to them when the device is switched on. This also applies even when the device is inhibited and the motor is at standstill.
> - The fact that the operation LED is no longer illuminated does not indicate that the inverter has been disconnected from the power supply and no longer carries any voltage.
> - Before you touch the power terminals, check that the inverter has been disconnected from the power supply.
> - Observe the general safety notes in the chapter "Safety notes" (→ 🕮 6) and the notes in the chapter "Electrical installation" (→ 🕮 17).

> ⚠ **DANGER**
>
> Risk of crushing if the motor starts up unintentionally.
>
> Severe or fatal injuries.
>
> - Ensure that the motor cannot start inadvertently, for example by removing the electronics terminal block X20.
> - Additional safety precautions must be taken, depending on the application, to avoid injury to personnel and damage to machinery.

> **NOTICE**
>
> Switching the motor output at the inverter with enabled output stage.
>
> Damage to the inverter.
>
> - The motor output of the inverter may only be switched or disconnected when the output stage is inhibited.

6.2 Operating displays

6.2.1 7-segment display

Display	Description	State	Comment/action
Displays during boot process			
b0 b1 b2 b3 br	Device passes through several states when loading firmware (boot) to become ready for operation	• Status: Not ready • Output stage is inhibited. • Communication is not yet possible.	• Waiting for boot process to finish. • Device stays in this condition: Device is defective.

Display	Description	State	Comment/action
Displays of different device states			
.	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 not ready		Check the module bus connection.
C1 Flashing	Startup state		Startup state is active.
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 bus incorrect. Process data processing 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 not ready		• Encoders are being initialized. • Device stays in this condition: – 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		

Display	Description	State	Comment/action
C8 Flashing	External device not ready		
C9 Flashing	Data flexibilization layer not ready		
Cd Flashing	Parameter download running		
CA	MOVILINK® DDI not ready		MOVILINK® DDI interface not ready.

Display	Description	State	Comment/action
Displays during initialization processes (parameters will be reset to default values)			
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		

Display	Description	State	Comment/action
Displays in normal operation			
01	Output stage inhibit	• Output stage is inhibited.	The drive is not actuated 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.
AC	Auto Configuration	Data is transferred to the inverter via MOVILINK® DDI interface.	The motor is started up via the MOVILINK® DDI interface.

Display	Description	State	Comment/action
02	Default stop	For further information, refer to the description of the FCBs.	Drive function (FCB) "Default stop" active, if not other FCB is selected and the system is ready.
04	Manual mode		Manual mode is 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, e.g. in the 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, e.g. in the higher-level controller.
12	Reference travel		The drive performs reference travel.
13	Stop at application limits		Deceleration at the application limit. FCB 13 is active if no other FCB is selected with the default FCB 02.
14	Emergency stop		Deceleration at the emergency stop limit.
18	Rotor position identification		Encoder commutation for synchronous motors.
19	Position hold control		Position control on current position.
20	Jog		Jog mode is active.
21	Brake test		Brake is tested by applying a torque when the brake is applied.
25	Motor parameter measurement		Motor parameter measurement is active.
26	Stop at user limits		Serves to stop at user limits.

6.2.2 LED displays – basic unit

"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".
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.

7 Service

7.1 Extended storage

The device is maintenance-free.

7.2 Shutdown

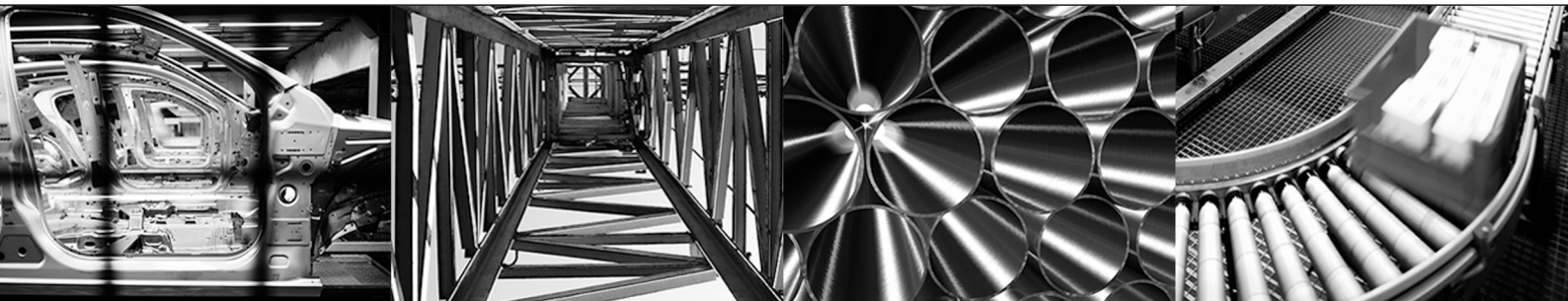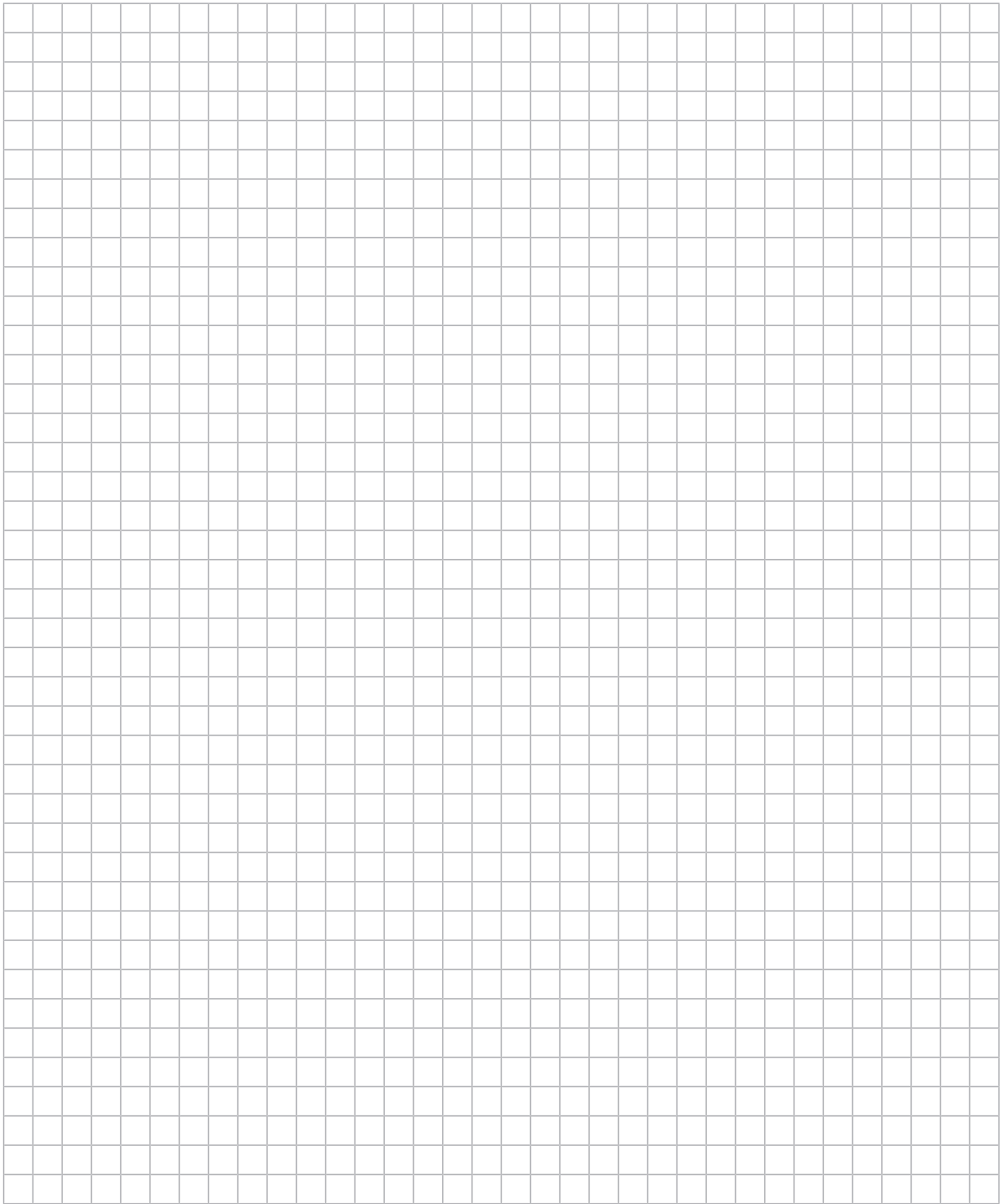To shut down the inverter, de-energize the inverter using appropriate measures.
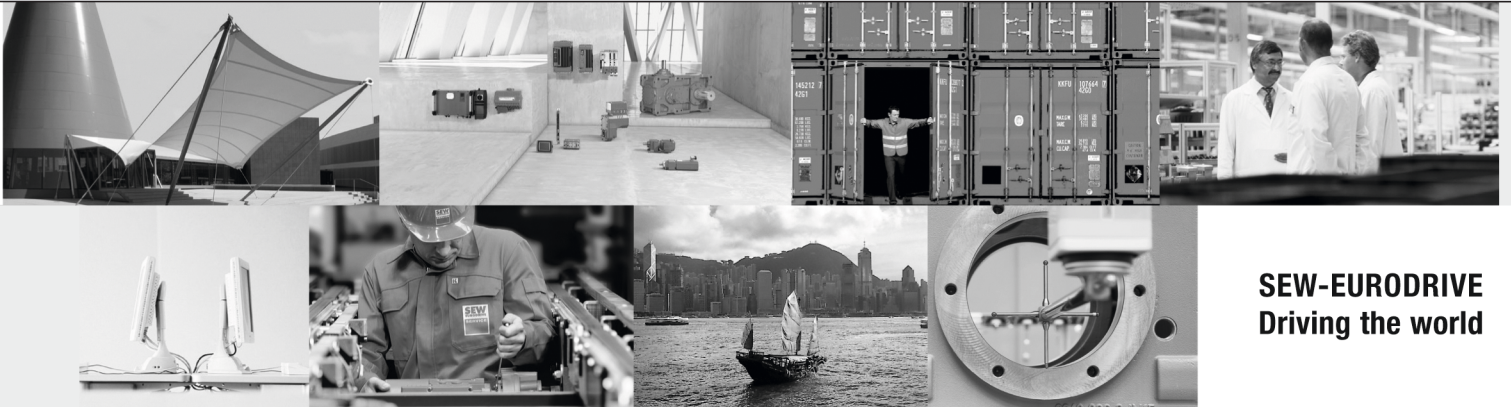
> ⚠ **WARNING**
>
> Electric shock due to incompletely discharged capacitors.
>
> Severe or fatal injuries.
>
> • Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.
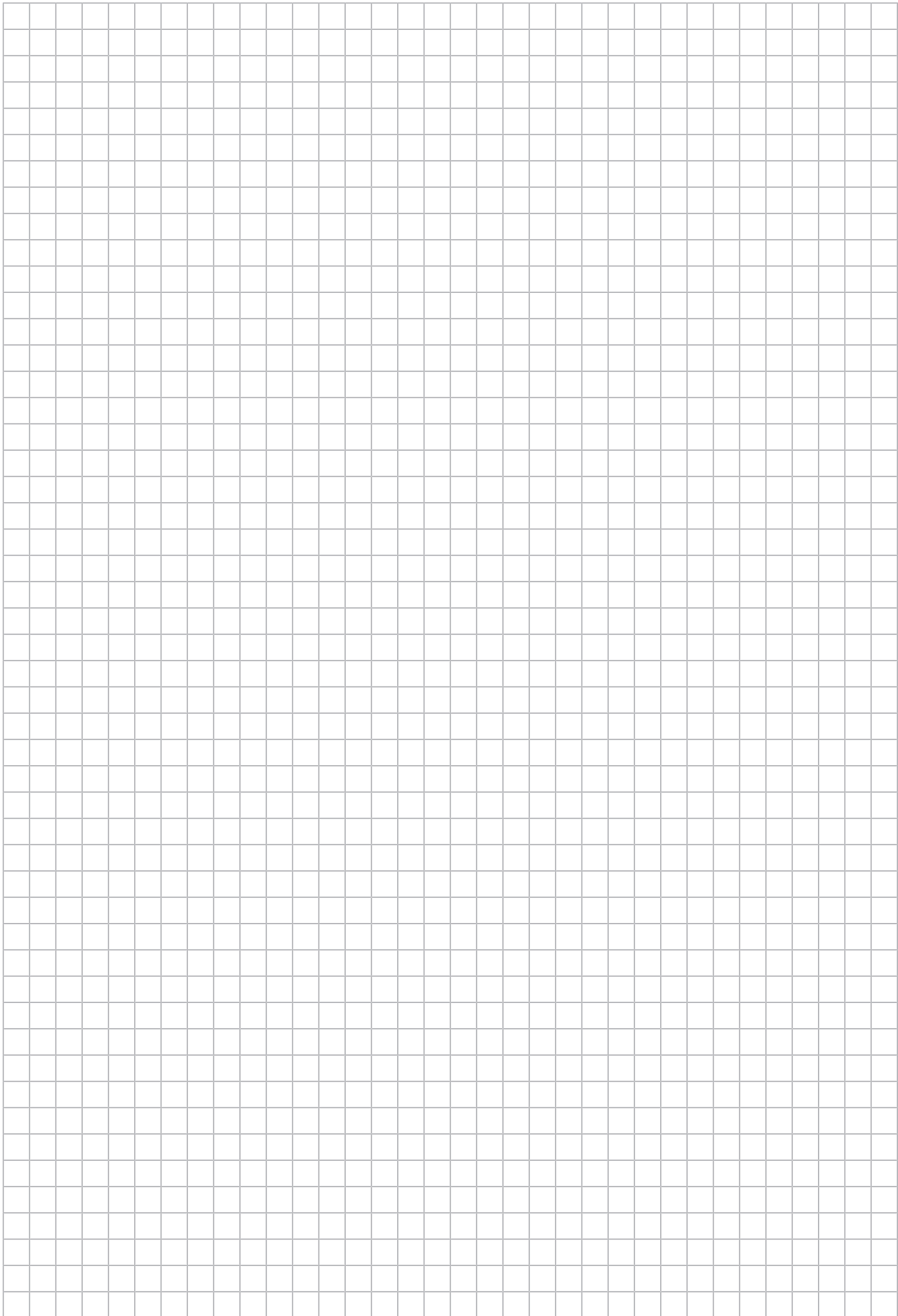
SEW-EURODRIVE
Driving the world