SEW EURODRIVE

Operating Instructions

Application Inverter

MOVIDRIVE® system

Edition 02/2019

28487877/EN

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1 General information

1.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE.

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.

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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 about suspended load
	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.

1.3 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.4 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

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1.5 Content of the documentation

This documentation contains additional safety-related information and conditions for operation in safety-related applications.

1.6 Other applicable documentation

Observe the corresponding documentation for all further components.

1.7 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.7.1 Trademark of Beckhoff Automation GmbH

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

1.8 Copyright notice

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1.9 Device availability

This documentation also lists devices that are not yet available at the time of the publication of this document.

The following table lists the available application inverters. Accessories required for the inverter operation such as braking resistors, chokes, and filters are available.

Type designation
MDX9_A-0020-5E3-4-S00/E00
MDX9_A-0025-5E3-4-S00/E00
MDX9_A-0032-5E3-4-S00/E00
MDX9_A-0040-5E3-4-S00/E00
MDX9_A-0055-5E3-4-S00/E00
MDX9_A-0070-5E3-4-S00/E00
MDX9_A-0095-5E3-4-S00/E00
MDX9_A-0125-5E3-4-S00/E00
MDX9_A-0160-5E3-4-S00/E00
MDX9_A-0240-503-4-S00/E00
MDX9_A-0320-503-4-S00/E00
MDX9_A-0460-503-4-S00/E00
MDX9_A-0620-503-4-S00/E00
MDX9_A-0750-503-4-S00/E00
MDX91A-0910-503-4-S00/E00
MDX91A-1130-503-4-S00/E00
MDX91A-1490-503-4-S00/E00
MDX9_A-0070-2E3-4-S00/E00
MDX9_A-0093-2E3-4-S00/E00
MDX9_A-0140-2E3-4-S00/E00
MDX9_A-0213-203-4-S00/E00
MDX9_A-0290-203-4-S00/E00
MDX9_A-0420-203-4-S00/E00
MDX9_A-0570-203-4-S00/E00
MDX91A-0840-203-4-S00/E00
MDX91A-1080-203-4-S00/E00

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

- Qualification in the mechanical area in accordance with the national regulations
- Familiarity with this documentation

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Specialist for electrotechnical work

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

- Qualification in the electrotechnical area in accordance with the national regulations
- Familiarity with this documentation

Additional qualification

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 units, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is that the persons are capable of performing the required tasks and work steps in a safe and correct manner.

2.4 Designated use

The product is intended for control cabinet installation in electrical plants 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.

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 the 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.

2.4.1 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.

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2.5 Functional safety technology

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

2.6 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 the chapter "Technical data" of the documentation.

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2.7 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".

2.7.1 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 asl, 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).

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2.8 Electrical installation

Ensure that all of the required covers are correctly attached after carrying out 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 Required preventive measure

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

2.8.2 Stationary application

Necessary preventive measure for the product is:

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

2.8.3 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.

2.9 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. To ensure protective separation, all connected circuits must also meet the requirements for protective separation.

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2.10 Startup/operation

Observe the safety notes in the 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.

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.

2.10.1 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".

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3 Device structure

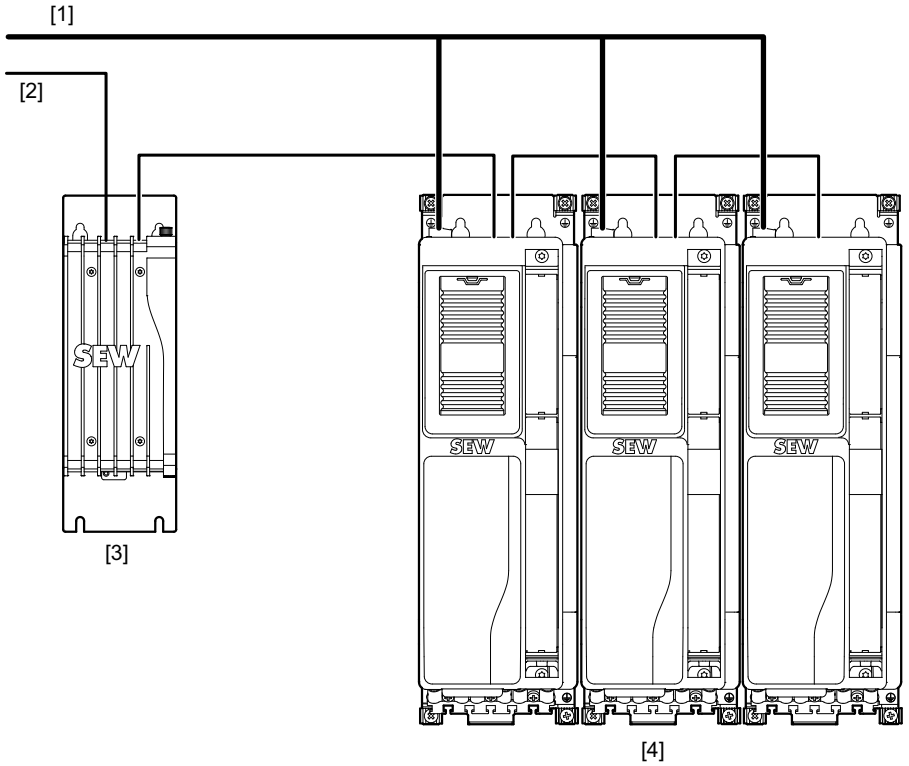
3.1 Connection variants

The MOVIDRIVE® system application inverter can be used in the following connection variants:

- As application inverter in connection with a MOVI-C® CONTROLLER power/power eco.
- As application inverter in connection with a MOVI-C® CONTROLLER advanced
- As application inverter in connection with a MOVI-C® CONTROLLER standard

3.1.1 Application inverter with MOVI-C® CONTROLLER power/power eco

MOVIDRIVE® system



9007214102794635

[1] Line voltage
[2] Industrial communication
[3] MOVI-C® CONTROLLER
[4] MOVIDRIVE® system

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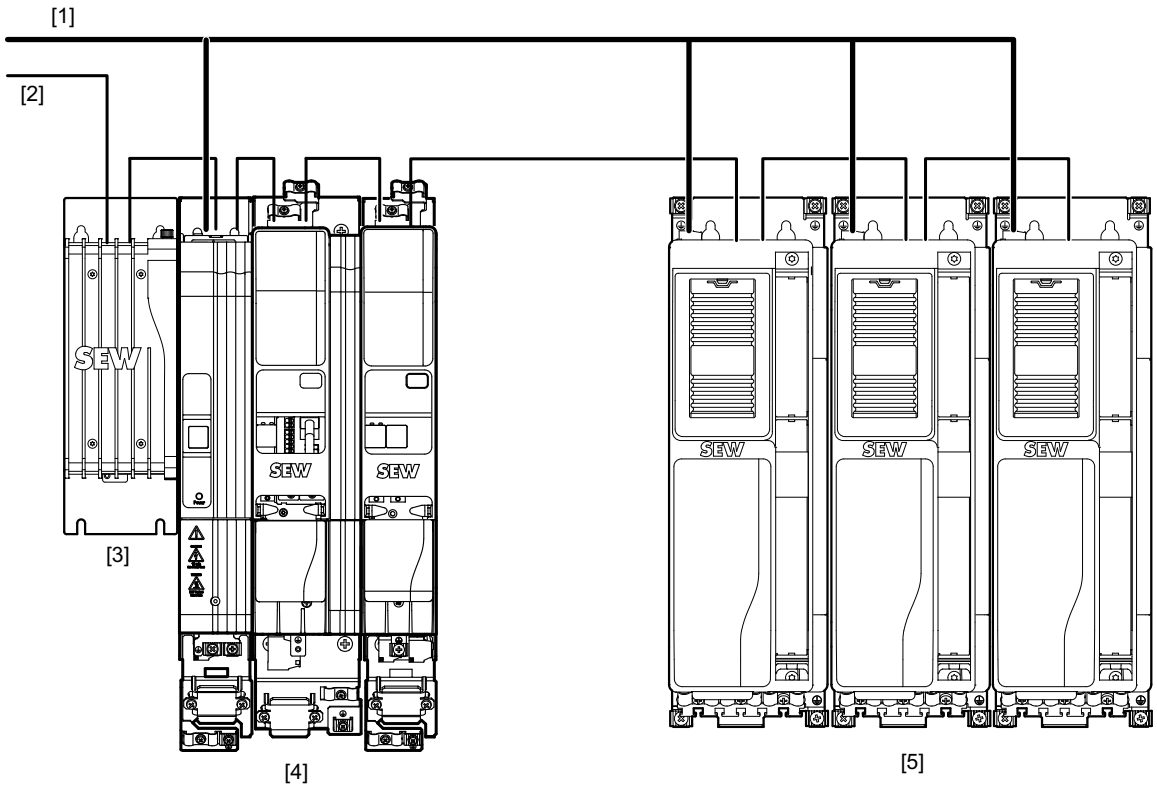
MOVIDRIVE® modular and MOVIDRIVE® system



9007214127262859

[1] Line voltage
[2] Industrial communication
[3] MOVI-C® CONTROLLER
[4] MOVIDRIVE® modular axis system
[5] MOVIDRIVE® system

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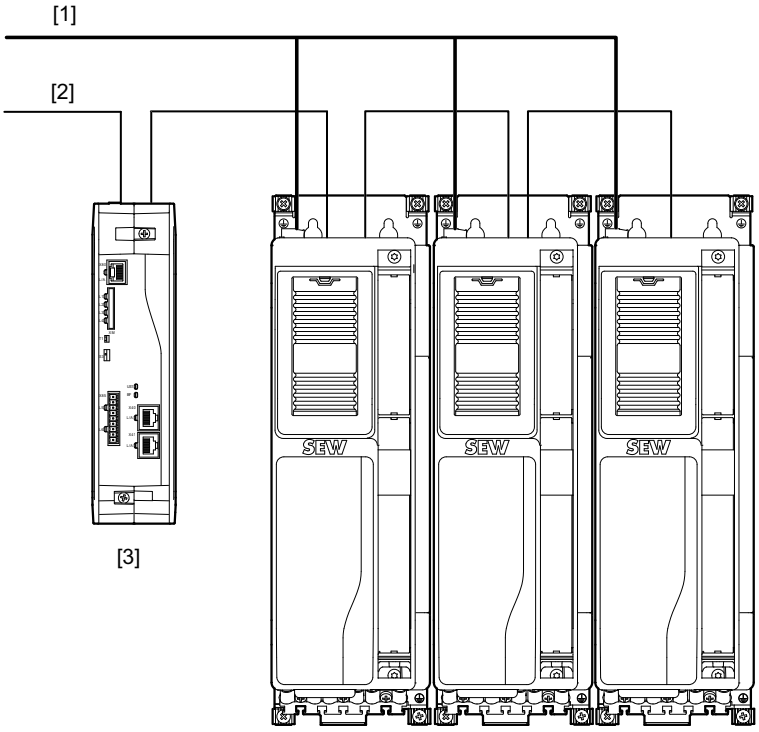
3.1.2 Application inverter with MOVI-C® CONTROLLER advanced

MOVIDRIVE® system



20972835467

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial communication

[3] MOVI-C® CONTROLLER advanced

[4] MOVIDRIVE® system

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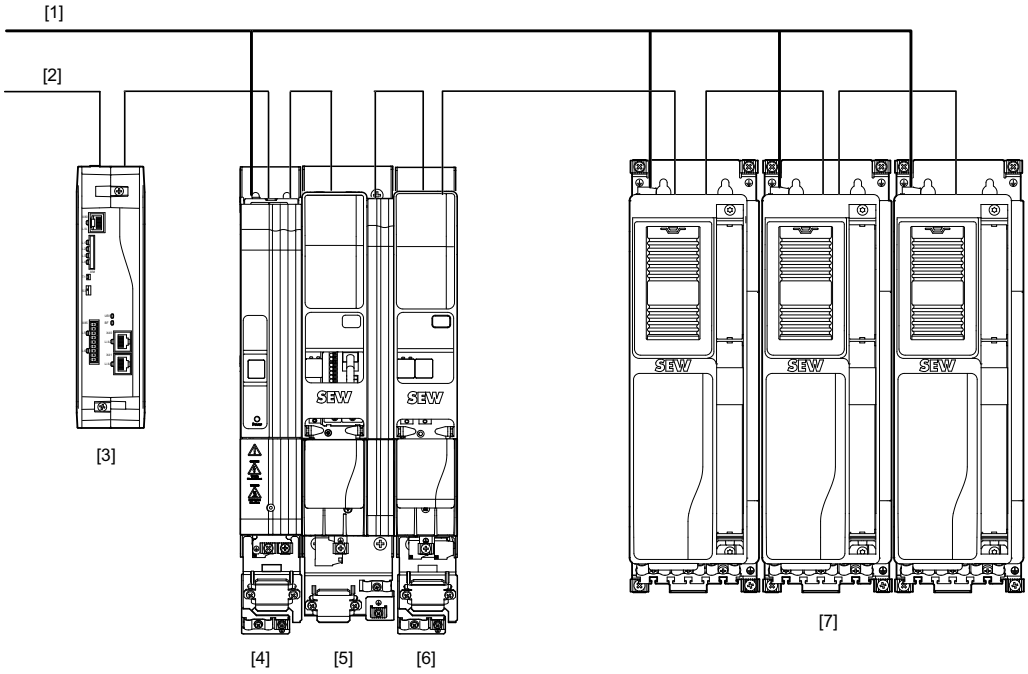
MOVIDRIVE® modular and MOVIDRIVE® system



20840829579

[1] Line voltage 3 × AC 380 – 500 V
[2] Industrial communication
[3] MOVI-C® CONTROLLER advanced
[4] MOVIDRIVE® modular power supply module MDP..
[5] MOVIDRIVE® modular single-axis module MDA.
[6] MOVIDRIVE® modular double-axis module MDD..
[7] MOVIDRIVE® system

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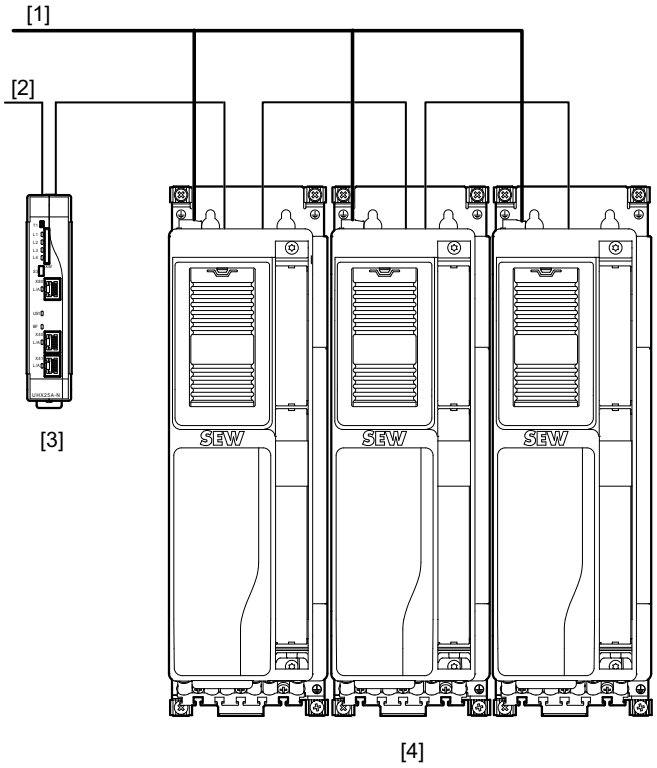
3.1.3 Application inverter with MOVI-C® CONTROLLER standard MOVIDRIVE® system



20972837899

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial communication

[3] MOVI-C® CONTROLLER standard

[4] MOVIDRIVE® system

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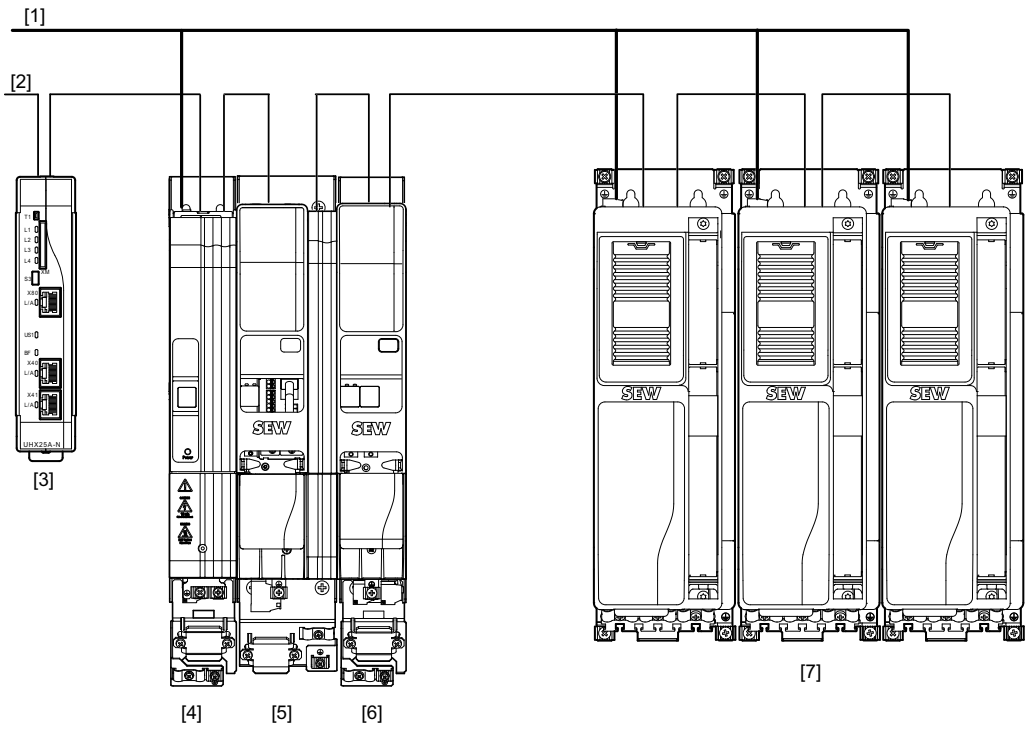
MOVIDRIVE® modular and MOVIDRIVE® system



20841203211

[1] Line voltage 3 × AC 380 – 500 V
[2] Industrial Communication
[3] MOVI-C® CONTROLLER standard
[4] MOVIDRIVE® modular power supply module MDP..
[5] MOVIDRIVE® modular single-axis module MDA.
[6] MOVIDRIVE® modular double-axis module MDD..
[7] MOVIDRIVE® system

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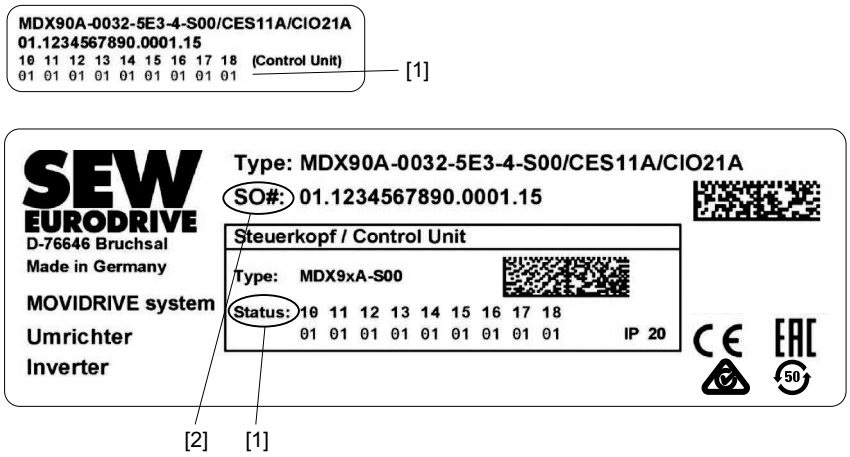
3.2 MOVIDRIVE® system nameplate

3.2.1 System nameplate

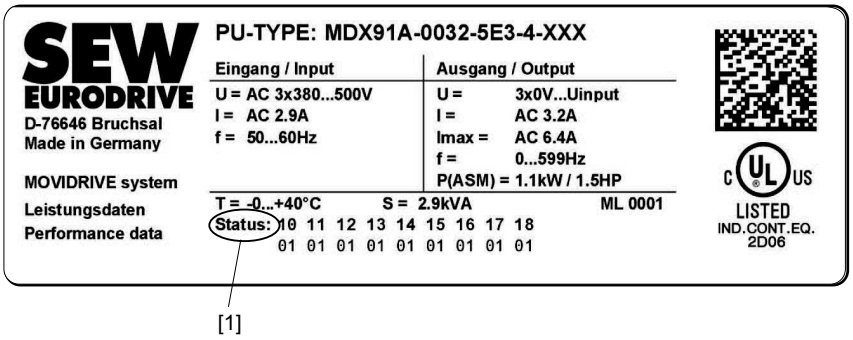


18014413567942667

[1] Device status

[2] Serial number

3.2.2 Performance data nameplate



23907979019

[1] Device status

3.3 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
Performance class	0125	• 0125 = Nominal output current – e.g. 0125 = 12.5 A
Connection voltage	5	• 2 = AC 200 to 240 V • 5 = AC 380 to 500 V
Power section design EMC	E	• 0 = Basic interference suppression integrated • E = EMC filter limit value category C2 acc. to 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 • T = MOVIDRIVE® technology: Control via fieldbus • E = Inverter with device profile CiA402
Designs	00	• 00 = Standard design
Options		• /L = Design with coated printed circuit boards The following list serves as an example: • /CES11A = Multi-encoder card • /CID21A, /CIO21A = Input/output cards • /CS..A = Safety card MOVISAFE® CS..A

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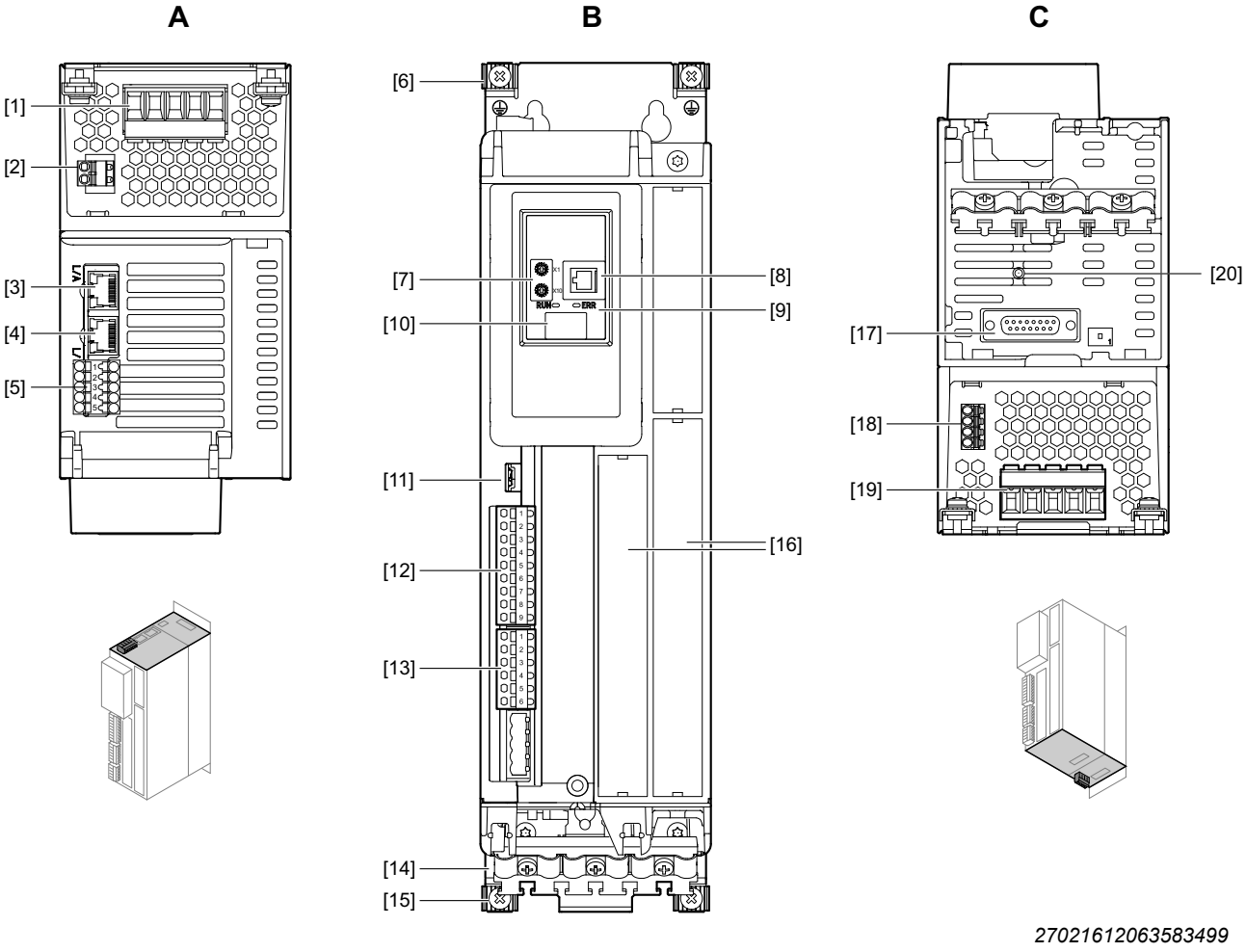
3.4 Device structure of the application inverter

3.4.1 MDX9_A-0020 – 0040-5_3-..



27021612063583499

A: View from top

[1] X1: Line connection

[2] X5: +24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: Connection for Safe Torque Off (STO)

W: View from front

[6] 2 × housing PE connection

[7] EtherCAT® ID switch

[8] X31: SEW-EURODRIVE Service interface

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERROR"

[10] 7-segment display

[11] S3: Switch for module bus operating mode

[12] X20: Digital inputs

[13] X21: Digital outputs

[14] Shield plate

[15] 2 × housing PE connection

[16] Card slot

C: View from bottom

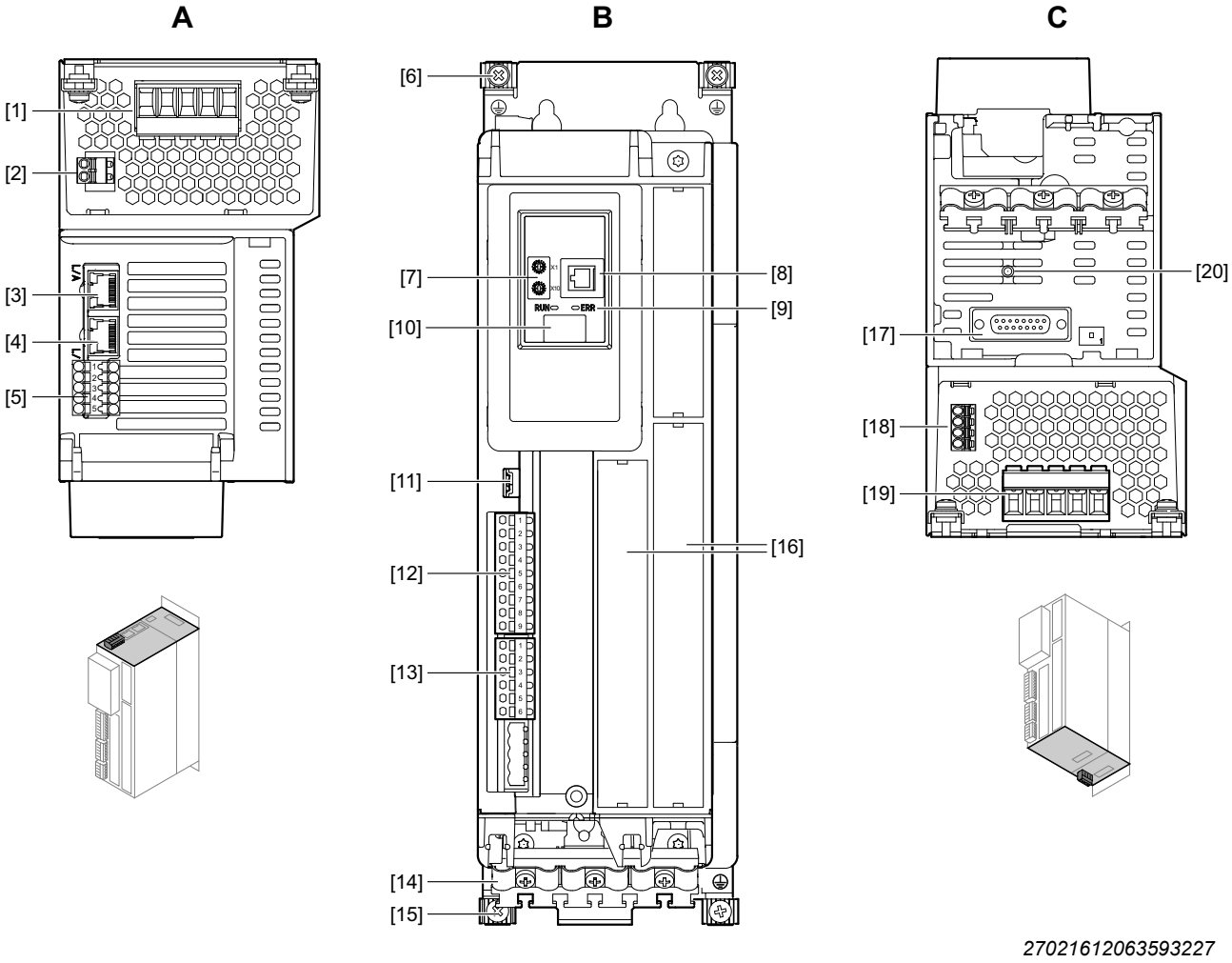
[17] X15: Motor encoder connection

[18] X10: Brake control and motor temperature monitoring

[19] X2: Motor and braking resistor connection

[20] X16: Connection for digital motor integration

3.4.2 MDX9_A-0055 – 0095-5_3-.. MDX9_A-0070 – 0093-2_3-..



27021612063593227

A: View from top

[1] X1: Line connection

[2] X5: +24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: Connection for Safe Torque Off (STO)

W: View from front

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[18] X10: Brake control and motor temperature monitoring

[19] X2: Motor and braking resistor connection

[20] X16: Connection for digital motor integration

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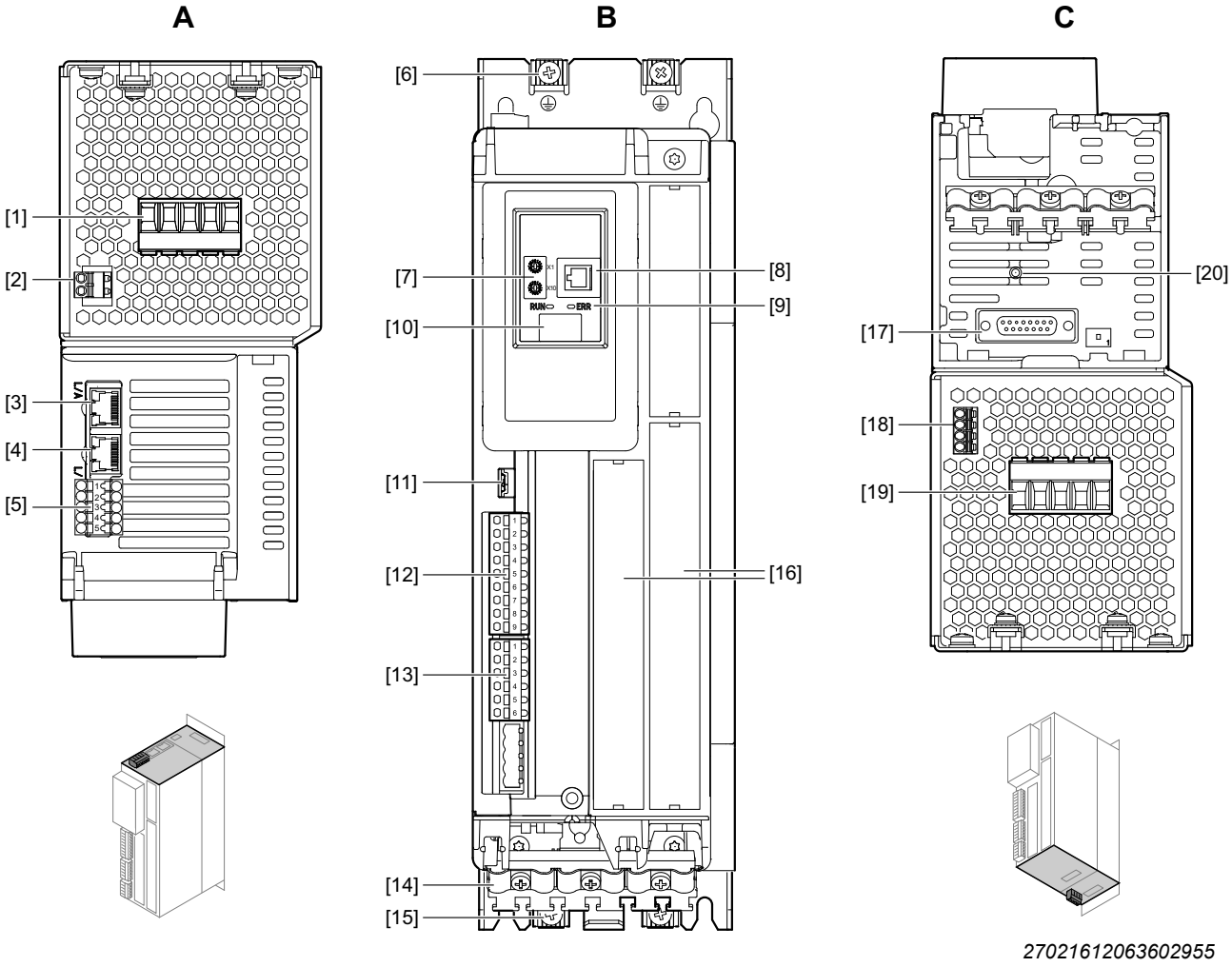
3.4.3 MDX9_A-0125 – 0160-5_3-.. MDX9_A-0140-2_3-..



A: View from top

[1] X1: Line connection

[2] X5: +24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: Connection for Safe Torque Off (STO)

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[6] 2 × housing PE connection

[7] EtherCAT® ID switch

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[11] S3: Switch for module bus operating mode

[12] X20: Digital inputs

[13] X21: Digital outputs

[14] Shield plate

[15] 2 × housing PE connection

[16] Card slot

C: View from bottom

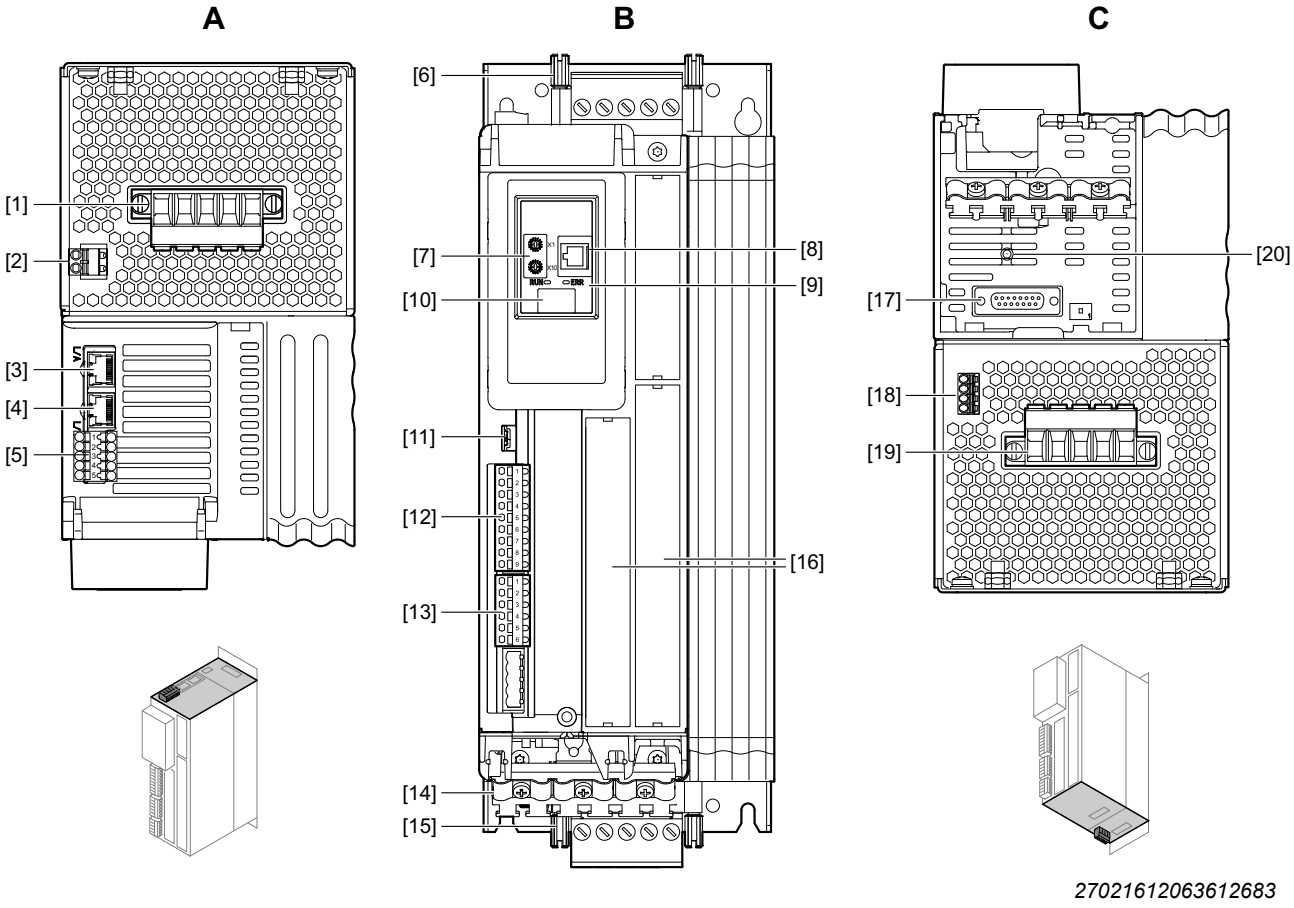
[17] X15: Motor encoder connection

[18] X10: Brake control and motor temperature monitoring

[19] X2: Motor and braking resistor connection

[20] X16: Connection for digital motor integration

3.4.4 MDX9_A-0240 – 0320-5_3-.. MDX9_A-0210 – 0290-2_3-..



27021612063612683

A: View from top

[1] X1: Line connection

[2] X5: +24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: Connection for Safe Torque Off (STO)

W: View from front

[6] 2 × housing PE connection

[7] EtherCAT® ID switch

[8] X31: SEW-EURODRIVE Service interface

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERROR"

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[11] S3: Switch for module bus operating mode

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[13] X21: Digital outputs

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C: View from bottom

[17] X15: Motor encoder connection

[18] X10: Brake control and motor temperature monitoring

[19] X2: Motor and braking resistor connection

[20] X16: Connection for digital motor integration

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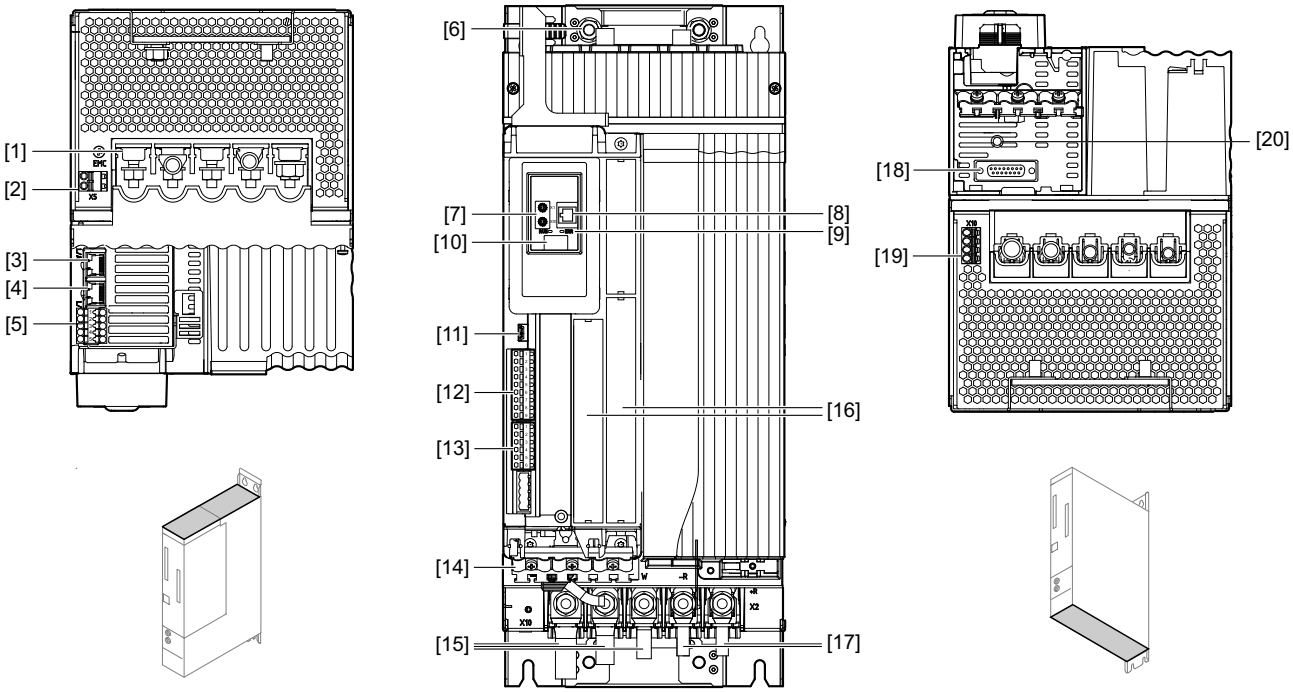
3.4.5 MDX9_A-0460 – 0750-5_3-.. MDX9_A-0420 – 0570-2_3-..



9007220618454155

A: View from top

[1] X1: Line connection

[2] X5: +24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

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[20] X16: Connection for digital motor integration

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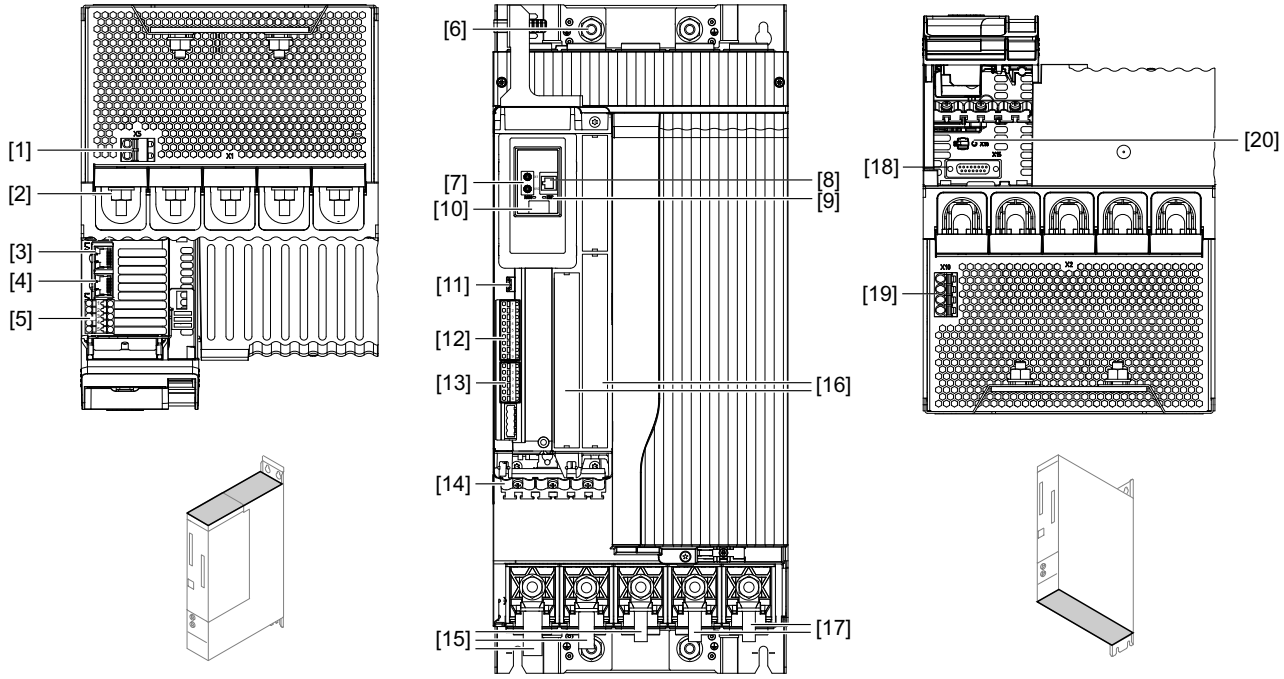
3.4.6 MDX91A-0910 – 1490-5_3-.. MDX91A-0840 – 1080-2_3-..



9007222917489675

A: View from top

[1] X5: +24 V supply voltage

[2] X1: Line connection

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: Connection for Safe Torque Off (STO)

W: View from front

[6] 2 × housing PE connection

[7] EtherCAT® ID switch

[8] X31: SEW-EURODRIVE Service interface

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERROR"

[10] 7-segment display

[11] S3: Switch for module bus operating mode

[12] X20: Digital inputs

[13] X21: Digital outputs

[14] Shield plate

[15] X2: Motor connection

[16] Card slot

[17] X2: Braking resistor connection

C: View from bottom

[18] X15: Motor encoder connection

[19] X10: Brake control and motor temperature monitoring

[20] X16: Connection for digital motor integration

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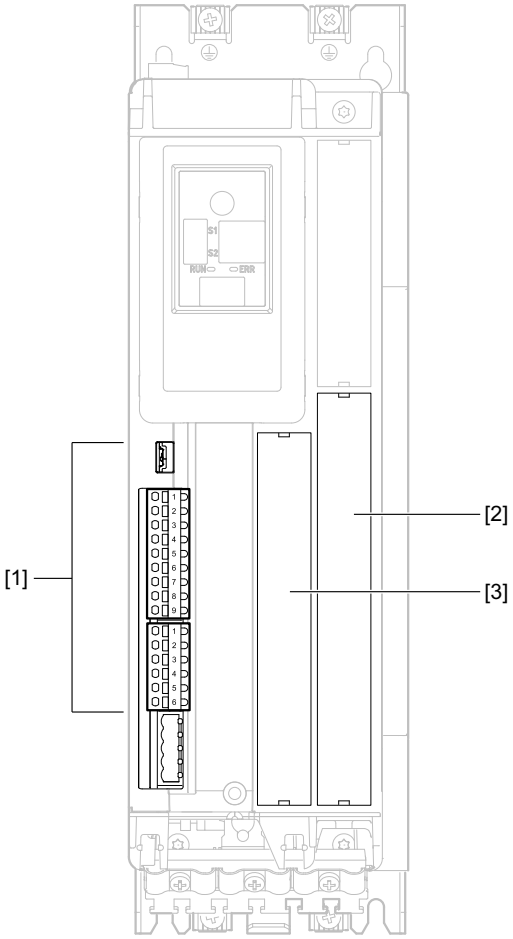
3.5 Card slots

The application inverters can have up to 2 cards installed. The following section describes the assignment of the slots and possible combinations of cards.

Type designation	Description	Slot
CES11A	Multi-encoder card	[2]
CS..A	MOVISAFE® safety card	[2]
CID21A, CIO21A	Input/output cards	[3]



[1] Connector panel of basic device

[2] Slot for safety card/multi-encoder card

[3] Slot for input/output cards

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4 Installation

MOVIDRIVE® system application inverters are exclusively suitable for control cabinet installation according to the degree of protection.

4.1 Permitted tightening torques

MDX9_A-....-5_3-..		0020 – 0040	0055 – 0095	0125 – 0160	0240 – 0320	0460 – 0750	0910 – 1490	1770 – 2200	2500 – 3000	3800 – 47009
MDX9_A-....-2_3-..		**-**	**0070 – 0093**	**0140**	**0213 – 0290**	**0420 – 0570**	**0840 – 0950**	**-**	**-**	**-**
Screw connection		**Tightening torque in Nm**								
Line connection	X1	0.5 – 0.8			1.7 – 1.8	8.5 – 9.5	18 – 22			
Motor and braking resistor connection	X2	0.5 – 0.8			1.7 – 1.8	8.5 – 9.5	18 – 22			
Terminal screw for TN/IT systems	EMC	1 – 1.2								
PE connections - M4 - M6		1 – 1.2 3 – 4								
Fastening of the cards		0.6 – 0.8								

NOTICE

Non-compliance with the stipulated tightening torques.

Possible damage to the application inverter.

- Always adhere to the stipulated tightening torques. Otherwise, excessive heat can develop which would damage the application inverter.
- An excessively high tightening torque may cause damage.

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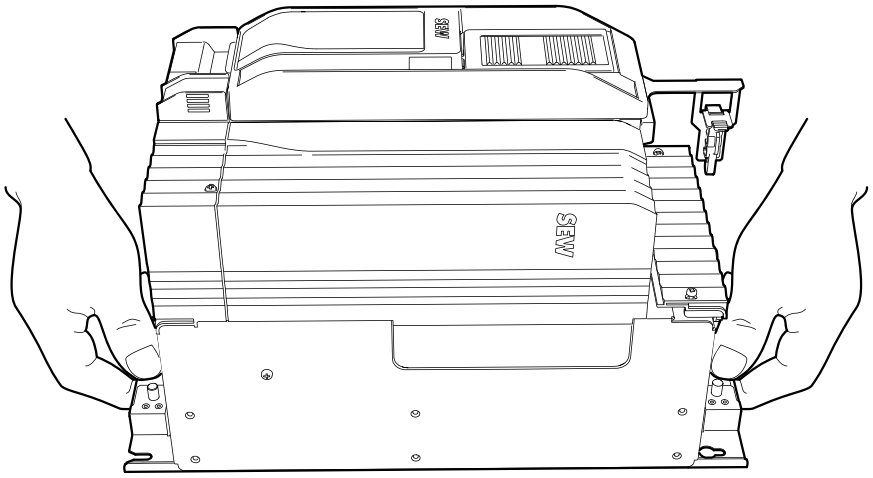
4.2 Special aspects when transporting the devices

The rear wall of the housing of the following devices is designed in such a way that you can grip them securely by hand to lift and transport the inverters without damaging them.

- MDX9_A-0460 – 1490-5_3-..
- MDX9_A-0420 – 1080-2_3-..



21435628299

NOTICE

Incorrect lifting and transporting of the inverter.

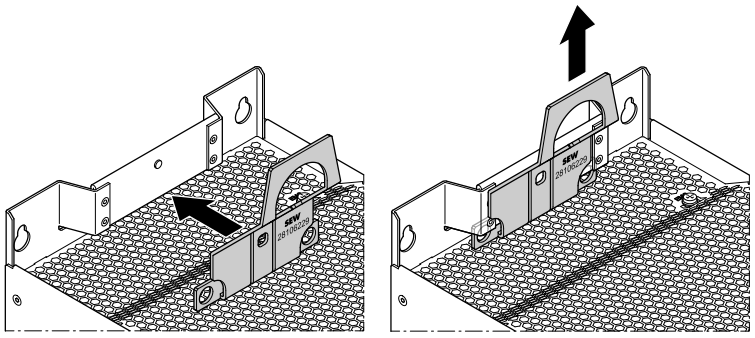
Inverter damage.

- When you lift or transport the inverter, use only the intended handling points for transportation at the rear wall of the housing to avoid any damage. Do not grip the inverter at any plastic parts or covers when lifting it.

The following devices must be transported with a lifting eye due to their weight:

- MDX91A-0910 – 1490-5_3-..
- MDX91A-0840 – 1080-2_3-..

The lifting eye is attached to the top of the housing; see the following figure.



24550948491

The lifting eye can be attached to hoists using suitable slings.

4.3 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.

Damage to the application inverter.

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

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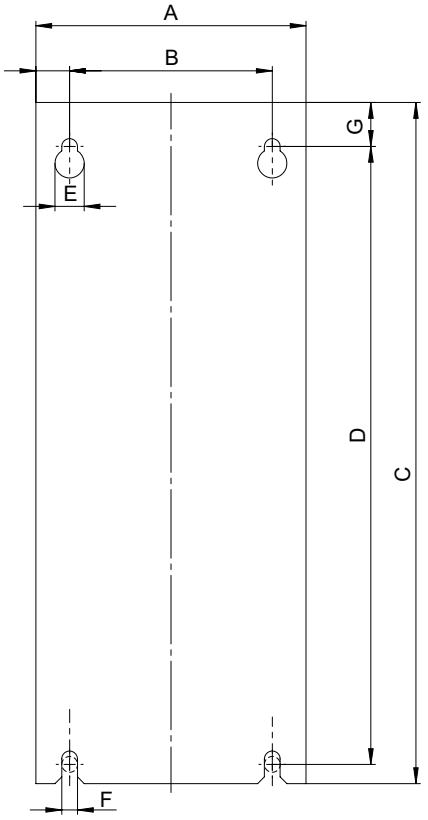
4.3.1 Bore patterns

Inverter	Dimensions of the device base plate in mm						
	A	B	C	D	E	F	G
MDX9_A-0020 – 0040-5_3-..	95	50	350	325	12	6	18
MDX9_A-0055 – 0095-5_3-.. MDX9_A-0070 – 0093-2_3-..	105	50	350	325	12	6	18
MDX9_A-0125 – 0160-5_3-.. MDX9_A-0140-2_3-...	105	80	350	325	12	6	18
MDX9_A-0240 – 0320-5_3-.. MDX9_A-0213 – 0290-2_3-..	135	80	350	325	12	6	18
MDX9_A-0460 – 0750-5_3-.. MDX9_A-0420 – 0570-2_3-..	195	160	471	440	12	6	18
MDX91A-0910 – 1490-5_3-.. MDX91A-0840 – 1080-2_3-..	240	200	544	510	12	6	18



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4.3.2 Minimum clearance and mounting position

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

- To ensure unobstructed cooling, leave a minimum clearance of 100 mm above and below the application inverter housings. Make sure air circulation in the clearance is not impaired by cables or other installation equipment.
- Make sure that the application inverters are not subjected to heated exhaust air from nearby components.
- Install the application inverters only vertically. You must not install them horizontally, tilted or upside down.

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.

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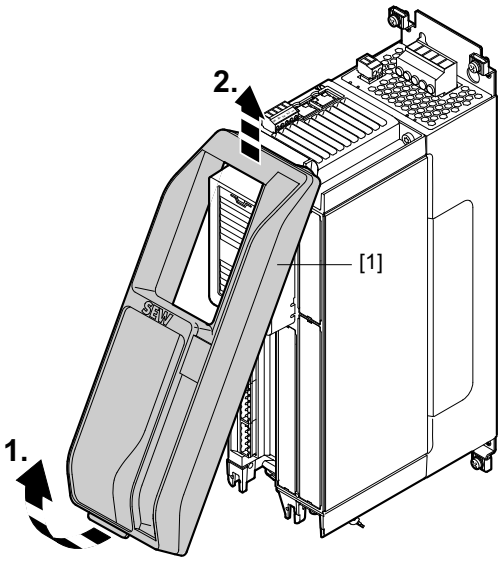
4.4 Covers

4.4.1 Covers

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

Removing the safety cover



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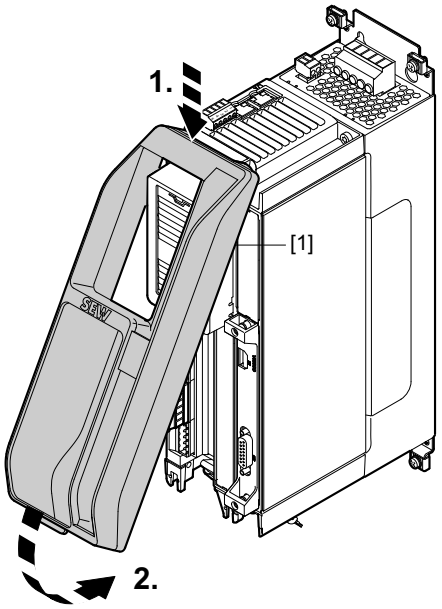
1. The safety cover [1] has a latching mechanism at the bottom. Pull the lower part of the safety cover away from the application inverter to unlatch it.
2. Pivot the safety cover forward and lift it to remove it from the application inverter.

Installing the safety cover



14578455307

3. Place the safety cover [1] into the upper recess and move it towards the application inverter until it clicks into place.
4. Always install the safety cover [1] after having worked on the application inverter.

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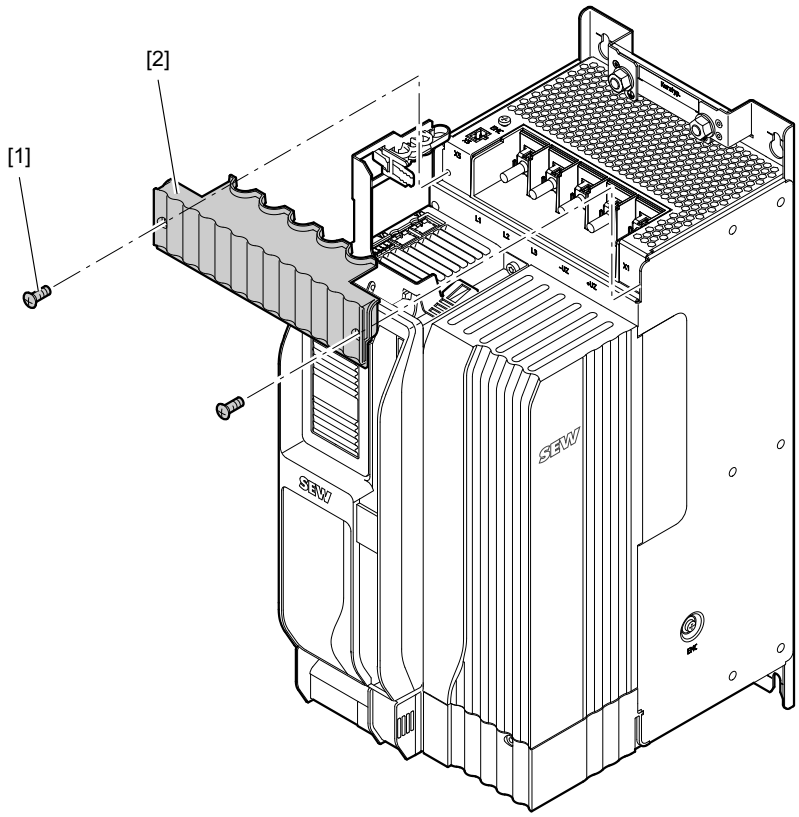
4.4.2 Touch guards

With the following devices, the touch guards must be removed for the line connection and the connection of the motor and the braking resistor:

- MDX9_A-0460 – 1490-5_3-..
- MDX9_A-0420 – 1080-2_3-..

Line connection



21425921035

1. Remove the 2 screws [1] on the upper touch guard [2].
2. Remove the touch guard [2].

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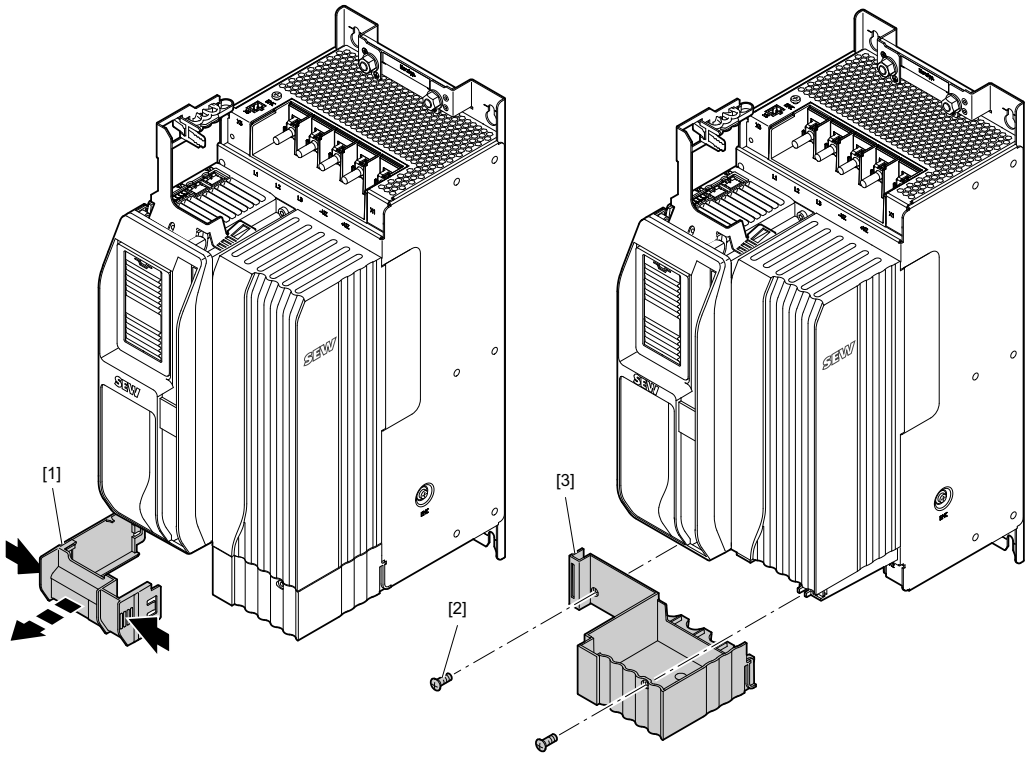
Connection motor/ braking resistor



21425950603

3. Push the plastic clips of the touch guard [1] to the inside and remove the touch guard [1] by moving it to the front.
4. Remove the 2 screws [2] and remove the touch guard [3] by moving it to the front.

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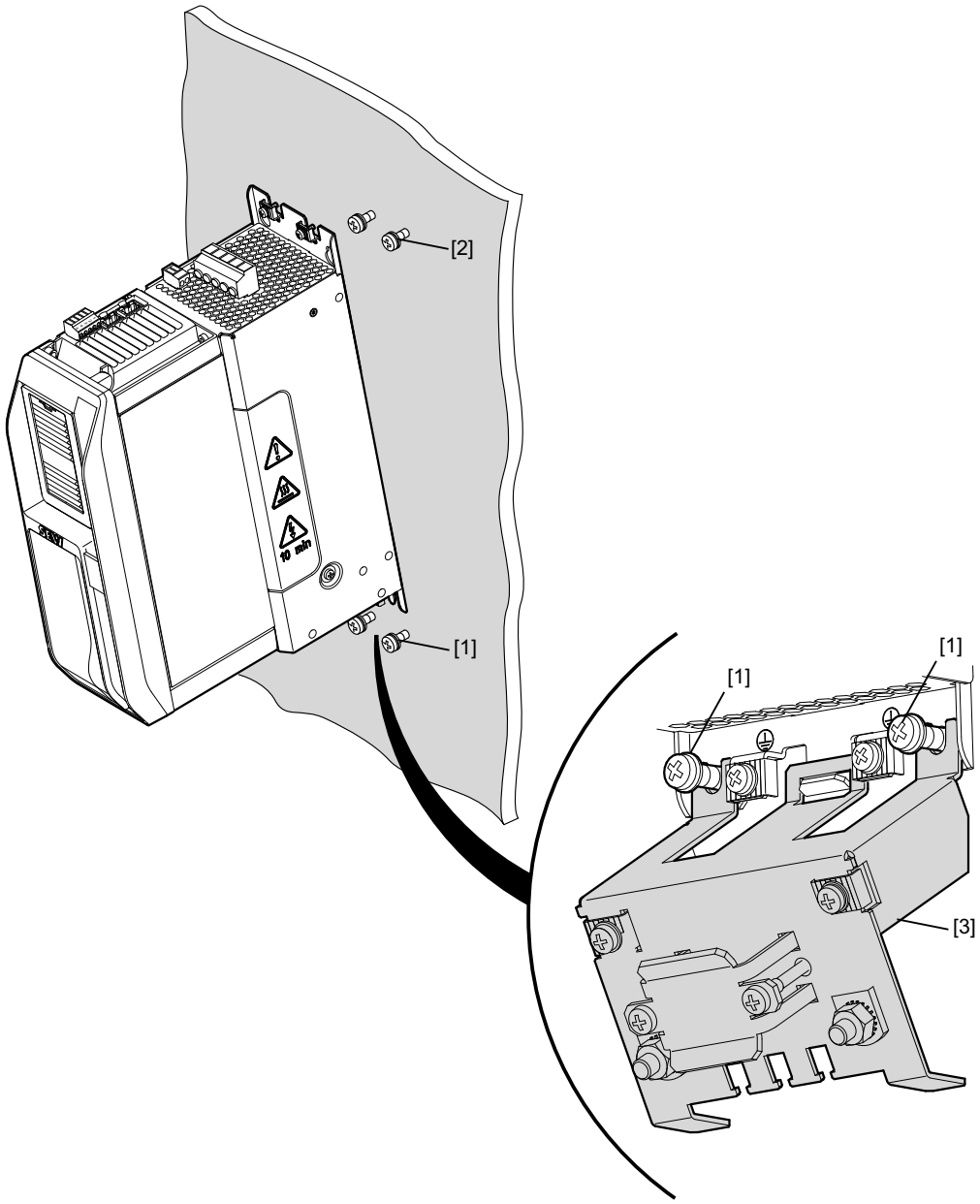
4.5 Control cabinet installation

4.5.1 Inverter and bottom shield plate

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

1. Place the application inverter with the slotted holes in the device base plate onto the retaining screws [1] from the top.



15026233355

2. Push the application inverter backwards to insert the retaining screws [2] into the upper holes in the device base plate.
3. Lower the application inverter.
4. Install the shield plate [3] as shown above. This work step applies to the inverters MDX9_A-0020 – 0320-5_3-.. and MDX9_A-0070 – 0290-2_3-..
5. Tighten the retaining screws [1] and [2].

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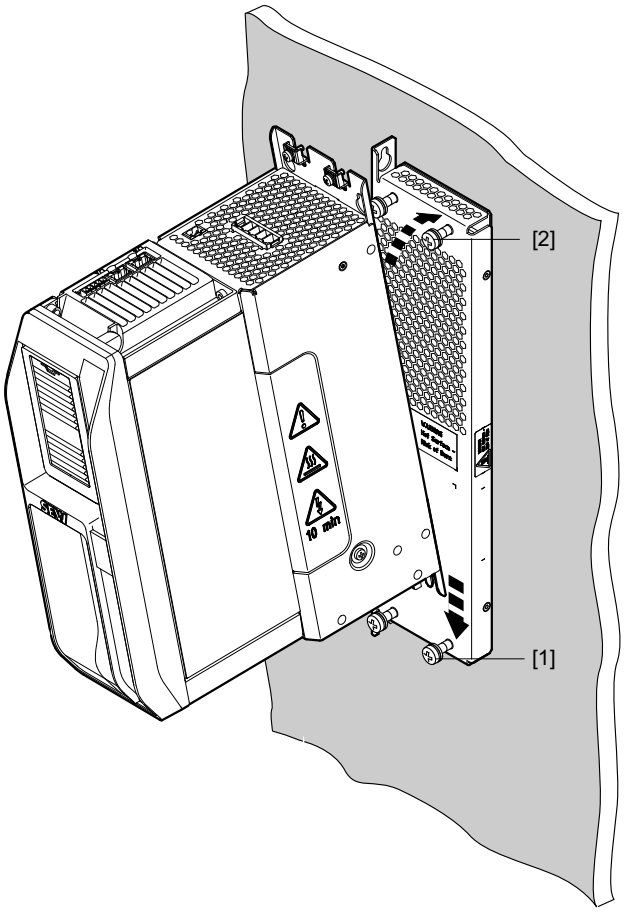
4.5.2 Installation with submounting resistor BR120-001

The MDX90A-0020 – 0040-.. inverters can be installed in the control cabinet together with a braking resistor. The braking resistor is located at the back wall of the inverter and therefore it has the same mounting hole pattern as the inverter.

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

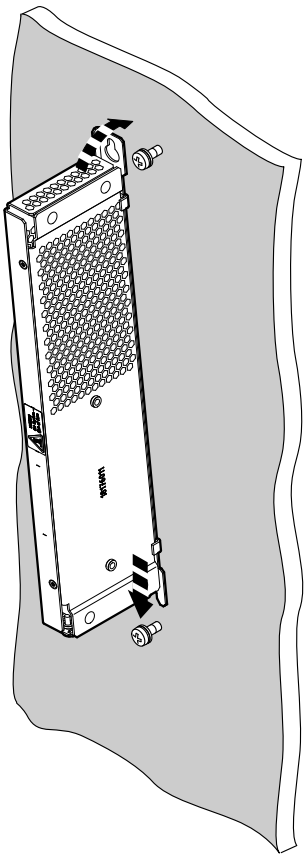


20363406219

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 application inverter with the slotted holes in the device base plate onto the retaining screws [1] from the top.
3. Push the application inverter backwards to insert the retaining screws [2] into the upper holes in the device base plate.
4. Lower the application inverter.
5. Install the shield plate; see the chapter "Control cabinet installation" (→ 🗎 42). This work step applies to the inverters MDX9_A-0020 – 0320-5_3-.. and MDX9_A-0070 – 0290-2_3-..
6. Tighten the retaining screws [1] and [2].

The submounting resistor can be installed next to an application inverter; see the following figure.

The hole distance of the submounting braking resistor must be larger than the hole distance of the application inverter.



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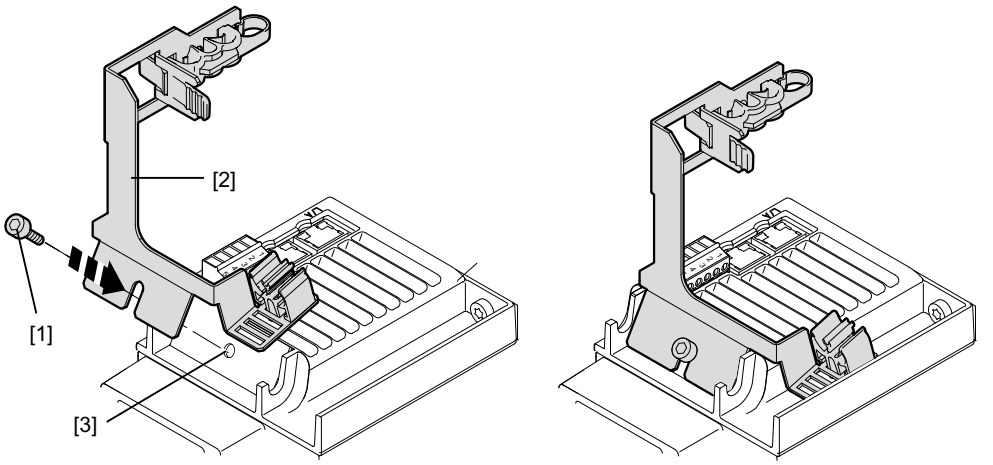
4.5.3 Top shield plate

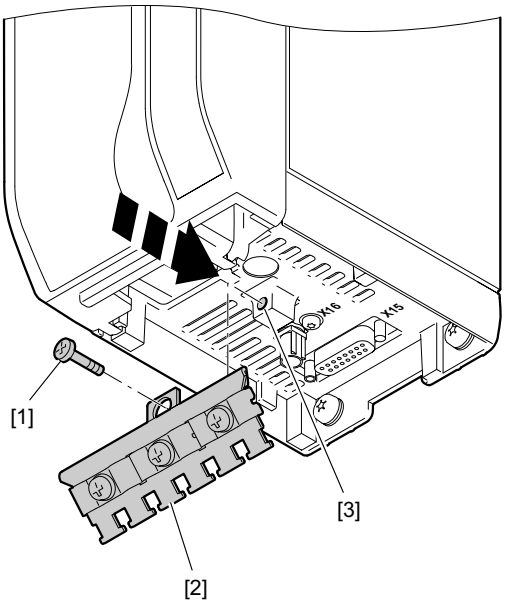
1. Insert the shield plate [2] so that you can fasten it to the device housing [3] with the screw [1].



27521510667

4.5.4 Shield plate at bottom of control unit

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 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.

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4.6.1 General information

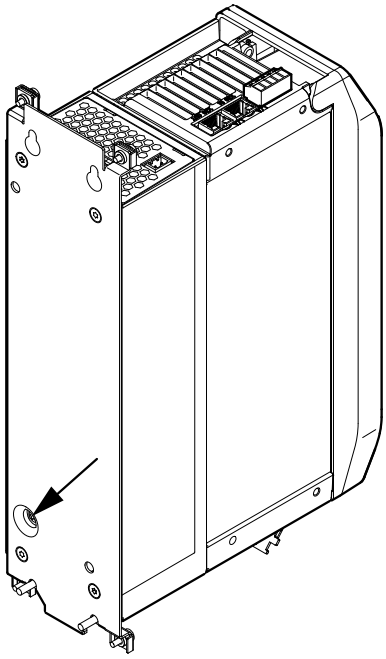
- Take suitable measures to prevent the motor starting up inadvertently, for example by removing the electronics terminal block X20. Take additional safety measures depending on the application to prevent possible injuries to people and damage to machinery.
- Only use closed cable lugs for connection to the screws in order to prevent litz strands from escaping.

4.6.2 Permitted voltage systems

Information on the 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 the chapter "Use in IT systems" (→ 🗎 47).
Voltage systems with grounded outer conductor.	Use only for line voltages up to max. 240 V.

4.6.3 Use in IT systems

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

Application inverter	Position of the terminal screw
MDX9_A-0020 – 0095-5_3-.. MDX9_A-0070 – 0093-2_3-..	On the back of the application inverter.  15144351755

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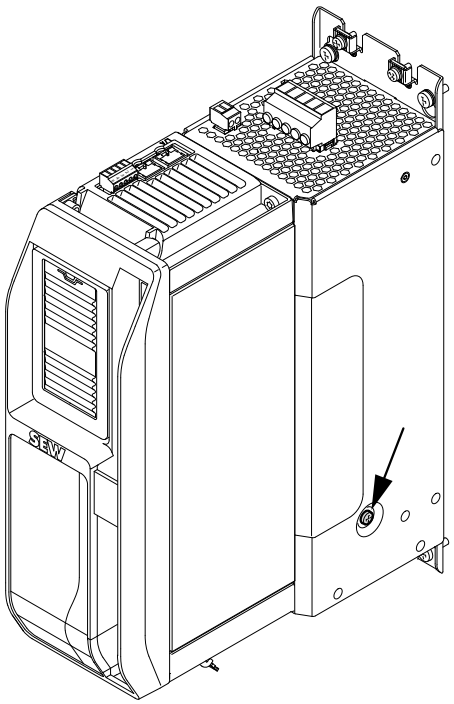
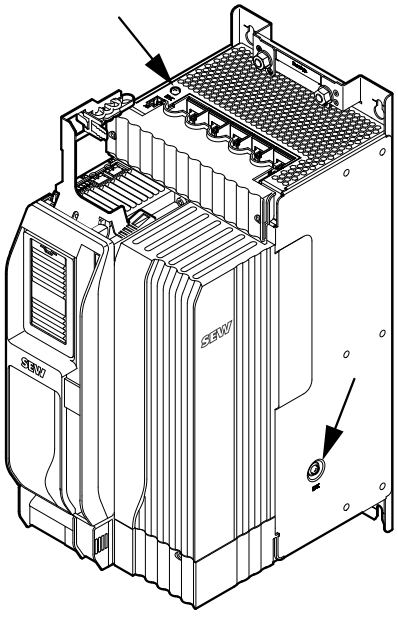
Application inverter	Position of the terminal screw
MDX9_A-0125 – 0320-5_3-.. MDX9_A-0140 – 0290-2_3-.. MDX91A-0910 – 1490-5_3-.. MDX91A-0840 – 1080-2_3-..	On the right side of the application inverter.  *9007214280971403*
MDX9_A-0460 – 0750-5_3-.. MDX9_A-0420 – 0570-2_3-..	One screw on the top, another screw on the right side of the application inverter.  *21425923467*

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INFORMATION

EMC limit values

No EMC limits are specified for interference emission in voltage supply systems without a grounded star point (IT systems). The effectiveness of line filters is severely limited.

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4.6.4 Line fuses, fuse types

Type class	Prerequisite
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 application inverter

4.6.5 Line connection

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

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

NOTICE

Non-compliance with the minimum switch-on/switch-off times

Damage to the application inverter

The specified times and intervals must be observed.

- Observe the minimum switch-off time of 10 s before switching the power back on.
- Do not turn the power of the supply system on or off more than once per minute.

- 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 application 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.

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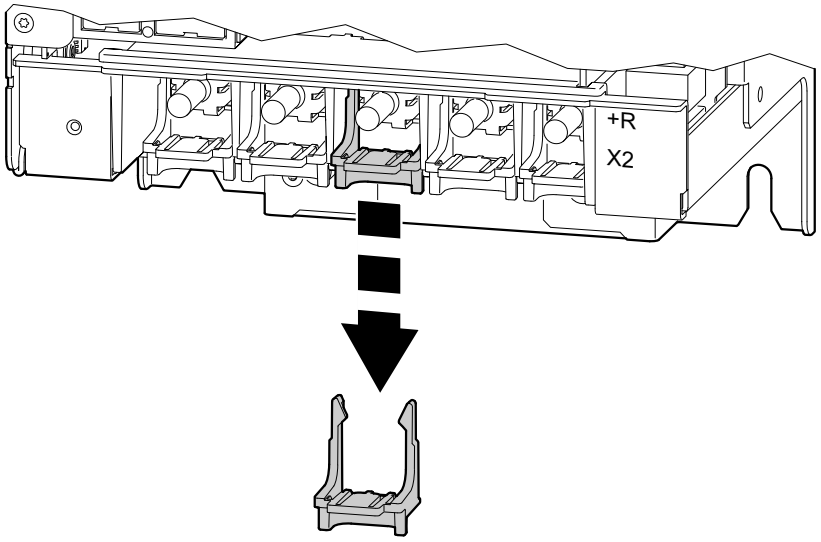
Special aspects for the line connection

Note that the IP20 degree of protection is achieved with the following devices only if the terminal studs are protected with special plastic covers against contact.

- MDX9_A-0460 – 1490-5_3-..
- MDX9_A-0420 – 1080-2_3-..

These covers must be ordered separately; see the chapter "Installation accessories" (→ 🗎 178).

1. Remove any plastic covers that are inserted in the connection block.



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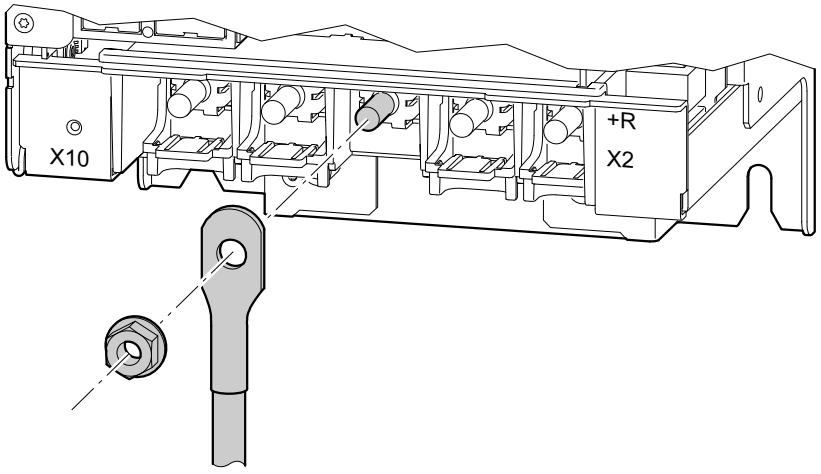
2. Connect the cables.



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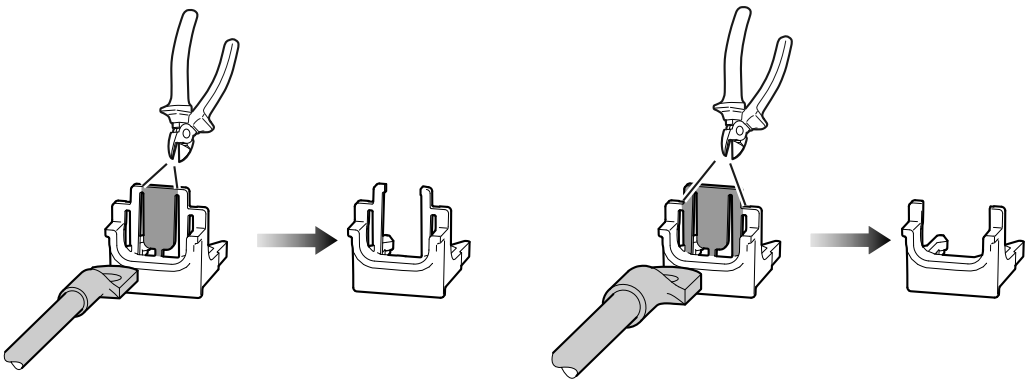
3. The plastic covers must be removed in different ways depending on the used cross section.



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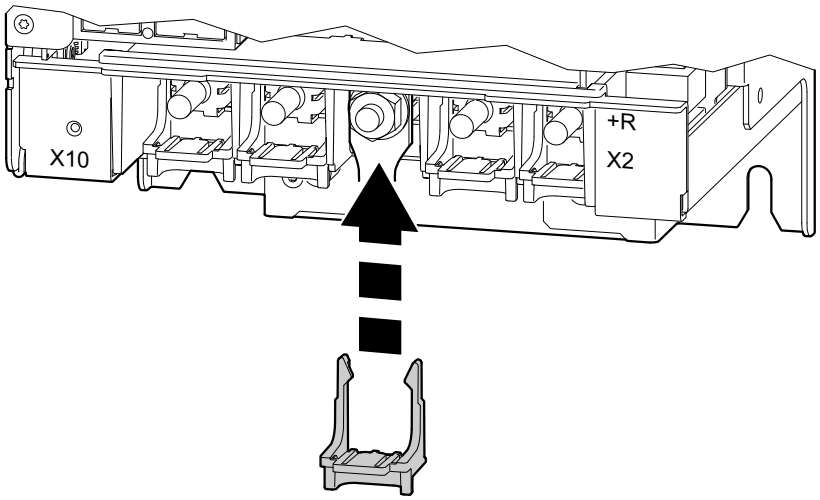
4. Attach the plastic covers at the individual connections.



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4.6.6 Motor connection

For the terminal assignment for motor connection of the various size, refer to the chapter "Terminal assignment" (→ 🗎 89).

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4.6.7 Line contactor

The following table provides an overview of when a line contactor is required and what kind of preventive measures must be taken for the used braking resistor, see also the chapter "Protection against thermal overload of the braking resistor" (→ 🗎 73).

Inverter type	Braking resistor type	Protective element/preventive measure	Line contactor required?
MDX9_A-0020 – 0160-5_3-..	No BR	–	No
	BR... flat design	–	No
	BR... as PTC	–	No
MDX9_A-0070 – 0140-2_3-..	BR...	External bimetallic relay	Yes
		TCB circuit breaker	No
	BR...-T	External bimetallic relay	Yes
		TCB circuit breaker	No
As of MDX9_A-0240-5_3-.. As of MDX9_A-0213-2_3-..	No BR	–	No
	BR... flat design	–	No
	BR... as PTC	–	No
	BR...	External bimetallic relay	No
		TCB circuit breaker	No
	BR...-T	Temperature contact evaluation	No
		External bimetallic relay	No
		TCB circuit breaker	No

When connecting a braking resistor, an external DC 24 V voltage supply must be provided for the application inverter with the following inverter types without line contactor:

- As of MDX9_A-0240-5_3-..
- As of MDX9_A-0213-2_3-..

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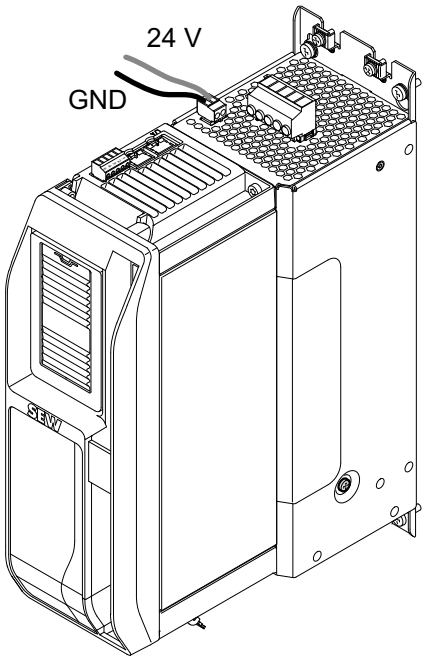
4.6.8 24 V supply voltage

MOVIDRIVE® **MDX90A**... must be connected to an external 24 V supply voltage.

MOVIDRIVE® **MDX91A** has an integrated 24 V power supply unit with a power rating of 80 W. An external power supply unit can be connected as well.

The maximum cable cross section is 2.5 mm^2.

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.

The maximally permitted length of the 24 V supply cable is 30 m.

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4.6.9 Motor output

NOTICE

Connecting capacitive loads to the application inverter.

Destruction of the application inverter.

- Only connect ohmic/inductive loads (motors).
- Never connect capacitive loads.

Special aspects for the motor connection

Note that the IP20 degree of protection is achieved with the following devices only if the terminal studs are protected with special plastic covers against contact.

- MDX9_A-0460 – 1490-5_3-..
- MDX9_A-0420 – 1080-2_3-..

For information on how to establish the connection and how to install the plastic covers, refer to the chapter "Special aspects for the line connection" (→ 🗎 51).

4.6.10 Output brake chopper

NOTICE

Connecting capacitive loads to the output of the brake chopper.

Connecting inductive loads to the output of the brake chopper.

Destruction of the application inverter.

- Only connect ohmic loads (braking resistors) to the output of the brake chopper.
- Never connect capacitive or inductive loads to the output of the brake chopper.

4.6.11 Temperature evaluation of the motor

The temperature evaluation can be connected in 2 ways:

- The encoder cable includes the cables of the temperature evaluation.
- The temperature evaluation is connected at terminal X10.

⚠ WARNING

Dangerous contact voltages at the terminals of the application inverter when connecting the wrong temperature sensors.

Severe or fatal injuries from electric shock.

- Connect only temperature sensors with protective separation from the motor winding to the temperature evaluation. Otherwise, the requirements for protective separation are not met. Dangerous contact voltages may occur at the terminals of the application inverter via the signal electronics in the event of a fault.

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4.6.12 Brake output

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 application inverter over a large area.
- SEW-EURODRIVE recommends to also use 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.

4.6.13 Inputs and outputs

NOTICE

Damage to the digital inputs and digital outputs.

The digital inputs and digital outputs are not electrically isolated. Incorrectly applied voltages can damage the digital inputs and digital outputs.

- Do not apply external voltages to the digital inputs and digital outputs.
- The digital inputs and outputs are dimensioned according to IEC 61131-2.

If you route the cables outside the control cabinet, you have to shield them irrespective of the length.

When connecting the shielding, ensure equipotential bonding.

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4.6.14 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

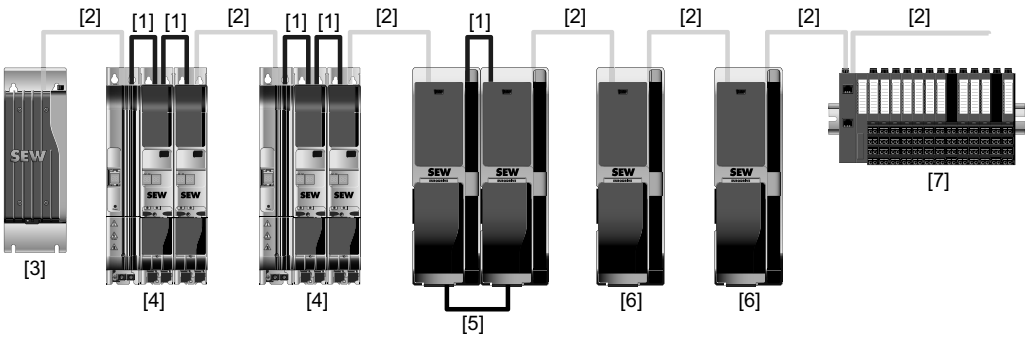
Only 4-pole cables are permitted to be used as system bus cables [2]. If an 8-pole cable is used, malfunctions or failures may occur at the connected devices.

INFORMATION

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

System bus and module bus cabling

Example of a system bus and module bus cabling



9007217271733643

[1] Module bus cable: EtherCAT®/SBus^{PLUS} and internal signals, 8-pole, color: anthracite

[2] System bus cable: EtherCAT®/SBus^{PLUS}, 4-pole, color: light gray

[3] MOVI-C® CONTROLLER power UHX8x

[4] MOVIDRIVE® modular

[5] MOVIDRIVE® system/technology with DC link connection

[6] MOVIDRIVE® system/technology

[7] Other EtherCAT® stations at the EtherCAT®/SBus^{PLUS}

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Correct cabling

Module bus cable

In the case of MOVIDRIVE® modular, the 8-core module bus cable connects the power supply module to the first axis module and the axis modules to one another; see figure (→ 🗎 57).

In the case of MOVIDRIVE® modular, in addition to the system bus communication, the module bus is routed in the cable for information inside the device. The module bus cable is delivered in the length required as part of the accessories for the axis modules.

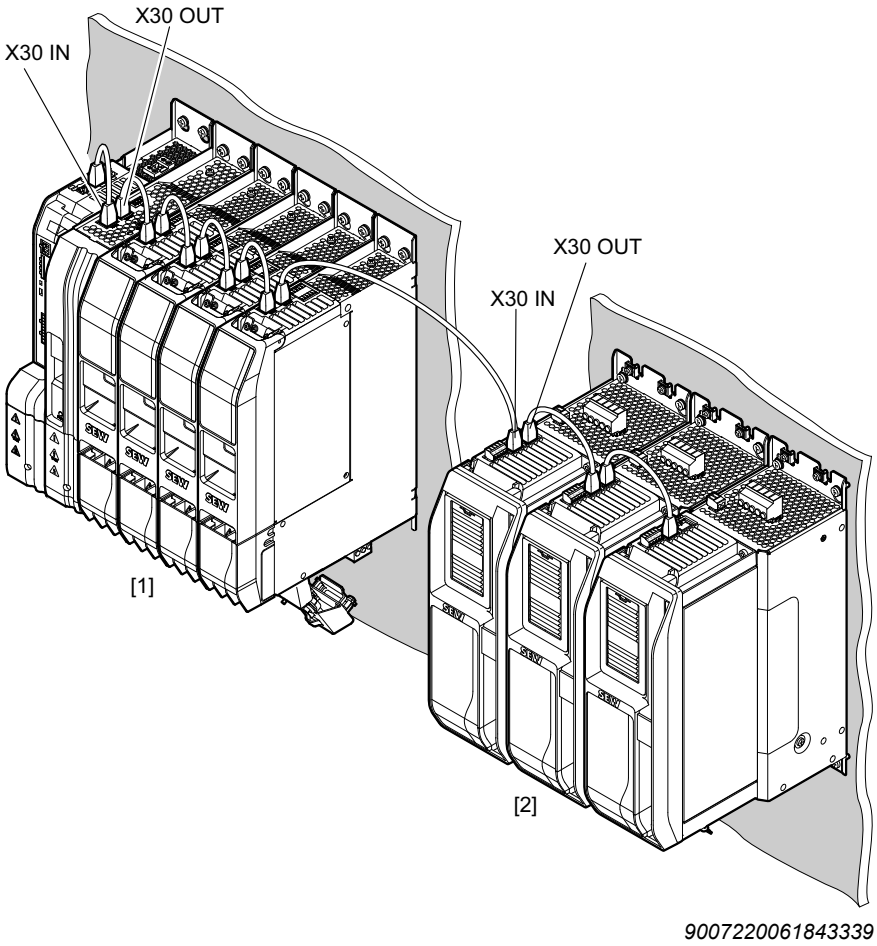
The connectors of the module bus cables are red and black to simplify correct attachment of the cables; see the following figure.

- The black connectors must be plugged into the bus input X30 IN.
- The red connectors must be plugged into the bus output X30 OUT.

System bus cable

The 4-pole system bus cable is used between automation components; see figure (→ 🗎 57). Some of these components are listed here as examples:

- MOVI-C® CONTROLLER
- MOVIDRIVE® modular/system application inverter
- PC with MOVISUITE® engineering software
- MOVI-PLC® I/O system
- Other EtherCAT® stations at the EtherCAT®/SBus^{PLUS}



[1] MOVIDRIVE® modular

[2] MOVIDRIVE® system

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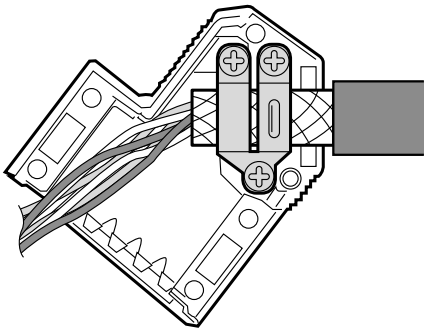
4.6.15 Encoders

Installation notes for encoder connection

Encoder cables

- 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,
  - To the application inverter in the housing of the D-sub connector.



13887834891

- Route the encoder cable separately from the power cables.
- Connect the shield on the inverter end in the housing of the D-sub connector over a large area.

On the encoder/resolver

- To ensure a flawless shield connection, an EMC screw fitting must be used for the cable entry of the signal line.
- For drives with a plug connector, connect the shield on the encoder plug.

Prefabricated cables

SEW-EURODRIVE offers pre-fabricated cables for connecting encoders. SEW-EURODRIVE recommends to use these prefabricated cables.

Encoder connection/cable lengths

Connection/encoder	Cable length
HTL encoder ES7C and EG7C	300 m
Standard HTL encoder	200 m
Other encoders	100 m

INFORMATION

The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer specifications.

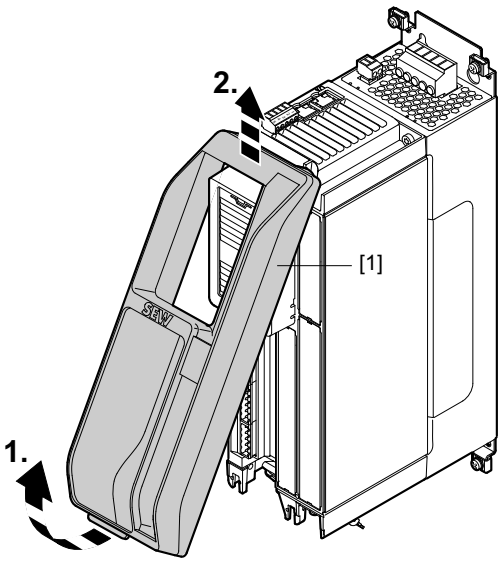
4.7 Installing options and accessories

4.7.1 Installing a card

Observe the safety notes in the chapter "Electrical installation" (→ 🗎 46).

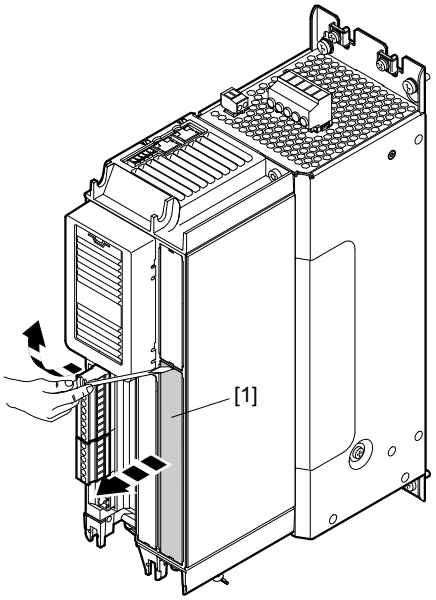
For information on which option card can be installed in which slot, refer to the chapter "Card slots".

1. Disconnect the application inverter from the power supply. Disconnect the DC 24 V supply and the line voltage.
2. Ensure electrostatic discharge with suitable measures before starting work. Suitable measures for equipotential bonding include, for example, the use of a discharge strap or wearing conductive shoes.
3. Remove the safety cover [1] from the front of the application inverter.



14299394571

4. Remove the plastic cover [1] of the card slot using a screwdriver.



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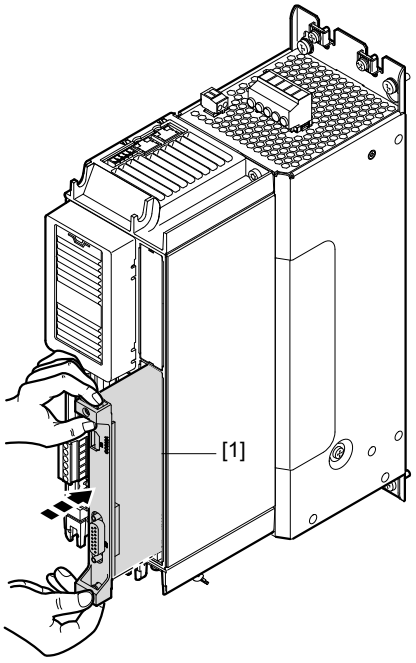
INFORMATION

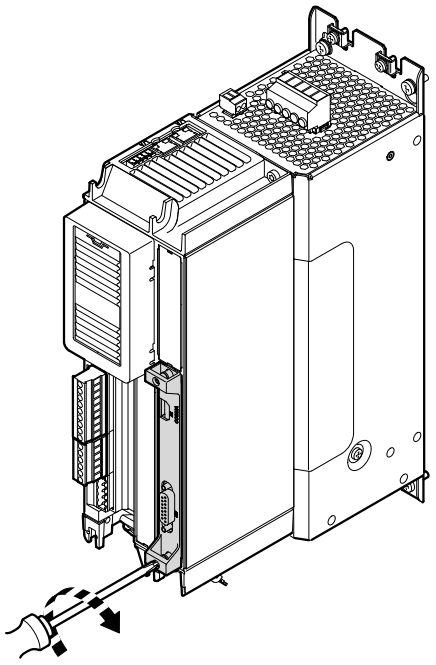
Hold the card by its edges only.

5. Take the card [1] and insert it in the slot with slight pressure.



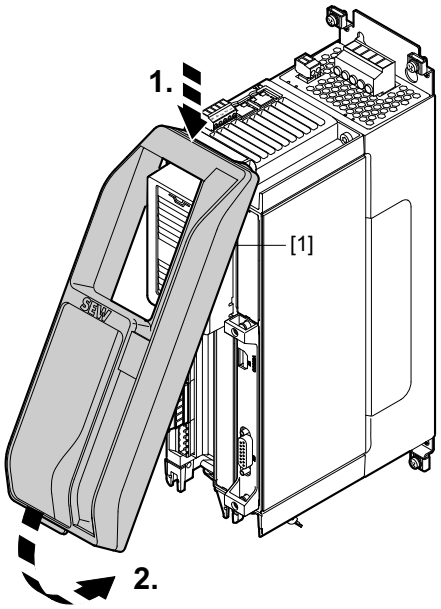
15160623243

6. Screw in the card with the specified tightening torque (→ 🗎 34).



15160625675

7. Install the safety cover [1] at the front of the application inverter.



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4.7.2 CIO21A and CID21A input/output card

INFORMATION

Technical data of the cards

For technical data and a detailed description of the encoder interface, refer to the chapter "Technical data of the cards".

Voltage supply

The I/O cards are supplied by the basic unit via the 24 V voltage supply.

Short-circuit behavior of digital outputs

The digital outputs are short-circuit-proof.

As soon as the short circuit is remedied, the target output voltage is output, meaning the output does not switch off.

Short circuit behavior of analog outputs

The analog outputs are short-circuit-proof.

In the event of a short circuit, the output current is limited to a maximum value of 30 mA. The short circuit current is not pulsating.

As soon as the short circuit is remedied, the target output voltage is output, meaning the output does not switch off.

Connecting inductive loads at digital outputs

For inductive loads an external protective element (e.g. freewheeling diode) is required.

Connecting 2 digital outputs in parallel

Connecting digital outputs in parallel is possible. The possible output current is doubled. Ensure identical parameterization of the digital outputs.

Cable lengths and shielding

The maximum cable length of connections on the inputs and outputs is 30 m.

Cables outside the control cabinet must be shielded.

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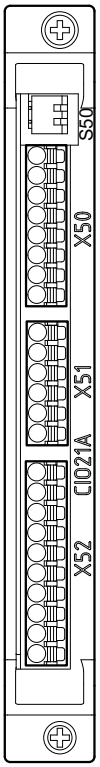
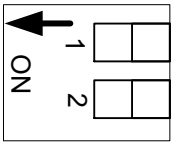
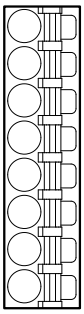
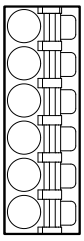
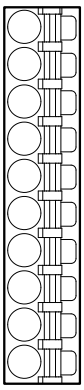
CIO21A terminal assignment

	Terminal		Connection	Short description
				S50/1 on: Current input active for AI2x S50/2 on: Current input active for AI3x S50/1 off[1]: Voltage input active for AI2x S50/2 off[1]: Voltage input active for AI3x
		X50:1	REF1	+10 V reference voltage output
		X50:2	AI21	Analog current and voltage input
		X50:3	AI22	Analog current and voltage input, reference for AI21
		X50:4	GND	Reference potential
		X50:5	AI31	Analog current and voltage input
		X50:6	AI32	Analog current and voltage input, reference for AI31
		X50:7	GND	Reference potential
		X50:8	REF2	-10 V reference voltage output
		X51:1	AOV2	Analog voltage output 1, freely programmable
		X51:2	AOC2	Analog current output 1, freely programmable
		X51:3	GND	Reference potential for the outputs AOV2 and AOC2
		X51:4	AOV3	Analog voltage output 2, freely programmable
		X51:5	AOC3	Analog current output 2, freely programmable
		X51:6	GND	Reference potential for the outputs AOV3 and AOC3
		X52:1	DI10	Digital input 1, freely programmable
		X52:2	DI11	Digital input 2, freely programmable
		X52:3	DI12	Digital input 3, freely programmable
		X52:4	DI13	Digital input 4, freely programmable
		X52:5	GND	Reference potential for the digital inputs DI10 – DI13
		X52:6	DO10	Digital output 1, freely programmable
		X52:7	DO11	Digital output 2, freely programmable
		X52:8	DO12	Digital output 3, freely programmable
		X52:9	DO13	Digital output 4, freely programmable
		X52:10	GND	Reference potential for the digital outputs DO10 – DO13

1) Delivery state

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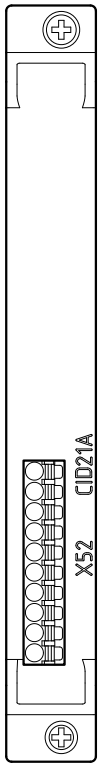
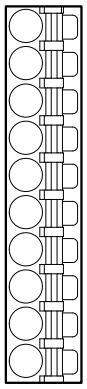
CID21A terminal assignment

	Terminal		Connec-tion	Short description
		X52:1	DI10	Digital input 1, freely programmable
		X52:2	DI11	Digital input 2, freely programmable
		X52:3	DI12	Digital input 3, freely programmable
		X52:4	DI13	Digital input 4, freely programmable
		X52:5	GND	Reference potential for the digital inputs DI10 – DI13
		X52:6	DO10	Digital output 1, freely programmable
		X52:7	DO11	Digital output 2, freely programmable
		X52:8	DO12	Digital output 3, freely programmable
		X52:9	DO13	Digital output 4, freely programmable
		X52:10	GND	Reference potential for the digital outputs DO10 – DO13

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4.7.3 CES11A multi-encoder card

INFORMATION

Technical data of the cards

For technical data and a detailed description of the encoder interface, refer to the chapter "Technical data of the cards".

Overview of functions

The CES11A multi-encoder card expands the functionality of the application inverter in a way that an additional encoder can be evaluated. The encoder connected to the CES11A multi-encoder card can be used as motor encoder or external encoder.

Supported encoder types

The following encoder types can be evaluated by the CES11A multi-encoder card:

HTL 12/24 V (differential)
TTL (differential)
RS422
sin/cos 1 V_{SS} (differential)
HIPERFACE® with sin/cos signals 1 V_{SS}
SEW encoder (RS485) with sin/cos signals 1 V_{SS}, e.g. AS7W, AG7W
EnDat 2.1 with sin/cos signals 1 V_{SS}
SSI encoder with/without sin/cos signals 1 V_{SS}
CANopen encoder

Encoder connection/cable lengths

Connection/encoder	Cable length
HTL encoder ES7C and EG7C	300 m
Standard HTL encoder	200 m
Other encoders	100 m

INFORMATION

The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer specifications.

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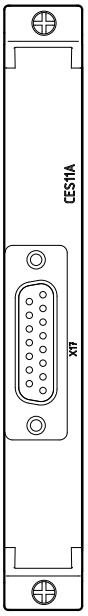
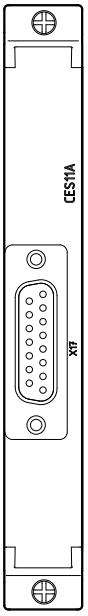
Terminal assignment of TTL, HTL, sin/cos encoder

Card	Terminal	Connection	Brief description
	X17:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X17:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X17:3	C	Signal track C (K0)
	X17:4	DATA+[1)]	Data cable for electronic nameplate
	X17:5	Reserved	–
	X17:6	-TEMP_M	Motor temperature evaluation
	X17:7	Reserved	–
	X17:8	GND	Reference potential
	X17:9	$\overline{A}$ (cos-) ($\overline{K1}$)	Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$)
	X17:10	$\overline{B}$ (sin-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$)
	X17:11	$\overline{C}$	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X17:12	DATA-[1)]	Data cable for electronic nameplate
	X17:13	U_{S24VG}	Encoder supply 24 V
	X17:14	+TEMP_M	Motor temperature evaluation
	X17:15	U_{S12VG}	Encoder supply 12 V

1) For encoders from SEW-EURODRIVE with electronic nameplate of type E.7S

Terminal assignment HIPERFACE® and SEW-EURODRIVE encoder (RS485)

Card	Terminal	Connection	Brief description
	X17:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X17:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X17:3	Reserved	–
	X17:4	DATA+	Data line
	X17:5	Reserved	–
	X17:6	-TEMP_M	Motor temperature evaluation
	X17:7	Reserved	–
	X17:8	GND	Reference potential
	X17:9	$\overline{A}$ (cos-) ($\overline{K1}$)	Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$)
	X17:10	$\overline{B}$ (sin-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$)
	X17:11	Reserved	–
	X17:12	DATA-	Data line
	X17:13	U_{S24VG}	Encoder supply 24 V
	X17:14	+TEMP_M	Motor temperature evaluation
	X17:15	U_{S12VG}	Encoder supply 12 V

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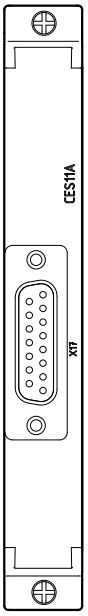
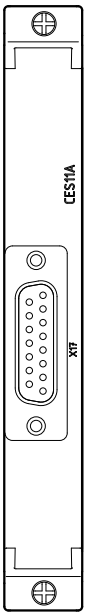
Terminal assignment EnDat encoder

Card	Terminal		Connection	Brief description
		X17:1	A (cos+)	Signal track A (cos+)
		X17:2	B (sin+)	Signal track B (sin+)
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (cos-)	Negated signal track $\overline{A}$ (cos-)
		X17:10	$\overline{B}$ (sin-)	Negated signal track $\overline{B}$ (sin-)
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	U_{S24VG}	Encoder supply 24 V
		X17:14	+TEMP_M	–
		X17:15	U_{S12VG}	Encoder supply 12 V

Terminal assignment SSI encoder

Card	Terminal		Connection	Brief description
		X17:1	Reserved	–
		X17:2	Reserved	–
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line RS485
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	Reserved	–
		X17:10	Reserved	–
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

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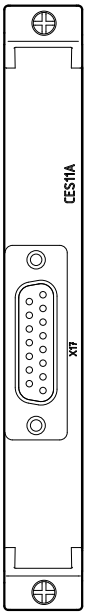
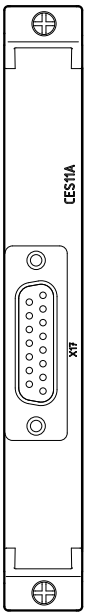
Terminal assignment SSI and sin/cos combination encoders

Card	Terminal		Connection	Brief description
		X17:1	A (cos+)	Signal track A (cos+)
		X17:2	B (sin+)	Signal track B (sin+)
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (cos-)	Negated signal track $\overline{A}$ (cos-)
		X17:10	$\overline{B}$ (sin-)	Negated signal track $\overline{B}$ (sin-)
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	U_{S24VG}	Encoder supply 24 V
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	U_{S12VG}	Encoder supply 12 V

Terminal assignment CANopen encoder

Card	Terminal		Connection	Brief description
		X17:1	Reserved	–
		X17:2	Reserved	–
		X17:3	Reserved	–
		X17:4	CAN_H	CAN high data cable
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	Reserved	–
		X17:10	Reserved	–
		X17:11	Reserved	–
		X17:12	CAN_L	CAN low data cable
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

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4.8 Braking resistors

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

⚠ DANGER

Dangerous pulsed DC voltage of up to 970 V.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

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

Braking resistors get very hot during operation.

⚠ 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.

To prevent burns:

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

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4.8.1 Permitted installation of braking resistors

The surfaces of the resistors become very hot if loaded with nominal power. Make sure that you select an installation site that will accommodate these high temperatures. For this reason, braking resistors are usually mounted on the control cabinet roof.

NOTICE

Braking resistors overheat

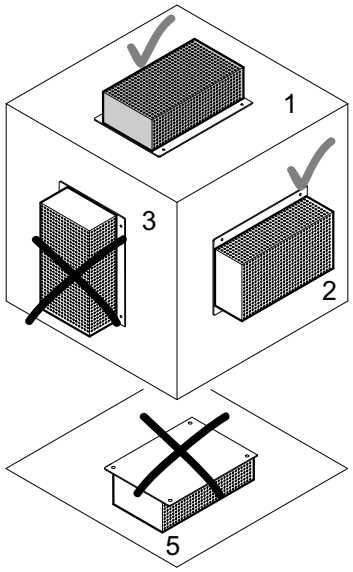
Non-permissible installation might lead to an accumulation of heat in the braking resistor due to reduced convection. A tripping temperature contact or an overheated braking resistor can lead to a system standstill.

Adhere to the following minimum clearances:

- 200 mm to adjacent components and walls
- 300 mm to above components/ceilings

Observe the following permitted mounting positions when installing the resistors:

- Grid resistor



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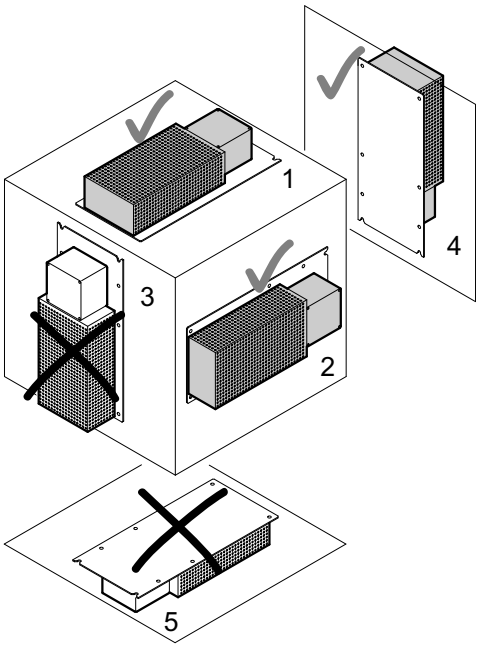
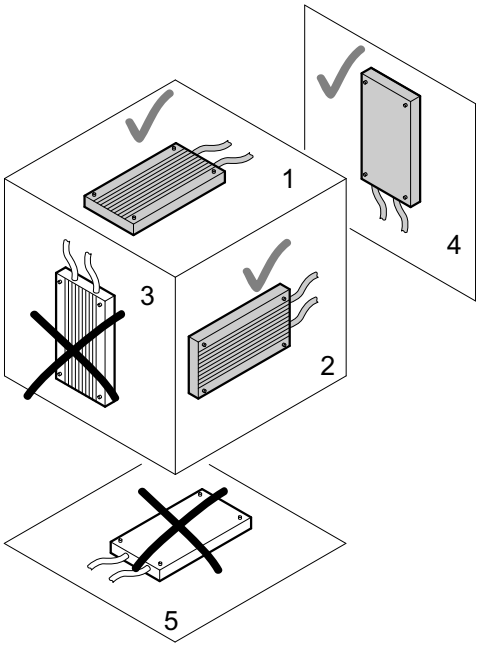
The brake resistors BR003-420-T and BR1.0-170 may be used only in position 1.

- Wire resistor



18512455307

- Flat type resistor



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4.8.2 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 project planning guidelines and the documented assignments of 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.

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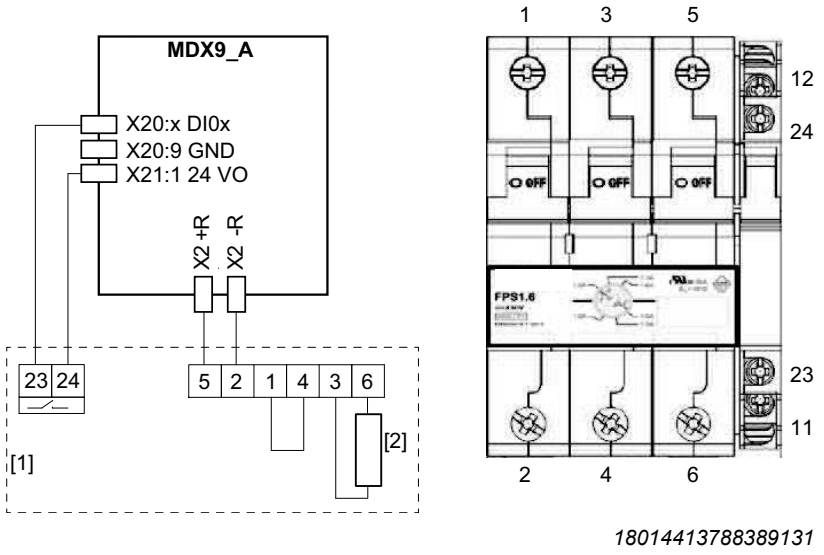
External thermal circuit breaker TCB

If an external TCB thermal circuit breaker is used for this application inverter, the following connection applies.

Connection



[1] TCB thermal circuit breaker

[2] Braking resistor

INFORMATION

The polarity of the connections 5 (+R) and 2 (-R) must be strictly adhered to during connection of the TCB circuit breaker to the inverter.

The digital input of the application inverter connected to the signal contact of the TCB thermal circuit breaker must be parameterized to the function "External braking resistor error".

- If the thermal circuit breaker trips, the signal contact is set (connection 23-24 is opened) and evaluated in the application inverter.
- The connection between application inverter and braking resistor is disconnected.
- This does not require a response by the PLC.
- It is not required to disconnect the supply system connection with an external switching device.
- The following applies to application inverters as of MDX9_A-**0240**-5_3 and MDX9_A-**0213**-2_3: 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 to "Output stage inhibit".
- Set the control knob of the thermal circuit breaker TCB to the tripping current I_F of the connected braking resistor. Use the scaling 40 °C.
- After all cables are connected, the 3 upper screw holes must be covered with 3 touch guard caps. The touch guard caps are included in the delivery.

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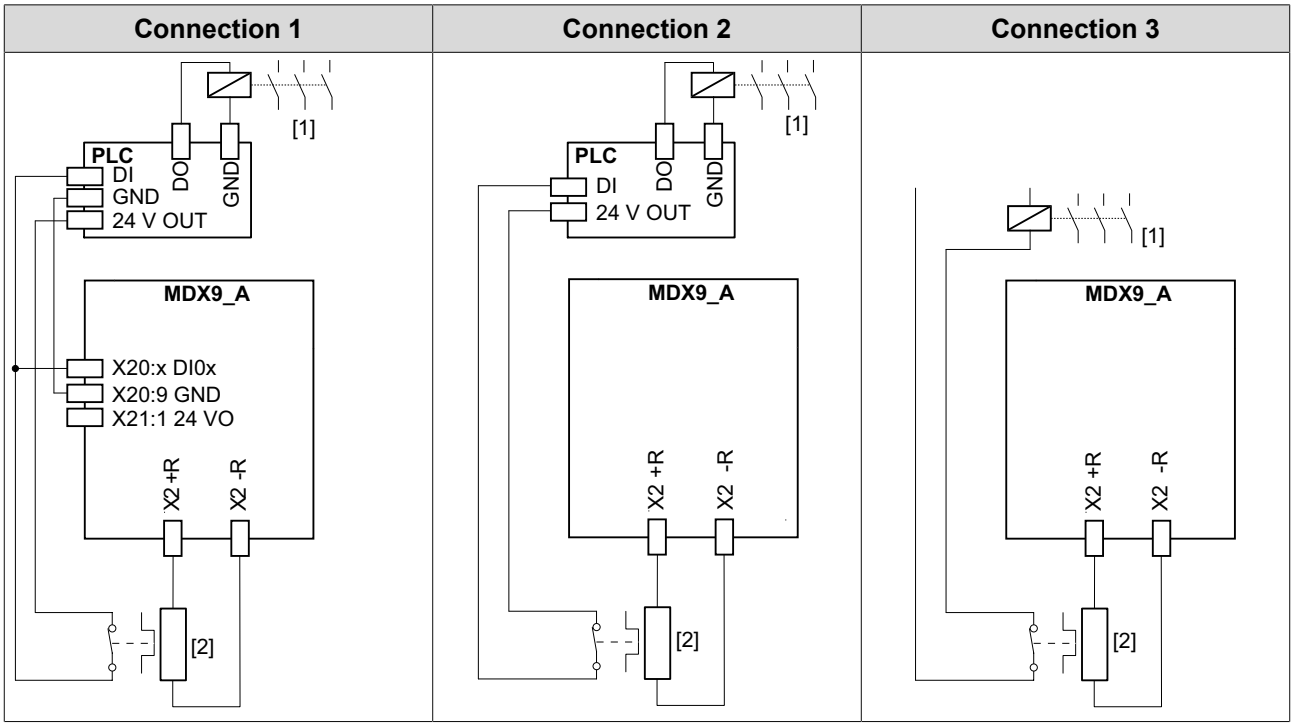
Internal temperature switch -T

Application inverter: MDX9_A-0020 – 0160-5_3-.., MDX9_A-0070 – 0140-2_3-..

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



[1] Line contactor

[2] Braking resistor

Note that the reference potential GND of the digital input control 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.

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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.

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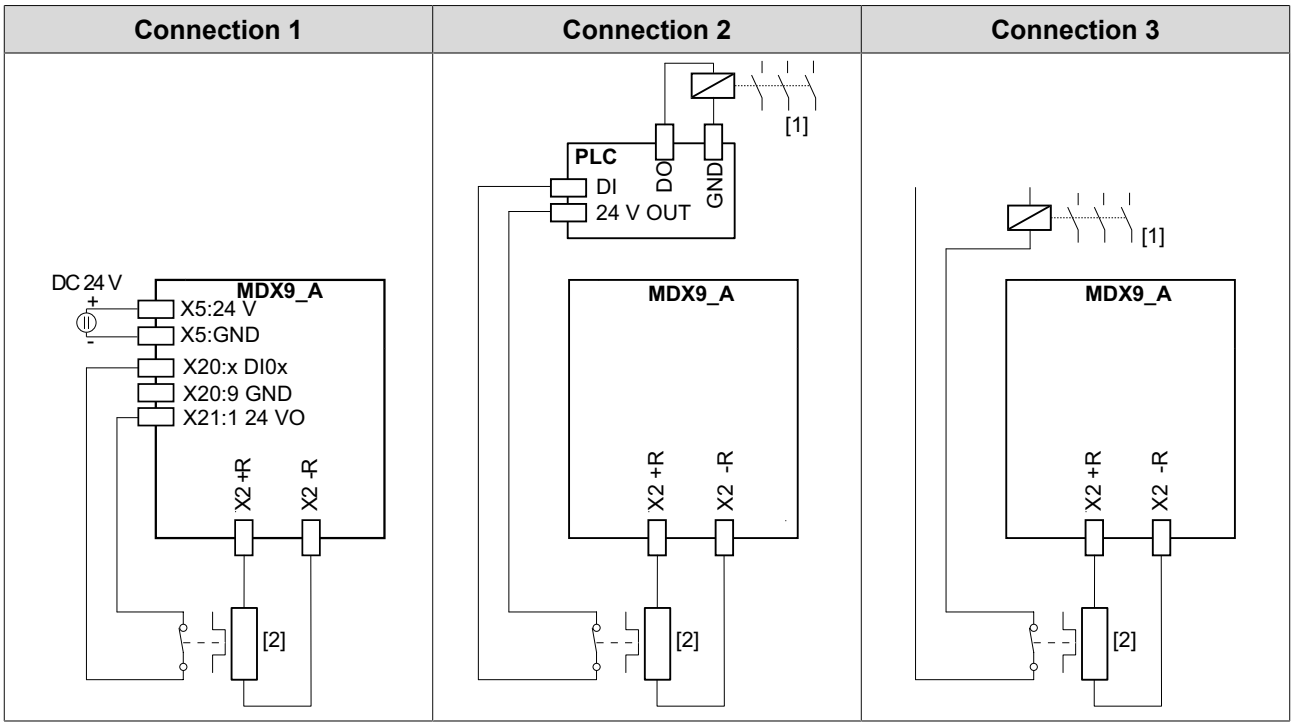
Application inverter: as of MDX9_A-0240-5_3-.., as of MDX9_A-0213-2_3-..

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



[1] Line contactor

[2] Braking resistor

- 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.

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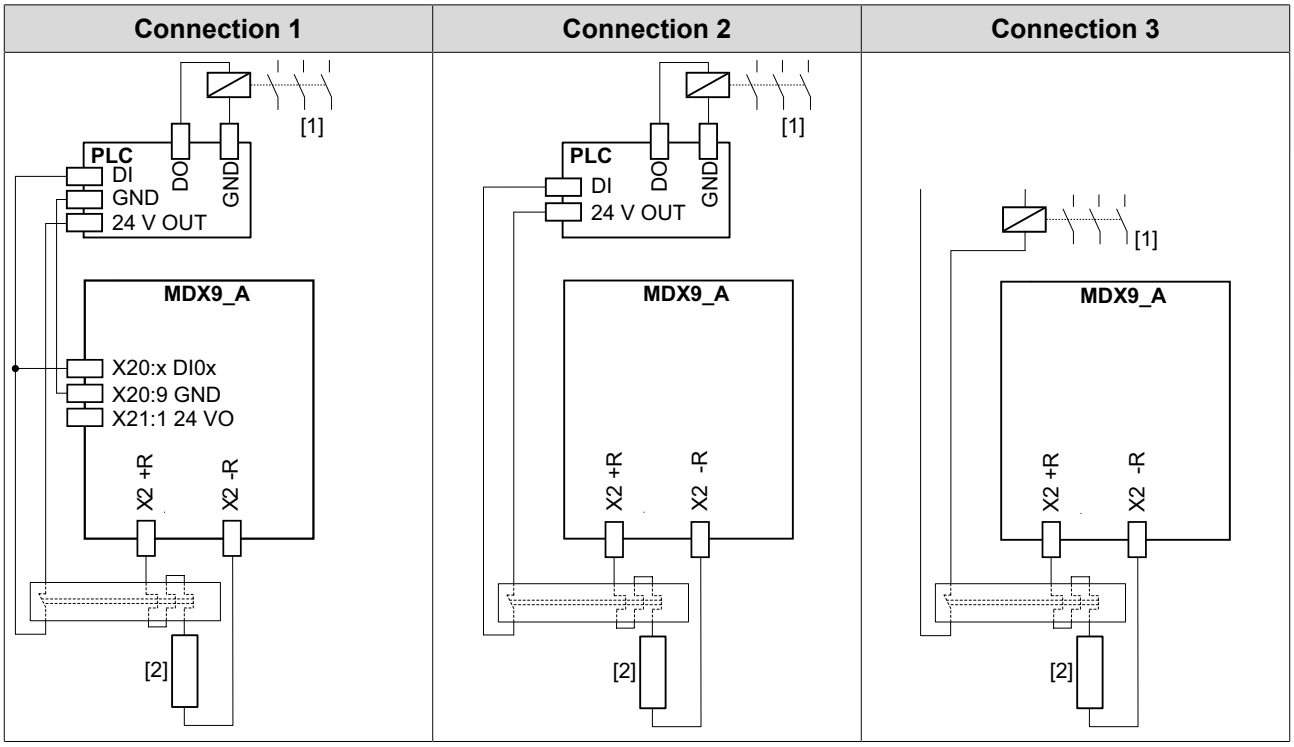
External bimetallic relay

Application inverter: MDX9_A-0020 – 0160-5_3-.., MDX9_A-0070 – 0140-2_3-..

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



[1] Line contactor

[2] Braking resistor

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.

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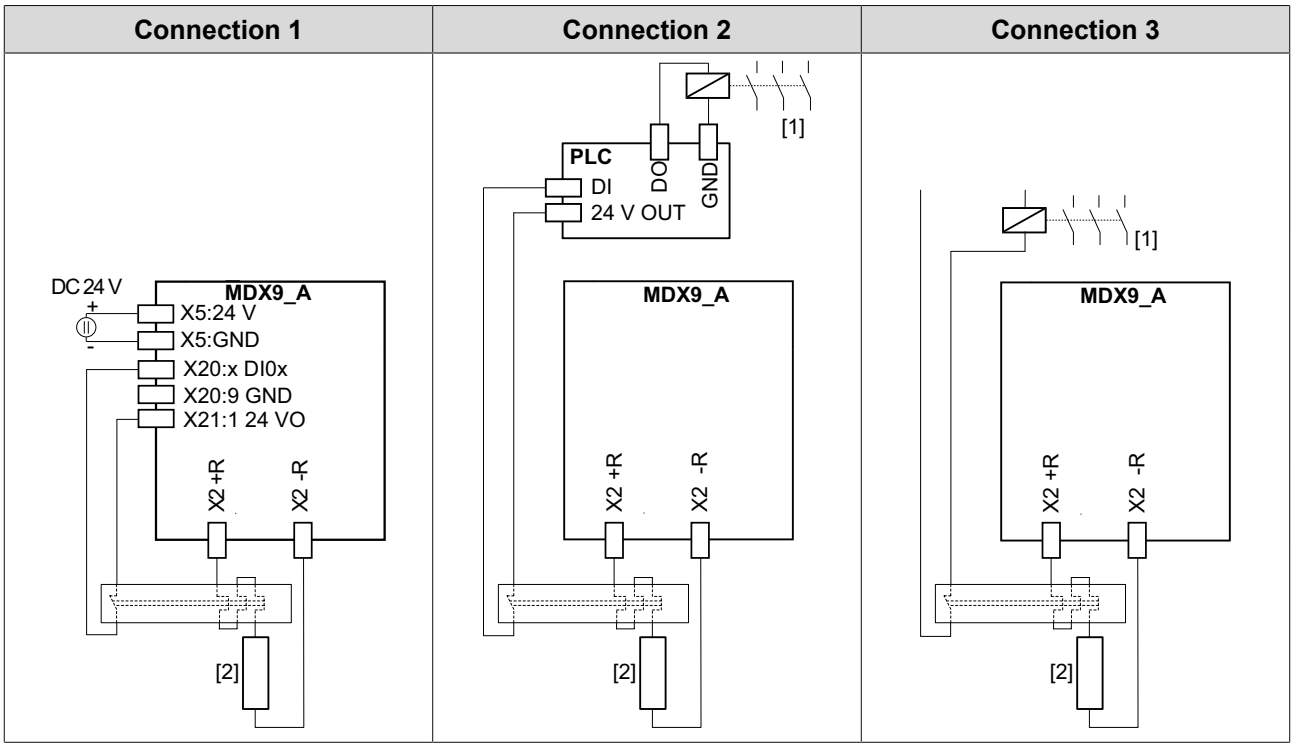
Application inverter: as of MDX9_A-0240-5_3-.., as of MDX9_A-0213-2_3-..

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



[1] Line contactor

[2] Braking resistor

- 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.

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4.9 Line filter

- Install the line filter close to the application inverter but outside the minimum clearance for cooling. The line filter must not be heated by the exhaust air of the application inverter.
- Do not wire any other consumers between the line filter and the application inverter.
- The connection cable between line filter and application inverter does not have to be shielded.
- Limit the length of the cable between the line filter and the application inverter to the absolute minimum needed.
- Do not switch between the line filter and application inverter.

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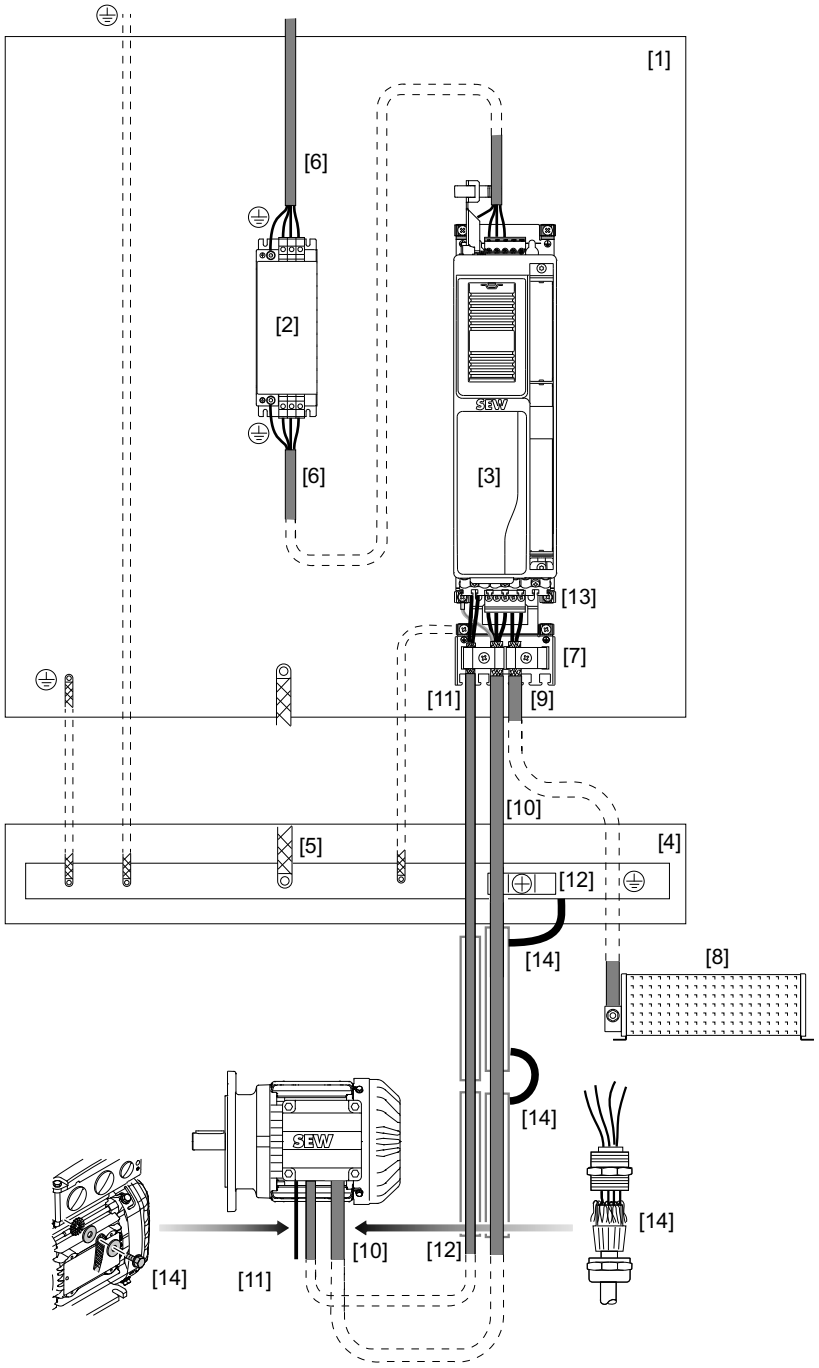
4.10 EMC-compliant installation



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[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
[8] Braking resistor
[9] Braking resistor cable
[10] Motor cable
[11] Brake cable
[12] Grounding clamp
[13] Electronics shield plate
[14] HF connection

The information in this chapter will help you to optimize the system with respect to electromagnetic compatibility, or to eliminate already existing EMC interferences.

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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 Technology – Practical Implementation, edition "EMC in Drive Technology – 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.

4.10.1 Control cabinet

Use control cabinets with electrically conductive (galvanized) mounting plates. If several mounting plates are used, connect the plates together conductively over a large area.

Mount the line filter and inverter on a shared mounting plate if possible. Make sure they are connected over a large area and with good conductivity.

4.10.2 HF equipotential bonding in the system

Make sure that there is a suitable equipotential bonding between the system, the control cabinet, the machine structure, the cable ducts, and the drives.

Connect the individual sections together in an HF-capable manner.

From an electrical safety perspective, the PE busbar is the star point. The PE connection does not replace either the HF grounding or the shielding.

In terms of EMC, it is advantageous if the mounting plate is used as a star point with respect to HF equipotential bonding.

Perform the following measures for a suitable 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 an HF braid.
- 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.

4.10.3 Cable installation

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.

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4.10.4 Supply system cable connection

The supply system cable can be connected to the line choke and/or line filter using twisted unshielded single conductors or using unshielded cables.

If necessary, shielded cables may improve EMC.

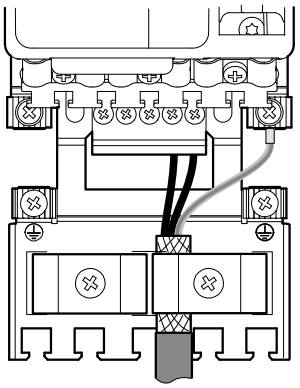
4.10.5 Line filter connection

Limit the length of the connection lead between the line filter and the inverter to the absolute minimum needed.

You must never route filtered and unfiltered cables together. For this reason, route incoming and outgoing line filter cables separately.

4.10.6 Braking resistor connection

For connecting braking resistors, use two closely twisted cores or a shielded power cable. In the case of shielded cables, connect the braided shields over the entire circumference. Use the designated shield plates at the basic device to connect the shield.



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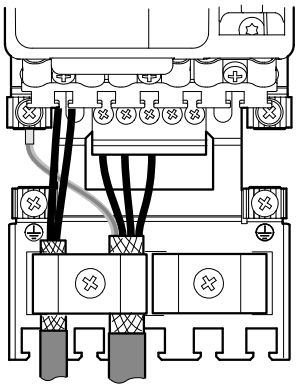
4.10.7 Motor and brake connection

Use shielded motor cables only. Connect the braided shield of the motor cable at both ends over its entire circumference to the power shield plate at the inverter.

Provide shielded cables for the brake supply. The shield of the brake cable can be connected to the power shield plate at 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.



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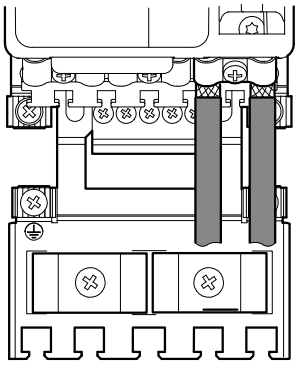
SEW-EURODRIVE recommends the use of prefabricated cables.

In the event of especially 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).

4.10.8 Control cable connection

Ensure that the digital inputs are connected with unshielded individual cores. 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.



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4.10.9 Encoder connection

SEW-EURODRIVE recommends the use of prefabricated encoder cables.

The shield of prefabricated cables from SEW-EURODRIVE is connected via the connector.

4.10.10 Shielding connection

Ensure that there is an HF-compatible shield connection, e.g. by using grounding clamps or EMC cable glands, so that the braided shield has a large connection surface.

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4.11 Terminal assignment

INFORMATION

Reference potentials inside the device:

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

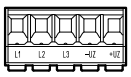
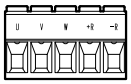
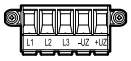
All reference potentials GND are internally connected to PE.

INFORMATION

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

INFORMATION

The technical data for the connection of power electronics and control electronics are listed in chapter "Technical data" (→ 🗎 169).

Representation	Terminal	Connection	Brief description
	X1:L1	L1	Line connection - MDX9_A-0020 – 0160-5_3-.. - MDX9_A-0070 – 0140-2_3-..
	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 - MDX9_A-0020 – 0160-5_3-.. - MDX9_A-0070 – 0140-2_3-..
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	PE connection
	X1:L1	L1	Line connection - MDX9_A-0240 – 0320-5_3-.. - MDX9_A-0213 – 0290-2_3-..
	X1:L2	L2	
	X1:L3	L3	
	X1:-U_Z	-U_Z	DC link connection
	X1:+U_Z	+U_Z	
	⏚	PE	PE connection

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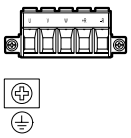
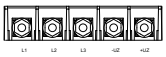
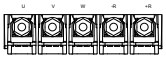
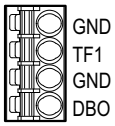
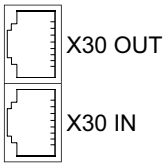
Representation	Terminal	Connection	Brief description
	X2:U	U	Motor connection - MDX9_A-0240 – 0320-5_3-.. - MDX9_A-0213 – 0290-2_3-..
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	PE connection
	X1:L1	L1	Line connection - MDX9_A-0460 – 1490-5_3-.. - MDX9_A-0420 – 1080-2_3-..
	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 - MDX9_A-0460 – 1490-5_3-.. - MDX9_A-0420 – 1080-2_3-..
	X2:V	V	
	X2:W	W	
	X2:+R	+R	Braking resistor connection
	X2:-R	-R	
	⏚	PE	PE connection
	X5:24 V	V_I24 V	DC 24 V supply voltage
	X5:GND	GND	Reference potential
	X10:DB0	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		System bus
	X30 IN		
	X31		SEW-EURODRIVE Service interface

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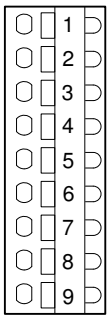
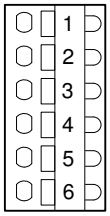
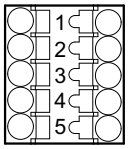
Representation	Terminal	Connection	Brief description
	X20:1	DI00	Digital input 1, with fixed assignment "Output stage enable"
	X20:2	DI01	Digital input 2, fixed setpoints – positive direction of rotation
	X20:3	DI02	Digital input 3, fixed setpoints – negative direction of rotation
	X20:4	DI03	Digital 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	+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	Digital output 3, fault
	X21:5	DO03	Digital output 4, STO active
	X21:6	GND	Reference potential
	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

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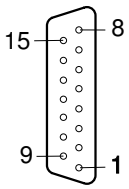
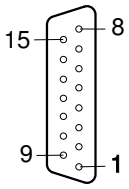
Representation	Terminal	Connection	Brief description
	X15:1	S2 (sin+)	Signal track
	X15:2	S1 (cos+)	Signal track
	X15:3	Reserved	–
	X15:4	Reserved	–
	X15:5	R1 (REF+)	Supply voltage resolver
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	Reserved	–
	X15:9	S4 (sin-)	Signal track
	X15:10	S3 (cos-)	Signal track
	X15:11	Reserved	–
	X15:12	Reserved	–
	X15:13	R2 (REF-)	Supply voltage resolver
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	Reserved	–
	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	U_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	U_{S12VG}	Encoder supply 12 V

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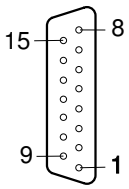
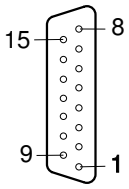
Representation	Terminal	Connection	Brief description
	X15:1	A (K1)	Signal track A (K1)
	X15:2	B (K2)	Signal track B (K2)
	X15:3	C (K0)	Signal track C (K0)
	X15:4	Reserved	–
	X15:5	Reserved	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ ($\overline{K1}$)	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	U_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	U_{S12VG}	Encoder supply 12 V
	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-	Data line
	X15:13	U_{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	U_{S12VG}	Encoder supply 12 V

1) For encoders from SEW-EURODRIVE with electronic nameplate of type E.7S

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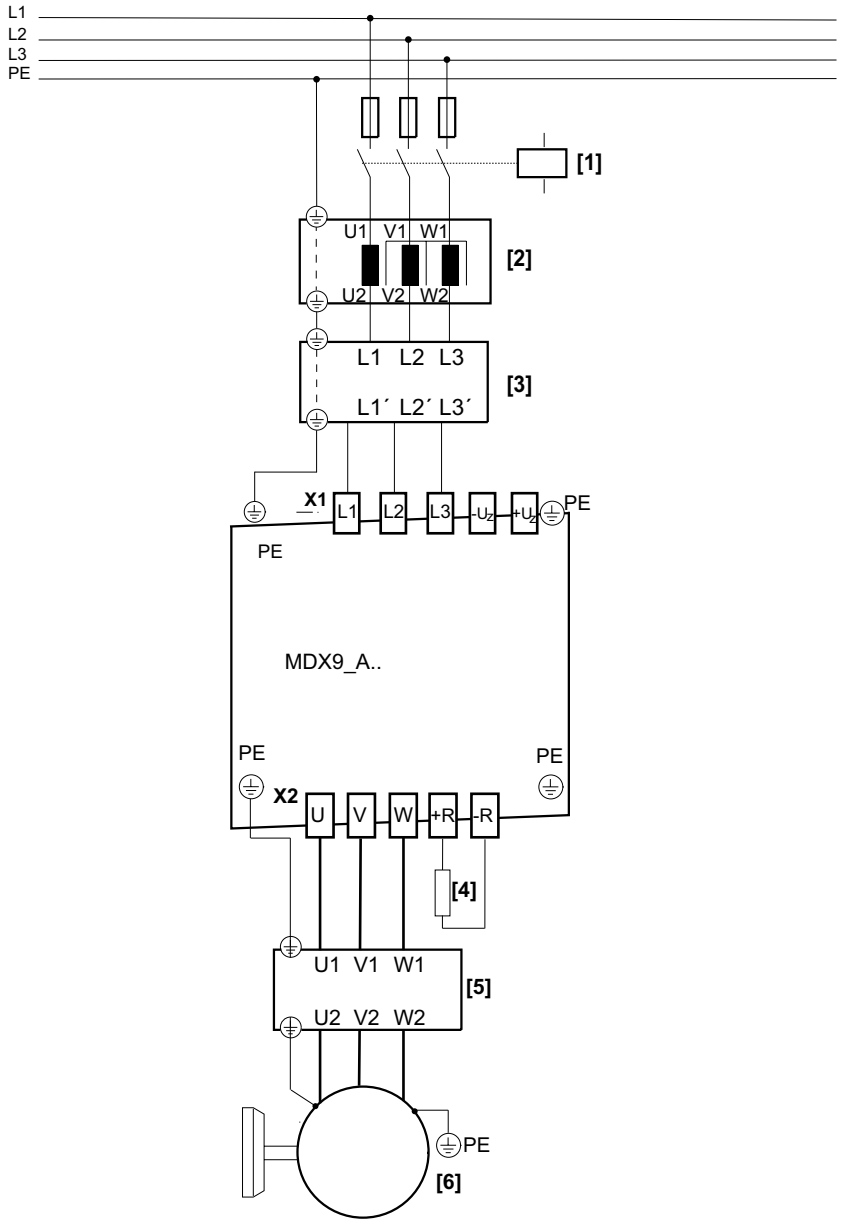
4.12 Wiring diagrams

4.12.1 General information on the wiring diagrams

- For technical data of the power electronics and the control electronics, refer to chapter "Technical data" (→ 🗎 169).
- For the terminal assignment and connections, refer to chapter "Terminal assignment" (→ 🗎 89).

4.12.2 Power connection

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



36028810897869451

[1] Line contactor
[2] Line choke (optional)
[3] Line filter (optional)
[4] Braking resistor (optional)
[5] Output choke
[6] Motor

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

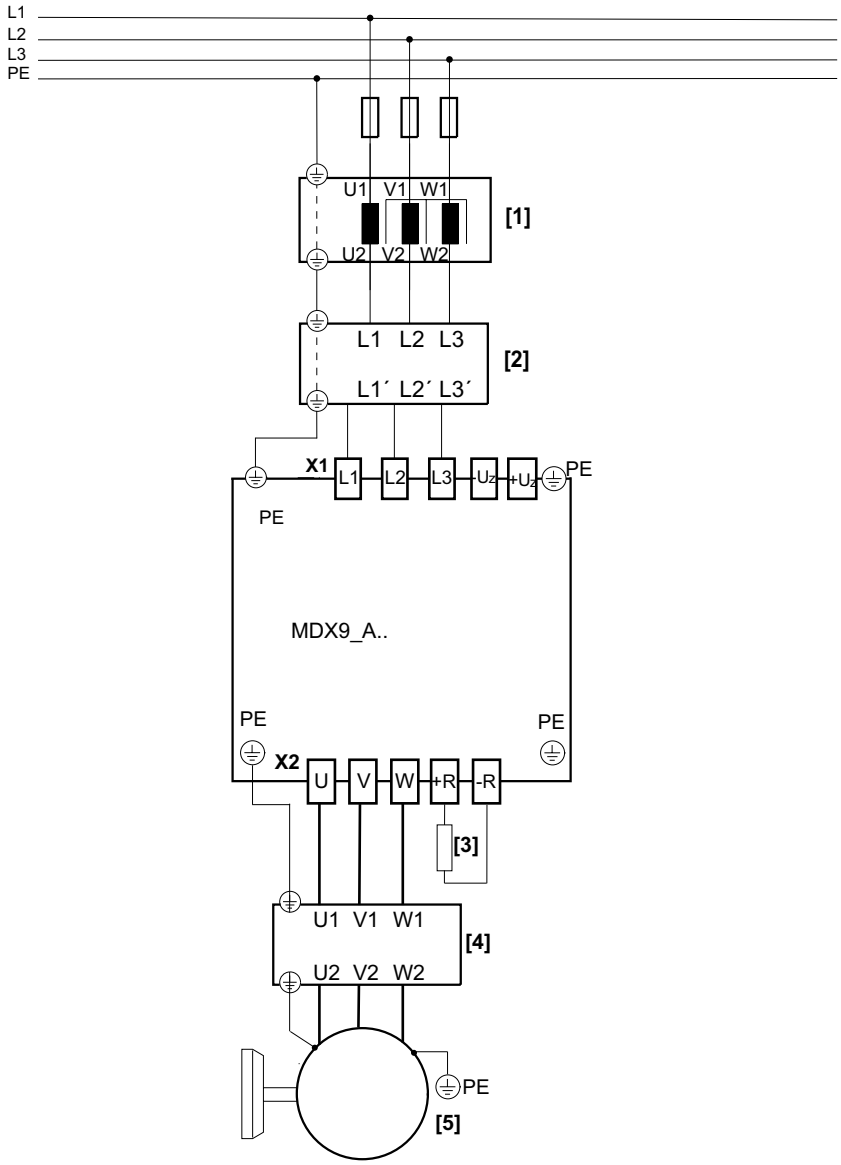
Refer to the table in the chapter "Line contactor" (→ 🗎 53) to find out which application inverters can be operated without a line contactor.

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" (→ 🗎 53) for the necessary measures.



36028810898214283

[1] Line choke (optional)
[2] Line filter (optional)
[3] Braking resistor (optional)
[4] Output choke
[5] Motor

INFORMATION

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 application inverter. The connected digital input must be parameterized for monitoring the braking resistor temperature evaluation.

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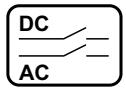
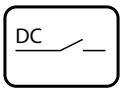
4.12.3 Brake control

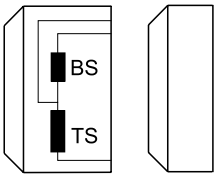
Legend:



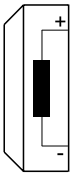
Cut-off in the DC and AC circuits
(rapid brake application)



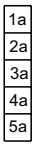
Cut-off in the DC circuit



Brake
BS = Accelerator coil
TS = Coil section



DC brake with one brake coil



Auxiliary terminal strip in terminal box

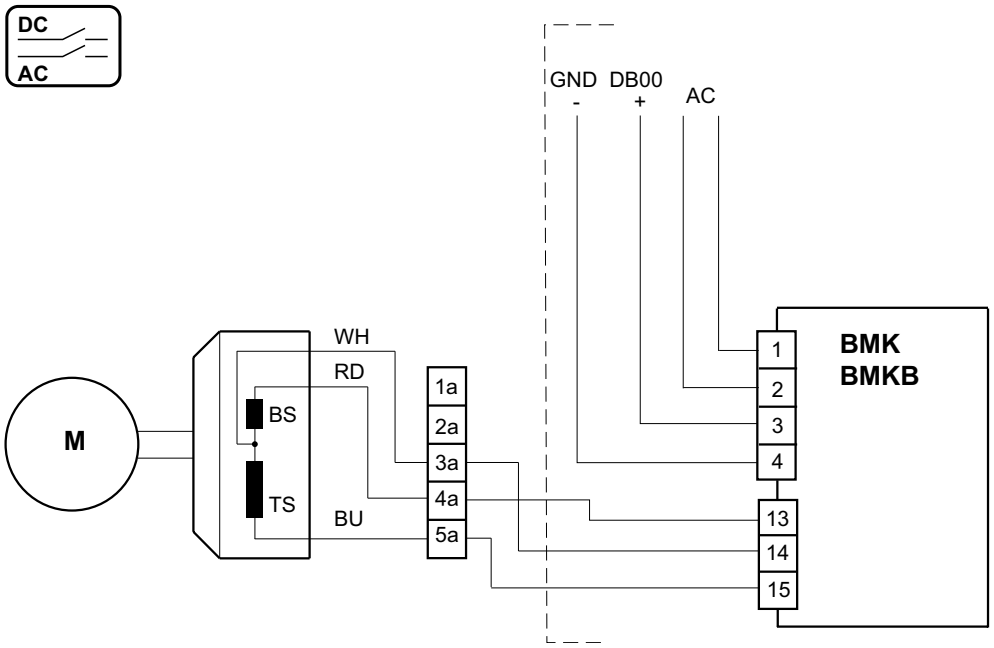
Control cabinet limit

WH	White
RD	Red
BU	Blue

INFORMATION

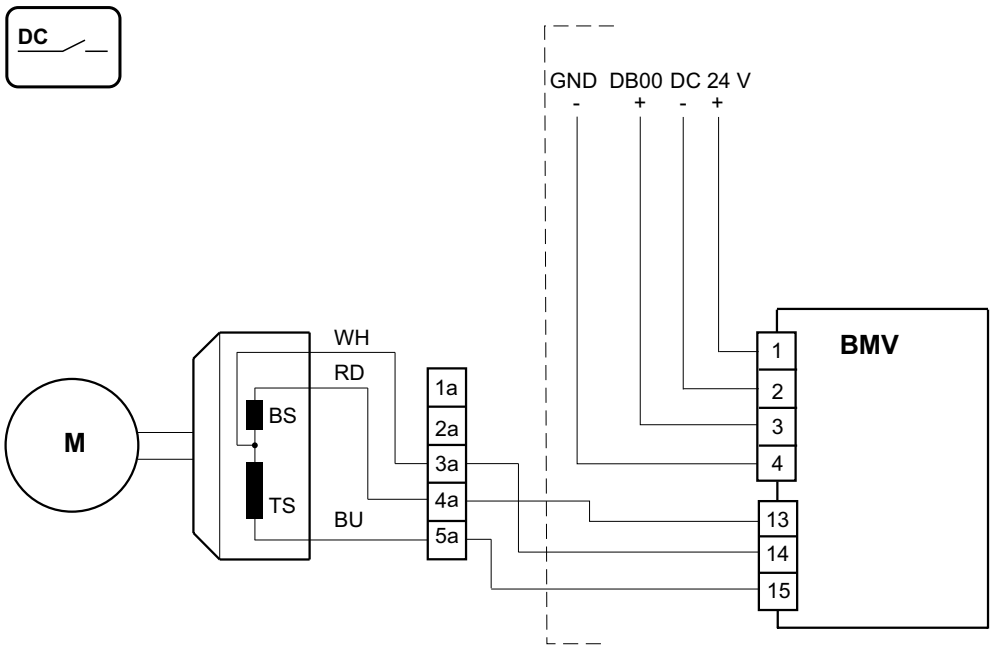
The selection of the brake control and the shown connection diagrams only represent one of the many possibilities. Observe the catalogs and operating instructions of the motors for more information and installation notes.

BMK. brake control



14324495755

BMV brake control – 2 coils



14373482507

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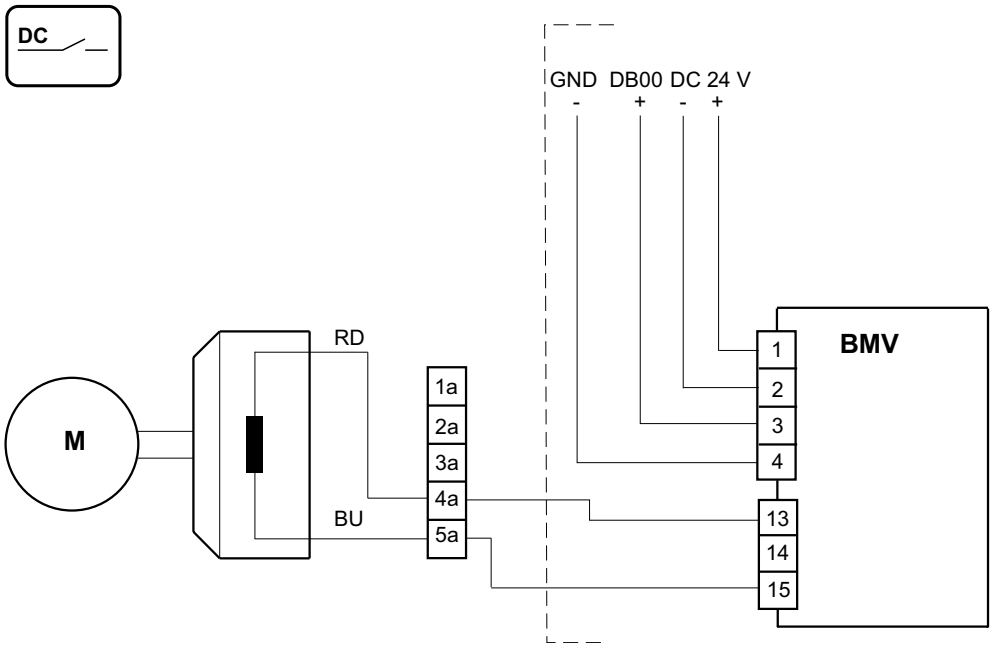
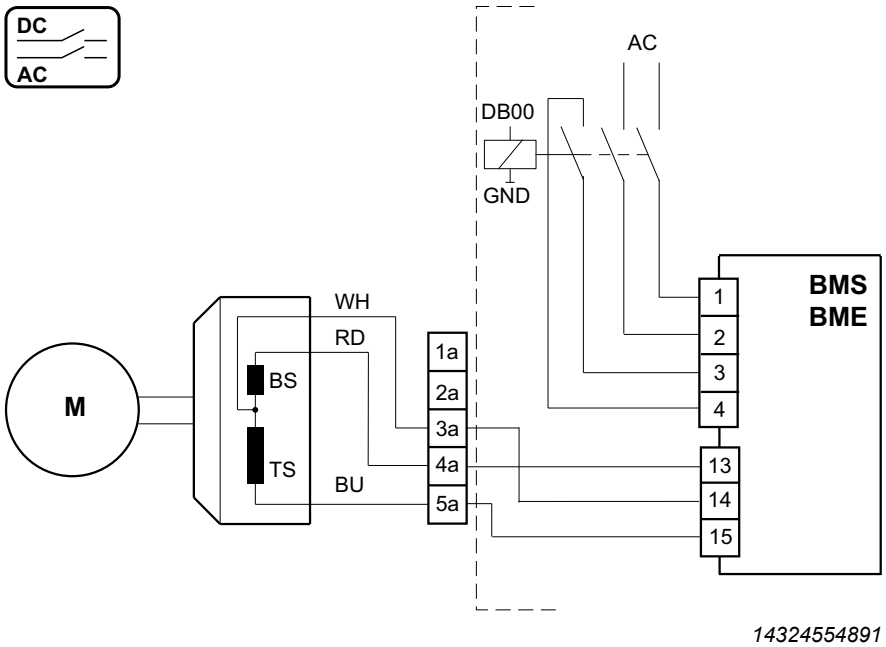
BMV brake control – 1 coil



14373494923

BMS, BME brake control



14324554891

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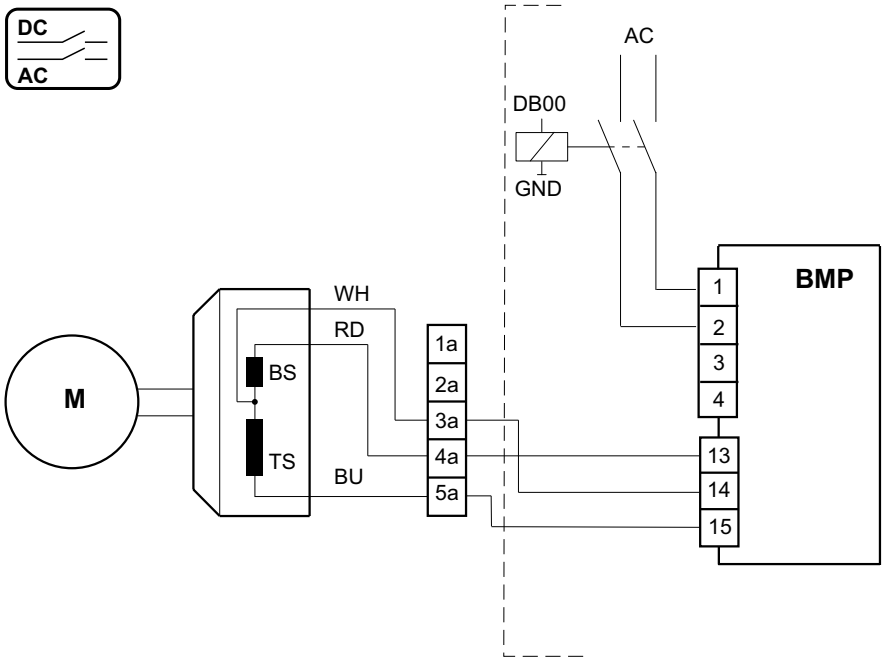
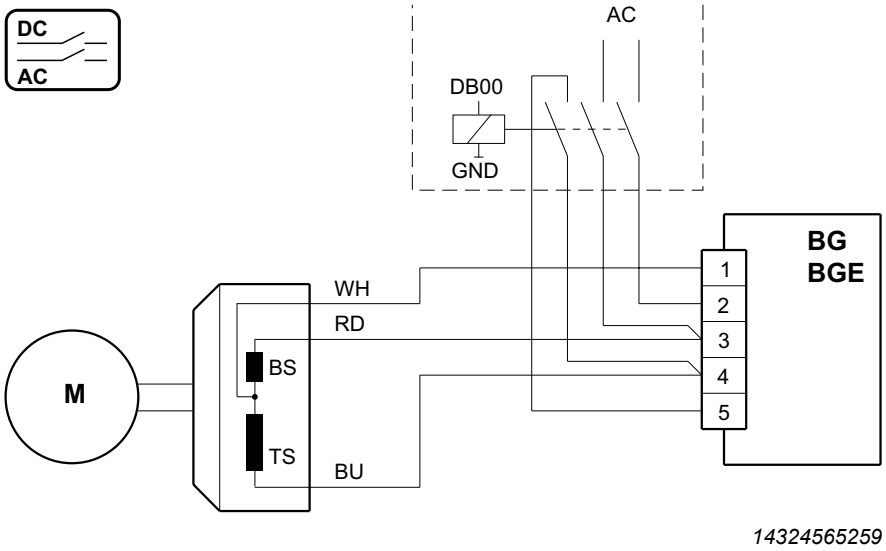
BMP brake control



14324544523

BG, BGE brake control



14324565259

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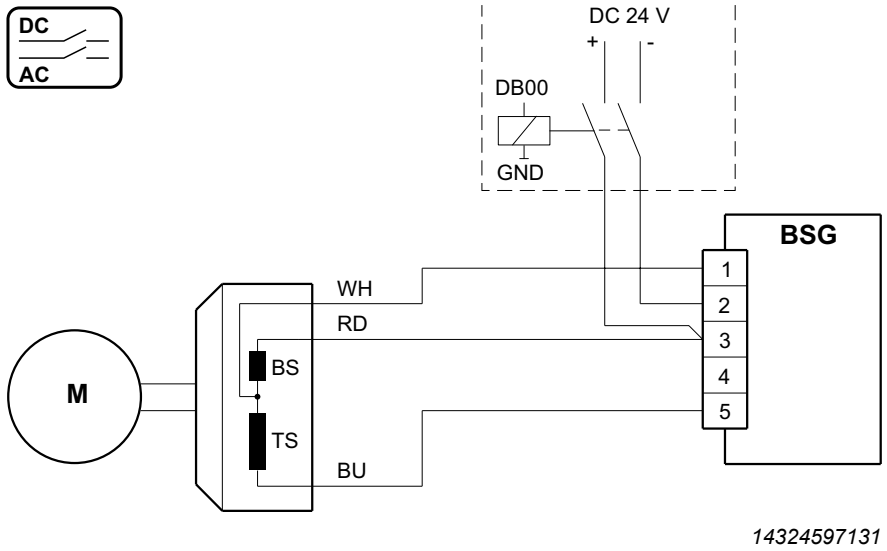
BSG brake control

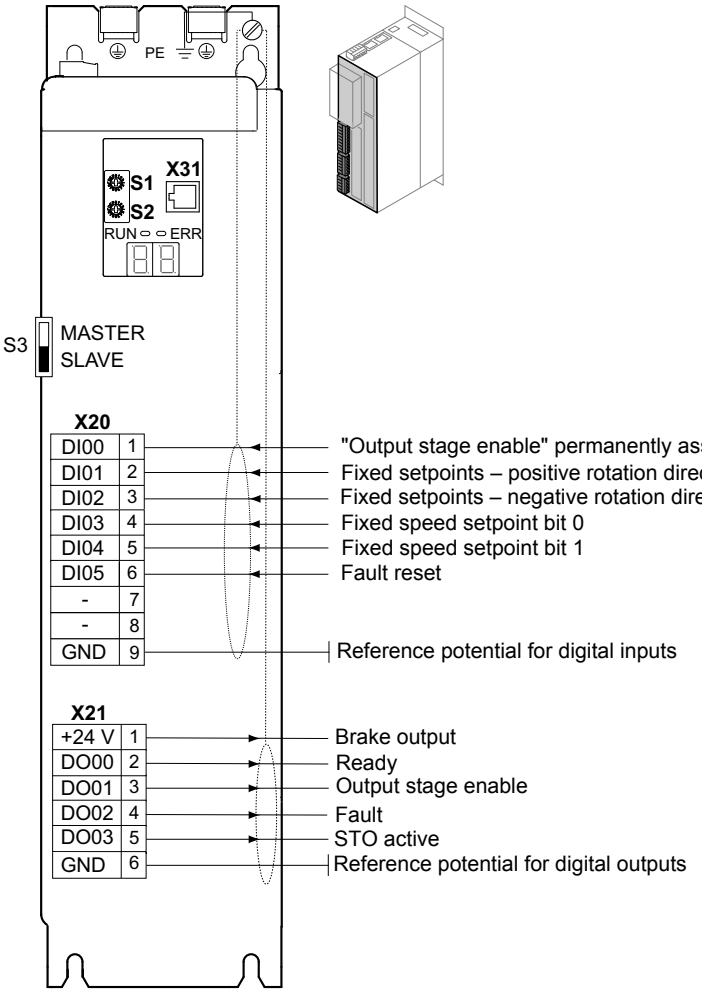


4.12.4 Electronics connection

Wiring the control electronics

For the terminal assignment and connections, refer to chapter "Terminal assignment" (→ 🗎 89).

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



25606792715

S3 Module bus operating mode
X20 Digital inputs
X21 Digital outputs

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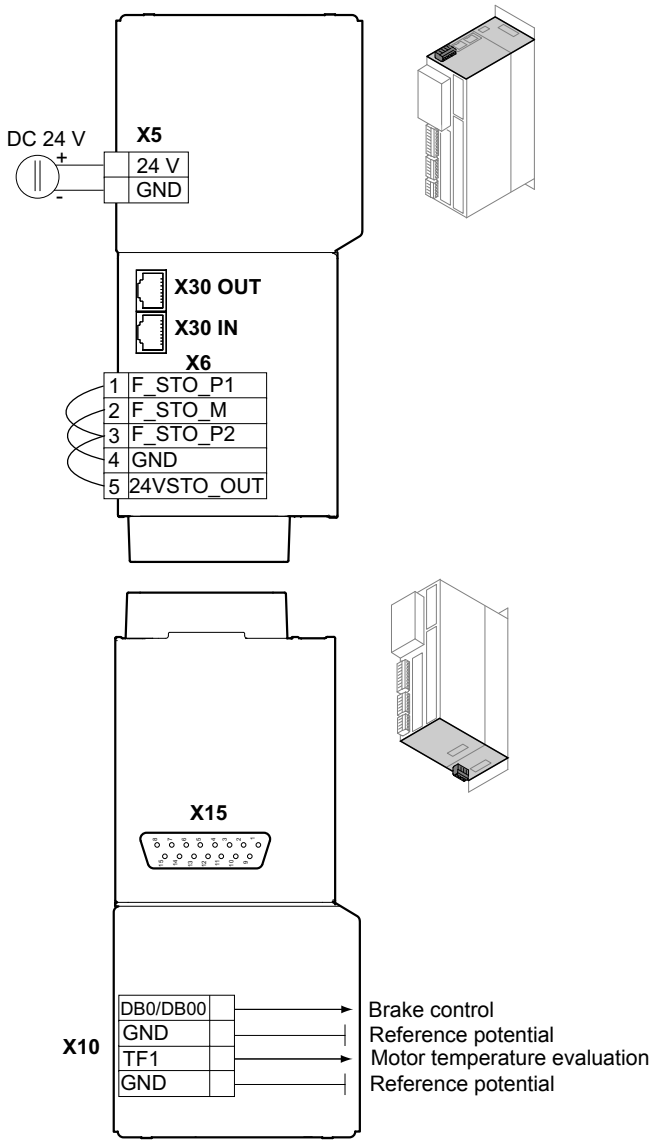

25606731275

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 Brake control and motor temperature monitoring
X15 Motor encoder connection
X30 System bus

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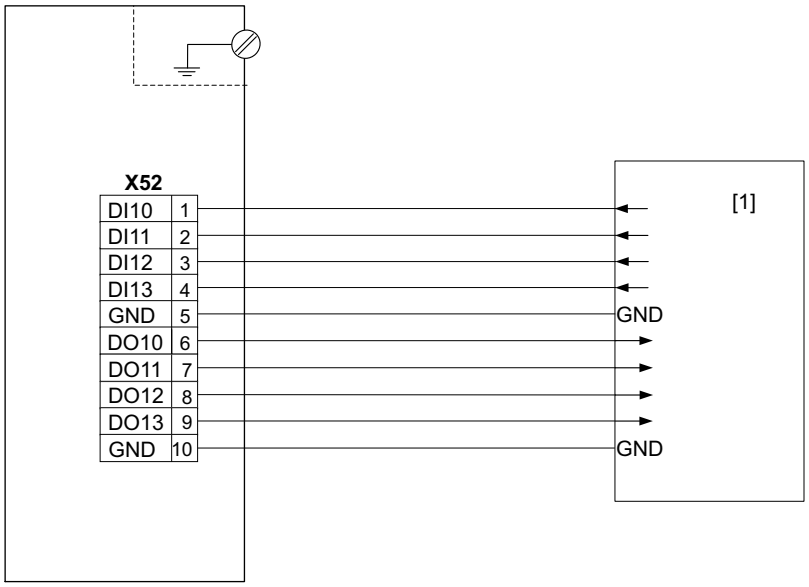
4.12.5 Connection diagram CIO21A and CID21A input/output card

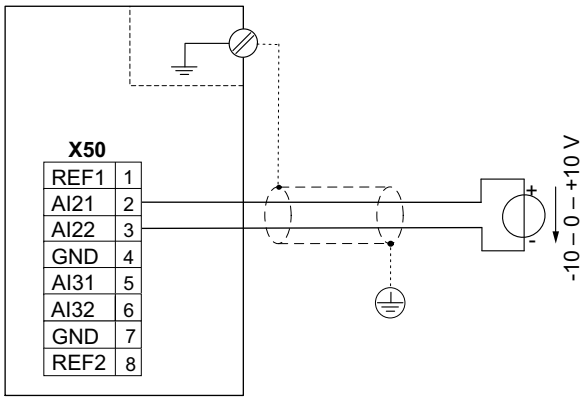
Digital inputs and outputs



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.

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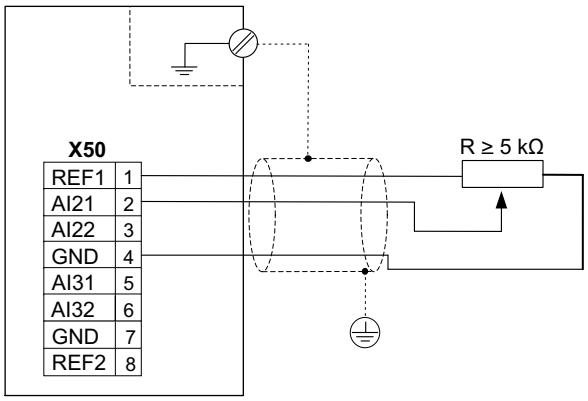
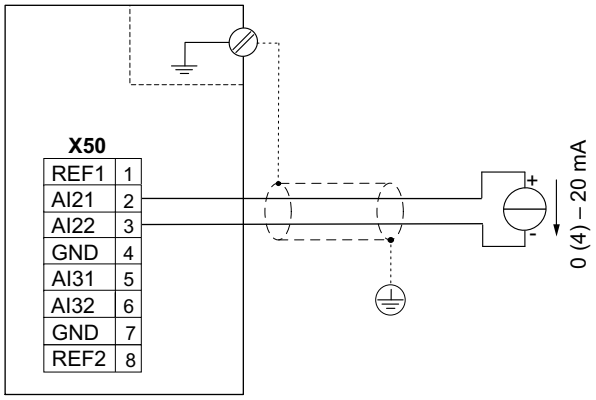


18014412830137099

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.

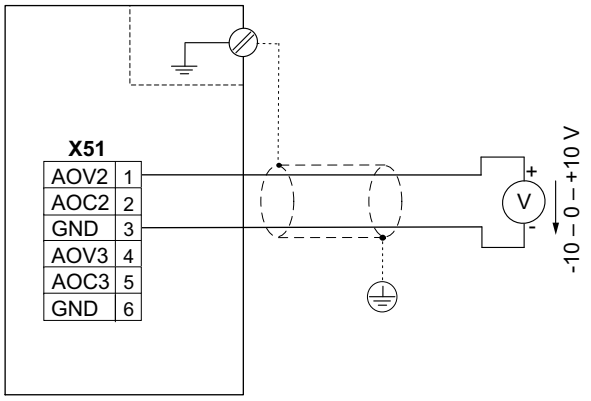
Current input



9007213575398539

Observe the switch position of "DIP switch S50" (→ 🗎 64) when activating the current input.

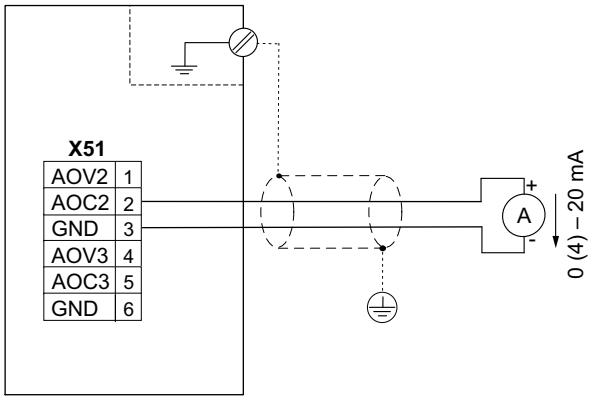
Voltage output



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.

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4.13 Information regarding UL

INFORMATION

Due to UL requirements, the following chapter is always printed in English independent of the language of the documentation.

INFORMATION

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

4.13.1 Field wiring power terminals

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

	Tightening torque in-lbs (Nm)			
MDX9_A-...-5_3-..	Line connection		Motor and braking resistor terminals	
0020 - 0160	X1	4.43 – 7.08 (0.5 – 0.8) Wire sizes 14 – 12 AWG	X2	4.43 – 7.08 (0.5 – 0.8) Wire sizes 14 – 12 AWG
0240 - 0320	X1	15.05 – 15.93 (1.7 – 1.8)	X2	15.05 – 15.93 (1.7 – 1.8)
MDX9_A-...-2_3-..	Line connection		Motor and braking resistor terminals	
0070 - 0140	X1	4.43 – 7.08 (0.5 – 0.8) Wire sizes 14 – 12 AWG	X2	4.43 – 7.08 (0.5 – 0.8) Wire sizes 14 – 12 AWG
0213 - 0290	X1	15.05 – 15.93 (1.7 – 1.8)	X2	15.05 – 15.93 (1.7 – 1.8)
All modules	PE connection			
		M4: 8.85 – 10.62 (1.0 – 1.2) M6: 26.55 – 35.4 (3.0 – 4.0		

4.13.2 Short circuit current rating

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

- 5,000 rms symmetrical amperes when protected by fuses and circuit breakers as described in the tables below.

4.13.3 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.

- If you use cable cross sections that are dimensioned for a smaller current than the rated current of the unit, make sure that the fuse is dimensioned for the used cable cross section.
- For information on selecting cable cross sections, refer to the project planning manual.
- Comply with the country-specific installation regulations in addition to the above notes.

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AC 380 – 500 V devices

MDX9_A-..	SCCR: 5 kA/ 500 V		
	Non semiconductor fuses (currents are maximum values)	Inverse-time circuit breaker (currents are maximum values)	Type E Combination Motor Controller
0020 – 0040 (size 1)	50 A/600 V Class: K5	50 A/500 V min.	Siemens Sirius 3RV2021-4DA10 (20 – 25 A)
0055 – 0095 (size 2)	50 A/600 V Class: K5	50 A/500 V min.	Siemens Sirius 3RV2021-4DA10 (20 – 25 A)
0125 – 0160 (size 3)	50 A/600 V Class: K5	50 A/500 V min.	Siemens Sirius 3RV1031-4HA10 (40 – 50 A)
0240 – 0320 (size 4)	60 A/600 V Class: K5	60 A/500 V min.	Siemens Sirius 3RV1031-4HA10 (40 – 50 A)

AC 200 – 240 V devices

MDX9_A-..	SCCR: 5 kA/ 240 V		
	Non semiconductor fuses (currents are maximum values)	Inverse-time circuit breaker (currents are maximum values)	Type E Combination Motor Controller
0070 – 0093 (size 2)	50 A/250 V	–	Siemens Sirius 3RV1031-4HA10 (40 – 50 A)
0140 (size 3)	50 A/250 V	50 A/240 V min.	Siemens Sirius 3RV1031-4HA10 (40 – 50 A)
0213 – 0290 (size 4)	60 A/250 V	60 A/240 V min.	Siemens Sirius 3RV1031-4HA10 (40 – 50 A)

4.13.4 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.

4.13.5 Ambient temperature

The units are suitable for a maximum surrounding air temperature of 40 °C, max. 60 °C with derated output current.

To determine output current rating at higher than 40 °C, the output current should be derated 2.0 % per °C between 40 °C and 60 °C.

INFORMATION

- 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).

4.13.6 Environmental conditions

The units are for use in pollution degree 2 environments.

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5 Startup

5.1 General

5.1.1 Lifting applications

⚠ WARNING

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- The application inverter is not designed for use as a safety device in lifting applications. Use monitoring systems or mechanical protection devices to ensure safety.

5.1.2 Connecting power

NOTICE

Undercutting the minimum switch-off time of the line contactor.

Irreparable damage to the application inverter or unforeseeable malfunctions.

The specified times and intervals must be observed.

- After disconnection from the supply system, observe a minimum switch-off time of 10 s.
- Do **not** turn the power of the supply system on or off **more than once per minute**.

5.1.3 Connecting cables

NOTICE

Cables may only be connected and plugged in a de-energized state.

Irreparable damage to the application inverter or unforeseeable malfunctions.

- De-energize the application inverter.

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5.2 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.

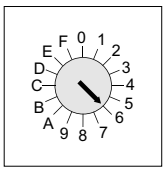
The EtherCAT® ID is always assigned by the EtherCAT® master. In the delivery state of the application inverter, the ID is set to 0 as standard (S1 = 0 and S2 = 0).

It is not strictly necessary to set one of the EtherCAT® IDs. The slaves are automatically addressed by the master as a standard.

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.

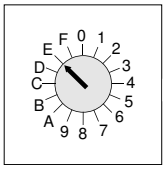
Required ID, decimal	ID, hexadecimal	Setting S1 (× 10)	Setting S2 (× 1)
3	03	0	3
18	12	1	2
25	19	1	9
100	64	6	4
110	6E	6	E
255	FF	F	F

S1 EtherCAT® ID (×10)



6

S2 EtherCAT® ID (×1)



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

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5.3 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 drive startup.
- Safety measures prevent danger to persons or machines.

Required hardware components:

- PC or laptop with Ethernet interface.
- Commercially available Ethernet cable for connection between PC and MOVI-C® CONTROLLER.
- MOVI-C® CONTROLLER with completed startup.

Required software:

- MOVISUITE® standard engineering software from SEW-EURODRIVE.

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5.4 Startup procedure

The application inverters are put into operation using the MOVISUITE® engineering software from SEW-EURODRIVE.

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The startup is functionally divided into segments. The following steps illustrate in exemplary fashion the startup procedure for an application inverter.

Drive train segment

Drive train		Configuring drive trains.

Interfaces segment

Inputs/outputs		• Basic device • I/O card
Setpoints		• Process data • PO data • Setpoint buffer • Fixed setpoints • Control word 1 – 3
Actual values		• PI data • Status word 1 – 3

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Drive functions		• FCB 01 Output stage inhibit • FCB 05 Speed control • FCB 06 Interpolated speed control • FCB 08 Interpolated torque control • FCB 09 Positioning • FCB 10 Interpolated position control • FCB 12 Reference travel • FCB 08 Rotor position identification • FCB 20 Jog mode • FCB 21 Brake test • FCB 26 Stop at user limit
Monitoring functions		• Reference signals 1 • Reference signals 2 • Limit values 1 • Limit values 2 • Monitoring functions 1 • Monitoring functions 2 • Output stage
Extended functions		• Parameter set • Auto reset • Standby mode • Touchprobe 1 • Touchprobe 2 • Cam switch

Functions segment

Device data		• Device identification • Main component • Subcomponents • Production data
Overview of fault responses		• Axis module • Power supply monitoring • Functions
Setup		• Permissions • Reset device parameters • Select memory source

Information on the application inverter

Standard		Basic settings of the installed interfaces • Basic device • Encoder 1

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Optional		Basic settings of the options • Fieldbus • I/O card • Encoder 2 • MOVISAFE® CS..

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5.4.1 Check list for startup

The following checklist lists the necessary steps for complete startup.

Step	Startup step	Done
1	Motor installation	
2	Install MOVI-C® component	
3	Start MOVISUITE®	
4	Start up the drive train	
5	Parameterize setpoints and FCBs	
6	Configure digital inputs and outputs	
7	Configure PD	
8	Configure software module (MOVIKIT®)	
9	Test drives/application	

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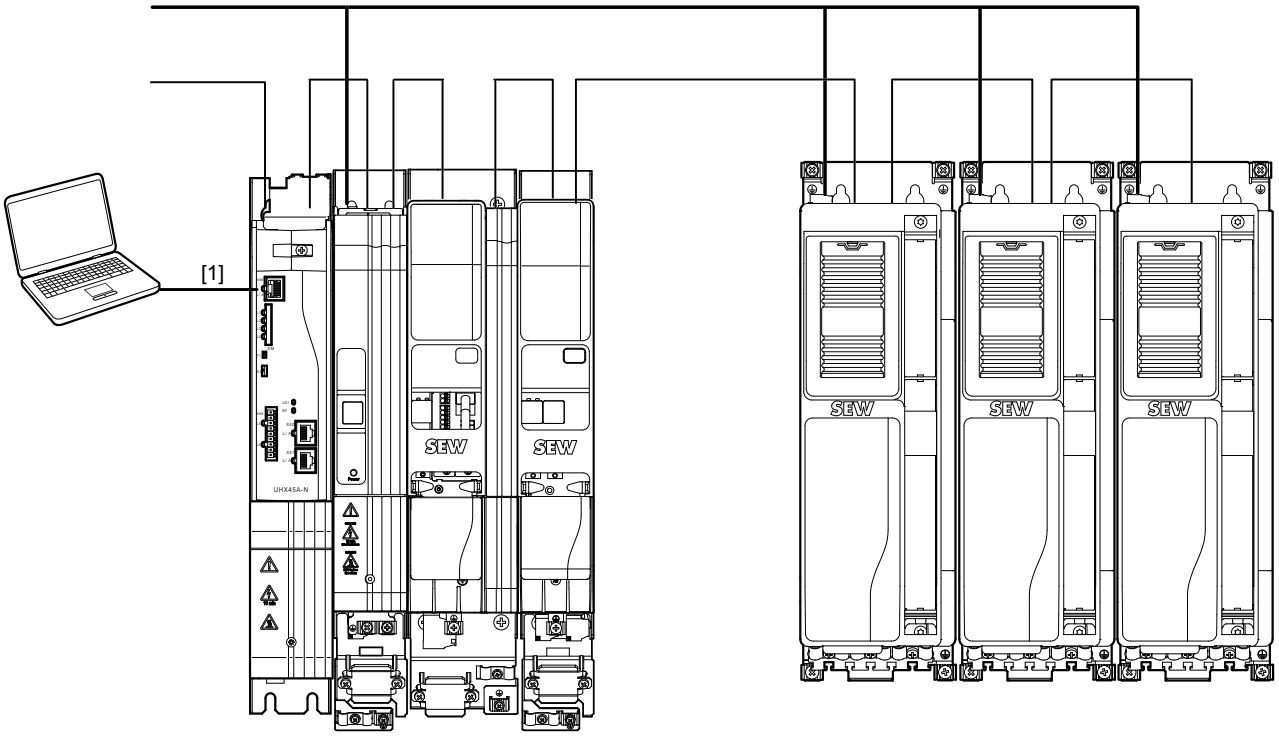
5.5 Connection to the engineering software

The following figure shows the connection of the application inverter to the MOVISUITE® engineering software using a PC.



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[1] Ethernet

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 application inverter has been disconnected from the power supply and no longer carries any voltage.
- Before you touch the power terminals, check that the application inverter has been disconnected from the power supply.
- Observe the general safety notes in the chapter "Safety notes" (→ 🗎 13) and the notes in the chapter "Electrical installation" (→ 🗎 46).

⚠ 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 application inverter with enabled output stage.

Damage to the application inverter.

- The motor output of the application inverter may be switched or disconnected only when the output stage is inhibited.

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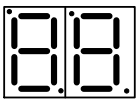
6.2 7-segment display

6.2.1 Operating displays



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

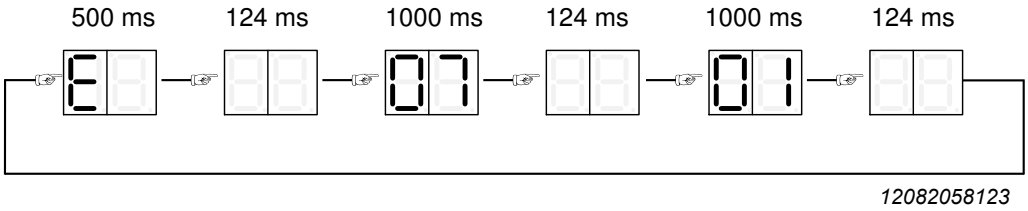
6.2.2 Fault display

The application inverter detects any faults that occur and displays them as fault code. Each fault is clearly defined by its fault code and corresponding attributes, as shown below:

- Fault response
- Final state after executing the fault response
- Type of reset response.

The fault codes are displayed as flashing numeric values in the application inverter.

The fault code is displayed in the following display sequence:



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In the example, a 2-digit fault code with subfault is shown, fault 07.01 in this example.

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6.3 Operating displays

Display	Description	State	Comment/action
Displays during boot process			
b0 b1 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. • No communication possible.	• Waiting for boot process to finish. • Device stays in this condition: Device is defective.
Display	**Description**	**State**	**Comment/action**
Displays of different device statuses			
.	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; see the chapter Setting the module bus operating mode.
C2 Flashing	STO active	• Status: Not ready. • Output stage is inhibited. • Communication is possible.	The function Safe Torque Off is active.
C3 Flashing	Synchronization with bus is incorrect. Process data processing not available		• Check the bus connection. • Check synchronization setting at device and controller. • Check process data settings at device and controller.
C4 Flashing	Encoder evaluation is 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 is 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		
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 is permanently selected with terminal DI00. However, it can also be selected by other sources.

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Display	Description	State	Comment/action
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 mode		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, e.g. in the higher-level controller.
07	Torque control		Torque control.
08	Interpolated torque control		Torque control with setpoints cyclically via bus.
09	Position control		Positioning mode with internal ramp generator.
10	Interpolated position 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 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		Serves to stop at user limits.

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6.4 Fault description on basic device

6.4.1 Fault 1 Output stage monitoring

Subfault: 1.1 **Description: Short circuit in motor output terminals**		
	Response: Output stage inhibit	
	Cause	Measure
	Overcurrent in output stage or faulty output stage control detected, and output stage inhibited by hardware.	Possible causes for overcurrent are short circuit at the output, excessive motor current, or a defective power output stage.
Subfault: 1.2 **Description: Overcurrent in output stage**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor current too high.	Connect a smaller motor.
	Current supply	Check the current supply.
	Current transformer	Check the current transformer.
	Ramp limit deactivated and set ramp time too short.	Increase the ramp time.
	Phase module defective.	Check the phase module.
	DC 24 V supply voltage unstable.	Check the DC 24 V supply voltage.
	Interruption or short circuit on signal lines of phase modules.	Check the signal lines.

6.4.2 Fault 3 Ground fault

Subfault: 3.1 **Description: Ground fault**	
Response: Output stage inhibit	
Cause	Measure
Ground fault in the motor lead.	Eliminate ground fault in motor lead.
Ground fault in the inverter.	Eliminate ground fault in inverter.
Ground fault in the motor.	Eliminate ground fault in motor.
Ground fault in line components.	Eliminate ground fault in line components.

6.4.3 Fault 4 Brake chopper

Subfault: 4.1 **Description: Brake chopper overcurrent**	
Response: Output stage inhibit	
Cause	Measure
Excessive regenerative power.	Extend the deceleration ramps.
Short circuit detected in braking resistor circuit.	Check supply cable to braking resistor.
Braking resistance too high.	Check the technical data of the braking resistor.
Subfault: 4.2 **Description: Brake chopper defective**	
Response: Output stage inhibit	
Cause	Measure
Output stage of brake chopper defective.	Replace the defective brake chopper.

6.4.4 Fault 6 Line fault

Subfault: 6.1 **Description: Line phase failure**	
Response: Line phase failure	
Cause	Measure
Missing line phase detected.	Check the supply system cable.
DC link voltage periodically too low.	Check the configuration of the supply system.
Inadequate line voltage quality.	Check supply (fuses, contactor).

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6.4.5 Fault 7 DC link

Subfault: 7.1 Description: DC link overvoltage		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum permitted DC link voltage limit exceeded and output stage inhibited by hardware.	– Extend deceleration ramps. – Check supply cable to the braking resistor. – Check the technical data of the braking resistor.
Subfault: 7.2 Description: DC link discharge failed		
	Response: Warning	
	Cause	Measure
	DC link voltage level not dropped below discharge threshold within discharge time.	Contact SEW-EURODRIVE Service.

6.4.6 Fault 8 Speed monitoring

Subfault: 8.1 Description: Speed monitoring – motor mode		
	Response: Output stage inhibit	
	Cause	Measure
	Speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor).	Increase the delay time set for speed monitoring, or reduce the load.
	Encoder not connected correctly.	Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce acceleration values.
	Encoder has incorrect direction of rotation.	– Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce acceleration values. – Check motor lead and motor, check line phases.
Subfault: 8.2 Description: Speed monitoring – generator mode		
	Response: Output stage inhibit	
	Cause	Measure
	Speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor).	Increase the delay time set for speed monitoring, or reduce the regenerative load.
	Encoder not connected correctly.	Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce deceleration values.
	Encoder has incorrect direction of rotation.	– Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce deceleration values. – Check motor cable and motor. Check line phases.
Subfault: 8.3 Description: Maximum speed at motor shaft		
	Response: Output stage inhibit	
	Cause	Measure
	Actual speed exceeded "Maximum speed at motor shaft" limit value (index 8360.9 / 8361.9). This limit value is set at startup matching the motor and gear unit.	Reduce the maximum rotational speed.

6.4.7 Fault 9 Control mode

Subfault: 9.1 Description: Magnetization of motor not possible		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit or output stage monitoring reduced possible maximum current to such a degree that required magnetizing current cannot be set.	– Reduce output stage utilization, e.g. by reducing the PWM frequency or reducing the load. – Increase user-defined current limit.

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Subfault: 9.2 **Description: Requested operating mode not possible with active control mode**		
	Response: Output stage inhibit	
	Cause	Measure
	The current FCB activated an operating mode. The active control mode does not support this operating mode, for example "position control" or "torque control" with U/f control mode.	Start up control mode that supports the required operating mode. Connect encoder if necessary. Select an operating mode that is supported by the current control mode.
Subfault: 9.3 **Description: Absolute rotor position not available**		
	Response: Output stage inhibit	
	Cause	Measure
	The current control mode requires an absolute rotor position. The encoder selected for "Source is actual speed" does not provide an absolute rotor position.	Use an absolute encoder, or identify the rotor position using FCB 18.
Subfault: 9.4 **Description: Correct current supply of motor not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	Failed to set required current during premagnetization.	Check the cabling, or disable the function "Current monitoring during premagnetization".
Subfault: 9.5 **Description: Maximum output frequency exceeded**		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum output frequency exceeded.	Reduce the maximum speed.
Subfault: 9.6 **Description: Maximum model speed exceeded**		
	Response: Output stage inhibit	
	Cause	Measure
	Speed of drive calculated in ELSM® control mode too high for motor control.	If possible, minimize the "Speed/position controller sampling cycle", or reduce the speed.
Subfault: 9.8 **Description: Flux model error**		
	Response: Output stage inhibit	
	Cause	Measure
	Rotor flux calculated by motor model not plausible, or calculated internal voltage too small.	– Check configuration data. – Check motor data. – Check machine: Idle state or speed too low. – Check the connection cable between inverter and motor – Contact SEW-EURODRIVE Service.
Subfault: 9.9 **Description: Parameter measurement not possible with active motor type**		
	Response: Output stage inhibit	
	Cause	Measure
	Parameter measurement is possible only with "asynchronous" and "synchronous" motor types. No magnetic reluctance and LSPM motors.	Select the correct motor type.
Subfault: 9.10 **Description: Rotor stall monitoring**		
	Response: Output stage inhibit	
	Cause	Measure
	The current control cannot hold the load torque. The deviation between stationary setpoint voltage and actual voltage is too large.	Reduce the load torque (hoist) in the controlled system.
Subfault: 9.11 **Description: Standstill current function**		
	Response: Output stage inhibit	
	Cause	Measure
	With the ELSM method, the standstill current function is possible only in combination with rotor position measurement.	– Enable rotor position measurement. – Check motor data.

6.4.8 Fault 10 Data Flexibility

Subfault: 10.1 Description: Initialization		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Init task error.	The init task has issued a return code != 0. Check the program.
Subfault: 10.2 Description: Illegal operation code		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Illegal opcode in Data Flexibility program.	Contact SEW-EURODRIVE Service.
Subfault: 10.3 Description: Memory access		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Memory area violated while accessing array.	For example, an array access results in writing beyond the permitted memory range. Check the program.
Subfault: 10.4 Description: Stack		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Overflow of Data Flexibility stack detected.	Check the program.
Subfault: 10.5 Description: Division by 0		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Division by 0.	Check the program.
Subfault: 10.6 Description: Runtime		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Runtime error/watchdog.	Check the program. The program execution time exceeds the permitted time.
	PDI or PDO tasks.	Check the program. The execution time of the PDI or PDO task exceeds the permitted time.
Subfault: 10.7 Description: Calculation result of multiplication/division command too large		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Calculation result of multiplication/division command exceeds 32 bits.	Check the program.
	Failed to write calculation result of multiplication/division command into result variable.	Check the program.
Subfault: 10.8 Description: Illegal connection		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Index used in connect not allowed.	Check the program. The index used either does not exist or is not permitted for access via process data; see parameter list.
Subfault: 10.9 Description: CRC code		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Wrong CRC checksum of code.	Load the program again. The program memory is corrupt. An unauthorized write access has been carried out on the program memory.

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Subfault: 10.10 Description: Setpoint cycle time not supported		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-supported setpoint cycle time parameterized.	Set the setpoint cycle time to the default value 1 ms.
Subfault: 10.11 Description: No application program loaded		
	Response: Output stage inhibit	
	Cause	Measure
	No Data Flexibility application program loaded.	Load the program or disable Data Flexibility.
Subfault: 10.99 Description: Unknown error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Unknown Data Flexibility error.	Contact SEW-EURODRIVE Service.

6.4.9 Fault 11 Temperature monitoring

Subfault: 11.1 Description: Heat sink overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum permitted heat sink temperature exceeded. The capacity utilization is possibly too high.	– Reduce the load. – Reduce the rms value of the current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.
Subfault: 11.2 Description: Heat sink utilization – prewarning		
	Response: Heat sink utilization – prewarning	
	Cause	Measure
	High thermal load on heat sink of device, and prewarning threshold reached.	– Reduce the load. – Reduce the rms value of the output current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.
Subfault: 11.3 Description: Device utilization		
	Response: Output stage inhibit	
	Cause	Measure
	The temperature has reached or exceeded the switch-off threshold. Possible causes: Mean output current too high.	Reduce the load.
	PWM frequency too high.	Reduce the PWM frequency.
	Ambient temperature too high.	Ensure sufficient cooling.
	Unfavorable air convection.	Check air convection.
	Fan defective.	Check the fan and replace if necessary.
Subfault: 11.5 Description: Electromechanical utilization		
	Response: Output stage inhibit	
	Cause	Measure
	Electromechanical components of device overloaded by excessive continuous current.	Reduce the load. If necessary, reduce the rms value of the current.
Subfault: 11.6 Description: Electromechanical utilization – prewarning		
	Response: Electromechanical utilization – prewarning	
	Cause	Measure
	High load on electromechanical components of device due to high continuous current. Prewarning threshold reached.	– Reduce the load. – Reduce the PWM frequency. – Reduce the rms value of the current. – Reduce the ambient temperature.

Subfault: 11.7 **Description: Wire break at temperature sensor of heat sink**		
	Response: Output stage inhibit	
	Cause	Measure
	Wire break at temperature sensor of heat sink.	Contact SEW-EURODRIVE Service.
Subfault: 11.8 **Description: Short circuit at temperature sensor of heat sink**		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit at temperature sensor of heat sink.	Contact SEW-EURODRIVE Service.

6.4.10 Fault 13 Encoder 1

Subfault: 13.1 **Description: Position comparison check**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Faulty comparison between raw position and track counter of absolute encoders.	– Check the track signal wiring. – Check interference sources (e.g. from EMC). – Replace encoder. – Replace card. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.2 **Description: Unknown encoder type**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder type not known and not supported by inverter.	– Check encoder type. – Contact SEW-EURODRIVE Service. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.3 **Description: Invalid data**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	– Check startup parameters. – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.4 **Description: Track measurement error**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error during track measurement.	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.5 **Description: Internal warning**		
	Response: Encoder – warning	
	Cause	Measure
	Encoder signaled warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Clean sensor.

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Subfault: 13.6 **Description: Signal level too low**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Vector below permitted limit during signal level monitoring.	– Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.7 **Description: Signal level too high**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Vector exceeds permitted limit during signal level monitoring.	Check the gear ratio of the resolver in use. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.8 **Description: Signal level monitoring**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Vector exceeds permitted limit during signal level monitoring.	Check the resolver mounting position. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.9 **Description: Quadrant check**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error checking quadrants (sine encoder).	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.10 **Description: Position tolerance range monitoring**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Position outside tolerance range.	– Check startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.11 **Description: Data timeout**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder process data timeout.	– Check interference sources (e.g. from EMC). – Check startup parameters. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Subfault: 13.12 **Description: Emergency**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder signaled emergency.	– Check interference sources (e.g. from EMC). – Check startup parameters. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.13 **Description: Error during initialization**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Communication error during initialization.	– Check parameterization. – Check baud rate. – Ensure that the CANopen interface on the encoder (Node ID) is correctly adjusted. – Check the wiring. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.14 **Description: Communication**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Faulty communication with encoder.	– Check voltage supply. – Check interference sources (e.g. from EMC). – Check the wiring. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.15 **Description: System error**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	System error while evaluating encoder.	– Ensure that the multi-turn encoder is within the projected path range. – Check limits. – Check correct settings of encoder numerator/denominator factors. – Check interference sources (e.g. from EMC). – Check startup parameters. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.16 **Description: Permanent high level in data line – critical**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Permanent high level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.17 **Description: Permanent high level in data line**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Permanent high level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Subfault: 13.18 Description: Permanent low level in data line – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Permanent low level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.19 Description: Permanent low level in data line		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Permanent low level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.20 Description: SSI error bit – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive even with a fault in an external position encoder.
Subfault: 13.21 Description: SSI error bit		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive even with a fault in an external position encoder.
Subfault: 13.22 Description: Internal fault – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder signaled internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.23 Description: Internal fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Encoder signaled internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.24 Description: Travel range exceeded		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Current position mode (index 8381.10) does not allow for larger travel range.	Check travel range. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 13.25 Description: Error during encoder startup		
	Response: Output stage inhibit	
	Cause	Measure
	Fatal error during encoder startup.	Switch the device off and on again. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

6.4.11 Fault 14 Encoder 2

Subfault: 14.1 Description: Position comparison check		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Faulty comparison between raw position and track counter of absolute encoders.	– Check the track signal wiring. – Check interference sources (e.g. from EMC). – Replace encoder. – Replace card. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.2 Description: Unknown encoder type		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Encoder type not known and not supported by inverter.	– Check encoder type. – Contact SEW-EURODRIVE Service. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.3 Description: Invalid data		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	– Check startup parameters. – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.4 Description: Track measurement error		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Error during track measurement.	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Subfault: 14.5 **Description: Internal warning**		
	Response: Encoder – warning	
	Cause	Measure
	Encoder signaled warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Clean sensor.
Subfault: 14.6 **Description: Signal level too low**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Vector below permitted limit during signal level monitoring.	– Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.7 **Description: Signal level too high**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Vector exceeds permitted limit during signal level monitoring.	Check the gear ratio of the resolver in use. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.8 **Description: Signal level monitoring**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Vector below permitted limit during signal level monitoring.	Check the resolver mounting position. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.9 **Description: Quadrant check**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Error checking quadrants (sine encoder).	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.10 **Description: Position tolerance range monitoring**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Position outside tolerance range.	– Check startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 14.11 **Description: Data timeout**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Encoder process data timeout.	– Check interference sources (e.g. from EMC). – Check startup parameters. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.12 **Description: Emergency**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Encoder signaled emergency.	– Check interference sources (e.g. from EMC). – Check startup parameters. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.13 **Description: Error during initialization**		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Communication error during initialization.	– Check parameterization. – Check baud rate. – Ensure that the CANopen interface on the encoder (Node ID) is correctly adjusted. – Check the wiring. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.14 **Description: Communication**		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Faulty communication with encoder.	– Check voltage supply. – Check interference sources (e.g. from EMC). – Check the wiring. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.15 **Description: System error**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	System error while evaluating encoder.	– Make sure that multi-turn encoder is within the configured track area. – Check limits. – Check correct settings of encoder numerator/denominator factors. – Check interference sources (e.g. from EMC). – Check startup parameters. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.16 **Description: Permanent high level in data line – critical**		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Permanent high level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Subfault: 14.17 Description: Permanent high level in data line		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Permanent high level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.18 Description: Permanent low level in data line – critical		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Permanent low level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.19 Description: Permanent low level in data line		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Permanent low level of data signal.	– Check the wiring. – Check the encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.20 Description: SSI error bit – critical		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive even with a fault in an external position encoder.
Subfault: 14.21 Description: SSI error bit		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive even with a fault in an external position encoder.
Subfault: 14.22 Description: Internal fault – critical		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Encoder signaled internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

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Subfault: 14.23 **Description: Internal fault**		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Encoder signaled internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.24 **Description: Travel range exceeded**		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Current position mode (index 8381.10) does not allow for larger travel range.	Check travel range. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
Subfault: 14.25 **Description: Error during encoder startup**		
	Response: Output stage inhibit	
	Cause	Measure
	Fatal error during encoder startup.	Switch the device off and on again. Information: In "emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

6.4.12 Fault 16 Startup

Subfault: 16.1 **Description: Motor not started up**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor not started up or not started up completely.	Perform complete motor startup.
Subfault: 16.2 **Description: Cannot calculate controller parameters**		
	Response: Output stage inhibit	
	Cause	Measure
	Delay of encoder in use too long to calculate required filter coefficients.	Use an encoder with a shorter delay, or contact SEW-EURODRIVE Service.
Subfault: 16.3 **Description: Thermal motor model not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	Invalid parameters for thermal motor model or for drive enable although starting up thermal model not yet completed.	Check the parameters of the thermal motor model, and perform startup.
Subfault: 16.5 **Description: Current limit smaller than magnetizing current of the motor**		
	Response: Output stage inhibit	
	Cause	Measure
	Current limit smaller than magnetizing current of the motor calculated by active control mode.	Increase current limit. Required magnetizing current: See diagnostics parameters of control mode.
Subfault: 16.6 **Description: Control mode not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong control mode selected for the motor.	Choose a control mode that matches the selected motor.

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Subfault: 16.7 **Description: PWM frequency not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	Specified PWM frequency not allowed for this power output stage.	Select different PWM frequency. Possible PWM frequencies; see device configuration data.
Subfault: 16.8 **Description: Temperature sensor motor 1**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty startup of temperature sensor of motor 1.	Perform startup again.
Subfault: 16.9 **Description: Temperature sensor motor 2**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty startup of temperature sensor of motor 2.	Perform startup again.
Subfault: 16.10 **Description: Actual position source not assigned**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Active control mode requires an encoder for position mode.	– Assign actual position source in encoder assignment of the active drive train (Index 8565.3 or 8566.3). – If no encoder is installed, activate the FCBs only using "torque control" or "speed control" operating mode.
Subfault: 16.11 **Description: Motor data calculation error**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor startup not possible because of inconsistent motor data or wrong device configuration data.	Check the motor data for plausibility, or contact SEW-EURODRIVE Service.
Subfault: 16.12 **Description: Motor data write sequence**		
	Response: Output stage inhibit	
	Cause	Measure
	Subindex 1 not written to zero before writing electrical startup parameters (index 8357, 8360, 8394, 8420 or 8358, 8361, 8395, 8421).	Reset the fault. Set parameters 8360/1 or 8361/1 to "0" before writing additional parameters.
Subfault: 16.20 **Description: Nominal speed too high or nominal frequency too low**		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Nominal speed too high or nominal frequency too low. The resulting number of pole pairs is 0.	Enter plausible motor data (nominal speed and nominal frequency).
Subfault: 16.21 **Description: Nominal slip negative**		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data, the calculated nominal slip is negative: Nominal frequency too low or nominal speed too high or number of pole pairs too high.	Enter plausible motor data (nominal frequency, nominal speed, number of pole pairs).
Subfault: 16.22 **Description: Specify the number of pole pairs**		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: It is not possible to calculate the number of pole pairs accurately from nominal frequency and nominal speed.	Enter the number of pole pairs.

Subfault: 16.23 **Description: Plausibility check failed**		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: the estimated nominal power does not match the entered nominal power.	Check entered nameplate data for plausibility.
Subfault: 16.24 **Description: Speed controller sampling cycle not possible with current PWM frequency or current control mode**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	At PWM frequency "2.5 kHz", only the speed controller sampling cycle of 2 ms is permitted. For the ELSM® control mode, the only permitted speed controller sampling cycles are 1 ms and 2 ms.	Increase PWM frequency or increase sampling cycle of speed controller to 2 ms. Set the sampling cycle to 1 ms or 2 ms for ELSM® control mode.
Subfault: 16.25 **Description: User-defined current limit too low for standstill current**		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit value too small for minimum standstill current.	Increase the user-defined current limit, or disable the standstill current function.
Subfault: 16.26 **Description: Nominal values incomplete or implausible**		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Nominal voltage, nominal current, nominal speed or nominal torque are not entered or not plausible.	Enter or check nominal voltage, nominal current, nominal speed, and nominal torque.
Subfault: 16.27 **Description: Maximum current or maximum torque not plausible**		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Maximum current or maximum torque not entered, or maximum current and maximum torque not plausible.	Check the maximum current and maximum torque.
Subfault: 16.30 **Description: Faulty EtherCAT® EEPROM configuration state**		
	Response: Warning	
	Cause	Measure
	Faulty EtherCAT®/SBus^{PLUS} EEPROM configuration status. EEPROM not loaded, binary file not loaded.	Contact SEW-EURODRIVE Service.
	Faulty EEPROM loading procedure.	Contact SEW-EURODRIVE Service.
	Faulty EEPROM checksum.	Contact SEW-EURODRIVE Service.

6.4.13 Fault 17 Internal processor fault

Subfault: 17.7 **Description: Exception error**		
	Response: Output stage inhibit	
	Cause	Measure
	Exception trap in CPU.	Contact SEW-EURODRIVE Service.

6.4.14 Fault 18 Software error

Subfault: 18.1 **Description: Motor management**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error detected at motor management interface.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

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Subfault: 18.3 Description: Task system warning		
	Response: Warning	
	Cause	Measure
	A fault was detected during the processing of the internal task system. This may be a timeout for cyclical tasks, for example.	– Acknowledge the warning. – Contact SEW-EURODRIVE Service if the warning occurs regularly.
Subfault: 18.4 Description: Task system		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A fault was detected during the processing of the internal task system. This may be a timeout for cyclical tasks, for example.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.
Subfault: 18.7 Description: Fatal error		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Fatal software error.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.
Subfault: 18.8 Description: Invalid fault code		
	Response: Output stage inhibit	
	Cause	Measure
	Invalid fault code requested.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.
Subfault: 18.9 Description: Internal software error		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The software reports an unexpected event.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.
Subfault: 18.10 Description: Watchdog		
	Response: Output stage inhibit	
	Cause	Measure
	Software no longer operates within intended cycle time.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.
Subfault: 18.12 Description: Configuration data		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Configuration data not plausible or cannot be interpreted by active firmware version.	Update the firmware or load valid configuration data.
Subfault: 18.13 Description: Calibration data		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Calibration data not plausible.	Load valid calibration data.

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6.4.15 Fault 19 Process data

Subfault: 19.1 **Description: Torque setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Implausible values specified as torque setpoints.	Adjust torque setpoints.
Subfault: 19.2 **Description: Position setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Position setpoint outside software limit switches.	Check position setpoint.
	Position setpoint outside modulo range.	Check position setpoint.
	Position in user unit generates number overflow in the system unit.	Check position in user unit.
Subfault: 19.3 **Description: Speed setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Specified rotational speed setpoints not plausible.	Adjust rotational speed setpoints.
Subfault: 19.4 **Description: Acceleration setpoint violation**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The specified acceleration setpoints are not plausible. Only a value range of >= 0 is permitted.	Adjust acceleration setpoints.
Subfault: 19.5 **Description: Drive function does not exist**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-existing drive function (FCB) selected via process data.	Specify an existing FCB number for FCB activation via process data.
Subfault: 19.6 **Description: Mass moment of inertia setpoint violation**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Implausible values specified as mass moment of inertia setpoints. Only a value range of >= 0 is permitted.	Adjust the setpoints for the mass moment of inertia.
Subfault: 19.7 **Description: Referencing missing**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Activated function only permitted with referenced encoder.	Reference the encoder first, then activate the function.
Subfault: 19.8 **Description: Drive train changeover not allowed**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Drive train changeover requested while output stage is enabled.	Inhibit the output stage before changing to another drive train.
Subfault: 19.9 **Description: Jerk setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Jerk values not plausible.	Adjust jerk setpoints.

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6.4.16 Fault 20 Device monitoring

Subfault: 20.1 **Description: Supply voltage fault**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Internal electronics supply voltage or externally connected DC 24 V standby supply voltage outside permitted voltage range.	Check the voltage level of the external DC 24 V standby supply voltage and check for correct port. If required, correct. – Acknowledge the fault. – If fault occurs repeatedly, replace device. For further support, contact SEW-EURODRIVE Service.
Subfault: 20.2 **Description: Supply voltage overload**		
	Response: Output stage inhibit	
	Cause	Measure
	For MOVIDRIVE® system, the current load of the current paths of the DC 24 V standby supply voltage inside the device is too high. The device signal output of the device was de-energized because of the fault message.	Identify consumers which are overloading the internal supply voltage: 1 Remove all external consumers: – At the digital outputs of the basic device. - At options that may be present. - At all encoder connections. - At other consumers at the DC 24 V output voltage terminals. 2 Acknowledge the fault. 3 Reconnect the consumers with the device, one after the other, until the fault message appears once again. 4 To eliminate the fault, connect a consumer with a lower current consumption or eliminate the short circuit.
Subfault: 20.7 **Description: Internal hardware fault**		
	Response: Output stage inhibit	
	Cause	Measure
	Error in device hardware.	– Acknowledge the fault. – If fault occurs repeatedly, replace device. For further support, contact SEW-EURODRIVE Service.
Subfault: 20.8 **Description: Fan warning**		
	Response: Warning with self-reset	
	Cause	Measure
	Fan function impaired.	Check fan for proper functioning.
Subfault: 20.9 **Description: Fan fault**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Fan defective.	Contact SEW-EURODRIVE Service.
Subfault: 20.10 **Description: Fan supply voltage fault**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Supply voltage of fan missing.	Check the connection or establish a connection.
Subfault: 20.11 **Description: STO – switching delay**		
	Response: Output stage inhibit	
	Cause	Measure
	Switching delay between STO signals F-STO_P1 and F-STO_P2.	– Check STO wiring. – Check the STO wiring before acknowledging the fault, and make sure that both STO signals are switched to low level.

6.4.17 Fault 23 Power section

Subfault: 23.1 Description: Warning		
	Response: Warning with self-reset	
	Cause	Measure
	Power section fault with fault response of the type "warning".	See also "Power section subcomponent" fault status.
Subfault: 23.2 Description: Fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section fault with fault response of the type "standard".	See also "Power section subcomponent" fault status.
Subfault: 23.3 Description: Critical fault		
	Response: Output stage inhibit	
	Cause	Measure
	Power section fault with fault response of the type "Critical fault".	See also "Power section subcomponent" fault status.
Subfault: 23.4 Description: Hardware fault		
	Response: Output stage inhibit	
	Cause	Measure
	A fault occurred in a hardware component of the power section, e.g.: Overcurrent hardware comparator.	– Check current supply. – Increase ramp time. – Check for correct motor size (the motor current is too high). – Contact SEW-EURODRIVE Service.
	Switched-mode power supply fault, hardware fault.	– Check current supply. – Check the DC 24 V supply voltage.
	Fault at the gate driver of an IGBT.	Defect in the power output stage. Contact SEW-EURODRIVE Service.
	Invalid process data configuration. Status of control section and power section are not compatible.	Contact SEW-EURODRIVE Service.
Subfault: 23.5 Description: Invalid process data configuration		
	Response: Output stage inhibit	
	Cause	Measure
	Invalid process data configuration.	Contact SEW-EURODRIVE Service.
Subfault: 23.6 Description: Process data timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section communication interface detected process data timeout.	If the error occurs repeatedly, contact SEW-EURODRIVE Service.
Subfault: 23.7 Description: Parameter communication timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section communication interface detected timeout in parameter communication.	If the error occurs repeatedly, contact SEW-EURODRIVE Service.
Subfault: 23.8 Description: Parameter communication error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Power section communication interface detected error in parameter communication.	If the error occurs repeatedly, contact SEW-EURODRIVE Service.
Subfault: 23.9 Description: Firmware of power section corrupt		
	Response: Output stage inhibit	
	Cause	Measure
	Failed to update firmware on power section.	Update the firmware again.

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6.4.18 Error 24 Cam switch

Subfault: 24.1 Description: Cam window limits interchanged		
	Response: Warning	
	Cause	Measure
	Left cam window limit larger than right limit.	Check cam window limits and adjust.
Subfault: 24.2 Description: Cam window limit not within modulo range		
	Response: Warning	
	Cause	Measure
	Cam window limits outside modulo range.	Check cam window limits and adjust.
Subfault: 24.3 Description: Cam windows of a track overlap		
	Response: Warning	
	Cause	Measure
	Cam window limits of a track overlap.	Adjust the cam window limits in such a way that they are flush.
Subfault: 24.4 Description: Modulo limits swapped		
	Response: Warning	
	Cause	Measure
	The left limit of the modulo range is larger than the right limit.	Check the limits of the modulo range and adjust accordingly.

6.4.19 Fault 25 Parameter memory monitoring

Subfault: 25.2 Description: NV memory – runtime error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error of non-volatile memory system.	– Reset the device. If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.
Subfault: 25.6 Description: Incompatible device configuration		
	Response: Output stage inhibit	
	Cause	Measure
	The data set in the device was copied from another device, which differs from the current device in the device family, power, or voltage.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	Replaceable memory module used by another device. Power rating, device family, or voltage differs from the current device.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	The power section was replaced and differs in its power rating or voltage from the original power section.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
Subfault: 25.7 Description: NV memory initialization – error		
	Response: Output stage inhibit	
	Cause	Measure
	Error initializing non-volatile memory system.	– Reset the device. If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.

Subfault: 25.10 **Description: Power section configuration data – version conflict**		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of configuration data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.12 **Description: Power section configuration data – CRC error**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.13 **Description: Control electronics configuration data – CRC error**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.14 **Description: Calibration data of power section – version conflict**		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.15 **Description: Calibration data of control electronics – version conflict**		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.16 **Description: Power section calibration data – CRC error**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty calibration data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.17 **Description: Control electronics calibration data – CRC error**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty calibration data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.18 **Description: Power section QA data – CRC error**		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.19 **Description: Control electronics QA data – CRC error**		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.20 **Description: Initialization error – basic device memory**		
	Response: Output stage inhibit	
	Cause	Measure
	Initialization error of the basic device memory.	Contact SEW-EURODRIVE Service.
Subfault: 25.21 **Description: Runtime error – basic device memory**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error in memory of basic device.	Contact SEW-EURODRIVE Service.

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Subfault: 25.30 **Description: Initialization error – replaceable memory module**		
	Response: Output stage inhibit	
	Cause	Measure
	The formatting of the replaceable memory module does not match.	Restore delivery state. NOTICE: All the data on the replaceable memory module will be reset to the default.
	Initialization error of replaceable memory module after delivery state.	Contact SEW-EURODRIVE Service.
Subfault: 25.31 **Description: Runtime error – replaceable memory module**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error of replaceable memory module.	Contact SEW-EURODRIVE Service.
Subfault: 25.50 **Description: Runtime error – replaceable safety memory module**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Runtime error of the replaceable safety memory module.	Contact SEW-EURODRIVE Service.
Subfault: 25.51 **Description: Initialization error – replaceable safety memory module**		
	Response: Warning	
	Cause	Measure
	Initialization error of the replaceable safety memory module.	Contact SEW-EURODRIVE Service.
Subfault: 25.61 **Description: Error – restore point**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to create restore point.	Delete restore point.
Subfault: 25.70 **Description: Incompatible card configuration**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The current configuration of the cards does not match the state of the stored startup. For example, a card was removed that was still present during startup.	– Restore the original configuration of the cards. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".

6.4.20 Fault 26 External fault

Subfault: 26.1 **Description: Terminal**		
	Response: External fault	
	Cause	Measure
	Error message about external error source.	Programmable via 8622.5 (Default: Application stop (+ES)).
Subfault: 26.2 **Description: Emergency shutdown**		
	Response: Output stage inhibit	
	Cause	Measure
	Another module bus station requested external emergency shutdown.	Check other module bus stations for errors.
Subfault: 26.3 **Description: Power section emergency shutdown**		
	Response: Output stage inhibit	
	Cause	Measure
	Power section requested external emergency shutdown because it detected critical fault.	Contact SEW-EURODRIVE Service.

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Subfault: 26.4 Description: External braking resistor fault		
	Response: Response to external braking resistor fault	
	Cause	Measure
	External braking resistor's temperature switch connected to terminal tripped.	– Check the resistor mounting position. – Clean the resistor. – Check the configuration of the resistor. – Install a larger resistor. – Check the trip switch settings. – Optimize travel cycle so that less regenerative operation energy arises.

6.4.21 Fault 28 FCB drive functions

Subfault: 28.1 Description: FCB 11/12 – Timeout while searching zero pulse		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to find zero pulse of encoder's C track within specified search time during reference travel.	Check the encoder wiring.
Subfault: 28.2 Description: FCB 11/12 – Hardware limit switch upstream of reference cam		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The hardware limit switch was reached during reference travel. The reference cam was not detected.	Make sure that the reference cam is not installed downstream of the hardware limit switch.
Subfault: 28.3 Description: FCB 11/12 – Hardware limit switch and reference cam not flush		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Hardware limit switch and reference cam not mounted flush.	Make sure that the reference cam and the hardware limit switch are mounted flush.
Subfault: 28.4 Description: FCB 11/12 – Reference offset error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Error when determining reference offset.	– Make sure that the reference offset is not set to a larger value than the "Modulo maximum" limit value. When using a single-turn absolute encoder, make sure that the reference offset is not set to a larger value than one encoder revolution.
Subfault: 28.5 Description: FCB 11/12 – Referencing not possible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	In the active drive train, the "Actual position source" parameter is set to "No encoder".	Assign "Actual position source", or do not carry out any referencing.
Subfault: 28.6 Description: FCB 11/12 – Limit switch/reference cam not flush/overlapping with fixed stop		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Hardware limit switch or reference cam that has not been selected was approached during reference travel to fixed stop.	Check whether the parameters set for reference travel are correct.
	During reference travel to fixed stop with selected hardware limit switch or reference cam, the fixed stop was reached without approaching the hardware limit switch or reference cam.	Check whether the parameters set for reference travel are correct.

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Subfault: 28.7 **Description: FCB 21 – Test torque greater than maximum torque at motor shaft**		
	Response: Output stage inhibit	
	Cause	Measure
	The required test torque for the brake test is higher than the maximum torque. It cannot be generated by the motor/inverter combination.	Reduce the test torque.
Subfault: 28.8 **Description: FCB 21 – Test torque not reached**		
	Response: Output stage inhibit	
	Cause	Measure
	Test torque required for brake test exceeds valid limit values.	– Reduce the test torque. – Check limit values.
Subfault: 28.9 **Description: FCB 18 – Rotor position identification not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	Rotor position identification started with incremental encoder but aborted prematurely.	– Restart the rotor position identification. – Check whether the encoder is connected correctly. – Check whether encoder is defective.
	Result of rotor position identification cannot be stored in encoder.	Select "inverter" as storage location.
	Combination of "Automatic" mode and "Encoder" storage location not permitted.	Set the operating mode to "Manual" or the storage location to "Inverter".
Subfault: 28.10 **Description: FCB 25 – Unbalanced motor phases**		
	Response: Output stage inhibit	
	Cause	Measure
	Significantly different values determined in the three phases while measuring stator resistances.	– Check whether the motor is connected correctly. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.
Subfault: 28.11 **Description: FCB 25 – At least one phase with high resistance**		
	Response: Output stage inhibit	
	Cause	Measure
	At least one motor phase could not be measured during motor parameter measurement.	– Check whether the motor is connected correctly. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.
Subfault: 28.12 **Description: FCB 25 – Timeout during stator resistance measurement**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement activated while motor is turning.	– Stop motor. – Start motor parameter measurement when the motor is at standstill.
Subfault: 28.13 **Description: FCB 25 – Characteristic curve identification not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement does not allow for unique identification of the characteristic curve.	Contact SEW-EURODRIVE Service.
Subfault: 28.14 **Description: Modulo min. and max. swapped**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	In the active data set, the value for "Modulo minimum" is greater than the value for "Modulo maximum"; see Monitoring functions\Limit values 1 or Monitoring functions\Limit values 2.	Swap the values for modulo minimum and modulo maximum.

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Subfault: 28.15 Description: FCB 25 – Timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Measuring rotor resistance, LSigma, or stator inductance not completed.	Contact SEW-EURODRIVE Service.

6.4.22 Fault 29 HW limit switch

Subfault: 29.1 Description: Positive limit switch approached	
Response: HW limit switch – current drive train	
Cause	Measure
Positive hardware limit switch approached.	– Check hardware limit switch wiring. – Check target position. – Move clear of hardware limit switch with negative speed.
Subfault: 29.2 Description: Negative limit switch approached	
Response: HW limit switch – current drive train	
Cause	Measure
Negative hardware limit switch approached.	– Check hardware limit switch wiring. – Check target position. – Move clear of hardware limit switch with positive speed.
Subfault: 29.3 Description: Limit switch missing	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Both positive and negative hardware limit switches approached at the same time.	– Check hardware limit switch wiring. – Check the parameter setting of digital inputs. – Check the parameter setting of process output data.
Subfault: 29.4 Description: Limit switches swapped	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Positive hardware limit switch approached at negative speed, or negative hardware limit switch approached at positive speed.	Check whether hardware limit switch connections are swapped.

6.4.23 Fault 30 Software limit switch

Subfault: 30.1 Description: Positive limit switch approached	
Response: SW limit switches – current drive train	
Cause	Measure
Positive software limit switch approached.	– Check software limit switch position. – Check target position. – Move clear of software limit switch with negative speed.
Subfault: 30.2 Description: Negative limit switch approached	
Response: SW limit switches – current drive train	
Cause	Measure
Negative software limit switch approached.	– Check software limit switch position. – Check target position. – Move clear of software limit switch with positive speed.
Subfault: 30.3 Description: Limit switches swapped	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Position value of negative software limit switch greater than position value of positive software limit switch.	Check software limit switch positions.

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6.4.24 Fault 31 Thermal motor protection

Subfault: 31.1 Description: Temperature sensor wire break – motor 1		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Connection to temperature sensor of motor 1 interrupted.	Check the temperature sensor wiring.
Subfault: 31.2 Description: Temperature sensor short circuit – motor 1		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit in connection with temperature sensor of motor 1.	Check the temperature sensor wiring.
Subfault: 31.3 Description: Temperature sensor overtemperature – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature sensor of motor 1 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).
Subfault: 31.4 Description: Temperature model overtemperature – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of motor 1 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).
Subfault: 31.5 Description: Temperature sensor prewarning – motor 1		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 exceeds prewarning threshold.	Check for motor overload.
Subfault: 31.6 Description: Temperature model prewarning – motor 1		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 exceeds prewarning threshold.	Check for motor overload.
Subfault: 31.7 Description: UL temperature monitoring		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of active motor signals overtemperature.	Check for motor overload.
Subfault: 31.8 Description: Communication timeout temperature sensor – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Communication with temperature sensor is disrupted, e.g. via MOVILINK® DDI.	Check the cabling.
Subfault: 31.9 Description: Temperature too low – temperature sensor – motor 1		
	Response: Warning with self-reset	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 below -50 °C.	– Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a Pt1000 temperature sensor. – Heat the motor.

Subfault: 31.11 **Description: Temperature sensor wire break – motor 2**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Connection to temperature sensor of motor 2 interrupted.	Check the temperature sensor wiring.
Subfault: 31.12 **Description: Temperature sensor short circuit – motor 2**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit in connection with temperature sensor of motor 2.	Check the temperature sensor wiring.
Subfault: 31.13 **Description: Temperature sensor overtemperature – motor 2**		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature sensor of motor 2 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).
Subfault: 31.14 **Description: Temperature model overtemperature – motor 2**		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of motor 2 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. – Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (Pt1000).
Subfault: 31.15 **Description: Temperature sensor prewarning – motor 2**		
	Response: Thermal motor protection 2 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 2 exceeds prewarning threshold.	Check for motor overload.
Subfault: 31.16 **Description: Temperature model prewarning – motor 2**		
	Response: Thermal motor protection 2 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 2 exceeds prewarning threshold.	Check for motor overload.
Subfault: 31.19 **Description: Temperature too low – temperature sensor – motor 2**		
	Response: Warning with self-reset	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 2 below -50 °C.	– Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a Pt1000 temperature sensor. – Heat the motor.

6.4.25 Fault 32 Communication

Subfault: 32.2 **Description: EtherCAT®/SBus^{PLUS} process data timeout**		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Process data timeout during EtherCAT®/SBusPLUS communication.	– Check the wiring of the system bus and module bus. – Check that the EtherCAT®/SBus^{PLUS} configuration is correctly set in the MOVI-C® CONTROLLER. – Check EtherCAT®/SBus^{PLUS} timeout configuration in the device.

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Subfault: 32.3 Description: Faulty synchronization signal		
	Response: External synchronization	
	Cause	Measure
	Faulty synchronization signal period.	Check for correct setting of the EtherCAT®/SBus^{PLUS} configuration in the MOVI-C® CONTROLLER.
Subfault: 32.4 Description: No synchronization signal		
	Response: External synchronization	
	Cause	Measure
	No synchronization signal present.	Check for correct setting of the EtherCAT®/SBus^{PLUS} configuration in the MOVI-C® CONTROLLER.
Subfault: 32.5 Description: Synchronization timeout		
	Response: External synchronization	
	Cause	Measure
	Timeout while synchronizing to synchronization signal.	Check for correct setting of the EtherCAT®/SBus^{PLUS} configuration in the MOVI-C® CONTROLLER.
Subfault: 32.6 Description: Copy parameter set		
	Response: Output stage inhibit	
	Cause	Measure
	Error while downloading parameter set to device.	– Check the wiring of the system bus and module bus. – Restart download.
Subfault: 32.7 Description: Application heartbeat timeout		
	Response: Application heartbeat – timeout response	
	Cause	Measure
	Communication interrupted between IEC program in MOVI-C® CONTROLLER and device.	– Check status of the IEC program. – Restart IEC program.
Subfault: 32.8 Description: User-timeout timeout		
	Response: User timeout timeout response	
	Cause	Measure
	The timeout time of the user timeout function elapsed.	Write the parameter for triggering the user timeout function cyclically before the timeout time elapses.
Subfault: 32.12 Description: Manual mode timeout		
	Response: Manual mode – timeout response	
	Cause	Measure
	Communication connection to device interrupted in manual mode.	– Check whether too many programs are open on the operator PC. – Increase the timeout time in manual mode.
	New Scope project created.	– Reset fault. – Restart manual operation.
	Scope measurement loaded from device.	– Reset fault. – Restart manual operation.

6.4.26 Fault 33 System initialization

Subfault: 33.1 Description: Motor current measurement		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Motor current measurement detected an error.	Contact SEW-EURODRIVE Service.

Subfault: 33.2 **Description: Firmware CRC check**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error checking firmware.	Contact SEW-EURODRIVE Service.
Subfault: 33.6 **Description: FPGA configuration**		
	Response: Output stage inhibit	
	Cause	Measure
	Error checking FPGA configuration.	Contact SEW-EURODRIVE Service.
Subfault: 33.7 **Description: Function block compatibility error**		
	Response: Output stage inhibit	
	Cause	Measure
	Error checking compatibility of function block.	Contact SEW-EURODRIVE Service.
Subfault: 33.8 **Description: SW function block configuration**		
	Response: Output stage inhibit	
	Cause	Measure
	Error detected while checking configuration of software function block.	Contact SEW-EURODRIVE Service.
Subfault: 33.10 **Description: Boot timeout**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system boot.	Contact SEW-EURODRIVE Service.
Subfault: 33.11 **Description: Hardware compatibility error**		
	Response: Output stage inhibit	
	Cause	Measure
	Firmware does not match device.	Contact SEW-EURODRIVE Service.
Subfault: 33.12 **Description: Memory module plugged in**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A plugged-in memory module was detected during device start. The setting for the device parameter source is set to "Internal memory".	– Switch off the device. Remove the memory module and restart the device. – Change the parameter "Non-volatile memory source" to "Arbitrary" or "Replaceable memory module". Switch the device off and on again.
Subfault: 33.13 **Description: Memory module removed**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The device was started without a memory module. The setting for the device parameter source is set to "Replaceable memory module".	Switch off the device. Insert the memory module and restart the device.
	Replaceable memory module removed during ongoing operation.	Change parameter "Non-volatile memory source" to "Internal memory". Switch the device off and on again.
Subfault: 33.14 **Description: EtherCAT® slave controller cannot be accessed**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	EtherCAT® slave controller cannot be accessed.	Contact SEW-EURODRIVE Service.

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Subfault: 33.15 Description: Firmware configuration		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The Device Update Manager detected a modified version of the application firmware.	Acknowledge the fault. Doing so will update the configuration data of the Device Update Manager.
	The error occurs repeatedly several times. The Device Update Manager is outdated and cannot save the configuration.	Update the Device Update Manager.

6.4.27 Fault 34 Process data configuration

Subfault: 34.1 Description: Changed process data configuration		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Process data configuration changed during active process data operation.	– Stop the process data and make your changes. Then start the process data again. – Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data.

6.4.28 Fault 35 Function activation

Subfault: 35.1 Description: Activation key – application level invalid		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activation key was entered incorrectly.	Enter the activation key again.
	The activation key was not created for this device.	Check the activation key.
	When using a double axis, the activation key for the wrong instance was entered in the device.	Enter the activation key for the allocated instance.
	An activation key for a technology level was entered in the parameter "Application level – Activation key".	Enter the activation key in the correct parameter.
Subfault: 35.2 Description: Application level too low		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activated software module requires a higher application level.	Enter an activation key for the required application level. You can find the required level in the parameter 8438.3 "Application level – Required level".
Subfault: 35.3 Description: Technology level too low		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	An activated technology function requires a higher technology level.	Enter an activation key for the required technology level. You can find the required level in the parameter 8438.13 "Technology level – Required level".
Subfault: 35.4 Description: Activation key – technology level invalid		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The activation key was entered incorrectly.	Enter the activation key again.
	The activation key was not created for this device.	Check the activation key.
	When using a double axis, the activation key for the wrong instance was entered in the device.	Enter the activation key for the allocated instance.
	An activation key for an application level was entered in the parameter "Technology level – Activation key".	Enter the activation key in the correct parameter.

6.4.29 Fault 42 Lag error

Subfault: 42.1 Description: Positioning lag error	
Response: Positioning lag error	
Cause	Measure
A lag error occurred during positioning. Incorrect encoder connection.	Check the connection of the encoder.
Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
Wiring faulty.	Check the wiring of encoder, motor, and line phases.
Acceleration ramps too short.	Extend acceleration ramps.
P component of position controller too small.	Set P component of position controller to a larger value.
Incorrectly set speed controller parameters.	Check controller parameters.
Value of lag error tolerance too small.	Increase the lag error tolerance.
Mechanical components cannot move freely or are blocked.	Make sure mechanical parts can move freely, and check whether they are blocked.
Subfault: 42.2 Description: Jog mode lag error	
Response: Output stage inhibit	
Cause	Measure
A lag error occurred in jog mode (FCB 20). Incorrect encoder connection.	Check the connection of the encoder.
Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
Wiring faulty.	Check the wiring of encoder, motor, and line phases.
Acceleration ramps too short.	Extend acceleration ramps.
P component of position controller too small.	Set P component of position controller to a larger value.
Incorrectly set speed controller parameters.	Check controller parameters.
Value of lag error tolerance too small.	Increase the lag error tolerance.
Mechanical components cannot move freely or are blocked.	Make sure mechanical parts can move freely, and check whether they are blocked.
Subfault: 42.3 Description: Standard lag error	
Response: Output stage inhibit	
Cause	Measure
A lag error has occurred outside a positioning process. Incorrect encoder connection.	Check the connection of the encoder.
Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
Wiring faulty.	Check the wiring of encoder, motor, and line phases.
Acceleration ramps too short.	Extend acceleration ramps.
P component of position controller too small.	Set P component of position controller to a larger value.
Incorrectly set speed controller parameters.	Check controller parameters.
Value of lag error tolerance too small.	Increase the lag error tolerance.

6.4.30 Fault 46 Safety card

Subfault: 46.1 Description: No response	
Response: Output stage inhibit	
Cause	Measure
Failed to synchronize with subcomponent.	– Check device assignment of basic device and option. – Check card slot and installation and correct if necessary. – Restart the device. – Contact SEW-EURODRIVE Service.

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Subfault: 46.2 Description: Invalid variant		
	Response: Output stage inhibit	
	Cause	Measure
	Plugged safety card design does not match inverter type.	– Remove safety card. – Use the correct safety card design.
	For double axes, only designs without encoder interface can be used.	– Remove option. – Use the design without encoder interface.
	For double axes, no encoder option must be plugged in.	Remove the option.
Subfault: 46.3 Description: Internal communication timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication interrupted between inverter and safety card.	Check card slot and installation and correct if necessary. Contact SEW-EURODRIVE Service if the error is still present.
	Safety card signals subcomponent fault of the type "warning".	Check card slot and installation and correct if necessary. Contact SEW-EURODRIVE Service if the error is still present.
Subfault: 46.50 Description: Warning		
	Response: Warning with self-reset	
	Cause	Measure
	Safety card signals subcomponent fault of the type "warning".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).
Subfault: 46.51 Description: Fault		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	Safety card signals subcomponent fault of the type "standard fault".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).
Subfault: 46.52 Description: Critical fault		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	Safety card signals subcomponent fault of the type "critical fault".	– For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3). – If the jumper plug is plugged at terminal "X6", remove the jumper plug.

6.4.31 Fault 47 Supply unit

Subfault: 47.1 Description: Supply unit – warning		
	Response: Warning with self-reset	
	Cause	Measure
	The supply unit signals a fault with response type "warning". The fault is only displayed.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).
Subfault: 47.2 Description: Supply unit – standard fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The supply unit signals a fault with response type "standard". The fault response is determined by the driver implemented on the axis. The axis performs the fault response.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

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Subfault: 47.3 Description: Supply unit – critical fault		
	Response: Output stage inhibit	
	Cause	Measure
	The supply unit signals a fault with response type "critical error". The fault response is determined by the driver implemented on the axis. The axis performs the fault response.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

6.4.32 Fault 48 Module bus

Subfault: 48.1 Description: Incompatible		
	Response: Output stage inhibit	
	Cause	Measure
	Module bus slave and module bus master not compatible.	Update the firmware of the module bus at the supply unit or the axis modules to a compatible version.
Subfault: 48.2 Description: Timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Timeout detected by module bus.	Check cable connections and voltage supply of module bus stations.
Subfault: 48.3 Description: Number of module bus slaves exceeded		
	Response: Output stage inhibit	
	Cause	Measure
	Too many module bus slaves.	Reduce the number of module bus slaves to a maximum of one module bus slave.
Subfault: 48.4 Description: CRC error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	CRC error during module bus communication.	– Restart the device. – Reset the fault. – Contact SEW-EURODRIVE service if the fault reoccurs.

6.4.33 Fault 50 I/O card

Subfault: 50.1 Description: Boot synchronization timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Card plugged in device but cannot be accessed.	– Check device assignment of basic device and option. – Check card slot and installation and correct if necessary. – Restart device.
Subfault: 50.2 Description: CRC error of FPGA driver		
	Response: Output stage inhibit	
	Cause	Measure
	Communication between FPGA and option card does not work, or is interrupted.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.
Subfault: 50.3 Description: CRC error of option card		
	Response: Output stage inhibit	
	Cause	Measure
	Option card signals CRC error on SPI bus.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.

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Subfault: 50.4 Description: Option card timeout error		
	Response: Output stage inhibit	
	Cause	Measure
	Option card signals timeout error on SPI bus.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.
Subfault: 50.5 Description: Option card watchdog error		
	Response: Output stage inhibit	
	Cause	Measure
	Microcontroller of option card signals a watchdog error.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.
Subfault: 50.6 Description: Ready signal timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Card booted but cyclical communication not possible.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.
Subfault: 50.7 Description: Frame error of option card		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty communication between option card and basic device.	–

6.4.34 Fault 51 Analog processing

Subfault: 51.1 Description: Analog current input 4 mA limit		
	Response: Warning with self-reset	
	Cause	Measure
	Input current below 4 mA.	Check input current.

6.4.35 Fault 52 Explosion protection function category 2

Subfault: 52.1 Description: Startup error		
	Response: Output stage inhibit	
	Cause	Measure
	No valid startup available.	Perform startup.
Subfault: 52.2 Description: Impermissible system function		
	Response: Output stage inhibit	
	Cause	Measure
	Impermissible system function activated.	Disable impermissible functions when Ex protection function is active, such as "Activate standstill current" = "On" in the active control mode.
Subfault: 52.3 Description: Inverter too large		
	Response: Output stage inhibit	
	Cause	Measure
	Ratio of inverter current to nominal motor current too large.	Check the assignment of motor and inverter, and check the dimensioning of the system.
Subfault: 52.4 Description: Parameterization of current limit characteristic		
	Response: Output stage inhibit	
	Cause	Measure
	Error setting parameters for current limit characteristic.	– Parameterize the current limit characteristic. – Perform startup again.

Subfault: 52.5 Description: Time duration exceeded f < 5 Hz		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Duration of 60 s for f < 5 Hz exceeded.	Check the dimensioning of the system: If speed control = FCB05, increase the speed. If speed = 0, inhibit output stage / with stop FCBs, activate the brake function if a brake is installed.

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6.5 Power section fault description

6.5.1 Fault 7 DC link

Subfault: 7.1 Description: DC link overvoltage		
	Response: Remote – critical fault	
	Cause	Measure
	Maximum permitted DC link voltage limit exceeded and output stage inhibited by hardware.	– Extend deceleration ramps. – Check supply cable to the braking resistor. – Check the technical data of the braking resistor.

6.5.2 Fault 11 Temperature monitoring

Subfault: 11.7 Description: Wire break at temperature sensor of heat sink		
	Response: Remote – warning with self-reset	
	Cause	Measure
	Wire break at temperature sensor of heat sink.	Contact SEW-EURODRIVE Service.
Subfault: 11.8 Description: Short circuit at temperature sensor of heat sink		
	Response: Remote – warning with self-reset	
	Cause	Measure
	Short circuit at temperature sensor of heat sink.	Contact SEW-EURODRIVE Service.

6.5.3 Fault 17 Internal processor fault

Subfault: 17.6 Description: Watchdog		
	Response: Disable rectifier	
	Cause	Measure
	CPU watchdog responded.	
Subfault: 17.7 Description: Exception error		
	Response: Disable rectifier	
	Cause	Measure
	Exception trap in CPU.	Contact SEW-EURODRIVE Service.

6.5.4 Fault 18 Software error

Subfault: 18.7 Description: Fatal error		
	Response: Disable rectifier	
	Cause	Measure
	Fatal software error.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.
Subfault: 18.8 Description: Invalid fault code		
	Response: Remote – standard fault	
	Cause	Measure
	Invalid fault code requested.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

6.5.5 Fault 20 Device monitoring

Subfault: 20.1 **Description: Supply voltage fault**		
	Response: Remote – critical fault	
	Cause	Measure
	Internal electronics supply voltage or externally connected DC 24 V standby supply voltage outside permitted voltage range.	Check the voltage level of the external DC 24 V standby supply voltage and check for correct port. If required, correct. – Acknowledge the fault. – If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service.
Subfault: 20.8 **Description: Fan warning**		
	Response: Remote – warning with self-reset	
	Cause	Measure
	Fan function impaired.	Check the fan for proper functioning.
Subfault: 20.9 **Description: Fan fault**		
	Response: Remote – standard fault	
	Cause	Measure
	Fan defective.	Contact SEW-EURODRIVE Service.

6.5.6 Fault 25 Parameter memory monitoring

Subfault: 25.2 **Description: NV memory – runtime error**		
	Response: Remote – standard fault	
	Cause	Measure
	Runtime error of non-volatile memory system.	– Reset the device. – If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.
Subfault: 25.3 **Description: NV data import – error**		
	Response: Remote – standard fault	
	Cause	Measure
	Error importing non-volatile memory data from non-volatile memory.	– Reset the device. – If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.
Subfault: 25.4 **Description: NV setup – fault**		
	Response: Remote – standard fault	
	Cause	Measure
	Error while performing delivery state or during basic initialization of the parameters.	– Reset the device. – If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.
Subfault: 25.5 **Description: NV data fault**		
	Response: Remote – standard fault	
	Cause	Measure
	Faulty data detected in non-volatile memory system.	The data on the (mobile) non-volatile memory might have been formatted for another unit. You can rectify the fault by reformatting the data (basic initialization).

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Subfault: 25.6 Description: Incompatible device configuration		
	Response: Remote – standard fault	
	Cause	Measure
	The data set in the device was copied from another device, which differs from the current device in the device family, power, or voltage.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	Replaceable memory module used by another device. Power rating, device family, or voltage differs from the current device.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	The power section was replaced and differs in its power rating or voltage from the original power section.	– Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
Subfault: 25.7 **Description: NV memory initialization – error**		
	Response: Remote – standard fault	
	Cause	Measure
	Error initializing non-volatile memory system.	– Reset the device. – If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.
Subfault: 25.9 **Description: NV memory hardware – fault**		
	Response: Remote – standard fault	
	Cause	Measure
	Faulty access to non-volatile memory hardware.	– Reset the device. – If this occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service.
Subfault: 25.10 **Description: Power section configuration data – version conflict**		
	Response: Remote – standard fault	
	Cause	Measure
	Wrong version of configuration data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.12 **Description: Power section configuration data – CRC error**		
	Response: Remote – standard fault	
	Cause	Measure
	Faulty configuration data of power section.	Contact SEW-EURODRIVE Service.

6.5.7 Fault 32 Communication

Subfault: 32.6 Description: Copy parameter set		
	Response: Remote – standard fault	
	Cause	Measure
	Error while downloading parameter set to device.	– Check the wiring of the system bus and module bus. – Restart download.
Subfault: 32.13 **Description: Process data timeout**		
	Response: Remote – warning with self-reset	
	Cause	Measure
	Process data timeout.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the safety card and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.

6.5.8 Fault 33 System initialization

Subfault: 33.2 **Description: Firmware CRC check**		
	Response: Disable rectifier	
	Cause	Measure
	Error checking firmware.	Contact SEW-EURODRIVE Service.
Subfault: 33.8 **Description: SW function block configuration**		
	Response: Remote – standard fault	
	Cause	Measure
	Error detected while checking configuration of software function block.	Contact SEW-EURODRIVE Service.
Subfault: 33.9 **Description: Power section hardware compatibility fault**		
	Response: Remote – critical fault	
	Cause	Measure
	Firmware does not match hardware of power section.	Contact SEW-EURODRIVE Service.

6.5.9 Fault 44 Subcomponent power section

Subfault: 44.1 **Description: Power section SMPS fault**		
	Response: Remote – critical fault	
	Cause	Measure
	The switched-mode power supply in power section is faulty. Hardware fault.	Contact SEW-EURODRIVE Service.
Subfault: 44.2 **Description: Overcurrent phase U**		
	Response: Remote – critical fault	
	Cause	Measure
	Overcurrent phase U.	– Rectify the short circuit. – Connect a smaller motor. – Increase the ramp time. – In the event of a defective output stage, contact SEW-EURODRIVE Service.
Subfault: 44.3 **Description: Overcurrent phase V**		
	Response: Remote – critical fault	
	Cause	Measure
	Overcurrent phase V.	– Rectify the short circuit. – Connect a smaller motor. – Increase the ramp time. – In the event of a defective output stage, contact SEW-EURODRIVE Service.
Subfault: 44.4 **Description: Overcurrent phase W**		
	Response: Remote – critical fault	
	Cause	Measure
	Overcurrent phase W.	– Rectify the short circuit. – Connect a smaller motor. – Increase the ramp time. – In the event of a defective output stage, contact SEW-EURODRIVE Service.
Subfault: 44.5 **Description: Faulty supply voltage for gate drivers**		
	Response: Remote – critical fault	
	Cause	Measure
	Faulty supply voltage for gate drivers for phases U, V, W.	Switch the power off and on again/perform a reset.
	Phase module not ready for operation.	If the fault is still present, replace the device. Contact SEW-EURODRIVE Service.

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Subfault: 44.6 Description: Faulty supply voltage in gate drivers for brake chopper		
	Response: Remote – critical fault	
	Cause	Measure
	Faulty supply voltage in gate drivers for brake chopper.	Switch the power off and on again/perform a reset.
	Brake chopper not ready for operation.	If the fault is still present, replace the device. Contact SEW-EURODRIVE Service.
Subfault: 44.7 Description: Hardware error signal		
	Response: Remote – critical fault	
	Cause	Measure
	Power section hardware signals a fault. It is not possible to pinpoint the fault.	– Switch the power off and on again/perform a reset. – If the fault is still present, replace the device. Contact SEW-EURODRIVE Service.

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6.6 Responses to fault acknowledgement

6.6.1 Fault acknowledgement

During fault acknowledgement, the final fault status determines which reset type will be executed, see following table.

Final fault status	Responses to fault acknowledgement
System blocked	System restart
System waiting	Warm start: Delete fault code
Only display fault	Warm start: Delete fault code

Software reset

Response	Effect
System restart with start of the CPU	Behavior equal to device start
	Reference is lost
	Fieldbus interface is restarted
	EtherCAT®/SBus^{PLUS} is restarted
	The active "fault message" is reset (digital output = 1, system status = 0).

Software restart

A software restart is **no** real reset of the micro controller.

Response	Effect
Software restart	The firmware will be restarted, without the boot loader becoming active (no display "b0"!).
	Reference positions of incremental encoder systems will be lost.
	Any existing fieldbus interfaces are not affected.
	The interface between options and firmware system is initialized again. A new boot synchronization to the fieldbus or control option takes place.
	The active "fault message" is reset (digital output = 1, system status = 0).

The ready signal is set again depending on the system state after the reset by the system state control.

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Warm start

A warm start only resets the fault code.

Response	Effect
Warm start	The firmware system is not rebooted.
	All reference positions will be maintained.
	Communication is not interrupted.
	The active "fault message" is reset (digital output = 1, system status = 0).

Fieldbus timeout

After manual reset of a fault, the fault message is deleted. The system changes to the state "Waiting for data".

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6.7 Fault responses

6.7.1 Default – fault response

Fault response	Description
No response	The inverter ignores the event.
Warning with self-reset	The inverter sends a warning message with self-reset. The fault is automatically reset after the cause of fault is eliminated.
Warning	The inverter issues a warning message.
Application stop (with output stage inhibit)	The inverter stops with the deceleration set for the application limit. Parameter set 1 Index 8375.0-13 Parameter set 2 Index 8375.8-13 For n=0: Brake "applied" and output stage "off".
Application stop (with output stage inhibit) with self reset	
Emergency stop (with output stage inhibit)	The inverter stops with the set emergency stop deceleration. Parameter set 1 Index 8375.0-20 Parameter set 2 Index 8375.8-20
Emergency stop (with output stage inhibit) with self-reset	
Inhibit output stage with self reset	The output stage is deactivated and the brake is applied.
Inhibit output stage	

Self-reset means: Eliminating the cause of the fault acknowledges the fault. The inverter automatically resumes the operation performed before the fault. The drive restarts automatically.

6.7.2 Parameterizable faults

Parameterizable faults	Description	Index no.	Possible fault response
Manual mode – timeout response	This parameter is used to set the response to a bus timeout during manual mode.	8504.3	• Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Heat sink overtemperature – prewarning	Here, you can set the device response when the prewarning threshold for heat sink utilization is exceeded (index 8336.1).	8622.2	• No response • Warning
Positioning lag fault	This parameter is used to set the device response to a lag error (lag error window exceeded, index 8509.4).	8622.3	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Line phase failure	This parameter is used to set the device response to a line phase failure (values below threshold defined by the user, index 8351.5).	8622.4	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
External fault	This parameter is used to set the device response to an external fault (e.g. triggered by terminal or control word).	8622.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage

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Parameterizable faults	Description	Index no.	Possible fault response
Fieldbus – timeout	This parameter is used to set the device response to an EtherCAT®/SBus^{PLUS} timeout (timeout time, index 8455.3).	8622.6	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self reset • Emergency stop (with output stage inhibit) with self reset • Inhibit output stage with self reset
External synchronization	This parameter is used to set the device response to loss of external synchronization.	8622.7	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self reset • Emergency stop (with output stage inhibit) with self reset • Inhibit output stage with self reset
Motor temperature prewarning – current parameter set	Motor temperature active parameter set – prewarning.	8622.8	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Electromechanical utilization – prewarning	This parameter is used to set the device response to an exceeded prewarning threshold for electromechanical utilization (index 8336.2).	8622.10	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
HW limit switches – current parameter set		8622.11	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self reset
SW limit switches – current parameter set		8622.12	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self reset
Encoder – warning	This parameter is used to set the device response to an encoder warning.	8622.13	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Encoder – fault	This parameter is used to set the device response to an encoder fault.	8622.14	• Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Additional encoder	This parameter is used to set the device response to a fault of an encoder that is not used for control (speed or positioning control).	8622.15	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Encoder 1 – latest fault		8622.16	• No response
Encoder 2 – latest fault		8622.17	• No response

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Parameterizable faults	Description	Index no.	Possible fault response
Encoder 1 – latest critical fault		8622.18	• No response • Inhibit output stage
Encoder 2 – latest critical fault		8622.19	• No response • Inhibit output stage
Response to external braking resistor fault	External braking resistor fault	8622.20	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Application heartbeat timeout	This parameter is used to set the device response to a timeout of the application heartbeat.	8622.21	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage

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7 Service

7.1 Electronics Service by SEW-EURODRIVE

If you are unable to rectify a fault, contact SEW-EURODRIVE Service. For the addresses, refer to www.sew-eurodrive.com.

When contacting SEW-EURODRIVE Service, always specify the following information so that our service personnel can assist you more effectively:

- Information on the device type on the nameplate (e.g. type designation, serial number, part number, product key, purchase order number)
- Brief description of the application
- Fault message on the status display
- Nature of the fault
- Accompanying circumstances
- Any unusual events preceding the problem

7.2 Extended storage

If the application inverters are stored in a temperature range of 5 °C to 40 °C, no measures are required.

The following table lists the application inverters, time intervals, and measures that are required if the application inverters are stored outside the abovementioned temperature range.

For all application inverters other than the ones listed, **no** measures are required.

Modules	Time interval	Measure
- MDX9_A-0020 – 5880-5_3-.. - MDX9_A-0070 – 1080-2_3-..	Every 2 years	Line connections: Connect the device to the line voltage for 5 minutes.
All application inverters		Connect the device to 24 V for 5 minutes.

7.2.1 Procedure in case maintenance has been neglected

If you have not performed maintenance regularly, SEW-EURODRIVE recommends that you increase the line voltage slowly up to the maximum voltage. This can be done, for example, by using a variable transformer for which the output voltage has been set according to the following overview. After you have completed the regeneration process, the device can be used immediately or stored again.

The following graduations are recommended:

AC 400/500 V devices:

- Stage 1: 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 1 hour

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7.3 Shutdown

To shut down the application inverter, de-energize the application 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.

7.4 Waste disposal

Observe the applicable national regulations.

Dispose of the following materials separately in accordance with the country-specific regulations in force, such as:

- Electronics scrap (printed circuit boards)
- Plastic
- Sheet metal
- Copper
- Aluminum

This product falls within the scope of the European WEEE Directive 2012/19/EU on waste electrical and electronic equipment.

Under no circumstances may electrical and electronic equipment be placed in regular household waste. The product must be disposed of properly in accordance with the currently applicable statutory regulations of the respective EU Member State, Norway, Liechtenstein, and Iceland.

The aim of this is to ease the burden on natural resources and to protect the environment and human health from hazardous substances by bringing them to recycling.

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8 Technical data

The following technical data applies to MOVIDRIVE® system and MOVIDRIVE® technology.

8.1 Markings

8.1.1 Basic device

The application inverter complies with the following directives and guidelines:

Marking	Definition
CE	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • EMC Directive 2014/30/EU • Machinery Directive 2006/42/EC • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
EAC	The EAC marking states compliance with the requirements of the technical regulations of the Customs Union of Russia, Kazakhstan, and Belarus.
RCM	The RCM marking states compliance with the technical regulations of the Australian Communications and Media Authority ACMA.
50	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c UL us LISTED	The UL and cUL marking state the UL approval.[1)] cUL is equivalent to CSA approval.

1) The UL and cUL marking for the following devices are still in preparation at the time of publication of this document: MDX9_A-0460 – 1490-5_3-.., MDX9_A-0420 – 1080-2_3-..

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8.1.2 Accessories

Braking resistors BR..

Marking	Definition
CE	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
25 e	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c UL us	The cUR marking states the UL approval for this component.

TCB thermal circuit breaker

Mark	Definition
CE	The CE mark states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
25	The China RoHS mark states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c UL us	The cUR mark states the UL approval for this component.

NF.. line filter

Mark	Definition
CE	The CE mark states the compliance with the following European guidelines: • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
e	The China RoHS mark states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c UL us	The cUR mark states the UL approval for this component.

ND.. line choke

Marking	Definition
CE	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment

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Marking	Definition
	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
	The cUR marking states the UL approval for this component.

Output filter

Marking	Definition
	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
	The cUR marking states the UL approval for this component.

Output choke

Marking	Definition
	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
	The cUR marking states the UL approval for this component.

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8.2 General technical data

The following table lists the technical data for all application inverters independent of

- Type
- Design
- Size
- Performance

General specifications	
Interference immunity	Meets EN 61800-3; 2. Environment
Interference emission	Limit value class C2 to EN 61800-3 The interference suppression level can be improved with relevant measures. Refer to the chapter "EMC-compliant installation according to EN 61800-3" in the product manual for further information.
Ambient temperature ϑ_{amb}	0 °C to +40 °C without derating 40 °C to +60 °C with derating[1)] For further information, refer to the chapter "Selection of an application inverter > Derating" in the product manual.
Type of cooling	Increased air cooling due to an installed, temperature-controlled fan.
Climatic conditions	• Long-term storage (weatherproof): EN 60721-3-1 class 1K2 temperature -25 °C to +70 °C (in contrast to the standard) Non-condensing, no moisture condensation • Transport (weatherproof): EN 60721-3-2 class 2K3 temperature -25 °C to +70 °C Non-condensing, no moisture condensation • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3K3 temperature 0 °C to +45 °C (in contrast to the standard) Non-condensing, no moisture condensation
Chemically active substances	• Long-term storage (weatherproof): EN 60721-3-1 class 1C2, no corrosive gases, no salt mist (in contrast to the standard) • Transport (weatherproof): EN 60721-3-2 class 2C2, no corrosive gases, no salt mist, no sea water (in contrast to the standard) • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3C2, no corrosive gases, no salt mist
Mechanically active substances	• Long-term storage (weatherproof): EN 60721-3-1 class 1S1, no conductive dust • Transport (weatherproof): EN 60721-3-2 class 2S1 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3S1, no conductive dust

1) When using a CS.A card the ambient temperature is limited to a maximum of 55 °C.

Degree of protection according to EN 60529	
MDX9_A-0020-... – MDX9_A-0320-5_3-... MDX9_A-0070-... – MDX9_A-0290-2_3-...	IP20
as of MDX9_A-0460-... as of MDX9_A-0420...	IP10, optional IP20
Pollution class	2 in accordance with IEC 60664-1
Overvoltage category	III in accordance with IEC 60664-1
Installation altitude	Up to h ≤ 1000 m without restrictions. The following restrictions apply to altitudes > 1000 m: • From 1000 m to max. 3800 m: I_N reduction by 1% per 100 m • From 2000 m to max. 3800 m: To maintain protective separation and the air gaps and to comply with creepage distances according to EN 61800-5-1, an overvoltage protection device must be connected upstream to reduce the overvoltages from category III to category II.

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8.3 Technical data of basic device

8.3.1 Performance data 3 × AC 400 V

	Unit	MDX9_A-...-5_3-4-..								
Type		**0020**	**0025**	**0032**	**0040**	**0055**	**0070**	**0095**	**0125**	**0160**
Size		1				2			3	
Nominal output current I_N f_{PWM} = 4 kHz	A	2	2.5	3.2	4	5.5	7	9.5	12.5	16
Input										
Nominal line voltage (to EN 50160) AC U_{line}		3 × 380 – 500 V								
Nominal line current AC I_{line}	A	1.8	2.25	2.88	3.6	4.95	6.3	8.55	11.3	14.4
Line frequency f_{line}	Hz	50 – 60 ± 10%								
Controlled rectifier		No								
X1 connection contacts		Plug connector – 1 core: 0.25 – 4 mm² – 2 cores: 0.25 – 2.5 mm² (twin AEH)[1)]								
Output										
Output voltage U_{out}	V	0 – U_{line}								
Motor power ASM P_{Mot}	kW	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5
Nominal output current I_N f_{PWM} = 4 kHz	A	2	2.5	3.2	4	5.5	7	9.5	12.5	16
Overload capacity		200%: 3 s at f_{PWM} = 4 kHz								
Continuous output current at f = 0 Hz		100% × I_N at f_{PWM} = 4 kHz								
Apparent output power S_N	kVA	1.9	2.3	2.9	3.7	5	6.5	8.8	11.6	14.9
Nominal DC link voltage U_{NDCL}	V	DC 560								
Frequency f_{PWM}	kHz	4, 8, 16 (adjustable)								
Max. output frequency f_{max}	Hz	U/f: 599 VFC^{PLUS}: 250 CFC: 500 ELSM®: 500								
X2 connection contacts		Plug connector – 1 core: 0.25 – 4 mm² – 2 cores: 0.25 – 2.5 mm² (twin AEH)[1)]								
General										
Nominal power loss 24 V	W	20								
Power section nominal power loss	W	16	20	27	34	45	58	83	112	147
Permitted number of times power may be switched on/off	min-1	1								
Minimum switch-off time for Power off	s	10								
EMC variant of power section		EMC filter limit value category C2 to EN 61800-3								
Mass	kg	4.1				4.4			5.7	
Brake chopper and braking resistor										
Minimum braking resistance value R_{BRmin}	Ω	100				47			27	
Brake chopper continuous power	kW	1.9	2.3	2.9	3.7	5	6.5	8.8	11.6	14.9
Brake chopper peak power		200% × apparent output power S_N × 0.9								
Connection contacts		Plug connector – 1 core: 0.25 – 4 mm² – 2 cores: 0.25 – 2.5 mm² (twin AEH)[1)]								
Dimensions										
Width	mm	95				105			105	
Height with shield plates	mm	479				479			494	
Depth	mm	215				215			260	

1) AEH: Conductor end sleeve

	Unit	MDX9_A-...-5_3-4-..							
Type		**0240**	**0320**	**0460**	**0620**	**0750**	**0910**	**1130**	**1490**
Size		4		5			6		
Nominal output current I_N f_{PWM} = 4 kHz	A	24	32	46	62	75	91	113	149

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	Unit	MDX9_A-...-5_3-4-..							
Type		**0240**	**0320**	**0460**	**0620**	**0750**	**0910**	**1130**	**1490**
Input									
Nominal line voltage (to EN 50160) AC U_{line}		3 × 380 – 500 V							
Nominal line current AC I_{line}	A	21.6	28.8	41.4	55.8	67.5	81.9	102	134
Line frequency f_{line}	Hz	50 – 60 ± 5%							
Controlled rectifier		Yes							
X1 connection contacts		Plug connector – 1 core: 0.5 – 16 mm² – 2 cores: 0.25 – 6 mm² (twin AEH)[1)]		M8			M10		
Output									
Output voltage U_{out}	V	0 – U_{line}							
Motor power ASM P_{Mot}	kW	11	15	22	30	37	45	55	75
Nominal output current I_N f_{PWM} = 4 kHz	A	24	32	46	62	75	91	113	149
Overload capacity		200%: 3 s at f_{PWM} = 4 kHz							
Continuous output current at f = 0 Hz		100% × I_N at f_{PWM} = 4 kHz							
Apparent output power S_N	kVA	15.3	19.8	28.8	38.7	46.8	56.7	70.2	92.7
Nominal DC link voltage U_{NDCL}	V	DC 560							
Frequency f_{PWM}	kHz	4, 8, 16 (adjustable)							
Max. output frequency f_{max}	Hz	U/f: 599 VFC^{PLUS}: 250 CFC: 500 ELSM®: 500							
X2 connection contacts		Plug connector – 1 core: 0.5 – 16 mm² – 2 cores: 0.25 – 6 mm² (twin AEH)[1)]		M8			M10		
General									
Nominal power loss 24 V	W	30		15			20		
Power section nominal power loss	W	202	282	419	600	760	931	968	1332
Permitted number of times power may be switched on/off	min-1	1							
Minimum switch-off time for Power off	s	10							
EMC variant of power section		Basic interference suppression integrated							
Mass	kg	6.6		12.1			24.1		
Brake chopper and braking resistor									
Minimum braking resistance value R_{BRmin}	Ω	15		10	6		4.7		3.6 at 149 A
Brake chopper continuous power	kW	15.3	19.8	28.8	38.7	46.8	56.7	70.2	92.7
Brake chopper peak power		200% × apparent output power S_N × 0.9							
Connection contacts		Plug connector – 1 core: 0.5 – 16 mm² – 2 cores: 0.25 – 6 mm² (twin AEH)[1)]		M8			M10		
Dimensions									
Width	mm	135		196			240		
Height with shield plates	mm	494		471			544		
Depth	mm	260		293			328		

1) AEH: Conductor end sleeve

	Unit	MDX9_A-...-5_3-4-..						
Type		**1770**	**2200**	**2500**	**3000**	**3800**	**4700**	**5880**
Size		7				8		

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	Unit	MDX9_A-...-5_3-4-..						
Type		**1770**	**2200**	**2500**	**3000**	**3800**	**4700**	**5880**
Nominal output current I_N f_{PWM} = 4 kHz	A	177	220	250	300	380	470	588
Input								
Nominal line voltage (to EN 50160) AC U_{line}		3 × 380 – 500 V						
Nominal line current AC I_{line}	A	159	198	225	270	342	423	529
Line frequency f_{line}	Hz	50 – 60 ± 5%						
Controlled rectifier		Yes						
X1 connection contacts		M12						
Output								
Output voltage U_{out}	V	0 – U_{line}						
Motor power ASM P_{Mot}	kW	90	110	132	160	200	250	315
Nominal output current I_N f_{PWM} = 4 kHz	A	177	220	250	300	380	470	588
Overload capacity		200% at f_{PWM} = 4 kHz	200% at f_{PWM} = 2.5 kHz		150% at f_{PWM} = 2.5 kHz	150% at f_{PWM} = 2.5 kHz		
Continuous output current at f = 0 Hz		100% × I_N at f_{PWM} = 2.5 kHz						
Apparent output power S_N	kVA	110.7	136.8	230	277	350	434	541
Nominal DC link voltage U_{NDCL}	V	DC 560						
Frequency f_{PWM}	kHz	4, 8		2.5, 4, 8		2.5, 4		
Max. output frequency f_{max}	Hz	U/f: 599 VFC^{PLUS}: 250 CFC: 500 ELSM®: 500						
X2 connection contacts		M12						
General								
Nominal power loss 24 V								
Power section nominal power loss								
Permitted number of times power may be switched on/off								
Minimum switch-off time for Power off								
EMC variant of power section		Basic interference suppression integrated						
Mass								
Brake chopper and braking resistor								
Minimum braking resistance value R_{BRmin}	Ω	2.3				1		
Brake chopper continuous power	kW	110.7	136.8	230	277	350	434	541
Brake chopper peak power		200% × apparent output power S_N × 0.9						
Connection contacts		M12						
Dimensions								
Width	mm							
Height	mm							
Depth	mm							

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8.3.2 Performance data 3 × AC 230 V

	Unit	MDX9_A-...-2_3-4-..		
Type		**0070**	**0093**	**0140**
Size		2		3
Nominal output current I_N f_{PWM} = 4 kHz	A	7	9.3	14
Input				
Nominal line voltage (to EN 50160) AC U_{line}		3 × 200 – 240 V		
Nominal line current AC I_{line}	A	6.3	8.37	12.6
Line frequency f_{line}	Hz	50 – 60 ± 10%		
Controlled rectifier		No		
X1 connection contacts		Plug connector – 1 core: 0.25 – 4 mm² – 2 cores: 0.25 – 2.5 mm² (twin AEH)[1)]		
Output				
Output voltage U_{out}	V	0 – U_{line}		
Motor power ASM P_{Mot}	kW	1.5	2.2	3.7
Nominal output current I_N f_{PWM} = 4 kHz	A	7	9.3	14
Overload capacity		200%: 3 s at f_{PWM} = 4 kHz		
Continuous output current at f = 0 Hz		100% × I_N at f_{PWM} = 4 kHz		
Apparent output power S_N	kVA	3.7	4.9	7.5
Nominal DC link voltage U_{NDCL}	V	DC 325		
Frequency f_{PWM}	kHz	4, 8, 16 (adjustable)		
Max. output frequency f_{max}	Hz	U/f: 599 VFC^{PLUS}: 250 CFC: 500 ELSM®: 500		
X2 connection contacts		Plug connector – 1 core: 0.25 – 4 mm² – 2 cores: 0.25 – 2.5 mm² (twin AEH)[1)]		
General				
Nominal power loss 24 V	W	20		
Power section nominal power loss	W	51	72	105
Permitted number of times power may be switched on/off	min-1	1		
Minimum switch-off time for Power off	s	10		
EMC variant of power section		EMC filter limit value category C2 to EN 61800-3		
Mass		4.4		5.7
Brake chopper and braking resistor				
Minimum braking resistance value R_{BRmin}	Ω	27		15
Brake chopper continuous power	kW	3.7	4.9	7.5
Brake chopper peak power		200% × apparent output power S_N × 0.9		
Connection contacts		Plug connector – 1 core: 0.25 – 4 mm² – 2 cores: 0.25 – 2.5 mm² (twin AEH)[1)]		
Dimensions				
Width	mm	105		105
Height with shield plates	mm	479		494
Depth	mm	215		260

1) AEH: Conductor end sleeve

	Unit	MDX9_A-...-2_3-4-..					
Type		**0213**	**0290**	**0420**	**0570**	**0840**	**1080**
Size		4		5		6	
Nominal output current I_N f_{PWM} = 4 kHz	A	21.3	29	42	57	84	108
Input							
Nominal line voltage (to EN 50160) AC U_{line}		3 × 200 – 240 V					

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	Unit	MDX9_A-...-2_3-4-..					
Type		**0213**	**0290**	**0420**	**0570**	**0840**	**1080**
Nominal line current AC I_{line}	A	19.2	26.1	37.8	51.3	75.6	97.2
Line frequency f_{line}	Hz	50 – 60 ± 10%					
Controlled rectifier		Yes					
X1 connection contacts		Plug connector – 1 core: 0.5 – 16 mm² – 2 cores: 0.25 – 6 mm² (twin AEH)[1)]		M8		M10	
Output							
Output voltage U_{out}	V	0 – U_{line}					
Motor power ASM P_{Mot}	kW	5.5	7.5	11	15	22	30
Nominal output current I_N f_{PWM} = 4 kHz	A	21.3	29	42	57	84	108
Overload capacity		200%: 3 s at f_{PWM} = 4 kHz					
Continuous output current at f = 0 Hz		100% × I_N at f_{PWM} = 4 kHz					
Apparent output power S_N	kVA	11.3	15.4	22.2	30.2	44.6	50.4
Nominal DC link voltage U_{NDCL}	V	DC 325					
Frequency f_{PWM}	kHz	4, 8, 16 (adjustable)					
Max. output frequency f_{max}	Hz	U/f: 599 VFC^{PLUS}: 250 CFC: 500 ELSM®: 500					
X2 connection contacts		Plug connector – 1 core: 0.5 – 16 mm² – 2 cores: 0.25 – 6 mm² (twin AEH)[1)]		M8		M10	
General							
Nominal power loss 24 V	W	30		15		20	
Power section nominal power loss	W	152	218	315	459	729	764
Permitted number of times power may be switched on/off	min-1	1					
Minimum switch-off time for Power off	s	10					
EMC variant of power section		Basic interference suppression integrated					
Mass		6.6		12.1		24.1	
Brake chopper and braking resistor							
Minimum braking resistance value R_{BRmin}	Ω	7.5		4.7		2.3	
Brake chopper continuous power	kW	11.3	15.4	22.2	30.2	44.6	50.4
Brake chopper peak power		200% × apparent output power S_N × 0.9					
Connection contacts		Plug connector – 1 core: 0.5 – 16 mm² – 2 cores: 0.25 – 6 mm² (twin AEH)[1)]		M8		M10	
Dimensions							
Width	mm	135		196		240	
Height with shield plates	mm	494		471		544	
Depth	mm	260		293		328	

1) AEH: Conductor end sleeve

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8.4 Technical data of accessories

8.4.1 Installation accessories

Type designation	Part number	Plastic cover	Number	Scope of delivery	Description
MDX9_A-0460 – 0750-5_3-..	28243625		10	Not included in scope of delivery	(→ 🗎 51)
MDX9_A-0420 – 0570-2_3-..					
MDX91A-0910 – 1490-5_3-..	28244540				
MDX91A-0840 – 1080-2_3-..					

Type designation	Part number	Lifting eye	Number	Scope of delivery	Description
MDX91A-0910 – 1490-5_3-..	28106229		1	Included in the scope of delivery	(→ 🗎 35)
MDX91A-0840 – 1080-2_3-..					

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8.5 Electronics data – signal terminals

	Terminal designation	Specification
General		
Design		According to IEC 61131-2
Supply voltage		
Port	X5	External power supply 24 V according to IEC 61131
Connecting contacts		Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1.5 mm² (Twin-AEH)[1)]

1) AEH: Conductor end sleeve

Digital inputs		
Cycle time input		1 ms / 500 µs
Quantity		• 6 with MOVIDRIVE® system • 8 with MOVIDRIVE® technology
Response time		100 µs plus cycle time
Assignment	X20: 1 – 6	DI00: "Output stage enable" fixedly assigned. DI01 – DI05: Selection option, see parameter menu. All inputs are suitable for touchprobe function. Latency period < 100 µs, max. 2 simultaneously. DI04, DI05: HTL low-resolution encoder connection. DI05: Primary frequency input.
	X20: 7 – 8	Reserved
	X20: 9	GND
Connecting contacts		Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1.5 mm² (Twin-AEH)[1)]

1) AEH: Conductor end sleeve

Digital outputs		
Cycle time output		1 ms / 500 µs
Quantity		4
Response time		175 µs plus cycle time
Output current		I_{max} = 50 mA
Short-circuit protection		Yes
Assignment	X21: 1	+24 V supply voltage Maximum output current = 50 mA
	X21: 2 – 5	DO00 – DO03: Selection option, see parameter menu.
	X21: 6	GND
Connecting contacts		Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1.5 mm² (Twin-AEH)[1)]

1) AEH: Conductor end sleeve

Brake control		
Assignment	X10:DB0	DB00: - Brake control - Control braking contactor DC 24 V, max. 150 mA
	X10:GND	GND
	X10:TF1	Sensor input for temperature evaluation of the motor
Connecting contacts		Plug connector MDX9_A-0020 – 0320-5_3-.. MDX9_A-0070 – 0290-2_3-..: - One core: 0.25 – 2.5 mm² MDX9_A-0460-5_3-.. and newer MDX9_A-0420-2_3-..: and newer - One core: 0.25 – 2.5 mm² - Two cores: 0.5 – 1 mm² (Twin-AEH)[1)]

1) AEH: Conductor end sleeve

Encoder input		
	X15:13	X15:13 DC 24 V, I_{max} = 500 mA
	X15:15	X15:15 DC 12 V, I_{max} = 500 mA

8.6 Electronics data – drive safety functions

The table below shows the technical data of the application inverter relating to the integrated safety technology.

The safety-related digital inputs comply with type 3 in accordance with IEC 61131-2.

Reference potential for the F_STO_P1 and F_STO_P2 is STO_M (contact at terminal X6:2).

		Terminal designation	General electronics data		
Safety contact STO		X6			
Electrical data of inputs F_STO_P1, F_STO_P2			**Minimum**	**Typical**	**Maximum**
Input voltage range		X6:1 and X6:3	DC -3 V	DC 24 V	DC 30 V
Input capacitance against STO_M			–	300 pF	500 pF
Input capacitance against GND			–	300 pF	500 pF
Power consumption at DC 24 V	F_STO_P1		–	150 mW	200 mW
	F_STO_P2		–	150 mW	200 mW
	Sum[1]		–	300 mW	400 mW
Input voltage for ON status (STO)			DC 11 V	–	–
Input voltage for OFF status (STO)			–	–	DC 5 V
Permitted leakage current of the external safety controller			–	–	1 mA
Technical data					
Time from disconnecting the safety voltage until the deactivation of the rotating field			–	1.5 ms	10 ms 2 ms[2]
Time from connecting the safety voltage until the activation of the rotating field			–	–	110 ms
Connection contacts			Plug connector – 1 core: 0.25 – 1.5 mm^2 – 2 cores: 0.25 – 0.5 mm^2 (twin AEH)[3]		

1) Each drive unit always requires a power consumption of 300 mW

2) Only when the STO is used and controlled via a MOVISAFE® CS.A card

3) AEH: Conductor end sleeve

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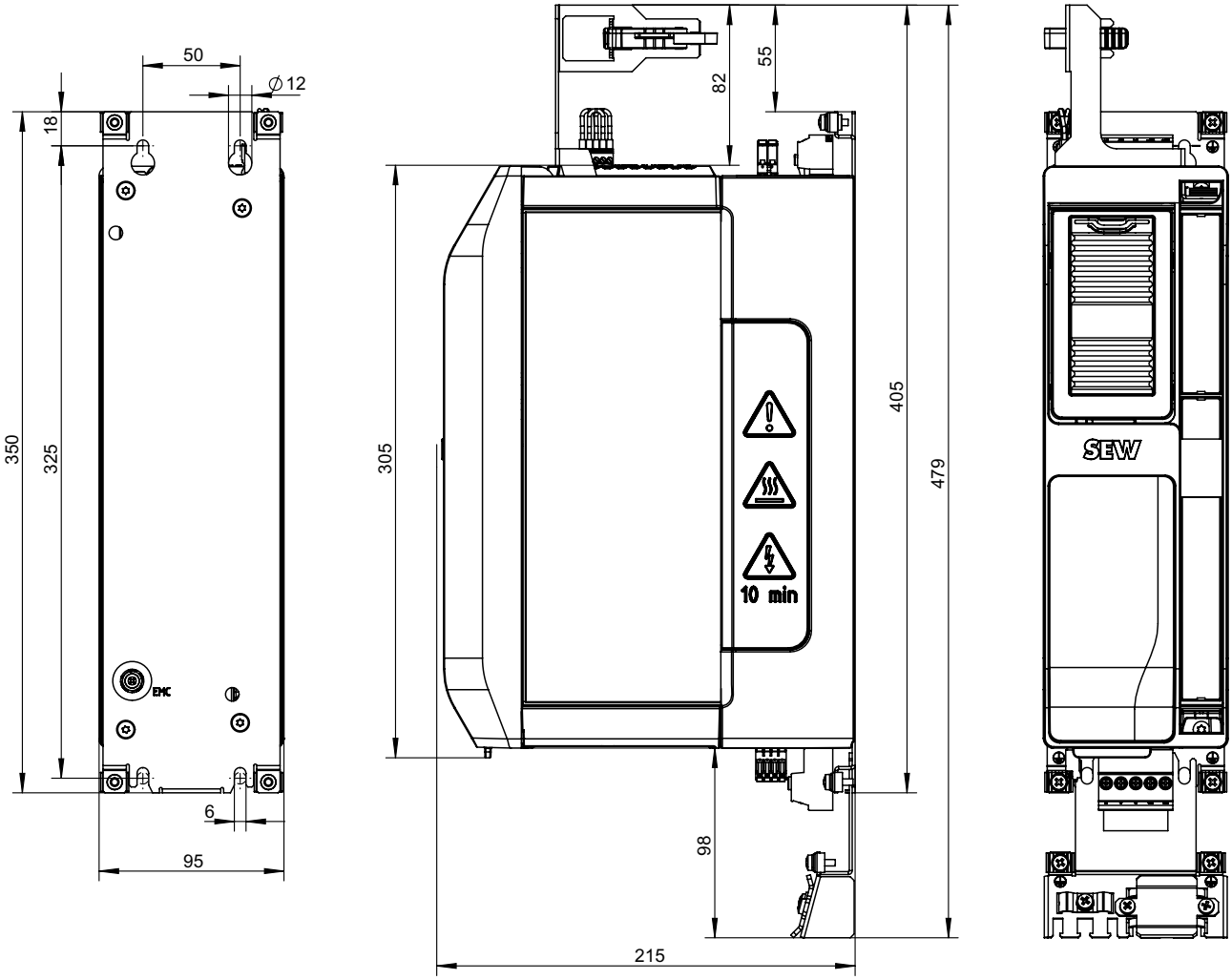
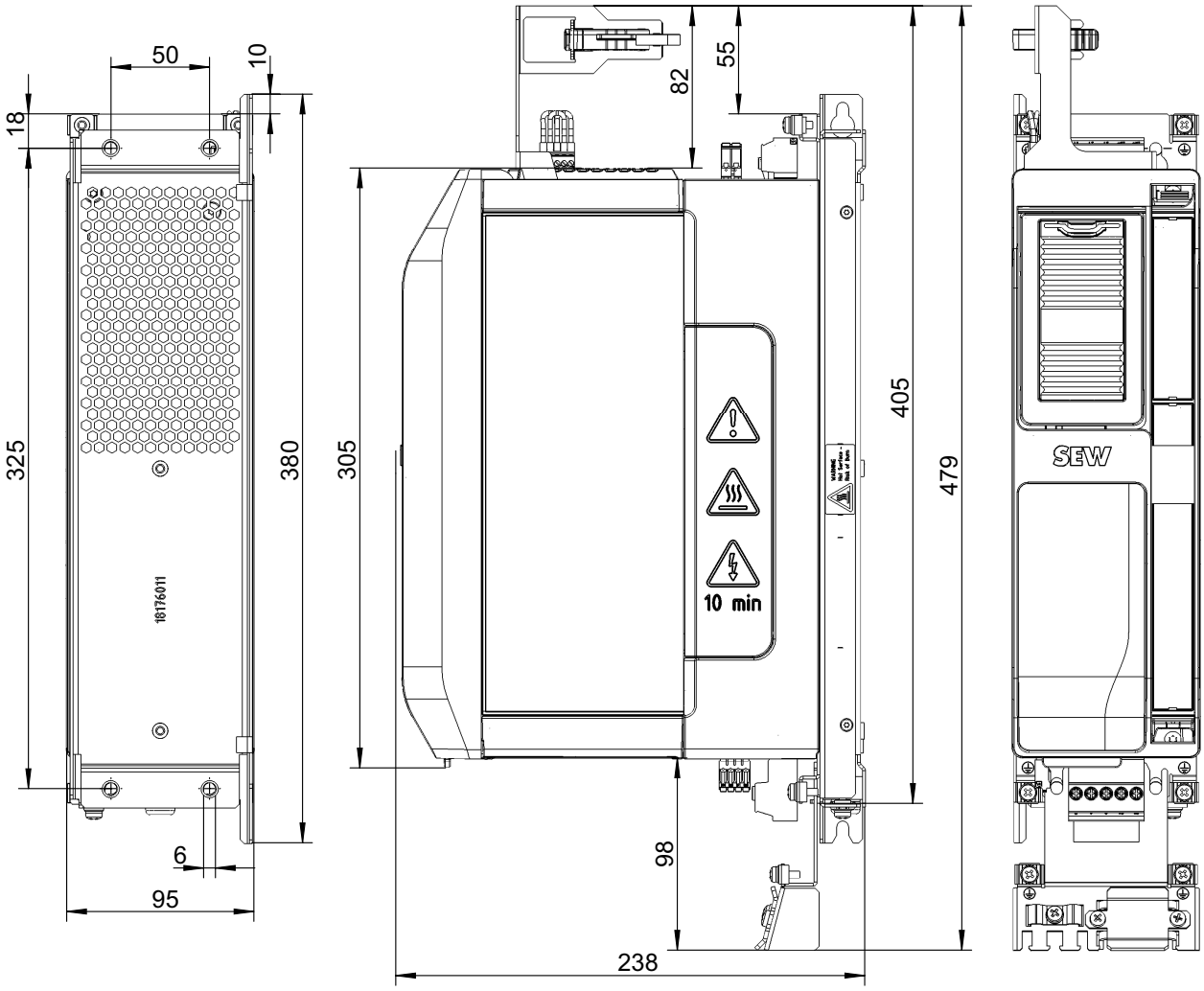
8.7 Dimension drawings

8.7.1 MDX9_A-0020 – 0040-5_3-..



8.7.2 MDX9_A-0020 – 0040-5_3-.. , MDX9_A-0070 – 0093-2_3-.. with braking resistor



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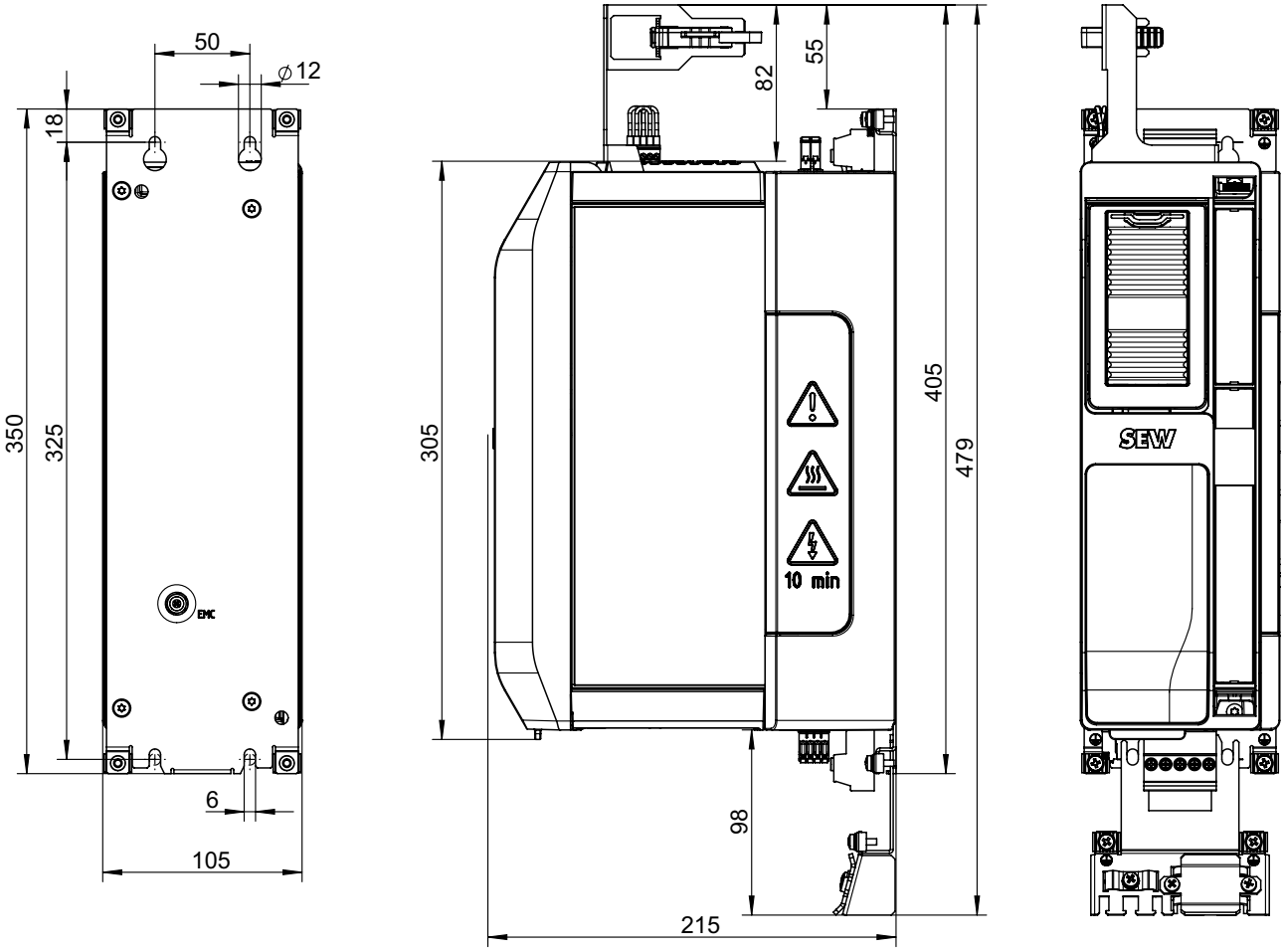
8.7.3 MDX9_A-0055 – 0095-5_3-.. , MDX9_A-0070 – 0093-2_3-..



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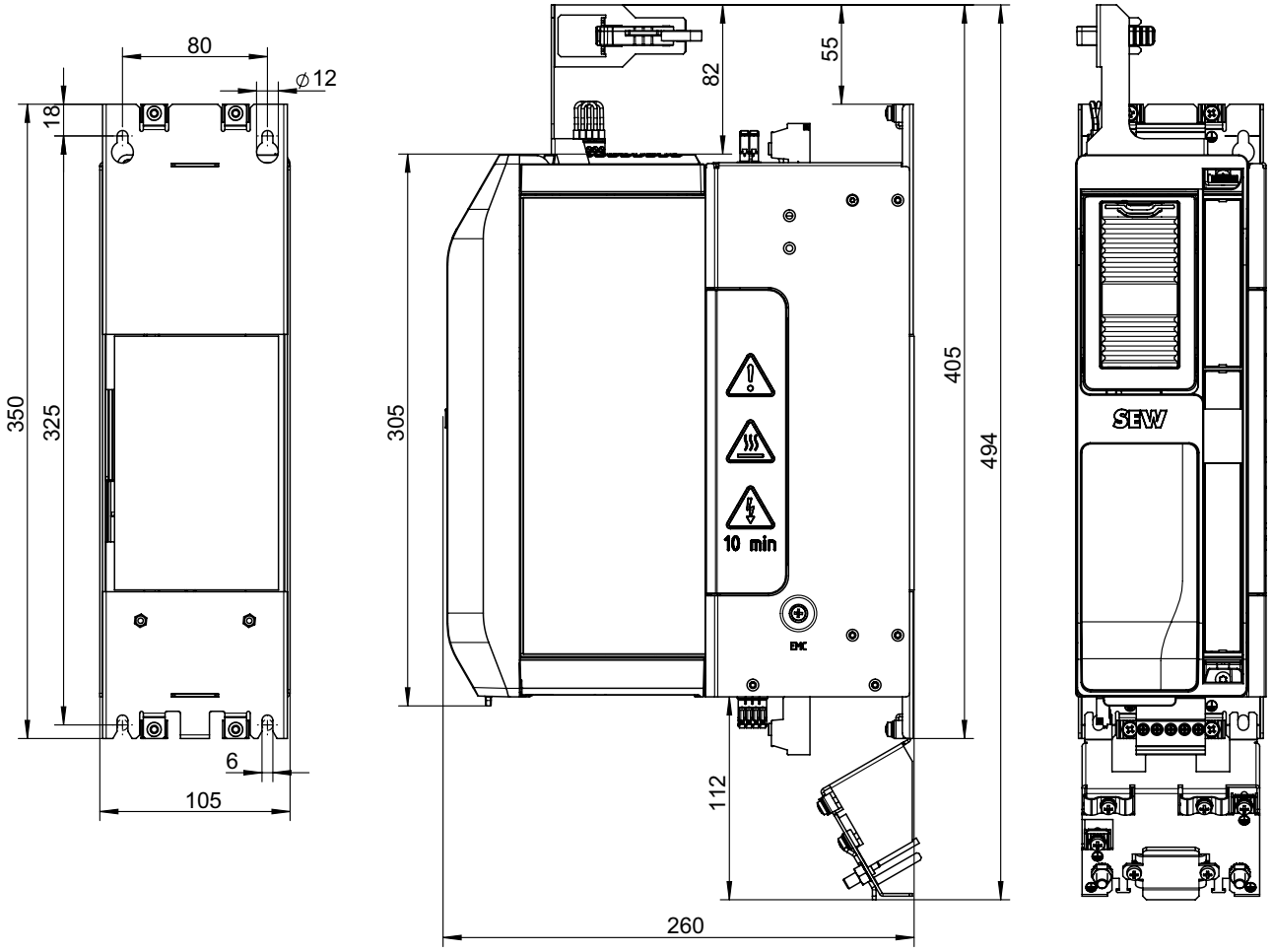
8.7.4 MDX9_A-0125 – 0160-5_3-.. , MDX9_A-0140-2_3-..



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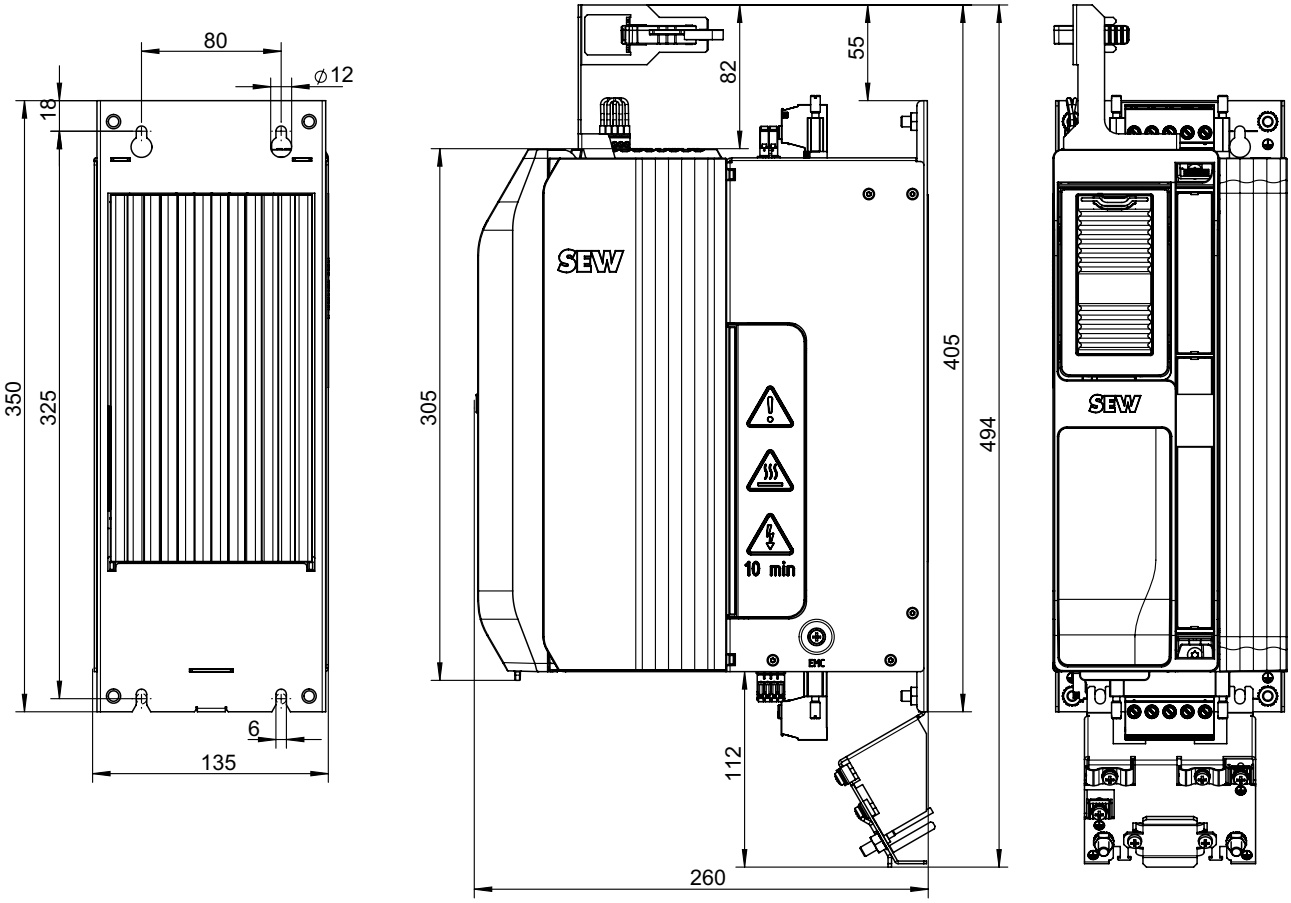
8.7.5 MDX9_A-0240 – 0320-5_3-.. , MDX9_A-0213 – 0290-2_3-..



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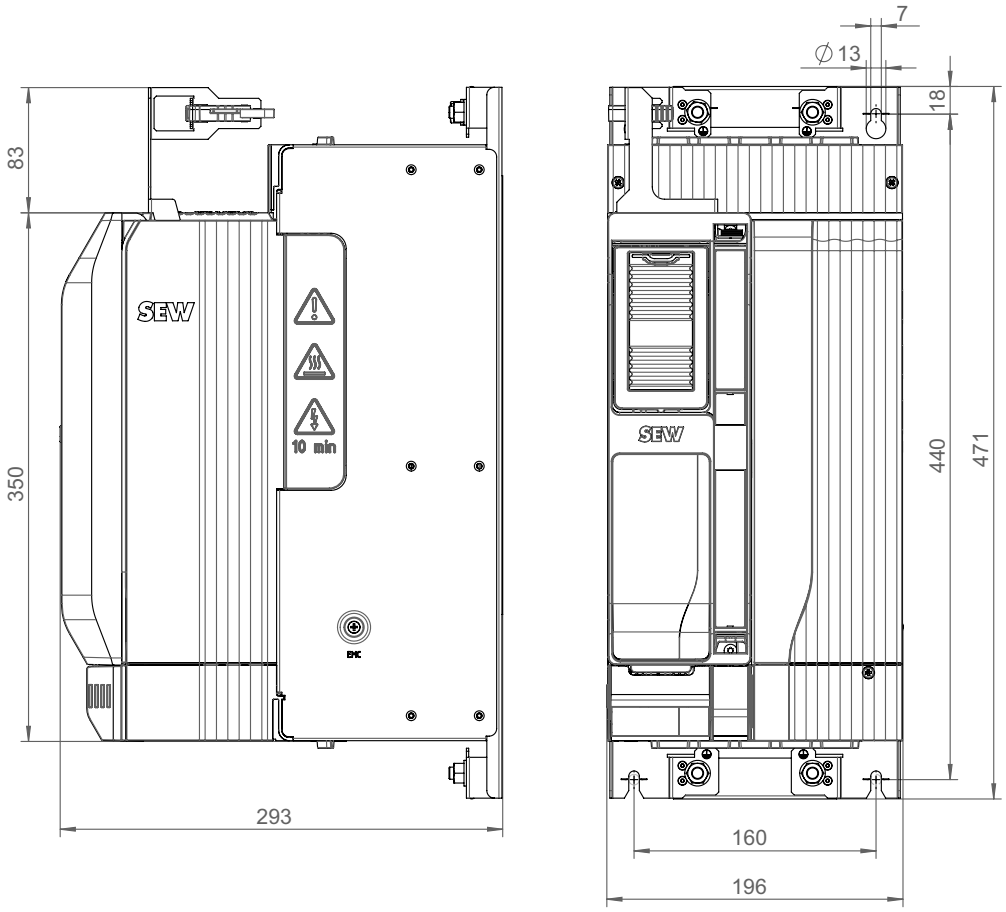
8.7.6 MDX9_A-0460 – 0750-5_3-.. , MDX9_A-0420 – 0570-2_3-..



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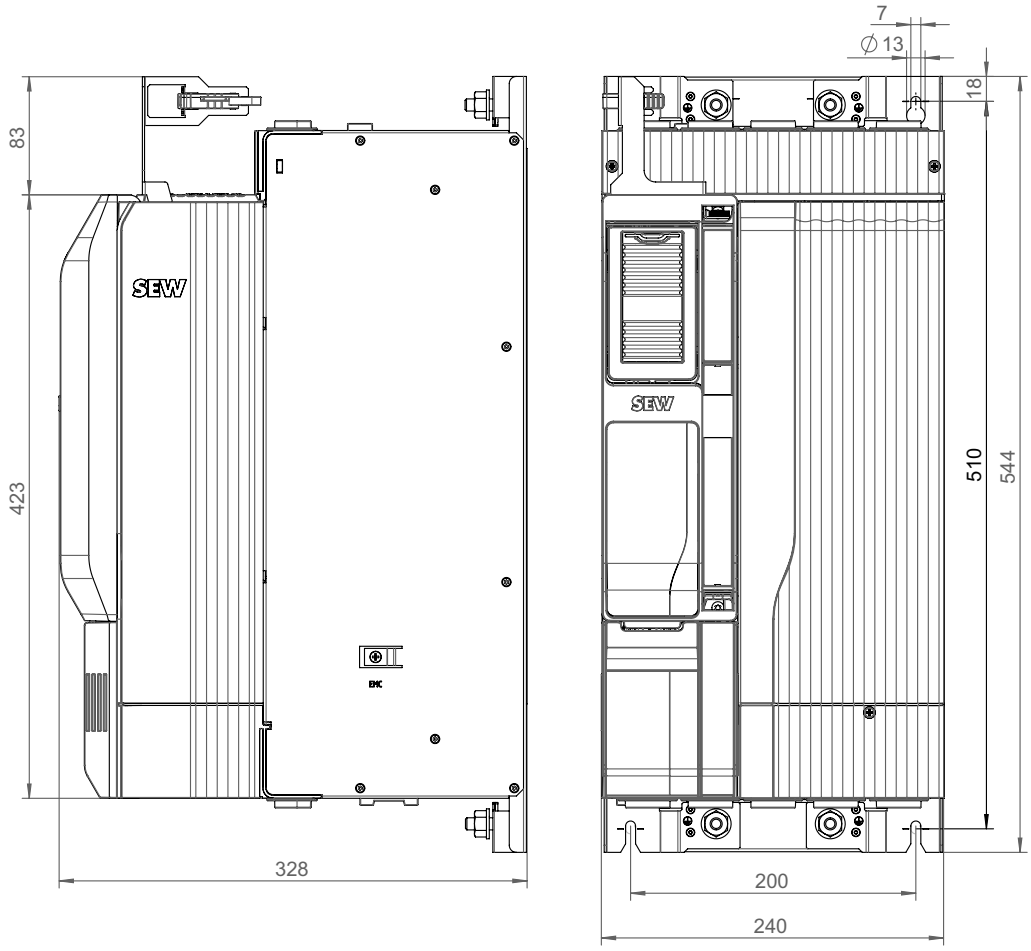
8.7.7 MDX91A-0910 – 1490-5_3-.., MDX91A-0840 – 1080-2_3-..



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8.8 Technical data of the cards

8.8.1 CIO21A and CID21A input/output cards

The CIO21A input/output card provides digital/analog inputs and outputs; the CID21A cards provide digital inputs and outputs.

	Terminal designation/ specification		Specifications
	CIO21A	CID21A	
Part number	28229495	28229487	
General			
Design			In accordance with IEC 61131-2 (type 3 for digital inputs)
Cycle time			1 ms
Power consumption	1.2 W	0.4 W	Base load (exclusively total power at outputs)
Connection contacts			Plug connector – 1 core: 0.25 – 0.5 mm² Shield terminals for control lines available
Digital inputs			
Number			4
Response time			160 µs plus cycle time
Assignment	X52: 1 – 4		DI10 – DI13: For the selection option, see parameter menu
	X52: 5		GND
Digital outputs			
Number			4
Response time			175 µs plus cycle time
Output current			I ≤ 50 mA
Capacitive load			≤ 300 nF
Inductive load			Not permitted
Protection device			Short-circuit proof, protected against external voltage DC 0 – 30 V
Assignment	X52: 6 – 9		DO10 – DO13: For the selection option, see parameter menu
	X52: 10		GND
Analog inputs			
Number			2
Type			Differential Switchable to current input
Range of values			0 to +10 V, -10 V to +10 V 0(4) – 20 mA
Assignment	X50:2 X50:3		Analog input AI21 Reference of analog input AI21
	X50:4 X50:7		GND
	X50:5 X50:6		Analog input AI31 Reference of analog input AI31
Voltage input			
Resolution			0 to +10 V (11 bit), -10 V to +10 V (12 bit)
Tolerance			± 0.5%
Overvoltage immunity			DC -20 V to DC +20 V
Input resistance			≥ 10 kΩ
Current input			
Resolution			0(4) – 20 mA (11 bit)
Tolerance			± 2%
Load impedance			(Internal) 250 Ω
Overvoltage immunity			DC -10 V to DC +10 V
Analog outputs			
Number			2
Short-circuit protection			Yes

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	Terminal designation/ specification		Specifications
	CIO21A	CID21A	
Assignment	X51:1 X51:4		Analog voltage output AOV2/AOV3
	X51:2 X51:5		Analog current output AOC2/AOC3
	X51: 3, 6		GND
Voltage output			
Tolerance			± 5%
Capacitive load			≤ 300 nF
Inductive load			≤ 500 µH
Load resistance			≥ 1 kΩ
Resolution			12 bit
Reset state			0 V
Output value			-10 V to +10 V ≤ 10 mA
Current output			
Tolerance			± 3 %
Capacitive load			≤ 300 nF
Inductive load			None
Load resistance			≤ 500 Ω
Resolution			11 bit
Reset state			0 mA
Measuring range			0(4) – 20 mA
Reference voltage output			
Short-circuit protection			Yes
Output voltage			DC -10 V, DC +10 V
Tolerance			± 0.5 %
Noise			≤ 10 mA
Output current			≤ 3 mA
Capacitive load			≤ 300 nF
Inductive load			≤ 500 µH
Assignment	X50: 1		REF1 (DC +10 V)
	X50: 8		REF2 (DC -10 V)

NOTICE

Connection of inductive loads to digital outputs

Destruction of digital outputs.

If inductive loads are connected to digital outputs, you must install an external protective element (freewheeling diode).

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8.8.2 CES11A multi-encoder card

Voltage supply

The multi-encoder card is supplied by the basic device.

Technical data of encoder supply

	Terminal designation	Specifications
Part number		28229479
Power consumption		
Nominal power loss 24 V		0.8 W
Maximum power consumption 24 V (card including encoder supply)		12.8 W
Encoder supply		
12 V	X17:15	DC 12 V ± 10%
24 V	X17:13	DC 24 V -10%, +20% in accordance with EN 61131[1)]
Nominal output current 12 V or 24 V		500 mA
Peak current I_{max} for 150 µs		1000 mA
Capacitive load		< 220 µF
Inductive load		< 500 µH
Short-circuit protection of 12 V supply		Yes, but a permanent short circuit is not permitted.
Short-circuit protection of 24 V supply		Yes, but a permanent short circuit is not permitted.
Evaluable temperature sensor		TF / TH / KTY84-130 / Pt1000

1) Note the restricted tolerance range

Encoder connection

Encoder connection	Specification
Connection on encoder card end	15-pin socket
Maximum encoder cable length	- HTL encoder ES7C and EG7C: 300 m - Standard HTL encoder: 200 m - Other encoders: 100 m

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8.8.3 Safety cards CS..A

General technical data

	Value
Ambient temperature for storage of the safety card	≥ -25 °C – ≤ 85 °C
Ambient temperature of MOVIDRIVE® system/ technology, all sizes (For derating, see the "MOVIDRIVE® system" and "MOVIDRIVE® technology" operating instructions)	• 0 °C – 40 °C without derating • 40 °C – 55 °C with derating
Ambient temperature of MOVIDRIVE® modular, all sizes	0 °C – 45 °C without derating
Installation altitude	Maximum 3800 m above sea level

Safe digital inputs

F-DI00 – F-DI03	Value/description
Properties	DC 24 V input pursuant to EN 61131-2, type 3
Signal level	• Logic "0" = LOW input: ≤ 5 V or ≤ 1.5 mA • Logic "1" = HIGH input: ≥ 11 V and ≥ 2 mA
Reference ground	GND
Power demand (typical)	0.21 W at DC 24 V
Input current	≤ 15 mA
Input resistance	≤ 4 kΩ at DC 24 V
Input filter time, parameterizable	4 ms – 250 ms
Permitted cable length	30 m
Error response time with single-pole connection	No greater than the response time without error.
Edge steepness of input signal	> 120 V/s
Input capacitance	< 500 pF

Sensor supply

F-SS0, F-SS1	Value/description
Properties	• DC 24 V output pursuant to EN 61131-2 • Short circuit and overload protection • No galvanic isolation
Rated current	150 mA
Inrush current (≤ 10 ms)	300 mA
Short-circuit protection	1.2 A

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F-SS0, F-SS1	Value/description
Internal voltage drop	< DC 1.3 V
Pulsed voltage supply (if activated)	• 2 ms open (LOW) • Period duration, pulsed voltage supply: 8 ms
Permitted cable length	30 m (per sensor)
Leakage current (F-SSx blocked)	< 0.1 mA

Safe digital outputs

F-DO00_P/M, F-DO01_P/M	Value/description
Features	• DC 24 V output in accordance with EN 61131-2 • Short circuit and overload protection
Rated current	150 mA
Inrush current (≤ 10 ms)	300 mA
Leakage current (F-DOx blocked)	< 0.1 mA
Maximum switching frequency	• 10 Hz during operation < 1 minute • 0.5 Hz during operation > 1 minute
Overload protection	210 mA
Minimum current for wire break monitoring	15 mA
Permitted cable length	30 m
Load capacitance (max. test pulse duration)	≤ 300 nF
Load capacitance (1 ms test pulse duration)	50 nF
Capacitance to GND/PE (sourcing output only)	≤ 10 nF
Load capacitance with diode de-coupling	≤ 12 µF
Load inductance	≤ 100 µH
Load inductance with freewheeling diode	≤ 40 H
Minimum load resistance	> 130 Ω

Part numbers of the safety cards

Safety card	Part number
MOVISAFE® CSB21A	28233360
MOVISAFE® CSS21A	28233379
MOVISAFE® CSB31A	28233387
MOVISAFE® CSS21A	28233395

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8.9 Technical data of encoder interfaces

8.9.1 Basic device

	Terminal designation	Specification
Encoder interface	X15:1 – 15	Supported encoders
		Resolver
		SIN/COS
		TTL/HTL
		HIPERFACE®
		Encoders with RS422 signals
Connecting contacts		15-pin socket
Encoder supply		
Nominal output voltage U_{S24VG} according to IEC 61131		DC 24 V
Nominal output voltage U_{S12VG} according to IEC 61131		DC 12 V
I_{max}		500 mA
I_{peak} for 150 µs		1000 mA
Short-circuit protection of 12 V supply		Yes, but a permanent short circuit is not permitted.
Short-circuit protection of 24 V supply		Yes, but a permanent short circuit is not permitted.

8.9.2 CES11A multi-encoder card

	Terminal designation	Specification
encoder interface	X17:1 – 15	Supported encoders
		SIN/COS
		TTL/HTL
		HIPERFACE®
		EnDat2.1 with sin/cos signals
		SSI
		CANopen
		Encoders with RS422 signals
Connecting contacts		15-pin socket
Encoder supply		
Nominal output voltage U_{S24VG} according to IEC 61131		DC 24 V
Nominal output voltage U_{S12VG} according to IEC 61131		DC 12 V
I_{max}		500 mA
I_{peak} for 150 µs		1000 mA

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8.10 Technical data of braking resistors, filters, and chokes

8.10.1 Braking resistors type BR.../BR...-T

General

The BR.../BR...-T braking resistors are adapted to the technical characteristics of the application inverter.

Braking resistors with different continuous and peak braking powers are available.

The braking resistors can be protected against overload and overtemperature by the customer when a thermal overload relay is used. The tripping current is set to the value I_F; for this, see the following tables "Technical data and assignment to an inverter".

The braking resistors of the series BR...-T are equipped with an integrated temperature switch that monitors the temperature. If the nominal operating temperature is exceeded, the temperature switch triggers a signal contact. The temperature switch does not switch off the braking resistor. This is why the temperature switch must be evaluated to avoid thermal overload of the braking resistor.

Another possibility to protect the braking resistor is the TCB thermal circuit breaker. The TCB thermal circuit breaker protects the braking resistor against continuous overload and against power peaks over short periods.

A PTC resistor protects itself (reversible) against regenerative overload by changing abruptly to high resistance and no longer consuming any more energy. The inverter then switches off and signals a "brake chopper" fault.

A flat-type resistor has internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. The project planning guidelines and the documented assignments of the drive inverter and braking resistor must be adhered to.

INFORMATION

Use of protection devices

Use only the protection devices listed in the following section:

- TCB thermal circuit breaker
- Internal temperature switch T
- External bimetallic relay

→ See also the chapter "Protection of the braking resistor against thermal overload"

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UL and cUL approval

The listed braking resistors have a cRUus approval independent of the application inverter.

Parallel connection of braking resistors

Identical braking resistors must be connected in parallel for some inverter/resistor combinations.

In this case, protect each braking resistor against overload and overtemperature using a thermal overload relay.

The temperature switches must be connected in series for braking resistors of the BR...-T series.

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Technical data and assignment to an inverter

Technical data

Braking resistor	Unit	BR120-001	BR100-001	BR100-002	BR100-006-T
Part number		18176011	08281718	08281653	18204198
Current-carrying capacity at 100% cdf	kW	0.03	0.1	0.2	0.6
Resistance value R_{BR}	Ω	117	100 ± 10%		
Tripping current I_{trip}	A		0.8	1	2.4
Design		PTC submounting resistor	Flat-type resistor		Wire resistor
Power connections		Single conductors			Ceramic terminal 2.5 mm²
Tightening torque	Nm	–			0.5
PE connection		–			M4
Tightening torque PE	Nm	–			1.8
Degree of protection in accordance with EN 60529		IP20	IP65		IP20
Ambient temperature ϑ_{amb}			-20 °C to +40 °C (Reduction 4% P_N/10 K to +60 °C)		
Mass	kg	0.95	0.3	0.6	3

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR120-001	BR100-001	BR100-002	BR100-006-T
MDX9_A-...-5_3-..	0020 0025 0032 0040	0020 0025 0032 0040		

Technical data

Braking resistor	Unit	BR047-010-T	BR147-T	BR247-T
Part number		17983207	18201342	18200842
Current-carrying capacity at 100% cdf	kW	1	1.2	2
Resistance value R_{BR}	Ω	47 ± 10%		
Tripping current I_{trip}	A	4.6	5.1	6.5
Design		Wire resistor		
Power connections		Ceramic terminal 2.5 mm²		
Tightening torque	Nm	0.5		
PE connection		M4		
Tightening torque PE	Nm	1.8		
Degree of protection		IP20		
Ambient temperature ϑ_{amb}		-20 °C to +40 °C		
Mass	kg	4	4.9	6.7

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR47-010-T	BR147-T	BR247-T
MDX9_A-...-5_3-..	0055 0070 0095		

Technical data

Braking resistor	Unit	BR027-016-T	BR027-024-T	BR027-042-T
Part number		17983215	17983231	19155301
Current-carrying capacity at 100% cdf	kW	1.6	2.4	4.2

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Braking resistor	Unit	BR027-016-T	BR027-024-T	BR027-042-T
Resistance value R_{BR}	Ω	27 ± 10%		
Tripping current I_{trip}	A	7.7	9.4	12.5
Design		Wire resistor		Frame resistor
Power connections		Ceramic terminal 2.5 mm²		
Tightening torque	Nm	0.5		
PE connection		M4		M5
Tightening torque PE	Nm	1.8		2.5
Degree of protection		IP20		
Ambient temperature ϑ_{amb}		-20 °C to +40 °C		
Mass	kg	5.8	8	10

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR027-016-T	BR027-024-T	BR027-042-T
MDX9_A-...-5_3-..	0125 0160		
MDX9_A-...-2_3-..	0070 0093		

Technical data

Braking resistor	Unit	BR015-016	BR015-042-T	BR015-075-T	BR915-T
Part number		17983258	19155328	19155271	18204139
Current-carrying capacity at 100% cdf	kW	1.6	4.2	7.5	16
Resistance value R_{BR}	Ω	15 ± 10%			
Tripping current I_{trip}	A	10.3	16.7	22.4	32.7
Design		Wire resistor	Frame resistor	Grid resistor mounting position 1	
Power connections		Ceramic terminal 2.5 mm²	Ceramic terminal 4 mm²	M8 stud	
Tightening torque	Nm	0.5	0.9	6	
PE connection		M4	M5	M6 stud	
Tightening torque PE	Nm	1.8	2.5	3	
Degree of protection		IP20			
Ambient temperature ϑ_{amb}		-20 °C to +40 °C			
Mass	kg	5.8	10	12	32

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR015-016	BR015-042-T	BR015-075-T	BR915-T
MDX9_A-...-5_3-..	0240 0320 0620 (Parallel connection of 2 braking resistors) 0750 (Parallel connection of 2 braking resistors)			
MDX9_A-...-2_3-..	0140 0213 (Parallel connection of 2 braking resistors) 0290 (Parallel connection of 2 braking resistors)			

Technical data

Braking resistor	Unit	BR010-024	BR010-050-T	BR010-108-T
Part number		17983266	17983274	19155298
Current-carrying capacity at 100% cdf	kW	2.4	5	10.8
Resistance value R_{BR}	Ω	10 ± 10%		
Tripping current I_{trip}	A	15.5	22.4	32.9
Design		Wire resistor	Grid resistor mounting position 1	
Power connections		Ceramic terminal 2.5 mm²	M8 stud	

Braking resistor	Unit	BR010-024	BR010-050-T	BR010-108-T
Tightening torque	Nm	0.5	6	
PE connection		M4 stud	M6 stud	
Tightening torque PE	Nm	1.8	3	
Degree of protection		IP20		
Ambient temperature ϑ_{amb}		-20 °C to +40 °C		
Mass	kg	8	11	17.5

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR010-024	BR010-050-T	BR010-108-T
MDX9_A-...-5_3-..	0460 0910 (Parallel connection of 2 braking resistors) 1130 (Parallel connection of 2 braking resistors)		
MDX9_A-...-2_3-..	0213 0290 0420 (Parallel connection of 2 braking resistors)		

Technical data

Braking resistor	Unit	BR006-025-01	BR006-050-01	BR106-T	BR206-T
Part number		18200117	18200125	18200834	18204120
Current-carrying capacity at 100% cdf	kW	2.5	5	13.5	18
Resistance value R_{BR}	Ω	6 ± 10%			
Tripping current I_{trip}	A	20.4	28.9	47.4	54.8
Design		Grid resistor			
Power connections		M8 stud			
Tightening torque	Nm	6			
PE connection		M6 stud			
Tightening torque PE	Nm	3			
Degree of protection		IP20			
Ambient temperature ϑ_{amb}		-25 °C to +40 °C			
Mass	kg	7.5	12	30	40

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR006-025-01	BR006-050-01	BR106-T	BR206-T
MDX9_A-...-5_3-..	0620 0750 1490 (Parallel connection of 2 braking resistors)			
MDX9_A-...-2_3-..	570 (Parallel connection of 2 braking resistors)			

Technical data

Braking resistor	Unit	BR005-070	BR005-170-T	BR004-050-01	BR004-070-01
Part number		17983282	17983290	18200133	17967678
Current-carrying capacity at 100% cdf	kW	7	17	5	7
Resistance value R_{BR}	Ω	4.7 ± 10%		3.6 ± 10%	
Tripping current I_{trip}	A	38.6	60.1	32.6	38.6
Design		Grid resistor mounting position 1			
Power connections		M8 stud			
Tightening torque	Nm	6			
PE connection		M6 stud			
Tightening torque PE	Nm	3			
Degree of protection		IP20			
Ambient temperature ϑ_{amb}		-20 °C to +40 °C			
Mass	kg	13	33	13	

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Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR005-070	BR005-170-T	BR004-050-01	BR004-070-01
MDX9_A-...-5_3-..	0910 1130 1770 (Parallel connection of 2 braking resistors) 2200 (Parallel connection of 2 braking resistors) 2500 (Parallel connection of 2 braking resistors)		1490	
MDX9_A-...-2_3-..	0420 0840 (Parallel connection of 2 braking resistors) 1080 (Parallel connection of 2 braking resistors)		570	

Technical data

Braking resistor	Unit	BR003-420-T	BR002-070
Part number		13302345	17983304
Current-carrying capacity at 100% cdf	kW	42	7
Resistance value R_{BR}	Ω	2.5	2.3 ± 10%
Tripping current I_{trip}	A	135.1	55.2
Design		Grid resistor mounting position 2	Grid resistor mounting position 1
Power connections		M12 stud	M8 stud
Tightening torque	Nm	15.5	6
PE connection		M10 stud	M6 stud
Tightening torque PE	Nm	10	3
Degree of protection		IP20	
Ambient temperature ϑ_{amb}		-20 °C to +40 °C	
Mass	kg	93	33

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR003-420-T	BR002-070
MDX9_A-...-5_3-..	1770 2200 2500 3000 (Parallel connection of 2 braking resistors) 3800 (Parallel connection of 2 braking resistors) 4700 (Parallel connection of 2 braking resistors) 5880 (Parallel connection of 2 braking resistors)	
MDX9_A-...-2_3-..	0840 1080	

Technical data

Braking resistor	Unit	BR1.0-170
Part number		17985455
Current-carrying capacity at 100% cdf	kW	17
Resistance value R_{BR}	Ω	1 ± 10%
Tripping current I_{trip}	A	130.4
Design		Grid resistor mounting position 2
Power connections		M12 stud
Tightening torque	Nm	15.5
PE connection		M10 stud
Tightening torque PE	Nm	10
Degree of protection		IP20
Ambient temperature ϑ_{amb}		-25 °C to +40 °C

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Braking resistor	Unit	BR1.0-170
Mass	kg	45

Assignment to an inverter

The assignment considers the maximum peak braking power of the inverter.

Braking resistor	BR1.0-170
MDX9_A-...-5_3-..	3000 3800 4700 5880

Technical data of BR..-T

Specifications for BR..-T	Design
Signal contact connection cross section	1 × 2.5 mm^2
Tightening torque signal contact	1 Nm
Switching capacity signal contact	DC 2 A / DC 24 V (DC11) AC 2 A / AC 230 V (AC11)
Switch contact (NC contact)	According to EN 60730

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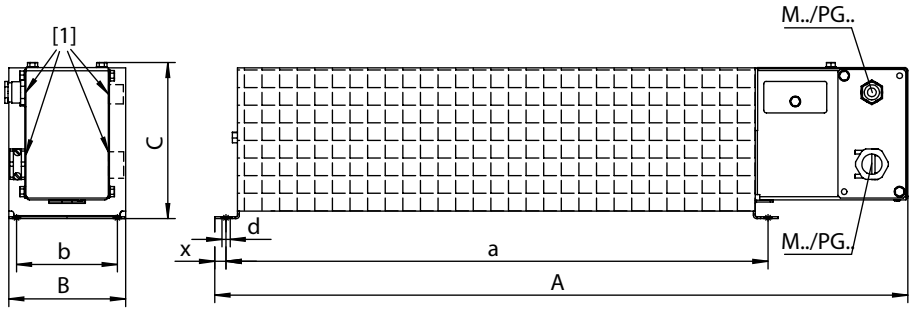
Dimension drawings and dimensions

Wire resistor



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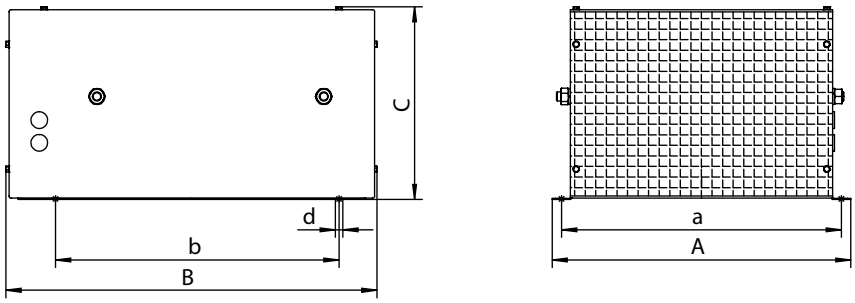
Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BR100-006-T	549	92	125	430	80	6.5	8	M25 + M12
BR47-010-T	749	92	125	630	80	6.5	8	M25 + M12
BR147-T	549	185	125	430	150	6.5	8	PG16 + M12
BR247-T	749	185	125	630	150	6.5	8	PG16 + M12
BR027-016-T	649	185	125	530	150	6.5	8	M25 + M12
BR027-024-T	649	275	125	530	240	6.5	8	M25 + M12
BR015-016	649	185	125	530	150	6.5	8	M25
BR010-024	649	275	125	530	240	6.5	8	M25

Grid resistor mounting position 1



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Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BR015-075-T	415	500	270	395	380	9	—	—
BR106-T	795	490	270	770	380	10.5	—	—
BR206-T	995	490	270	970	380	10.5	—	—
BR915-T	795	490	270	770	380	10.5	—	—
BR010-050-T	395	490	260	370	380	10.5	—	—
BR010-108-T	525	500	270	505	380	9	—	—
BR004-050-01	395	490	260	370	380	10.5	—	—
BR005-070	395	490	260	370	380	10.5	—	—
BR002-070	395	490	260	370	380	10.5	—	—
BR005-170-T	490	795	270	380	770	10.5	—	—
BR006-025-01	295	490	260	270	380	10.5	—	—
BR006-050-01	395	490	260	370	380	10.5	—	—

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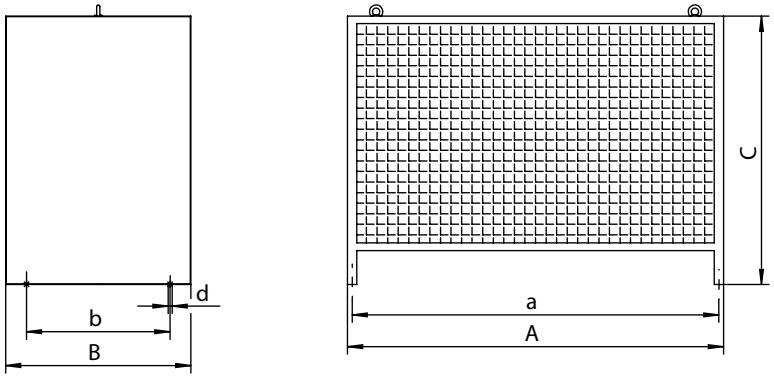
Grid resistor mounting position 2



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Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BR003-420-T	995	490	710	970	380	10.5	—	—
BR1.0-170	490	795	490	380	770	10.5	—	—

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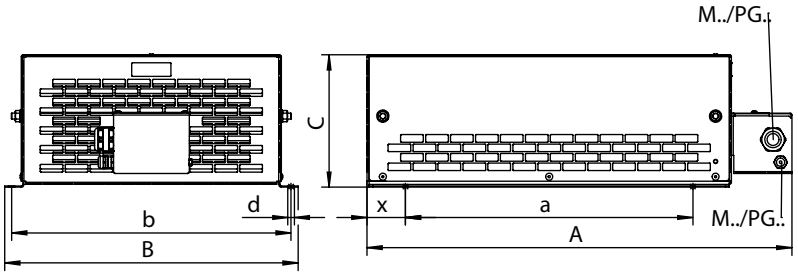
Frame resistor



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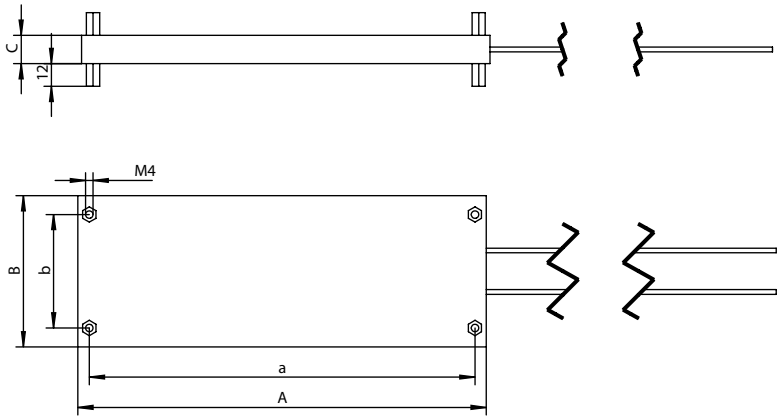
Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BR027-042-T	570	390	180	380	370	6.5	55	M25 + M12
BR015-042-T	570	390	180	380	370	6.5	55	M25 + M12

Flat type resistor



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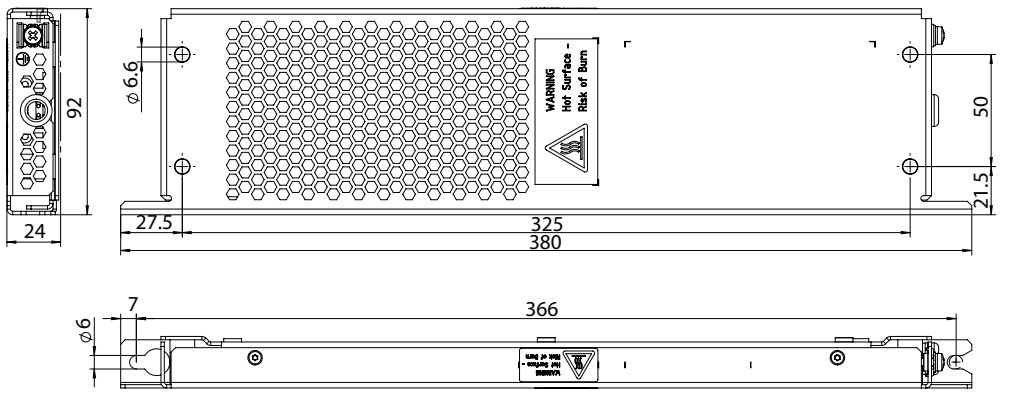
Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BR100-001	110	80	15	98	60	—	—	—
BR100-002	216	80	15	204	60	—	—	—

Submounting resistor BR120-001



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8.10.2 TCB thermal circuit breaker option

General

The TCB thermal circuit breaker protects the braking resistor from constant overload and protects in case of a short circuit in the cable or the braking resistor.

The setting range of the thermal circuit breaker has to be selected in such a way that it corresponds to the tripping current I_F of the braking resistor.

The switch reacts to the following events:

- Thermal overload via current monitoring device.
- Short circuit.

In the event of a fault, the thermal circuit breaker switches off the braking resistor. The present fault is signaled via isolated NO and NC contacts.

After fault elimination, the thermal circuit breaker can be reconnected like a normal miniature circuit breaker.

The thermal circuit breaker is installed on DIN rails (TS35).

UL and cUL approval

The thermal circuit breaker has the cRUus approval, independent of the application inverter.

Technical data

Circuit breaker type	Unit	TCB0040	TCB0063	TCB0100
Part number		19170424	19170432	19170440
Setting range	A	2.5 – 4	4 – 6.3	6.3 – 10
Connection cross section main contact	mm^2	1.5 – 16		
Tightening torque	Nm	2.5		
Signal contact connection cross section	mm^2	0.5 – 1.5		
Tightening torque	Nm	0.8		
Mechanical service life		20000 switching cycles		

Circuit breaker type	Unit	TCB0160	TCB0200	TCB0250	TCB0320	TCB0400
Part number		19170459	19148658	19170467	19170475	19170483
Setting range	A	10 – 16	16 – 20	20 – 25	25 – 32	32 – 40
Connection cross section main contact	mm^2	2.5 – 16	4 – 16		6 – 16	10 – 16
Tightening torque	Nm	2.5				
Signal contact connection cross section	mm^2	0.5 – 1.5				
Tightening torque	Nm	0.8				
Mechanical service life		20000 switching cycles				

Technical data of signal contact

Specifications of the signal contacts	Design
Connecting contacts	0.5 – 1.5 mm^2
Tightening torque	0.8 Nm
Switching capacity	DC 5 A / DC 24 V AC 10 A / AC 230 V

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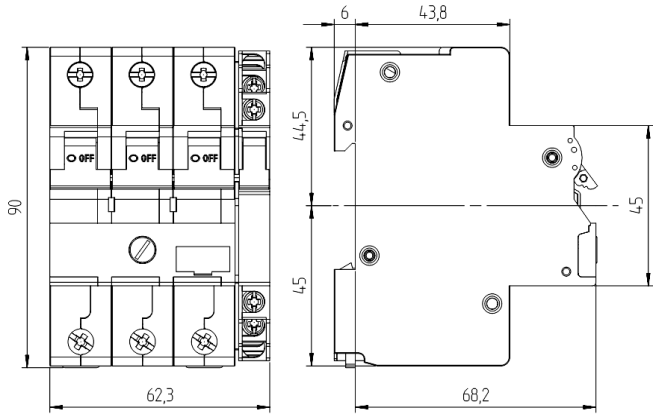
Dimension drawing



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8.10.3 Line filter

Line filters are used to suppress interference emission on the line side of inverters.

INFORMATION:

- Do not switch between the NF... line filter and inverter.

UL and cUL approval

The listed line filters have cRUus approvals independent of the application inverter.

Technical data

Line filter	NF0055-503	NF0120-503	NF0220-503	NF0420-513	NF0910-523	NF1800-523
Part number	17984319	17984270	17984300	17983789	17987504	17987865
Nominal line voltage V_N	3 × AC 230 V - 500 V, 50/60 Hz					
Nominal current I_N	5.5 A	12 A	22 A	42 A	91 A	180 A
Nominal power loss	4 W	6 W	9 W	30 W	51.5 W	89 W
Ambient temperature ϑ_{amb}	0 to 45 °C (reduction: x% I_N up to max. 60 °C)					
Connecting contacts L1/L2/L3 - L1'/L2'/L3'	Spring-loaded terminals max. 6 mm²			2.5 – 16 mm²	25 – 50 mm²	16 – 120 mm²
Tightening torque L1/L2/L3 - L1'/L2'/L3'	—			2 – 4 Nm	6 – 8 Nm	12 – 20 Nm
PE terminal contacts	M4		M5	M6	M8	M10
Tightening torque PE	1.5 Nm		3 Nm	6 Nm	12 Nm	23
Degree of protection	IP20 according to EN 60529					
Mass	1 kg	1 kg	1.4 kg	3 kg	5 kg	9 kg

Assignment to an inverter

Line filter	NF0055-503	NF0120-503	NF0220-503	NF0420-513	NF0910-523	NF1800-523
MDX9_A-...-5_3-..	0020 – 0040	0055 – 0095	0125 – 0160	0240 – 0320	0460 – 0750	0910 – 1490
MDX9_A-...-2_3-..	—	0070 – 0093	0140	0213 – 0290	0420 – 0570	0840 – 1080

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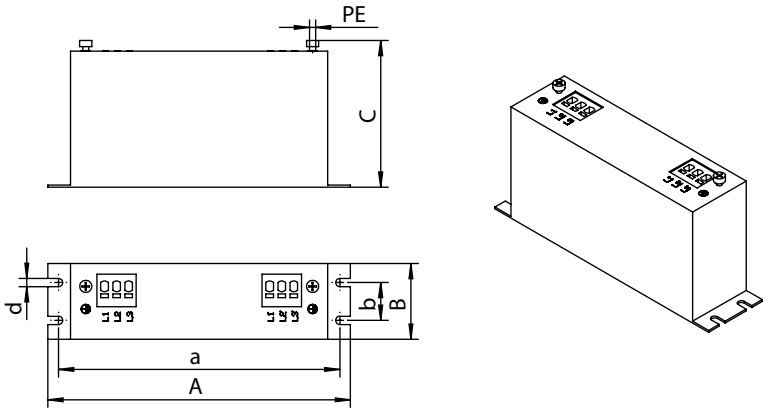
Dimension drawings and dimensions



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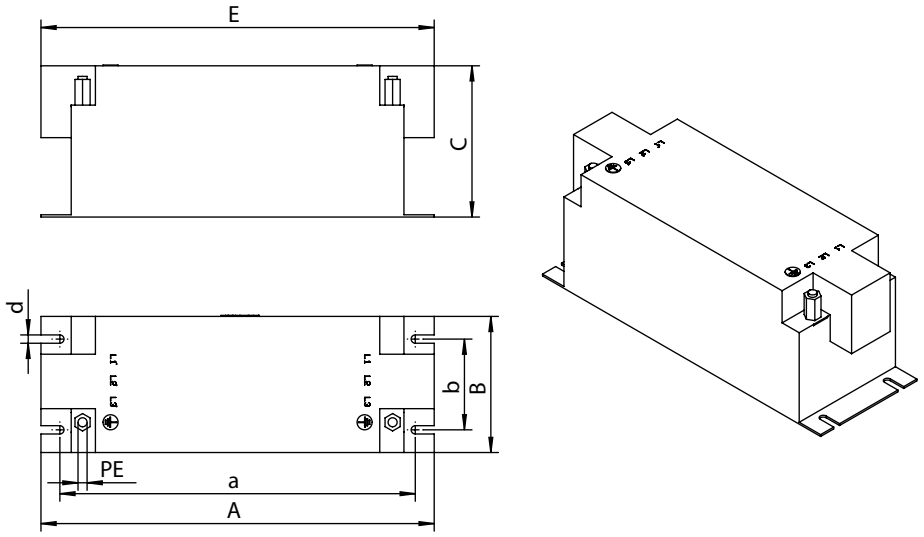
Line filter	Main dimensions in mm				Mounting dimensions in mm			Port
	A	B	C	E	a	b	d	PE
NF0055-503	200	50	97	—	186	25	5.5	M4
NF0120-503	200	50	97	—	186	25	5.5	M4
NF0220-503	230	55	102	—	216	30	5.5	M4



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Line filter	Main dimensions in mm				Mounting dimensions in mm			Port
	A	B	C	E	a	b	d	PE
NF0420-513	250	88	97	255	235	60	5.5	M6
NF0910-523	270	100	152	320	255	65	6.5	M8
NF1800-523	380	132	185	465	365	102	6.5	M10

8.10.4 Line choke

Using line chokes is optional:

- To support overvoltage protection
- To smoothen the line current, to reduce harmonics
- Protection in the event of distorted line voltage
- To limit the charging current when several inverters are connected together in parallel on the input end with shared line contactors (nominal current of line choke = total of inverter currents).

UL and cUL approval

The listed line chokes have cRUus approvals independent of the application inverter.

Technical data

Line choke	ND0070-503	ND0160-503	ND0300-503	ND0420-503	ND0910-503	ND1800-503
Part number	17984173	17984181	17983800	17983819	17987520	17987539
Nominal line voltage U_N	3 × AC 230 V – 500 V, 50/60 Hz					
Nominal current I_N	7 A	16 A	30 A	42 A	91 A	180 A
Nominal inductance	0.36 mH	0.2 mH	0.1 mH	0.045 mH	0.035 mH	0.018 mH
Nominal power loss	4 W	9 W	11 W	13 W	53 W	116 W
Ambient temperature ϑ_{amb}	-10 °C to 45 °C (reduction: 3% I_N up to maximum 60 °C)					
Connection contacts L1/L2/L3 – L1'/L2'/L3'	0.2 – 4 mm²		0.2 – 10 mm²	2.5 – 16 mm²	25 – 50 mm²	16 – 120 mm²
Tightening torque L1/L2/L3 – L1'/L2'/L3'	0.5 – 1 Nm		1.2 – 2 Nm	2.5 Nm	3 – 6 Nm	12 – 20 Nm
PE connection contact	M4		M5		M8	M10
Tightening torque PE	1.5 Nm		3 Nm		12 Nm	20 Nm
Degree of protection	IPXXB in accordance with EN 60529				IPXXA in accordance with EN 60529	
Mass	0.5 kg	1.3 kg	1.95 kg	1.82 kg	4.6 kg	10 kg

Assignment to an inverter

Line choke	ND0070-503	ND0160-503	ND0300-503	ND0420-503	ND0910-503	ND1800-503
MDX9_A-...-5_3-..	0020 – 0040	0055 – 0095	0125 – 0160	0240 – 0320	0460 – 0750	910 – 1400
MDX9_A-...-2_3-..	-	0070 – 0093	0140	0213 – 0290	0420 – 0570	0840 – 1080

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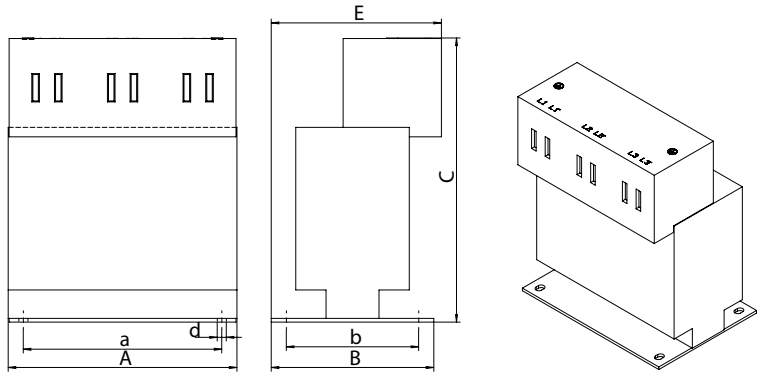
Dimension drawings and dimensions



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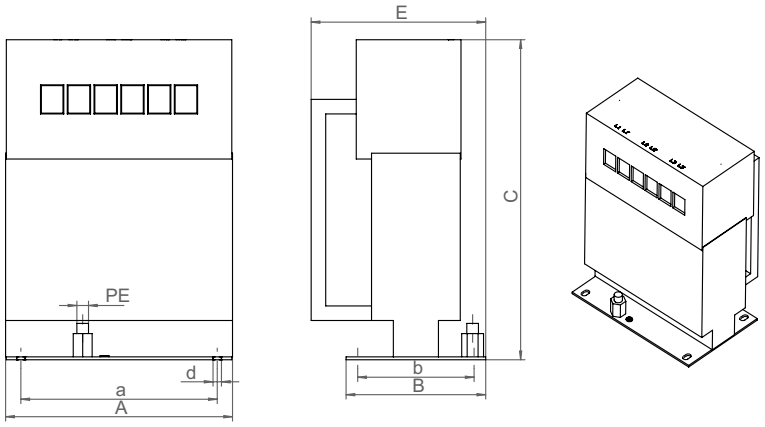
Line choke	Main dimensions in mm				Mounting dimensions in mm			Port
	A	B	C	E	a	b	d	PE
ND0070-503	78	57	105	56	65	40	4.8	M4
ND0160-503	96	70	120	65	71	54	4.8	M4
ND0300-503	121	86	145	86	105	70	4.8	M5
ND0420-503	121	86	150	90	105	70	4.8	M5



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Line choke	Main dimensions in mm				Mounting dimensions in mm			Port
	A	B	C	E	a	b	d	PE
ND0910-503	156	96	220	120	135	80	5.8	M8
ND1800-503	187	121	260	153	166	93	6.2	M10

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8.10.5 Output filter

Description of the output filter

HF.. type output filters are sine filters used to smooth the output voltages of inverters.

- Discharge currents in the motor cables are suppressed.
- Motor winding insulations of third-party motors that are not suitable for inverters are protected.
- For long motor cables (> 100 m), overvoltage peaks are prevented.

UL and cUL approval

The listed output filters have cRUus approvals independent of the application inverter.

Technical data

Output filter	HF0055-503	HF0125-503	HF0240-503	HF0460-503	HF0650-503	HF1150-503
Part number	17985110	17985129	17985137	17985145	17991277	17991269
Nominal voltage U_N	3 × AC 230 V – 500 V, 50/60 Hz					
Nominal current I_N	5.5 A	12.5 A	24 A	46 A	65 A	115 A
Nominal power loss	80 W	120 W	200 W	400 W		
Ambient temperature ϑ_{amb}	0 °C to 45 °C (reduction: 3% I_N/K up to maximum 60 °C)					
Connection contacts U1/ V1/W1/UDC – U2/V2/W2	0.2 – 10 mm²		2.5 – 16 mm²		16 – 50 mm²	16 – 95 mm²
Tightening torque U1/V1/ W1/UDC – U2/V2/W2	1.2 – 2 Nm		2 – 4 Nm		3 – 6 Nm	12 – 20 Nm
PE connection contacts	M6 stud				M8 stud	M10 stud
Tightening torque PE	6 Nm				12 Nm	23 Nm
Degree of protection in accordance with EN 60529	IP20				IPXXA	
Mass	8 kg	18 kg	25 kg	40 kg	48 kg	70 kg

Assignment to an inverter

Output filter	HF0055-503	HF0125-503	HF0240-503	HF0460-503	HF0650-503	HF1150-503
MDX9_A-...-5_3-..	0020 – 0040	0055 – 0095	0125 – 0160	0240 – 0320	0460 0910 (Parallel connection of 2 filters)	0620 – 0750 1130 – 1490 (Parallel connection of 2 filters)
MDX9_A-...-2_3-..	–	0070 – 0093	0140	0213 – 0290	0420	0570

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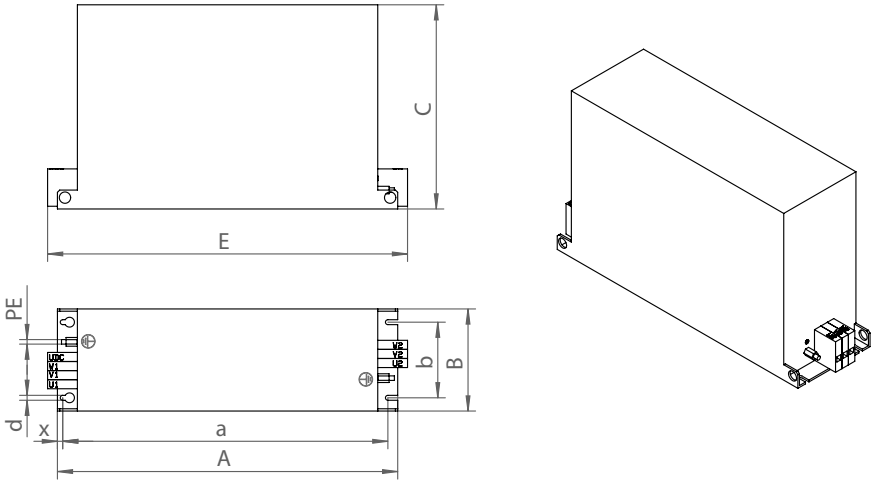
Dimension drawings and dimensions



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Output filter	Main dimensions in mm				Mounting dimensions in mm				Connection
	A	B	C	E	a	b	d	x	PE
HF0055-503	310	105	160	–	290	75	6.5	7	M6
HF0125-503	390	120	215	–	370	90	6.5	7	M6
HF0240-503	450	135	270	–	430	100	6.5	7	M6
HF0460-503	450	160	310	–	430	120	6.5	7	M6
HF0650-503	635	210	285	637	610	174	8.5	10	M8
HF1150-503	725	260	273	751	700	224	8.5	10	M8

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8.10.6 Output choke

Description of output choke

HD.. type output chokes suppress interference emitted from unshielded motor cables.

UL and cUL approval

The listed output chokes have cRUus approvals independent of the application inverter.

Technical data

Output choke	HD0125-503	HD0240-503	HD0460-503	HD1000-503	HD2000-503
Part number	17985153	17985188	17985161	17991307	17991250
Nominal voltage U_N	3 × AC 230 V – 500 V, 50/60 Hz				
Nominal current I_N	12.5 A	24 A	46 A	100 A	200 A
Nominal power loss	2.9 W	6 W	14 W	37 W	83 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C (reduction: 3% I_N/K up to maximum 60 °C)				
Connection contacts U1/ V1/W1/UDC – U2/V2/W2	0.2 – 10 mm²	2.5 – 16 mm²		16 – 50 mm²	16 – 150 mm²
Tightening torque U1/V1/ W1/UDC – U2/V2/W2	1.2 – 2 Nm	2 – 4 Nm		6 – 8 Nm	12 – 20 Nm
PE connection contact	M6			M8	M10
Tightening torque PE	6 Nm			12 Nm	23 Nm
Degree of protection in accordance with EN 60529	IPXXB			IPXXA	
Mass	0.85 kg	1.46 kg	2.35 kg	3 kg	6.5 kg

Assignment to an inverter

Output choke	HD0125-503	HD0240-503	HD0460-503	HD1000-503	HD2000-503
MDX9_A-...-5_3-..	0020 – 0095	0125 – 0160	0240 – 0320	0460 – 0750	0910 – 1490
MDX9_A-...-2_3-..	0070 – 0093	0140	0213 – 0420	0420 – 0840	1080

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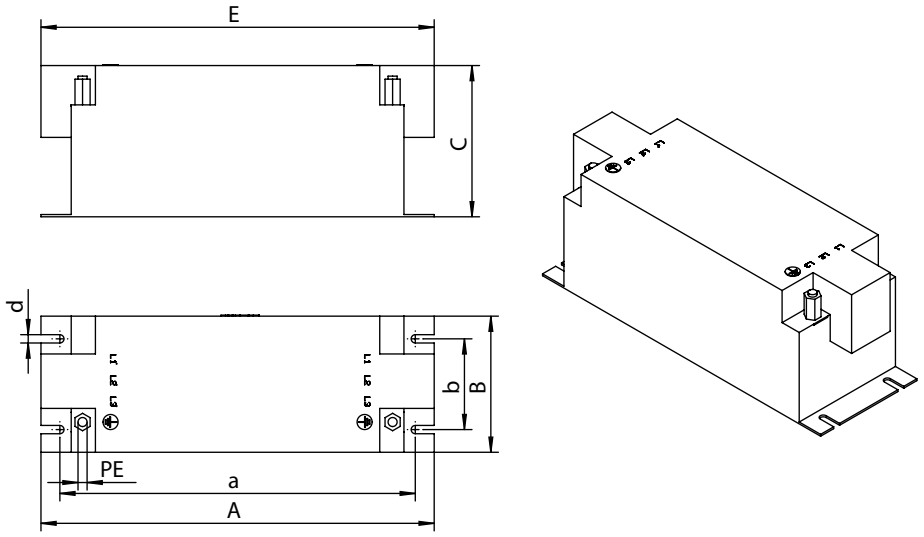
Dimension drawings and dimensions



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Line filter	Main dimensions in mm				Mounting dimensions in mm			Connection
	A	B	C	E	a	b	d	PE
HD0125-503	153	65	73	151	138	40	5.5	M6
HD0240-503	173	95	83	178	158	65	5.5	M6
HD0460-503	185	125	113	189	170	90	5.5	M6
HD1000-503	255	116	143.5	265	240	82	6.5	M8
HD2000-503	300	152.5	160.5	330	286	120	6.5	M10

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9 Functional safety

9.1 General information

9.1.1 Underlying standards

The safety assessment of the device is based on the following standards and safety classes:

Underlying standards	
Safety class/ underlying standard	• Performance level (PL) in accordance with ISO 13849-1:2015 • Safety Integrity Level (SIL) in accordance with IEC 61800-5-2:2016 • Safety Integrity Level Claim Limit (SILCL) in accordance with IEC 62061 2015

9.2 Integrated safety technology

The described safety technology of the device has been developed and tested in accordance with the following safety requirements:

- SIL 3 in accordance with IEC 61800-5-2:2016, IEC 61508:2010.
- PL e in accordance with ISO 13849-1:2015.

This was certified by TÜV Rheinland. Copies of the TÜV certificate and the corresponding report are available from SEW-EURODRIVE on request.

9.2.1 Safe condition

For safety-related operation of the device, Safe Torque Off is defined as safe state (see STO drive safety function). The safety concept is based on this definition.

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9.2.2 Safety concept

The device is supposed to be able to perform the drive safety function "Safe Torque Off" in accordance with IEC 61800-5-2:

- Device is characterized by the optional connection of an external safety controller/ safety relay. This external safety controller/safety relay disconnects the safety-related STO input via a 2-pole 24 V switching signal (sourcing/sinking) when a connected command device (e.g. emergency stop button with latching function) is activated. This activates the STO function of the device. As an alternative to an external safety controller/safety relay, the STO function can also be implemented with the optional MOVISAFE® CS..A safety card.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT).
- Instead of a galvanic isolation of the drive from the supply system by means of contactors or switches, the disconnection of the STO input described here safely prevents the activation of the power semiconductors in the output stage. The rotary-field generation for the respective motor is deactivated even though the line voltage is still present.
- When the STO drive safety function is activated, the generated PWM signals from the device are interrupted by the STO circuit and not transmitted to the IGBTs.
- If the internal diagnostics of the STO circuit detects a discrepancy between the two channels, the PWM signals are locked, i.e. the STO is activated. This locking requires a reset by switching the DC 24 V supply voltage of the device or the DC 24 V switching signal at the STO inputs F_STO_P1 and F_STO_P2 off and on.

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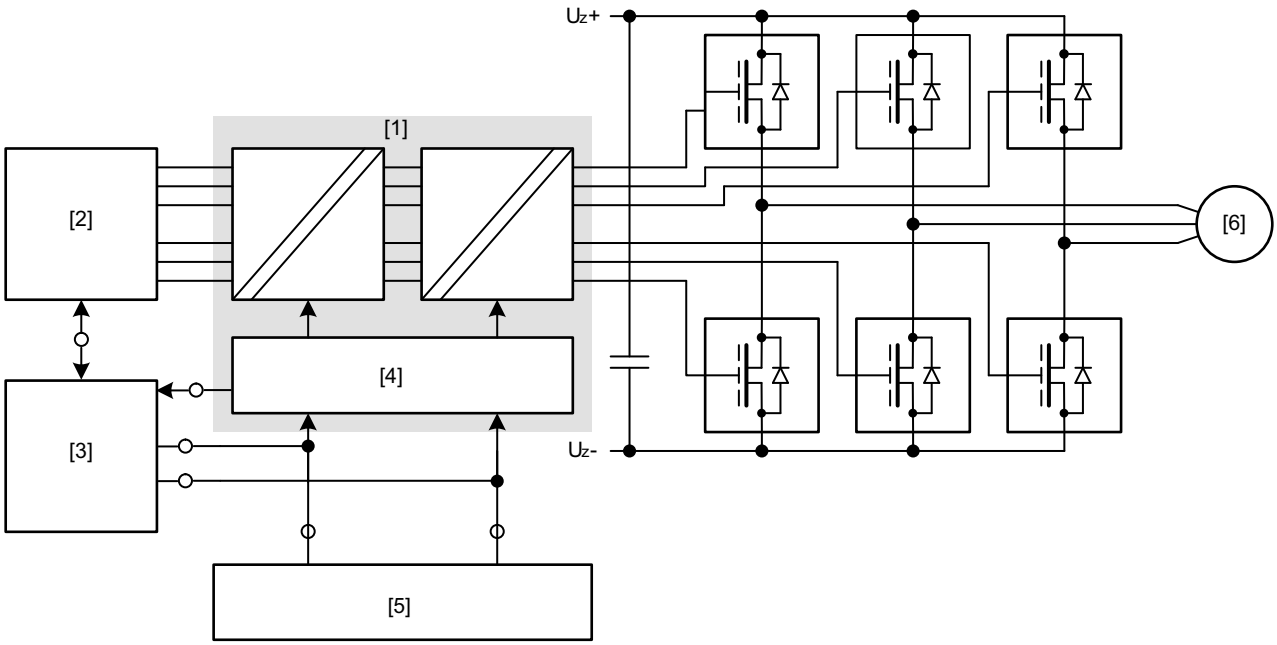
9.2.3 Schematic representation of the safety concept



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[1] STO function
[2] Drive controller
[3] Internal safety card/safety option (optional)
[4] Diagnostics and inhibiting unit
[5] External safety device (optional)
[6] Motor

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9.2.4 Drive safety functions

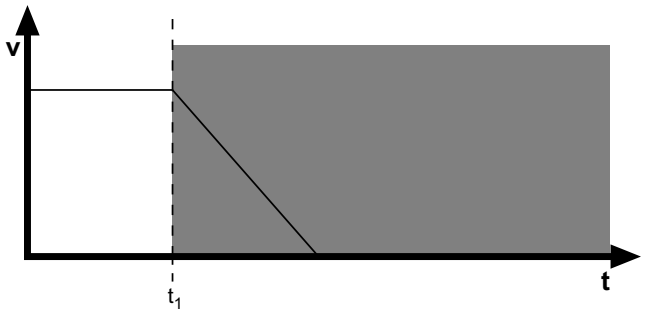
The following drive-related safety functions can be used:

- **STO** (Safe Torque Off in accordance with IEC 61800-5-2) by disconnecting the STO input.

  If the STO function is activated, the frequency inverter no longer supplies power to the motor for generating torque. This drive safety function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

  The STO input must be disabled by a suitable external safety controller/safety relay.

  The following figure shows the STO function:



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v	Speed
t	Time
t_1	Point of time when STO is triggered
	Disconnection range

- **SS1(c) (SS1-t)** (safe stop 1, function variant c in accordance with IEC 61800-5-2) by means of suitable external control (e.g. safety relay with delayed disconnection).

  The following sequence is mandatory:

  – Decelerate the drive using an appropriate brake ramp specified via setpoints.

  – Disconnect the STO input (= triggering the STO function) after a specified safety-related time delay.

  This drive safety function corresponds to a controlled stop in accordance with EN 60204-1, stop category 1.

  The following figure illustrates the SS1(c) (SS1-t) function:

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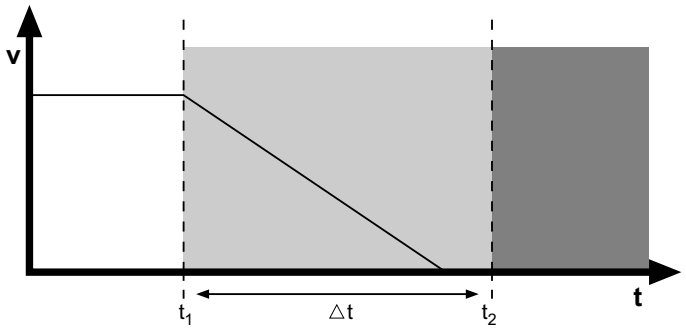

2463226251

v	Speed
t	Time
t_1	Point of time when brake ramp is initiated
t_2	Point of time when STO is triggered
Δt	Delay time until STO is triggered
	Safe time delay range
	Disconnection range

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9.2.5 Restrictions

- Note that if the drive does not have a mechanical brake or if the brake is defective, the drive may coast to a halt (depending on the friction and mass moment of inertia of the system). In the event of regenerative loads or with axes that are loaded with gravitational forces or driven externally, the drive can even accelerate. This must be taken into account in a risk assessment of the system/machine. Additional safety measures might have to be implemented (e.g. safety brake system).

  In the case of application-related drive safety functions that require bringing the hazardous motion safely to a standstill, an additional safety brake system may be necessary on an application-specific basis.
- When using the function SS1(c) (SS1-t) as described in the chapter "Drive safety functions", the brake ramp of the drive is not monitored with respect to safety. In the event of a fault, deceleration may fail during the delay time or, in the worst-case scenario, there might be an acceleration. In this case, the STO function (see the chapter "Safety functions") is only activated after the set time delay elapsed. The resulting danger must be taken into account in the risk assessment of the system/machine. Additional safety measures might have to be implemented.
- The STO function cannot prevent a possible jerk or DC braking.

⚠ WARNING

The safety concept is suitable only for performing mechanical work on driven system/machine components.

When the STO signal is disconnected, the voltage is still present at the DC link of the device.

- Before working on the electric part of the drive system, disconnect it from the supply voltage using an appropriate external disconnecting device and secure it against unintentional reconnection.

⚠ 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.

INFORMATION

In the event of a safety-related disconnection of the DC 24 V supply voltage at the STO connection, the brake controller is switched off. The brake control in the device is not safety-related.

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9.3 Safety conditions

The requirement for safe operation is that the drive safety functions of the application inverter are properly integrated into an application-specific, higher-level drive safety function. A system/machine-specific risk assessment must be carried out without fail by the system/machine manufacturer and taken into account for the use of the drive system with the device.

The system/machine manufacturer and the user are responsible for the compliance of the system/machine with the applicable safety regulations.

The following requirements are mandatory when installing and operating the device in safety-related applications:

- Use of the approved devices
- Installation requirements
- Requirements for external safety controllers and safety relays
- Startup requirements
- Operational requirements

9.3.1 Approved devices

The following device versions of MOVIDRIVE® system are permitted for safety-related applications:

Device	Size
MOVIDRIVE® system	All sizes

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9.3.2 Requirements for the installation

- The components must be protected against conductive dirt, e.g. by installing them in a control cabinet with degree of protection IP54 in accordance with IEC 60529.

  Assuming that the presence of conductive dirt can be excluded at the installation site, a control cabinet with a correspondingly lower degree of protection is also permitted if in accordance with the applicable standards (e.g. EN 60204-1).
- The wiring technology used must comply with the standard EN 60204-1.
- The STO control cables must be routed according to EMC guidelines and as follows:
  - Inside an electrical installation space: Single conductors can be routed.
  - Outside a closed installation space: Shielded cables must be routed permanently (fixed) and protected against external damage, or equivalent measures must be taken.
  - Adhere to the regulations in force for the application.
  - The sinking and sourcing cables from the external safety controller/safety relay to the device must be routed right next to each other with a cable length of ≤ 100 m.
  - The sinking and sourcing cables from the external safety device to the device must have the same cable length. A difference in length ≤ 3% of the two cables is permitted.
  - You must use suitable measures to ensure that STO control cables are routed separately from the power lines of the drive. This does not apply to cables approved by SEW-EURODRIVE specifically for this application case.
- The STO function does not detect short circuits or interference voltage in the supply line, so you must ensure the following:
  - No parasitic voltages can occur in the STO control cables
  - The external safety controller can detect a cross fault from an external potential to the STO control lines
- Observe without fail the values specified for safety components when designing the safety circuits.
- The STO signal (F_STO_P1, F_STO_P2, and F_STO_M) must not be used for feedback.
- For safety controller/safety relays, you must only use grounded voltage sources with protective electrical separation (PELV) in accordance with EN 61131-2 and EN 60204-1.
- If several voltage sources are used, each voltage source must be connected to a PE system.
- When planning the installation, observe the technical data of the devices.
- Do not use the port X6:5 (24 V_Out) of the device for safety-related applications. The voltage is only permitted to supply the port for the safe disconnection X6 when a jumper plug is plugged.
- For safety-related applications with the device, the jumper plug at the STO input X6 must be removed.

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9.3.3 Requirements for external safety controllers

A safety relay can be used as an alternative to a safety controller. The following requirements apply analogously.

- The safety controller and all other safety-related subsystems must be approved for at least that safety class which is required in the overall system for the respective, application-related drive safety function.

  The following table shows an example of the required safety class of the safety controller:

Application	Safety controller requirements
Performance level d in accordance with ISO 13849-1, SIL 2 in accordance with EN 62061	Performance level d in accordance with ISO 13849-1 SIL 2 in accordance with IEC 61508
Performance level e in accordance with ISO 13849-1, SIL 3 in accordance with EN 62061	Performance level e in accordance with ISO 13849-1, SIL 3 in accordance with EN 61508

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation). The STO input of the device can be switched with 2 poles (sourcing or sourcing/sinking) or with 1 pole (sourcing).
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- No electro-sensitive protective equipment (such as a light grid or scanner) in accordance with EN 61496-1 or emergency stop buttons may be connected directly to the STO input. The connection must be made via a safety controller or a safety relay.
- To ensure protection against an unintended startup in accordance with EN ISO 14118, the safe control system must be designed and connected in such a way that resetting the command device alone does not lead to a restart. This means that a restart may be carried out only after a manual reset of the safety circuit.
- If no fault exclusion is used for the STO wiring in accordance with ISO 13849-2 or IEC 61800-5-2, the external safety device must detect the following faults in the STO wiring within 20 s depending on the connection type:
  - 2-pole sourcing output:

    Short circuit of 24 V at F_STO_P1 or F_STO_P2 (Stuck-at 1)

    Crossfault between F_STO_P1 and F_STO_P2
  - 2-pole sourcing/sinking:

    Short circuit of 24 V at F_STO_P1 (Stuck-at 1)

    Short circuit of 0 V at F_STO_M (Stuck-at 0)
  - 1-pole sourcing output:

    In the case of a single-pole connection, a fault exclusion is necessary for the wiring between the safety relay and the STO input.

2-pole sourcing output:

- Test pulses can be present when the device is switched on or off:
  - The test pulses on both sourcing channels must be switched with a time delay. However, additional test pulses may occur simultaneously.
  - The test pulses in both sourcing channels must not exceed 1 ms.

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- The next test pulse in one sourcing channel must occur only after a 2 ms time period.
- A maximum package of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any package before you generate another switch-on test pulse or another switch-on test pulse package.
- The test pulses must be monitored in the safety device. If a fault is detected, the safety device must initiate a suitable fault response.

2-pole sourcing/sinking:

- Test pulses can be present when the device is switched on or off:
  - The test pulses in the sourcing and sinking channel must not exceed 1 ms.
  - The next test pulse in the sourcing or sinking channel must only occur after a 2 ms time period at the earliest.
  - A maximum package of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any package before you generate another switch-on test pulse or another switch-on test pulse package.
  - The test pulses must be monitored in the safety device. If a fault is detected, the safety device must initiate a suitable fault response.

1-pole sourcing output:

- In switched-off state, no switch-on test pulses must occur in the sourcing cable.
- In switched-on state:
  - The switch-off test pulse in the sourcing channel must not exceed 1 ms.
  - The next switch-off test pulse may only occur after a time period of 2 ms at the earliest.
  - A maximum package of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any package before you generate another switch-on test pulse or another switch-on test pulse package.
  - The test pulses must be monitored in the safety device. If a fault is detected, the safety device must initiate a suitable fault response.

9.3.4 Requirements for startup

- To validate the implemented drive safety functions, they must be checked and documented after successful startup (functional test).
- Observe the restrictions for drive safety functions in the chapter "Restrictions". Non-safety-related parts and components that affect the result of the functional test (e.g. motor brake) must be deactivated, if necessary.
- For using the device in safety-relevant applications, it is essential that you perform and document startup checks for the disconnecting device and the correct electrical connection.

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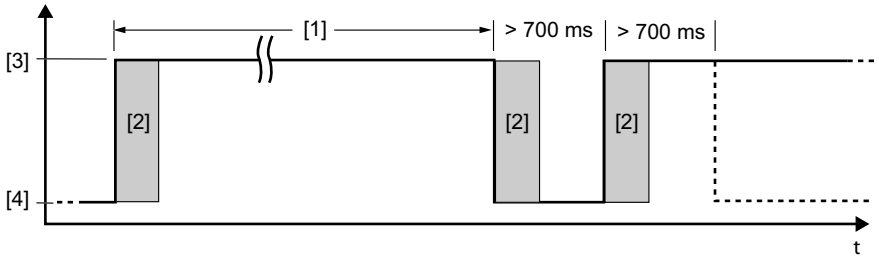
9.3.5 Requirements for operation

- Operation is permitted only within the limits specified in the corresponding documentation. This principle applies to the external safety controller as well as to the device and any approved options.
- The built-in diagnostic function is limited in the case of a permanently enabled or permanently disabled STO input. Advanced diagnostic functions are performed only upon a level change of the STO signal. This is why the STO input of the device must be requested with connected line voltage at least once every 12 months for PL d in accordance with ISO 13849-1 and SIL 2 IEC 61800-5-2 and at least once every 3 months for PL e in accordance with ISO 13849-1 and SIL 3 IEC 61800-5-2 to achieve complete test coverage. Adhere to the following test procedure.



15205932683

[1] Maximum 12 months with PL d/SIL 2
Maximum 3 months with PL e/SIL 3
[2] Internal diagnostics
[3] High: No STO
[4] Low: STO active

- To achieve complete test coverage after a device reset (e.g. after connecting the line voltage), the state transition (STO active → not active) can be started only > 700 ms later. The device signals "ready for operation" or "STO – Safe Torque Off" if it is not in fault state.
- A detected hardware fault in the internal switch-off channels for STO will lead to a locking fault state in the device. If the fault is reset (e.g. by switching the line voltage on/off or by a low level at the STO input for at least 30 ms), a complete test with internal diagnostics according to the abovementioned test procedure must be performed. If the fault occurs again, replace the device or contact SEW-EURODRIVE Service.

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9.4 Connection designs

9.4.1 General information

Generally, all the connection designs listed in this documentation are permitted for safety-relevant applications, insofar as the safety conditions arising from this documentation are satisfied. This means that you must ensure without fail that the DC 24 V safety inputs are activated by a safety controller or an external safety relay, so that an independent restart is not possible.

All the safety conditions stipulated in the chapters "Integrated safety technology", "Safety conditions", and "Connection variants" must be satisfied on a primary basis for the basic selection, installation, and application of the safety components, such as safety relay, emergency stop switch, and the approved connection variants.

The wiring diagrams are block diagrams whose only purpose is to show the drive safety function(s) with the relevant components. For reasons of clarity, circuit-related measures that usually always have to be implemented are not shown in the diagram. These measures are e.g.:

- Ensuring the availability of touch guards.
- Handling overvoltages and undervoltages.
- Avoiding installation errors.
- Detecting ground faults or short circuits in externally installed lines.
- Guaranteeing the required interference immunity against electromagnetic interference.

9.4.2 Requirements

Use of safety relays

The requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or of other safety components must be strictly observed. The basic requirements for cable routing apply as described in this documentation.

For connecting the device to the safety relays, observe the installation requirements in accordance with the chapter "Installation requirements".

All instructions by the manufacturer of the safety relay used in the particular application must be observed.

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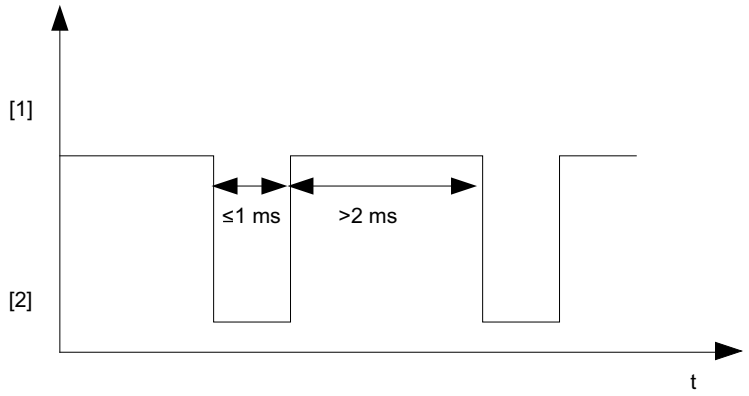
Use of safety controllers

The switch-off test pulse of the used safe digital outputs (F-DO) must be ≤ 1 ms and another switch-off test pulse must only occur 2 ms later at the earliest.



15214338827

[1] High
[2] Low

INFORMATION

If the safety-related control voltage at X6 is switched off (STO activated), you must observe the chapter "Requirements for the external safety controller" with regard to the test pulses.

INFORMATION

If F_STO_P1, F_STO_P2 are connected to DC 24 V, and F_STO_M is connected to GND, STO is deactivated.

STO signal for group disconnection

For group drives, the STO signal may be provided for several devices by a single safety relay. The following requirements must be met:

- The total cable length is limited to max. 100 m. Any other instructions published by the manufacturer on the use of the safety device (for the respective application) must also be observed.
- The maximum output current and the maximally permitted contact load of the safety device must be observed (see the chapter "Technical data" > "Electronic data – Drive safety functions").
- You must comply with the permitted signal levels at the STO input and all other technical data of the device. The respective routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety device manufacturer (such as protecting the output contacts against welding) must be strictly observed. The basic requirements for cable routing also apply.
- A calculation based on the technical data of the device must be performed separately for each case of group drive disconnection.
- A maximum of 20 devices may be used in a group disconnection.

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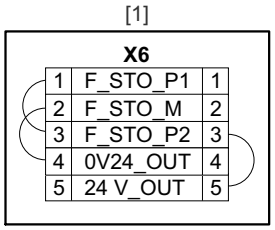
9.4.3 Wiring diagrams

Delivery state

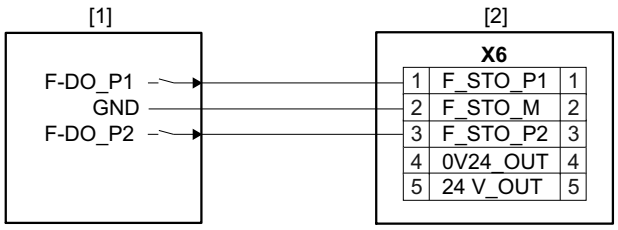
In the delivery state, the terminals at the port for safe disconnection X6 are jumpered.



27743538443

[1] STO terminal X6

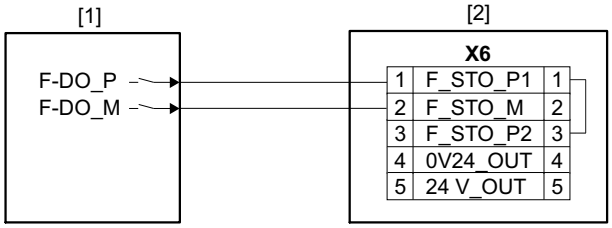
2-pole sourcing



27743543947

[1] External safety device
[2] STO terminal X6

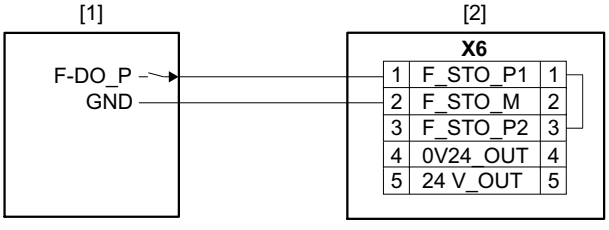
2-pole sourcing/sinking



27743625995

[1] External safety device
[2] STO terminal X6

1-pole sourcing



27743633163

[1] External safety device
[2] STO terminal X6

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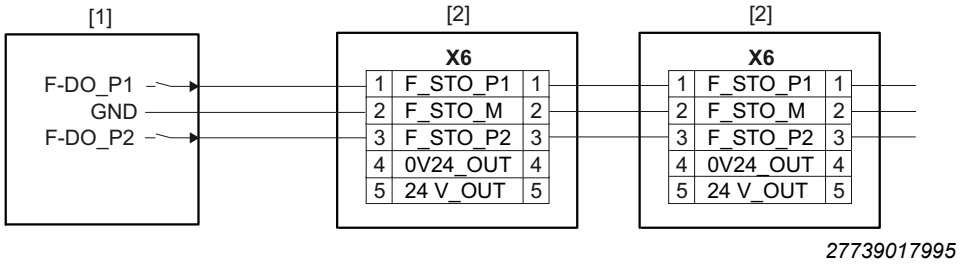
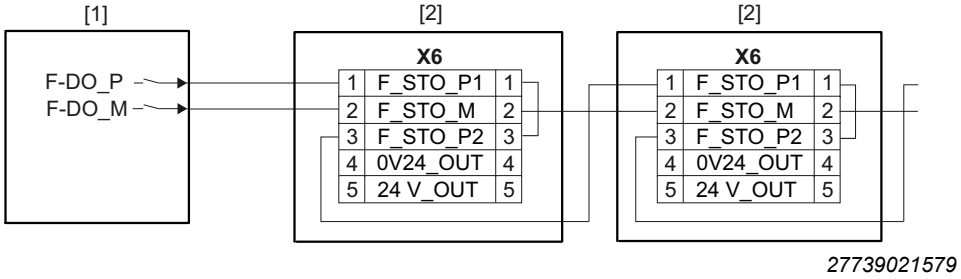
STO group disconnection, 2-pole, sourcing



27739017995

[1] External safety controller
[2] STO terminal X6

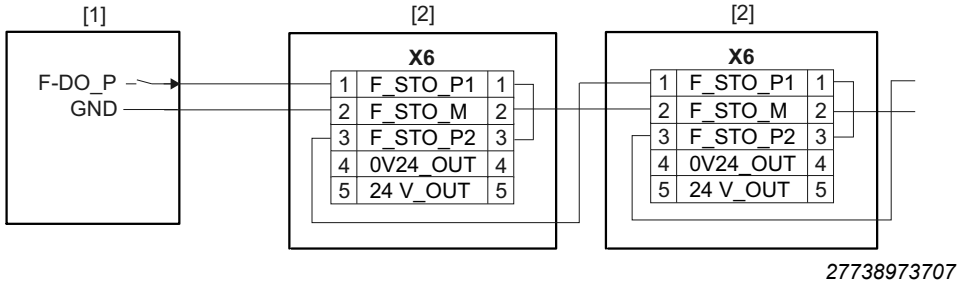
STO group disconnection, 2-pole, sourcing/sinking



27739021579

[1] External safety controller
[2] STO terminal X6

STO group disconnection, 1-pole, sourcing



27738973707

[1] External safety controller
[2] STO terminal X6

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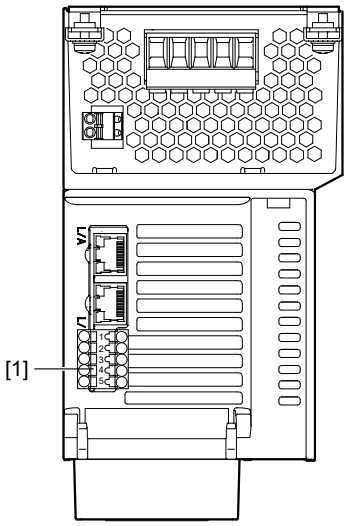
9.4.4 Port X6 on the device

The following figure shows the X6 port on the top of the device.



17915451659

[1] X6: Connection for Safe Torque Off (STO)

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9.5 Safety characteristics

	Characteristic values in accordance with	
	IEC 61800-5-2	**ISO 13849-1**
Tested safety class/underlying standards	Safety integrity level 3	Performance level e / category 3
Probability of a dangerous failure per hour (PFH value)	2.5×10^{-9} h-1	
Service life	20 years, after which the component must be replaced with a new one.	
Proof test interval	> 20 years	–
Safe state	Safe Torque Off (STO)	
Drive safety function	STO, SS1[1)] in accordance with IEC 61800-5-2	

1) With suitable external control

INFORMATION

In the case of 1-pole wiring, the achievable performance level in accordance with ISO 13849-1 is reduced to PL d, and the achievable Safety Integrity Level in accordance with IEC 61800-5-2 is reduced to SIL 2. A fault exclusion is necessary for the wiring between the safety relay and the STO input.

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10 Appendix

10.1 Abbreviation key

The following table lists the abbreviations that are used in this document together with their unit and meaning.

Abbreviation	Information on the nameplate	Unit	Meaning
ASM			Asynchronous motor
C	C	µF	Capacitance
f_{max}	f	Hz	Maximum output frequency
f_{line}	f	Hz	Line frequency
f_{PWM}		kHz	Frequency of the pulse width modulation
h		m	Installation altitude
I_{trip}		A	Tripping current (braking resistor)
I_{max}	Imax	A	Max. DC link current (specification on the nameplate)
I_{max}		A	Maximum output current (encoder cards)
I_{peak}		A	Output peak current (encoder cards)
$I_{A\ max}$		A	Max. output current
I_{Appl}		A	Total current of the application
I_N		A	Nominal output current/nominal current (filter, choke)
I_{line}	I	A	Nominal line current
I_{NDCL}	I	A	Nominal DC link current
L_N		mH	Inductance
LSPM			Line Start Permanent Magnet
P_{eff}		kW	Effective power (braking resistor)
P_{max}		kW	Maximum power (braking resistor)
P_{Mot}	P(ASM)	kW	Motor power of the asynchronous motor
P_N		kW	Nominal motor power (rated power)
P_V		W	Power loss
PWM			Pulse width modulation
R_{BR}		Ω	Value of the braking resistance
R_{BRmin}		Ω	Minimum value of the braking resistance
S_N	S	kVA	Apparent output power
SM			Synchronous motor
U_A	U	V	Motor output voltage
U_{BR}		V	Brake supply voltage
U_N		V	Nominal line voltage (filter, choke)
U_{line}	U	V	Connection voltage
U_{NDCL}	U	V	Nominal DC link voltage

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Abbreviation	Information on the nameplate	Unit	Meaning
U_{out}		V	DC 24 V to supply STO_P1 and STO_P2
U_S		V	Supply voltage of encoders
U_{S12VG}		V	DC 12 V supply voltage of encoders
U_{S24VG}		V	DC 24 V supply voltage of encoders
U_{I24}		V	Voltage supply for electronics and brake
ϑ_{amb}	T	°C	Ambient temperature
(+ES)			... with output stage inhibit

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Germany			
	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 18 89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 dc-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 dc-wuerzburg@sew-eurodrive.de
Drive Service Hotline / 24 Hour Service			0 800 SEWHELP 0 800 7394357
Great Britain			
Assembly Sales Service	Normanton	SEW-EURODRIVE Ltd. DeVilliers Way Trident Park Normanton West Yorkshire WF6 1GX	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
	Drive Service Hotline / 24 Hour Service		Tel. 01924 896911
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyí út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 http://www.varmaverk.is vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 http://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
Sales Service	Gurgaon	SEW-EURODRIVE India Private Limited Drive Center Gurugram Plot no 395, Phase-IV, UdyogVihar Gurugram , 122016 Haryana	Tel. +91 99588 78855 salesgurgaon@seweurodriveindia.com
Indonesia			
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id

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Indonesia			
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 20020 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 21 21 81 05 Fax +225 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp hamamatsu@sew-eurodrive.co.jp
Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.kz sew@sew-eurodrive.kz
	Tashkent	SEW-EURODRIVE LLP Representative office in Uzbekistan 96A, Sharaf Rashidov street, Tashkent, 100084	Tel. +998 71 2359411 Fax +998 71 2359412 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C 1073 Riga	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.lv info@alas-kuul.com

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Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn
Morocco			
Sales Service	Bouskoura	SEW-EURODRIVE Morocco Parc Industriel CFCIM, Lot 55 and 59 Bouskoura	Tel. +212 522 88 85 00 Fax +212 522 88 84 50 http://www.sew-eurodrive.ma sew@sew-eurodrive.ma
Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com
Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl

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New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd Plot 296A, Adeyemo Akapo Str. Omole GRA Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com bolaji.adekunle@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro
Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» а. я. 36 195220 Санкт-Петербург	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

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Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Sales	Bratislava	SEW-Eurodrive SK s.r.o. Rybničná 40 831 06 Bratislava	Tel.+421 2 33595 202, 217, 201 Fax +421 2 33595 200 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
	Košice	SEW-Eurodrive SK s.r.o. Slovenská ulica 26 040 01 Košice	Tel. +421 55 671 2245 Fax +421 55 671 2254 Mobile +421 907 671 976 sew@sew-eurodrive.sk
Slovenia			
Sales Service	Celje	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za
South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE KOREA CO., LTD. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com
	Busan	SEW-EURODRIVE KOREA CO., LTD. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230

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Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sri Lanka			
Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
Swaziland			
Sales	Manzini	C G Trading Co. (Pty) Ltd Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtradingswaziland.com
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
Switzerland			
Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Taiwan			
Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
Tanzania			
Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
Thailand			
Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn
Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRİVE Hareket Sistemleri San. Ve TIC. Ltd. Sti Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Ukraine			
Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

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United Arab Emirates			
Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochiminh City Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam	Tel. +84 937 299 700 huytam.phan@sew-eurodrive.com
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn
Zambia			
Representation: South Africa			

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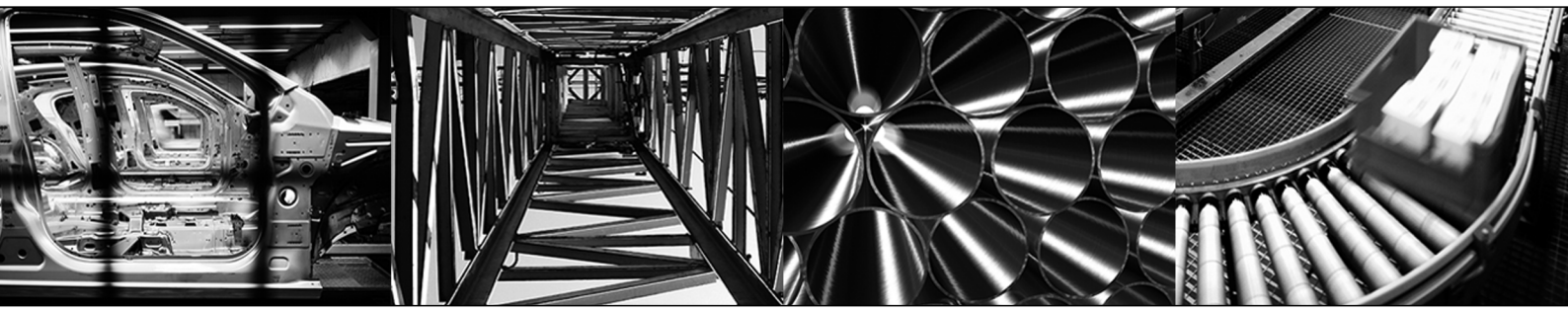

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