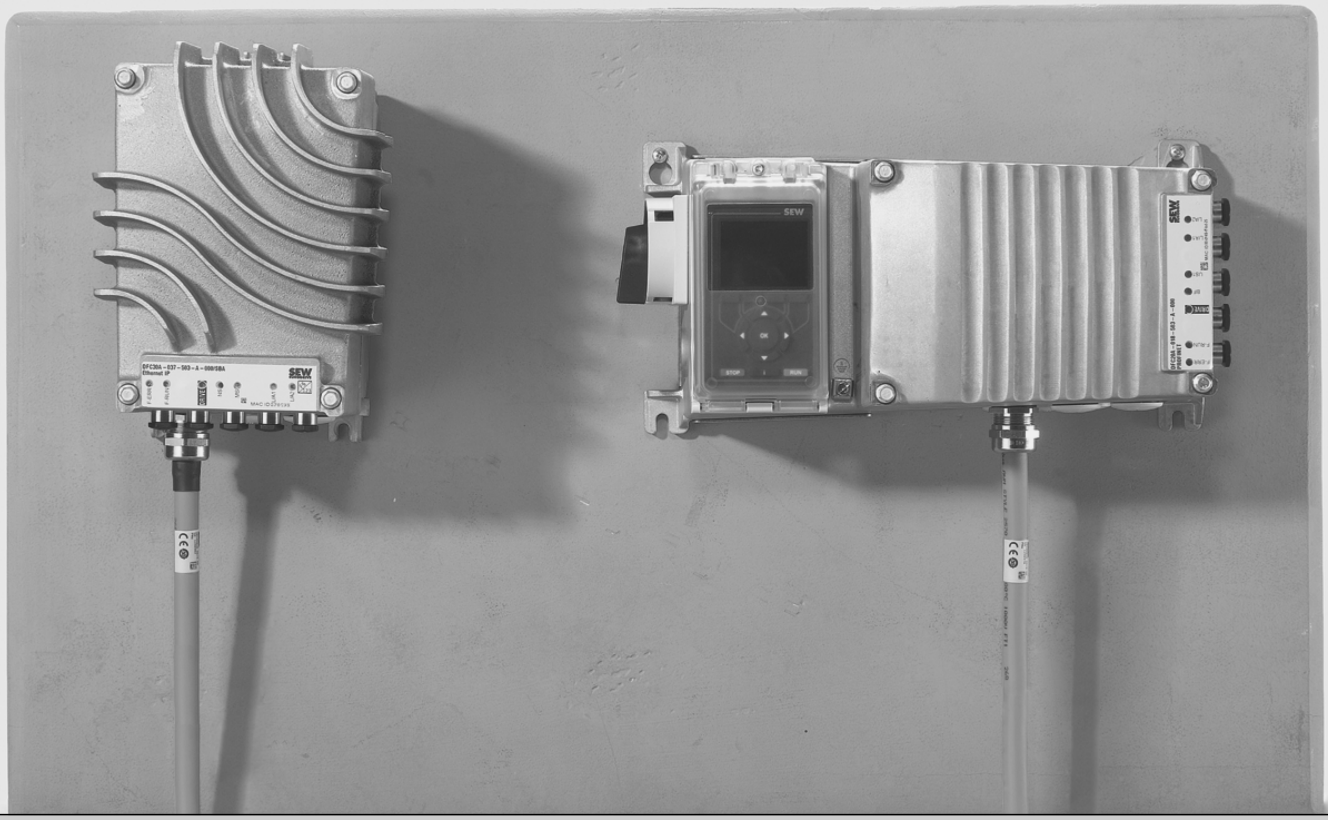
Operating Instructions



Decentralized frequency inverter

MOVIMOT® flexible

MMF1..-C/DBC.., MMF3..-C/DBC.. (binary)

Edition 12/2019

29129451/EN

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1 General information

1.1 About this documentation

The documentation at hand 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 Other applicable documentation

Observe the corresponding documentation for all further components.

1.3 Structure of the safety notes

1.3.1 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.	

1.3.2 Structure of section-related safety notes

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

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

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning about suspended load
	Warning of automatic restart

1.3.3 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.

1.4 Decimal separator in numerical values

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

Example: 30.5 kg

1.5 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.

1.6 Product names and trademarks

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

1.7 Copyright notice

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.

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2.3 Target group

Specialist for mechanical work

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

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

Specialist for electrotechnical work

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

- 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 devices, 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 to give persons the ability to perform the required tasks and work steps in a safe and correct manner.

2.4 Designated use

The product is intended for 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.

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

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

Do not use the product as a climbing aid.

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

You may use options and accessories from SEW-EURODRIVE exclusively in connection with products from SEW-EURODRIVE.

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2.4.2 Hoist applications

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

- The product is not designed for use as a safety device in lifting applications.
- Use additional monitoring systems or mechanical protection devices.

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 Transportation

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.
- Before transportation, cover the connections with the supplied protection caps.
- Only place the product on the cooling fins or on the side without connectors during transportation.

If necessary, use suitable, sufficiently dimensioned handling equipment.

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

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2.7 Installation/assembly

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

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

Observe the notes in chapter Mechanical installation in the documentation.

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:

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter Technical data in the documentation.
- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level, limiting measures must be taken which reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation (in accordance with EN 61800-5-1 and EN 60204-1) is required, then implement this outside the product at altitudes of more than 2000 m above sea level.

2.8 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.

2.9 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).

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2.9.1 Stationary application

Necessary preventive measure for the product is:

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

2.9.2 Regenerative operation

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

2.10 Startup/operation

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

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

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

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.

Do not separate the connection to the product during operation. This may result in dangerous electric arcs damaging the product.

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:

5 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.

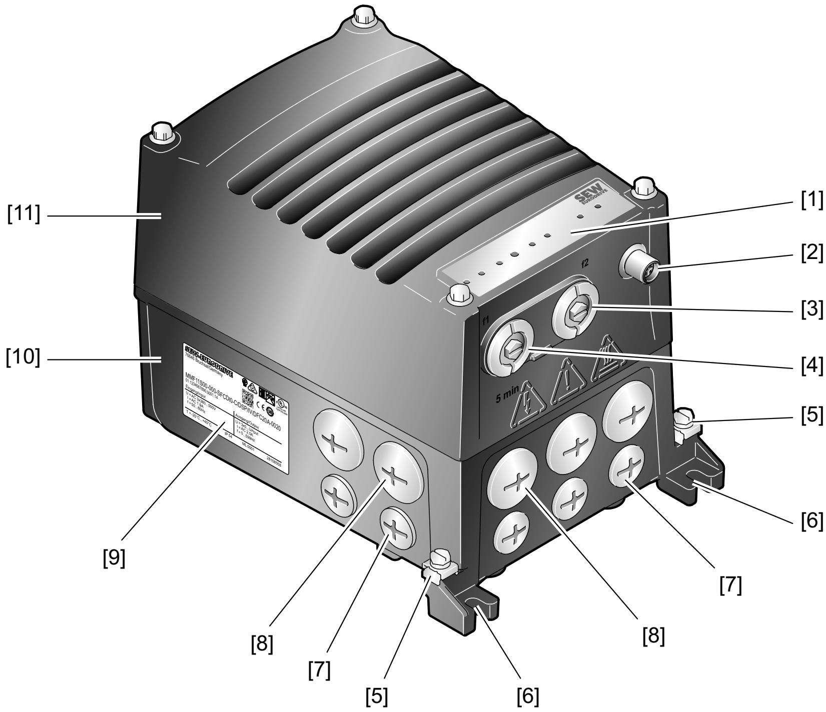
2.10.1 Switch disconnector

The switch disconnector only disconnects the device from the supply system. The terminals of the device are still connected to the line voltage after the switch disconnector is activated.

3 Device structure

3.1 MOVIMOT® flexible MMF1.

MOVIMOT® flexible MMF1. is a decentralized frequency inverter that serves to control drive units. It comprises of 2 core components, the electronics cover and the universal connection box (see the following figure).



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[1] LED displays
[2] Plug connector
[3] Potentiometer f2 (underneath the screw plug)
[4] Potentiometer f1 (underneath the screw plug)
[5] Screws for PE connection
[6] Mounting lug
[7] Cable glands M16
[8] Cable glands M25
[9] Nameplate
[10] Connection box
[11] Electronics cover (inverter)

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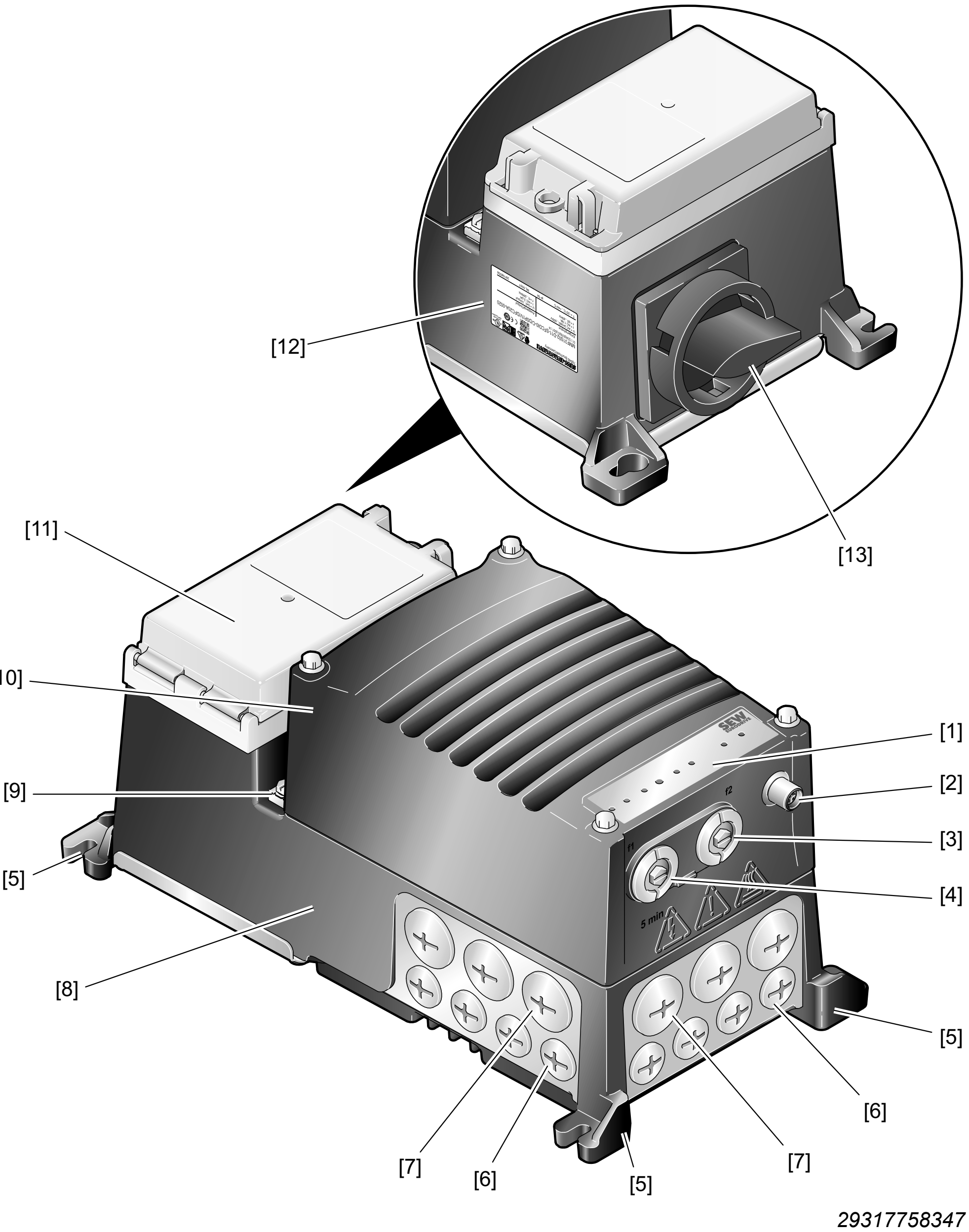
3.2 MOVIMOT® flexible MMF3.

MOVIMOT® flexible MMF3. is a decentralized frequency inverter that serves to control drive units. It comprises of 4 core components, the electronics cover, connection box, front module, and maintenance switch (see the following figure).



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[1] LED displays
[2] Plug connector
[3] Potentiometer f2 (underneath the screw plug)
[4] Potentiometer f1 (underneath the screw plug)
[5] Mounting lug
[6] Cable glands M16
[7] Cable glands M25
[8] Connection box
[9] Screws for PE connection
[10] Electronics cover (inverter)
[11] Front module
[12] Nameplate
[13] Switch disconnector

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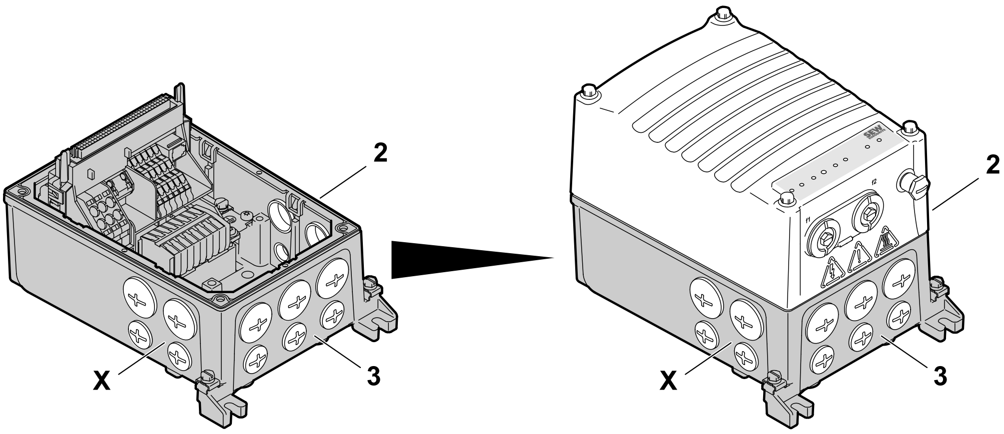
3.3 Cable entry position

3.3.1 Design MMF1.

The following cables entries are possible for the device:

- Position X + 2 + 3
  - X: 2 × M25 × 1.5 + 2 × M16 × 1.5
  - 2: 2 × M25 × 1.5 + 2 × M16 × 1.5
  - 3: 3 × M25 × 1.5 + 3 × M16 × 1.5

The following figure shows the possible cable entries:



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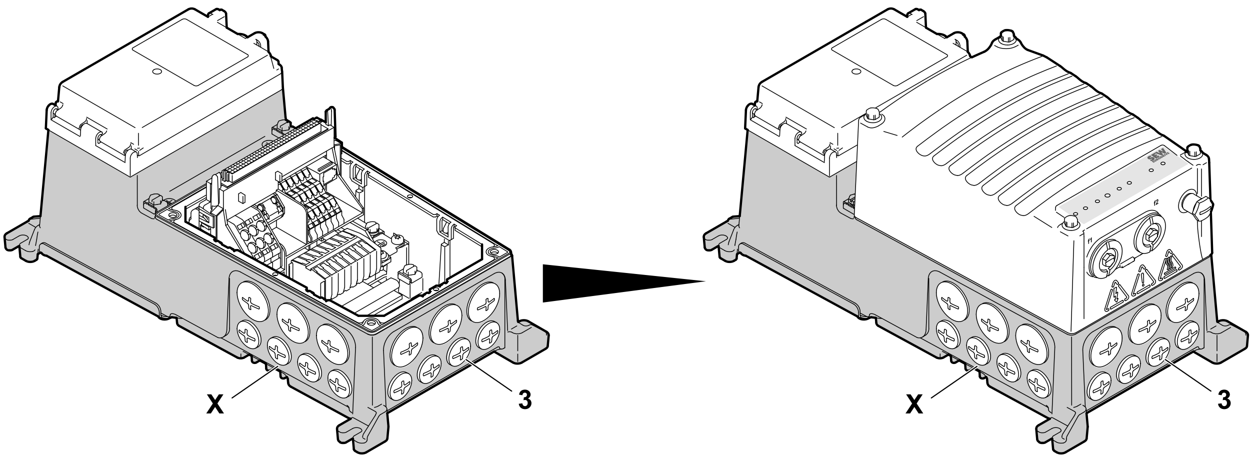
3.3.2 Design MMF3.

The following cables entries are possible for the device:

- Position X + 3
  - X: 3 × M25 × 1.5 + 4 × M16 × 1.5
  - 3: 3 × M25 × 1.5 + 4 × M16 × 1.5

The following figure shows the possible cable entries:



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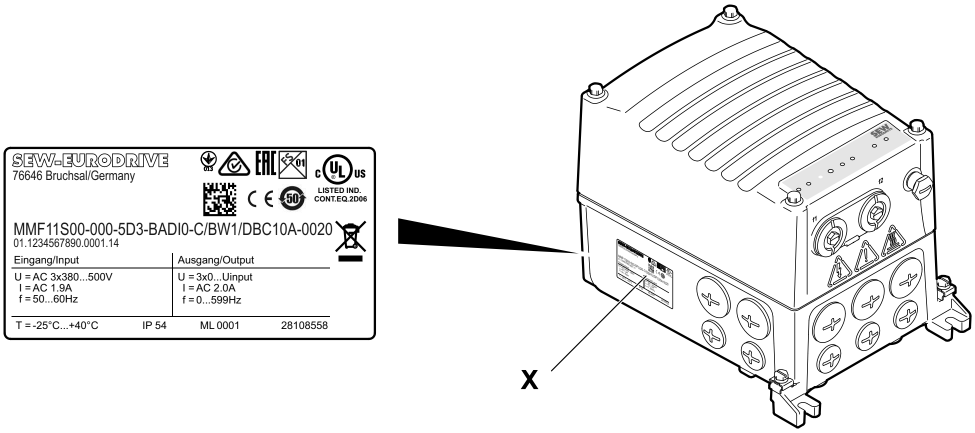
3.4 Nameplate position

3.4.1 Design MMF1.

The following nameplate positions are possible for the device:

- Nameplate of the complete device: Position X
- Optional nameplate: Position 2

The following figure shows the position of the nameplate:



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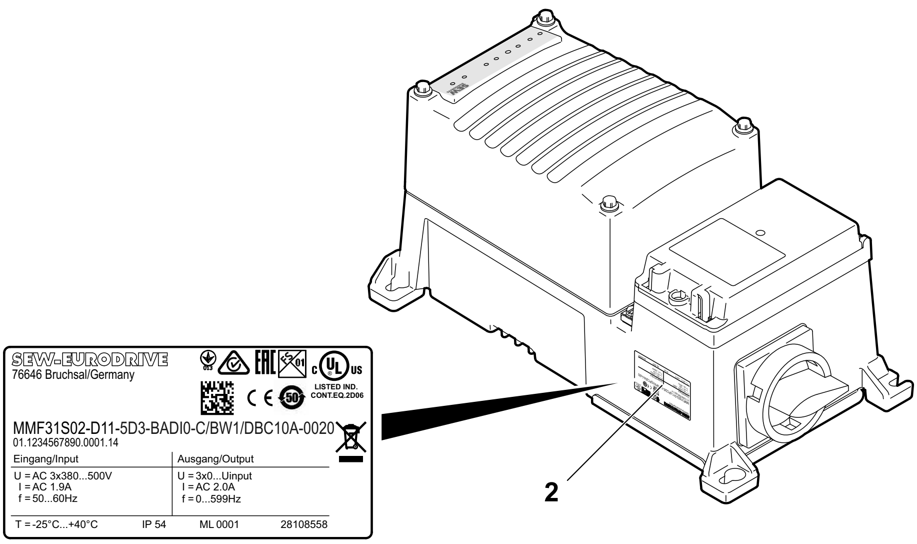
3.4.2 Design MMF3.

The following nameplate positions are possible for the device:

- Nameplate of the complete device: Position 2 (left)
- Optional nameplate: Position 2 (right)

The following figure shows the position of the nameplate:



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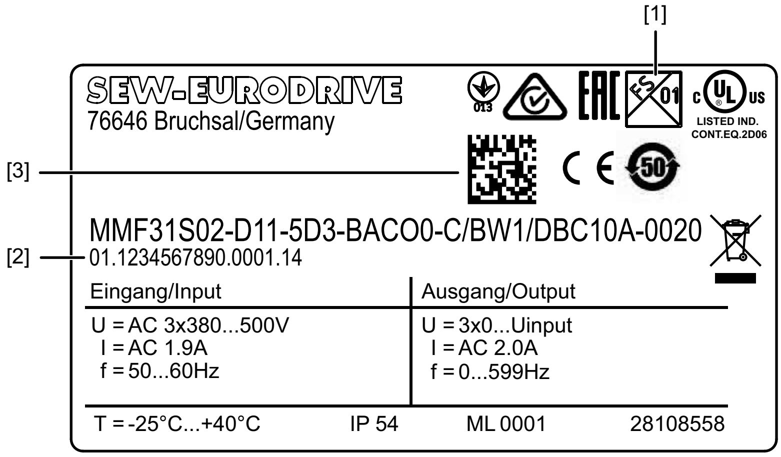
3.5 Example nameplate and type designation

3.5.1 Nameplate

The following figure gives an example of a nameplate of the device. For the structure of the type designation, refer to chapter "Type designation".



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[1] FS logo
[2] Unique serial number
[3] The DataMatrix code on the nameplate indicates the unique serial number.

FS logo description

The FS logo on the nameplate is based on the combination of safety-related components that is installed.

The following FS logo variants are possible:

FS 01 — Device with STO connection via terminals or plug connectors.

3.5.2 Type designation

The following table shows the type designation of MOVIMOT® flexible **MMF31S02-D11-5D3-SFCO0-C/DSP/DFC20A-0020** as an example:

MMF	**product family** MMF = MOVIMOT® flexible
3	**Design** 1 = device variant 1 3 = device variant 3
1	**Flange dimensions for relevant electronics cover size** 1 = Suitable for electronics cover size 1 with or without cooling fins
S0	**Mechanics design** S0 = housing with metric threads for cable entry
2	**Front module** 0 = Closed 1 = Engineering interface M12[1)] 2 = Prepared for CBG[1)] keypad 3 = Prepared for CBG[1)] local operator panel
–	
D11	**Maintenance switch** 000 = Without switching element D11 = Switch disconnector with feedback contact[1)] M11 = Switch disconnector with feedback contact and line protection [1)]
–	
5	**Connection voltage** 5 = AC 500 V
D	**Power section design EMC** D = EMC filter with limit value category C3 (EN 61800-3)
3	**Connection type** 3 = 3-phase
–	
BA	**Connection unit** BA = Connection unit binary or AS-Interface
CO	**Digital interface (MOVILINK® DDI)** DI = Integrated MOVILINK® DDI slave (for motors without digital interface) CO = MOVILINK® DDI interface via coaxial cable (for motors with digital interface)
0	**Board design** 0 = standard connection board
–	

C	**Version** C = generation C
/	
BW1	**Options** DSP = DynaStop® electrodynamic deceleration option IV = Plug connector PE = pressure compensation fitting for electronics BW1 = integrated BG1 braking resistor
/	
DBC10A	**Electronics cover design** DBC10A = **D**irect **B**inary **C**ommunication – Binary
–	
0020	**Nominal output current of the electronics cover** 0020 = 2.0 A 0025 = 2.5 A 0032 = 3.2 A 0040 = 4.0 A 0055 = 5.5 A

1) Only available in combination with MOVIMOT® flexible MMF3.

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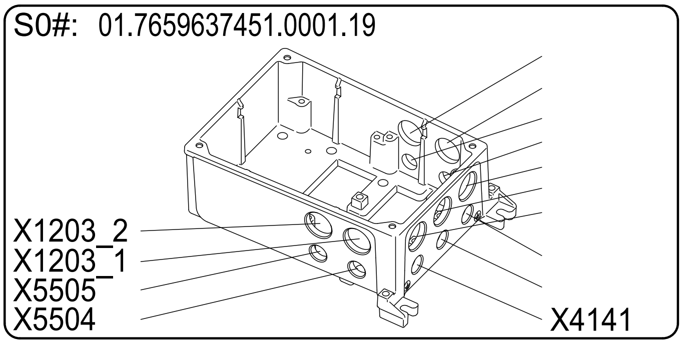
3.6 Examples for the optional nameplate "Plug connector positions"

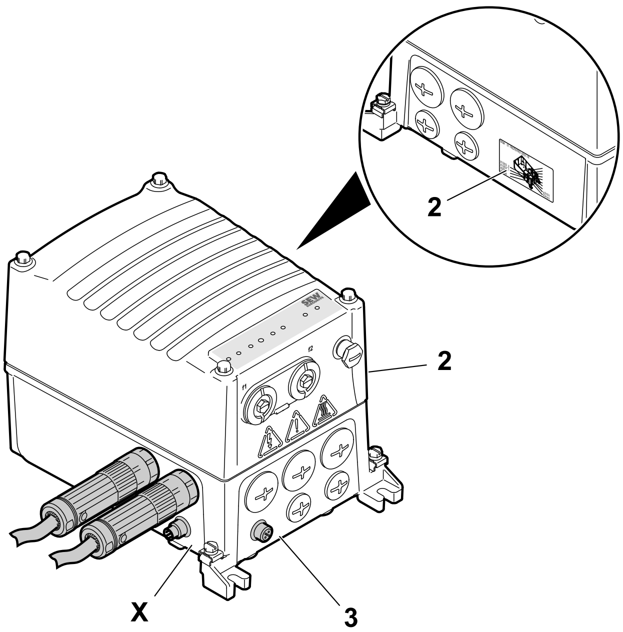
3.6.1 Design MMF1.

The following figure shows an example of the optional nameplate "Plug connector positions":



18014424412268555

The nameplate shows the designations and positions of the plug connectors at the connection box. This nameplate can be installed in position 2.



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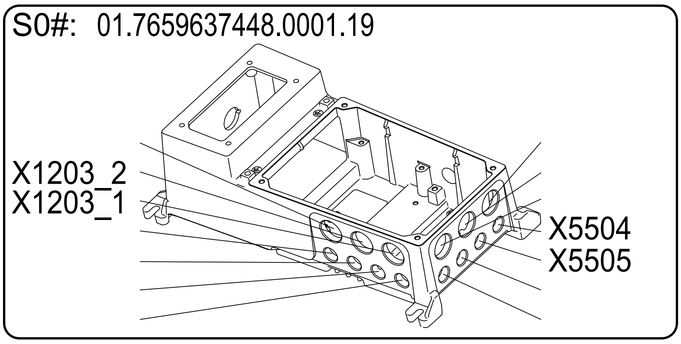
3.6.2 Design MMF3.

The following figure shows an example of the optional nameplate "Plug connector positions":



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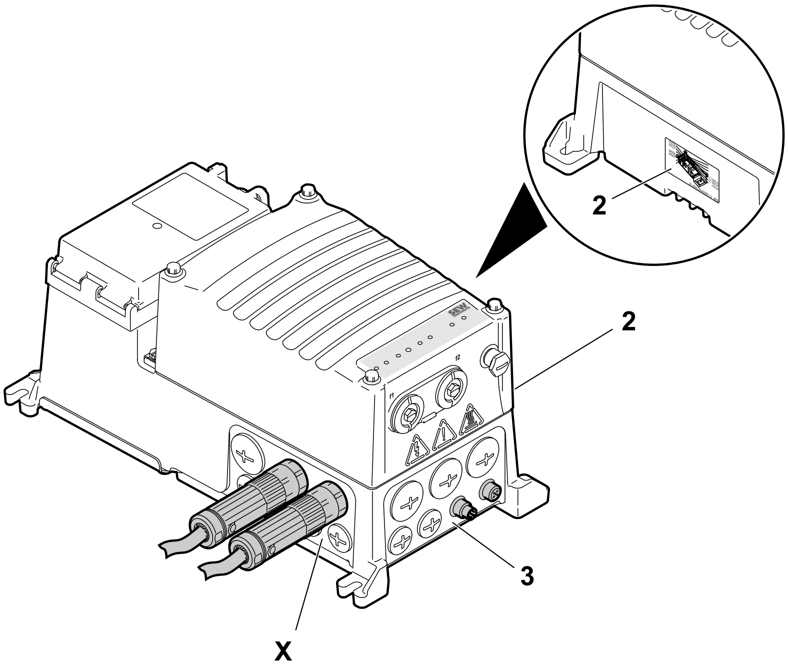
The nameplate shows the designations and positions of the plug connectors at the connection box. This nameplate can be installed in position 2.



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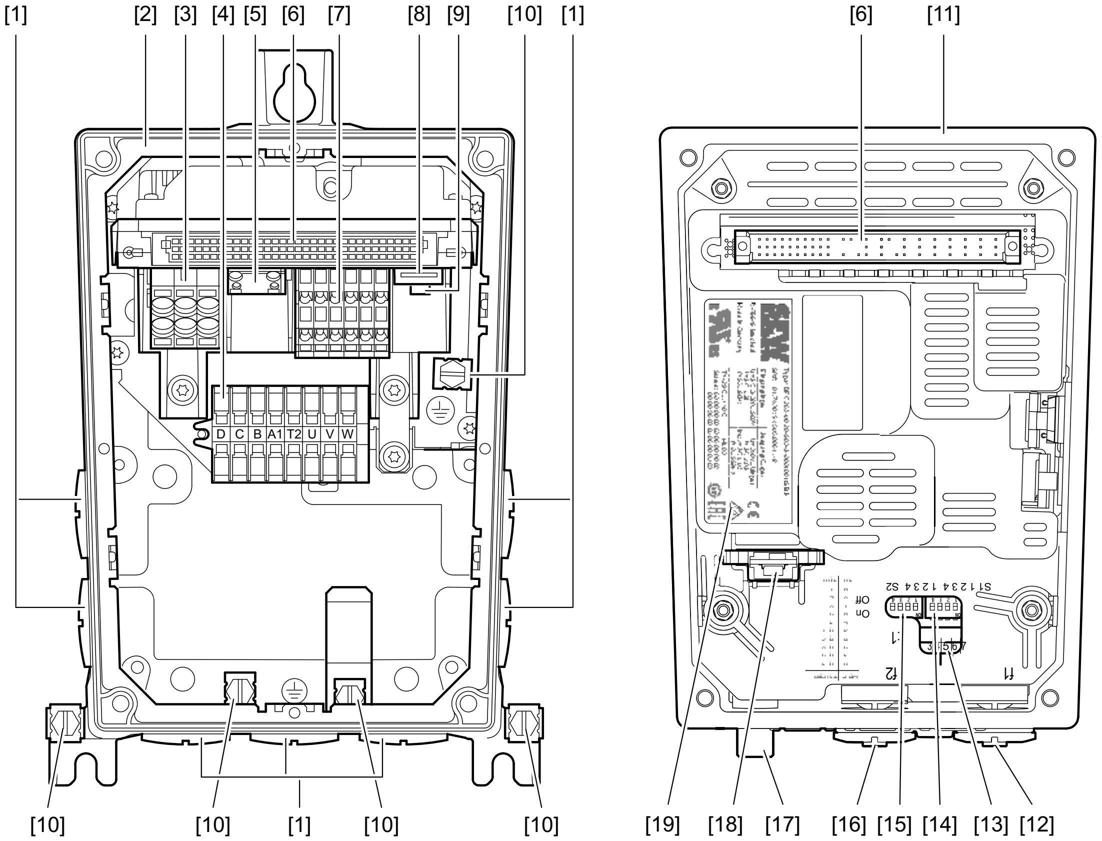
3.7 Electronics

3.7.1 Electronics cover (inside) and connection box

Design MMF1.

The following figure shows the connection box and the bottom side of the electronics cover:



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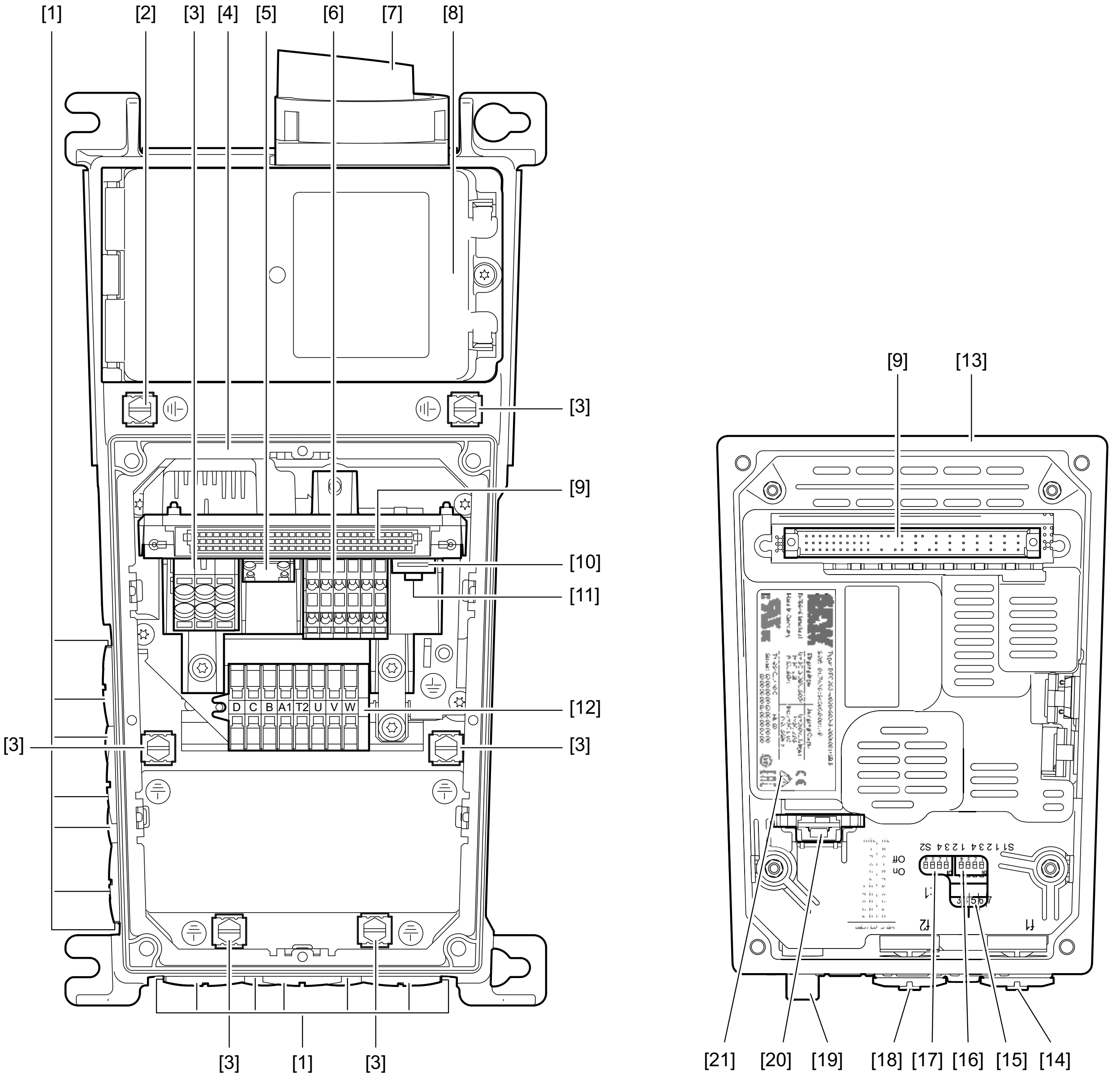
[1] Cable glands
[2] Connection box
[3] Connection line L1, L2, L3
[4] Connection for motor, brake and temperature sensor
[5] Braking resistor connection
[6] Plug connector connection unit for electronics cover
[7] Electronics terminal strip
[8] Engineering interface
[9] MOVILINK® DDI connection
[10] Screws for PE connection
[11] Electronics cover
[12] Potentiometer f1 (underneath the screw plug)
[13] Potentiometer t1
[14] DIP switches S1/1 – S1/4
[15] DIP switches S2/1 – S2/4
[16] Potentiometer f2 (underneath the screw plug)
[17] Plug connector
[18] Replaceable memory module
[19] Electronics cover nameplate

Design MMF3.

The following figure shows the connection box and the bottom side of the electronics cover:



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[1]	Cable glands	[11]	MOVILINK® DDI connection
[2]	Screws for PE connection	[12]	Motor and brake connection
[3]	Connection line L1, L2, L3	[13]	Electronics cover
[4]	Connection box	[14]	Potentiometer f1 (underneath the screw plug)
[5]	Braking resistor connection	[15]	Potentiometer t1
[6]	Electronics terminal strip	[16]	DIP switches S1/1 – S1/4
[7]	Maintenance switch	[17]	DIP switches S2/1 – S2/4
[8]	Front module	[18]	Potentiometer f2 (underneath the screw plug)
[9]	Plug connector connection unit for electronics cover	[19]	Plug connector
[10]	Engineering interface	[20]	Replaceable memory module
		[21]	Electronics cover nameplate

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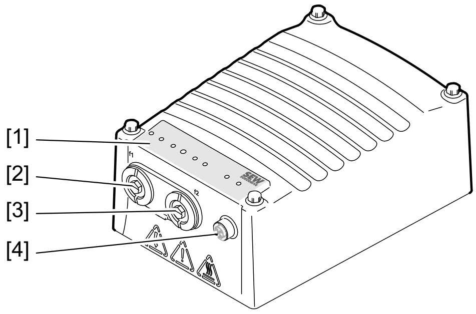
3.7.2 Electronics cover (outside)

The following figure gives an example of electronics cover designs:



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[1] LED displays
[2] Potentiometer f1 (underneath the screw plug)
[3] Potentiometer f2 (underneath the screw plug)
[4] Plug connector

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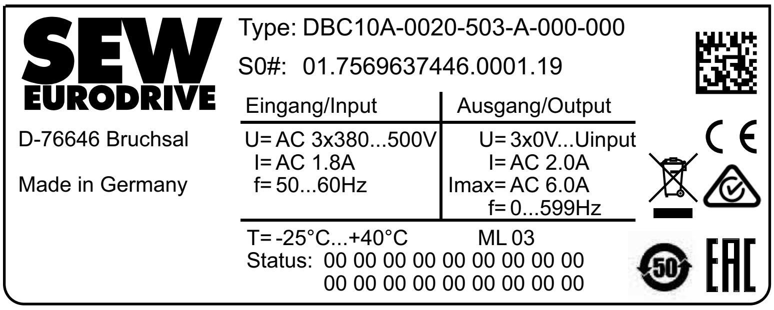
3.8 Example nameplate and type designation of the electronics

3.8.1 Nameplate

The following figure gives an example of a nameplate of the electronics cover. For the structure of the type designation, refer to chapter "Type designation of the electronics cover".



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3.8.2 Type designation of the electronics cover

The following table shows the type designation of the electronics cover:

DBC	**Product family** DBC = Electronics cover **D**irect **B**inary **C**ommunication
1	**Communication type** 1 = Binary
0	**Port configuration** 0 = M12 plug connector on electronics cover (standard)
A	**Communication version**
–	
0020	**Nominal output current of the electronics cover** 0020 = 2.0 A 0025 = 2.5 A 0032 = 3.2 A 0040 = 4.0 A 0055 = 5.5 A
–	
5	**Connection voltage** 5 = AC 500 V
0	**Power section design EMC** 0 = Basic interference suppression 1 = IT system design
3	**Connection type** 3 = 3-phase
–	

A	**Version**
–	
0	**Device variant** 0 = standard
0	**Technology level** = Technology level 0 (standard)
0	**Application level** 0 = Application level 0 (standard)
–	
000	**MOVIKIT® version** 000 = No MOVIKIT® module loaded at factory settings

/	
B	**Operating mode options** B = Brake control

3.9 Example nameplate and type designation of connection unit

3.9.1 Nameplate

The following figure gives an example of a nameplate of the connection unit. For the structure of the type designation, refer to chapter "Type designation of the connection unit".

3.9.2 Type designation of connection unit

The following table shows the type designation of the connection unit:

CU	**product family** CU = Connection unit
I	**Hardware design** I = for MOVIMOT® flexible MMF1. C = for MOVIMOT® flexible MMF3.
1	**Flange dimensions for relevant cover size** 1 = Suitable for electronics cover size 1 (with/without cooling fins)
H	**Fieldbus connection configuration** S = Standard H = Hybrid
–	
DFC	**Communication variant** DBC = **D**irect **B**inary **C**ommunication DAC = **D**irect **A**S-Interface **C**ommunication DFC = **D**irect **F**ieldbus **C**ommunication DSI = **D**irect **S**ystem bus **I**nstallation
–	
5	**Connection voltage** 5 = AC 500 V
D	**EMC variant** D = EMC filter with limit value category C3 (EN 61800-3)
3	**Connection type** 3 = 3-phase
–	
C	**Version**
/	
CO	**Option** DI = Digital Interface (MOVILINK® DDI) CO = Digital interface (MOVILINK® DDI) via coaxial element DSP = DynaStop® electrodynamic deceleration option

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4 Mechanical installation

4.1 Installation notes

INFORMATION

Adhere to the safety notes during installation.

⚠ WARNING

Improper installation/disassembly of the device and mount-on components.

Serious injuries.

- Adhere to the notes about installation and disassembly.

⚠ WARNING

Risk of injury if the device starts up unintentionally, and danger of electrical voltage.

Dangerous voltages may still be present for up to 5 minutes after disconnection from the line voltage.

- Disconnect the device from the power supply with suitable external measures before you start working on the device and secure it against unintentional reconnection to the voltage supply.
- Secure the output shaft against rotation.
- Before removing the electronics cover, wait for at least the following time: **5 minutes.**

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4.2 Required tools and resources

- Set of wrenches, set of screwdrivers, set of socket wrenches
- Torque wrench
- Mounting device
- Compensation elements (washers and spacing rings), if necessary
- Fasteners for output elements
- Standard parts are not included in the delivery

4.3 Tolerances for torque ratings

The specified torques must be adhered to with a tolerance of +/- 10%.

4.4 Installation requirements

Check that the following conditions have been met:

- The information on the nameplate of the device corresponds to the line voltage.
- The device is undamaged (no damage caused by transport or storage).
- The ambient temperature corresponds to the operating instructions and nameplate.
- The device must not be installed in the following ambient conditions:
  - Potentially explosive atmosphere
  - Oils
  - Acids
  - Gases
  - Vapors
  - Radiation
- For special designs: The device is designed in accordance with the actual ambient conditions.

4.5 Installing the device

4.5.1 Notes

- Only install the device on a level, low-vibration, and torsionally rigid support structure.
- Check the validity of the degree of protection using the information in the operating instructions and the data on the nameplate.
- Ensure that cooling air supply is unobstructed and that air discharged by other units does not influence cooling.
- Use suitable cable glands for the supply leads (use reducing adapters if necessary).
- Seal the cable entries properly.
- Clean the sealing surfaces of the cover before reinstalling it.

4.5.2 Electronics cover

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

NOTICE

Loss of the guaranteed degree of protection.

Possible damage to property.

- When the cover is removed from the connection box, you have to protect the cover and the wiring space from humidity, dust or foreign particles.
- Make sure that the cover is mounted properly.

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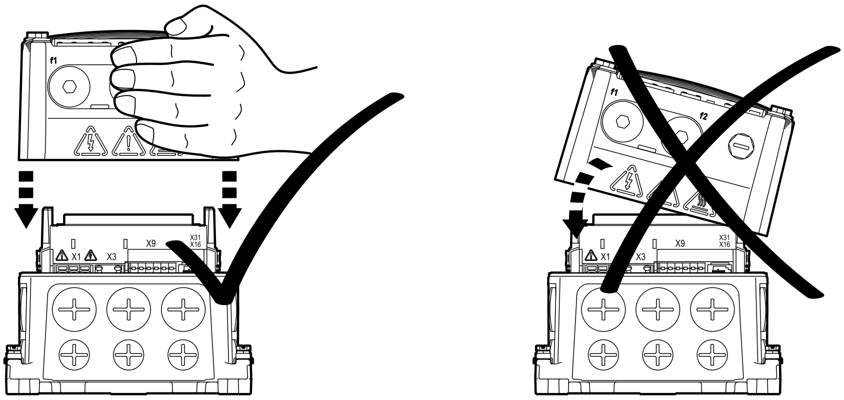
Installing the electronics cover

- Use only electronics covers that match the size.
- Be careful not to tilt the electronics cover when placing it on the connection box.

Design MMF1.

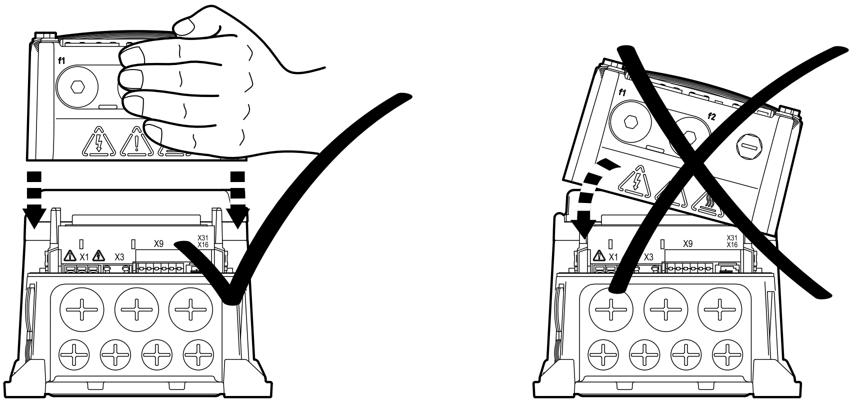
The following figure shows how to correctly place the electronics cover onto the connection box:



30566967563

Design MMF3.

The following figure shows how to correctly place the electronics cover onto the connection box:



30566976139

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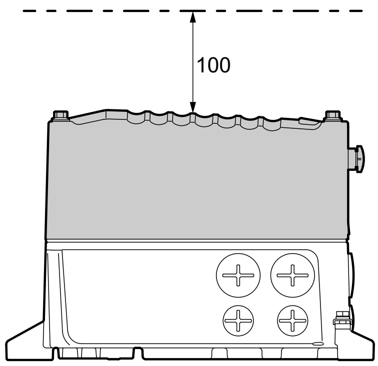
Minimum installation clearance

Note the minimum installation clearance required to remove the electronics cover. For detailed dimension drawings, see chapter "Technical data and dimension sheet".

Design MMF1.

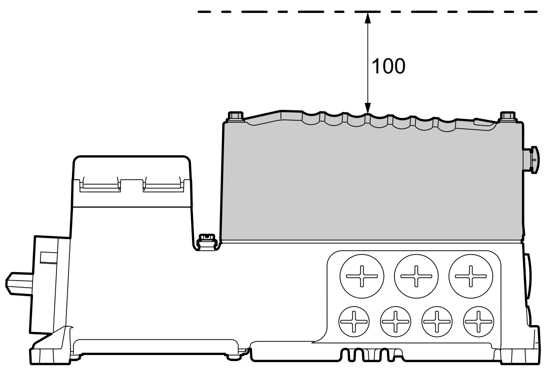
The following figure shows the minimum clearance when installing the electronics cover:



25847860491

Design MMF3.

The following figure shows the minimum clearance when installing the electronics cover:

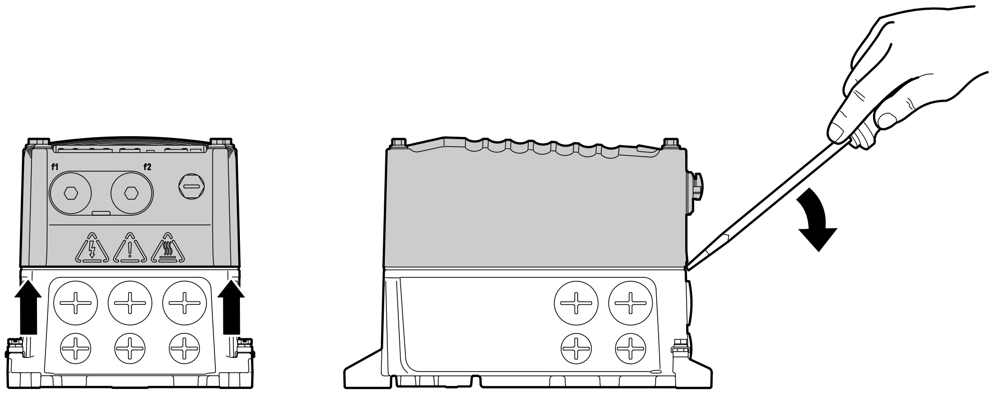


25847856907

Removing the electronics cover

Design MMF1.

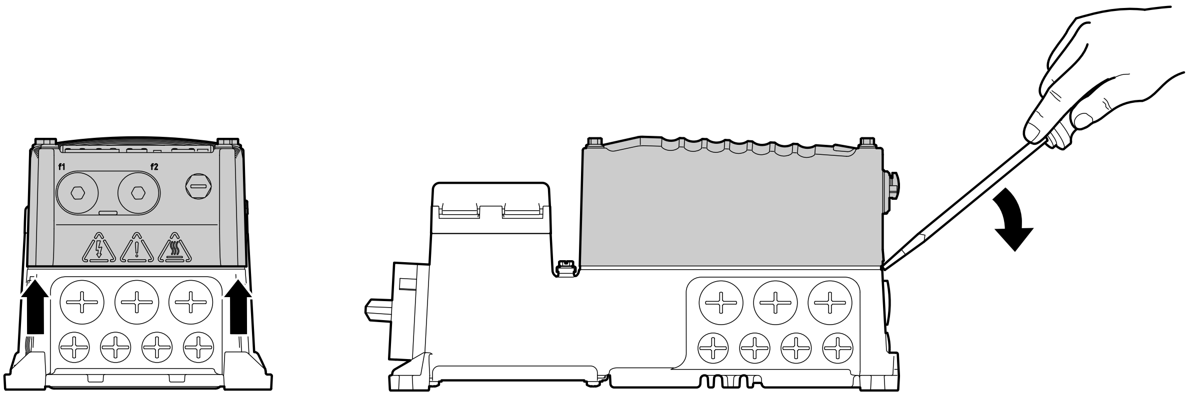
The following figure shows how you can lever off the electronics cover in the intended places:



30567202827

Design MMF3.

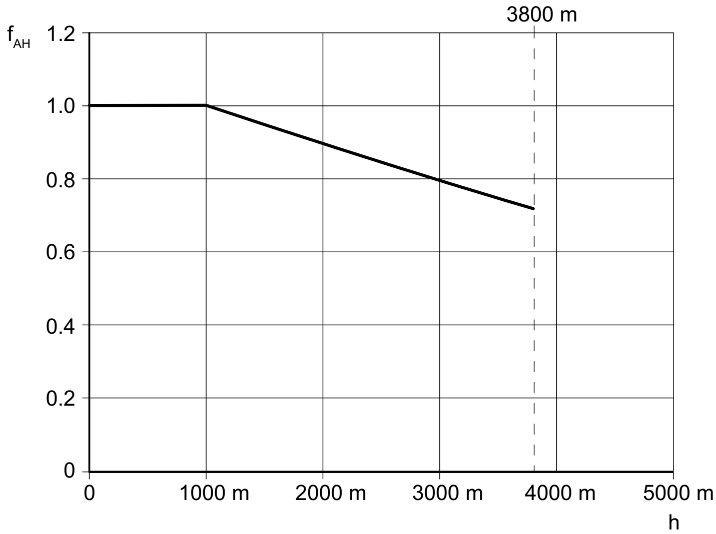
The following figure shows how you can lever off the electronics cover in the intended places:



30567211403

4.5.3 Derating depending on the installation altitude

The following diagram shows the factor f_{AH} (according to IEC 60034-1:2017, Table 12) by which the thermal motor torque has to be reduced depending on the installation altitude H. Observe the additional chapter "Technical data and dimension drawings" > "Derating depending on the ambient temperature".

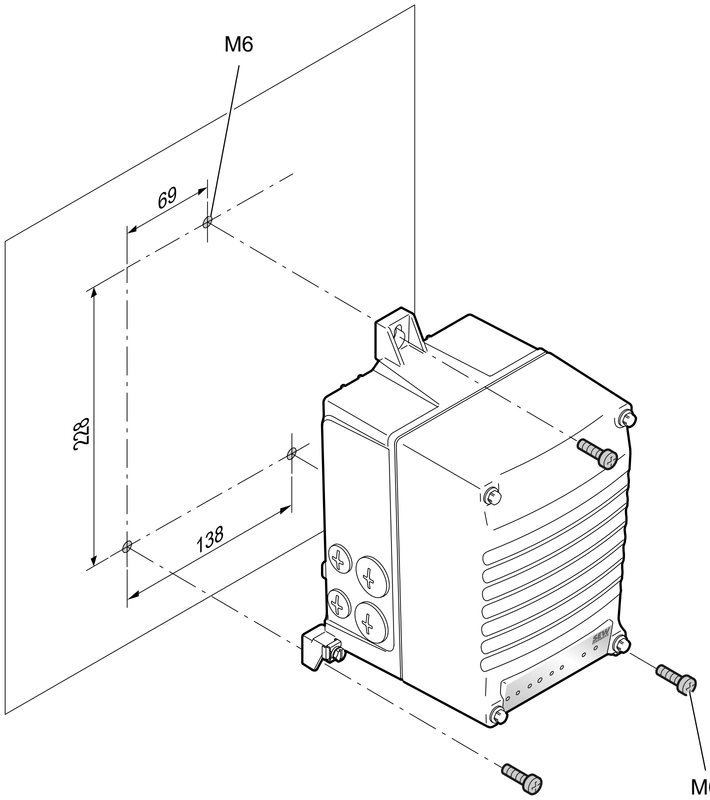


25852074635

4.6 Mounting the unit

4.6.1 Design MMF1.

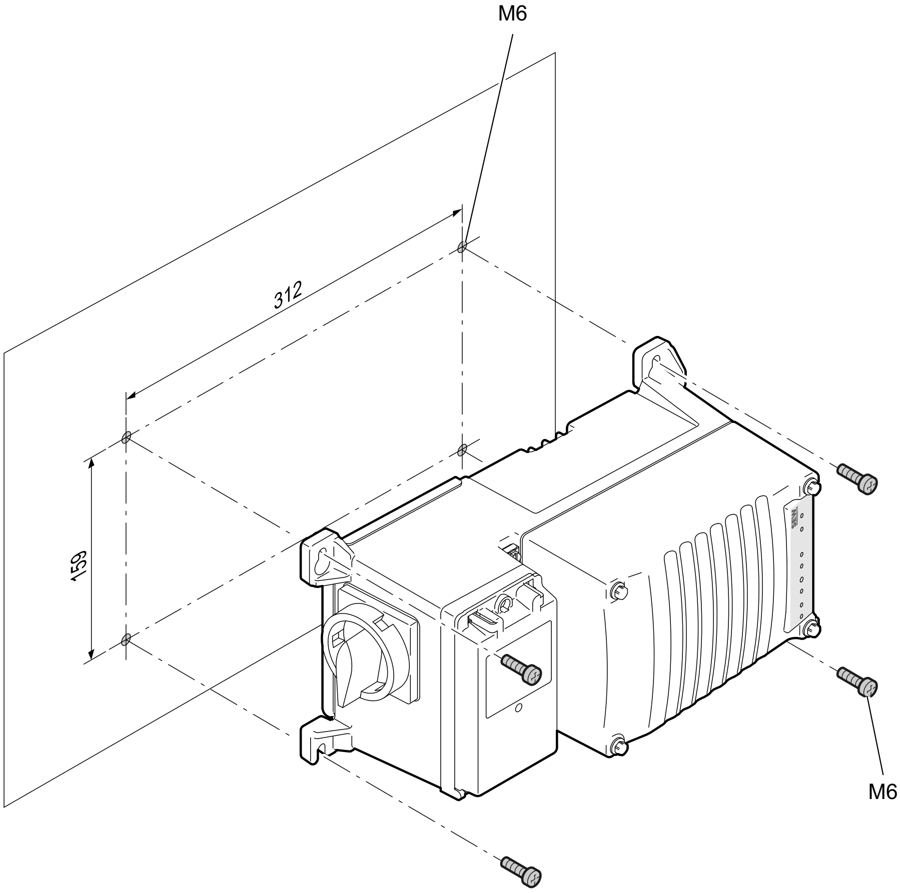
The following figure shows the mounting dimensions for the device:



25829928715

4.6.2 Design MMF3.

The following figure shows the mounting dimensions for the device:

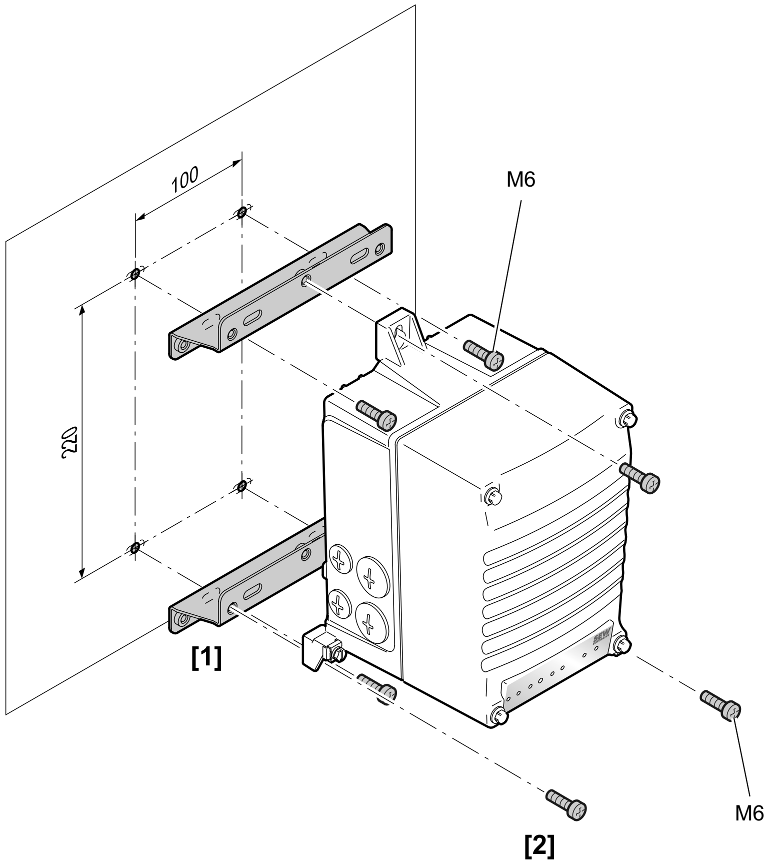


25829932299

4.7 Mounting the device with spacers

4.7.1 Design MMF1.

The following figure shows the mounting dimensions for the device with spacers:



31263212171

[1] Spacers (stainless steel)
(available for delivery from SEW-EURODRIVE, part number: 28266129,
Scope of delivery: 2 spacers, 4 hex head screws M6 × 20,
stainless steel, torque: 3.3 Nm)

[2] Hex head screw 4 × M6

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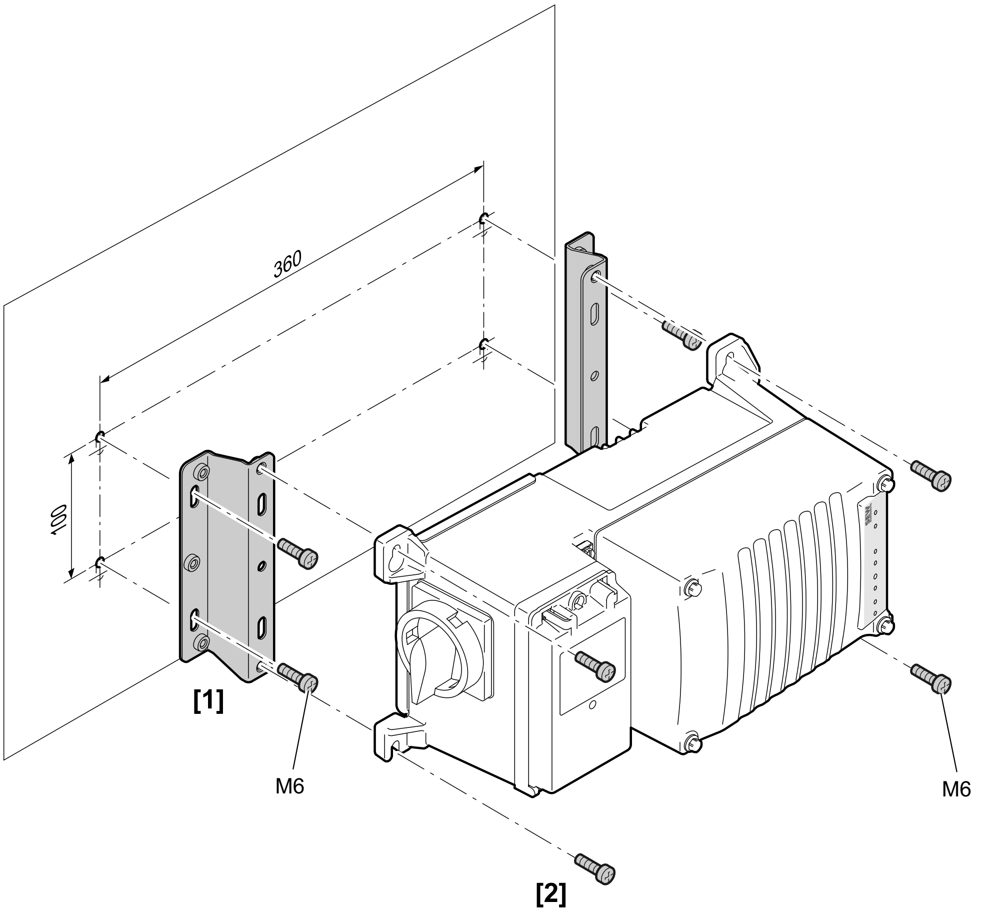
4.7.2 Design MMF3.

The following figure shows the mounting dimensions for the device with spacers:



31263214603

[1] Spacers (stainless steel)
(available for delivery from SEW-EURODRIVE, part number: 28266129,
Scope of delivery: 2 spacers, 4 hex head screws M6 × 20,
stainless steel, torque: 3.3 Nm)

[2] Hex head screw 4 × M6

4.8 Tightening torques

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

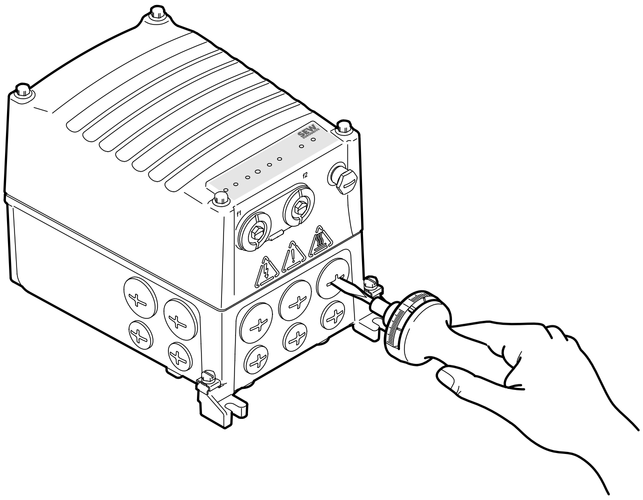
- Let the devices cool down before touching them.

4.8.1 Blanking plugs

Tighten the plastic blanking plugs **included in the delivery** by SEW-EURODRIVE with 2.5 Nm:

Design MMF1.

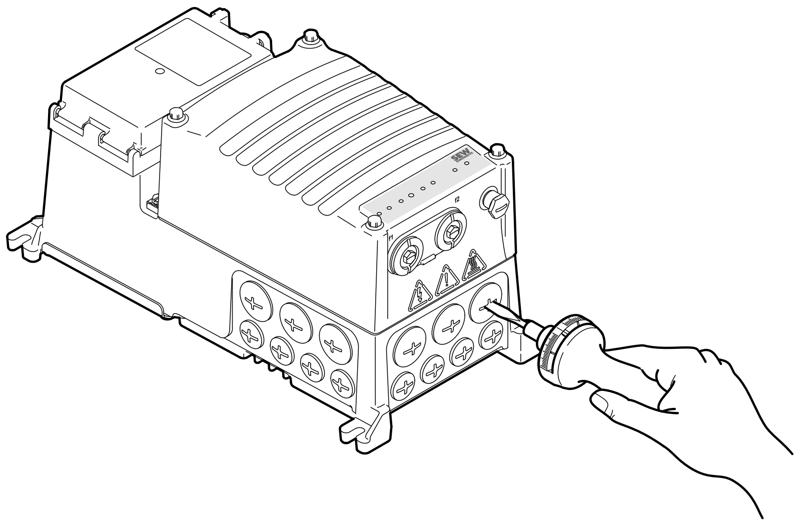
The following figure shows the blanking plugs for the device:



29490169355

Design MMF3.

The following figure shows the blanking plugs for the device:



29490172939

4.8.2 Cable glands

Tightening torques

Tighten the EMC cable glands **optionally** supplied by SEW-EURODRIVE to the following torques:

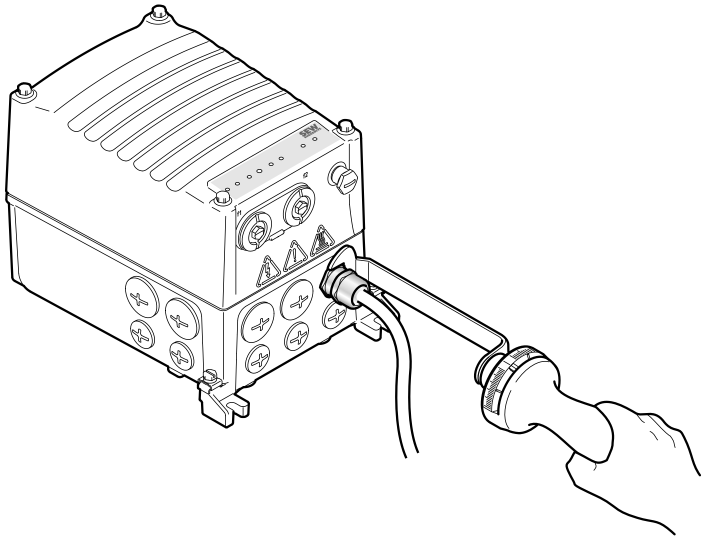
Screw fitting	Part number	Content	Size	Outer cable diameter	Tightening torque
EMC cable glands (nickel-plated brass)	18204783	10 pcs	M16 × 1.5	5 to 9 mm	4.0 Nm
	18204805	10 pcs	M25 × 1.5	11 to 16 mm	7.0 Nm
EMC cable glands (stainless steel)	18216366	10 pcs	M16 × 1.5	5 to 9 mm	4.0 Nm
	18216382	10 pcs	M25 × 1.5	11 to 16 mm	7.0 Nm

The cable retention in the cable gland must withstand the following removal force of the cable from the cable gland:

- Cable with outer diameter > 10 mm: ≥ 160 N
- Cable with outer diameter < 10 mm: = 100 N

Design MMF1.

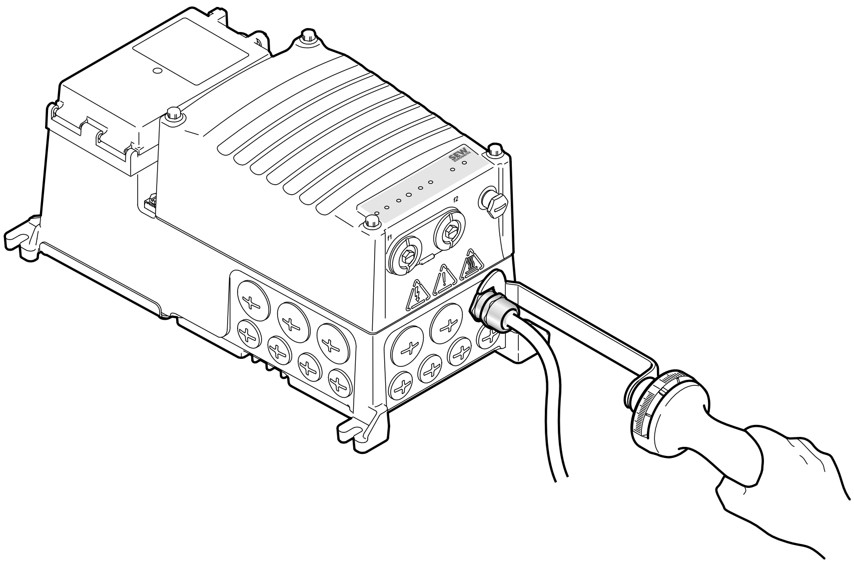
The following figure shows the cable glands of the device:



29490218763

Design MMF3.

The following figure shows the cable glands of the device:



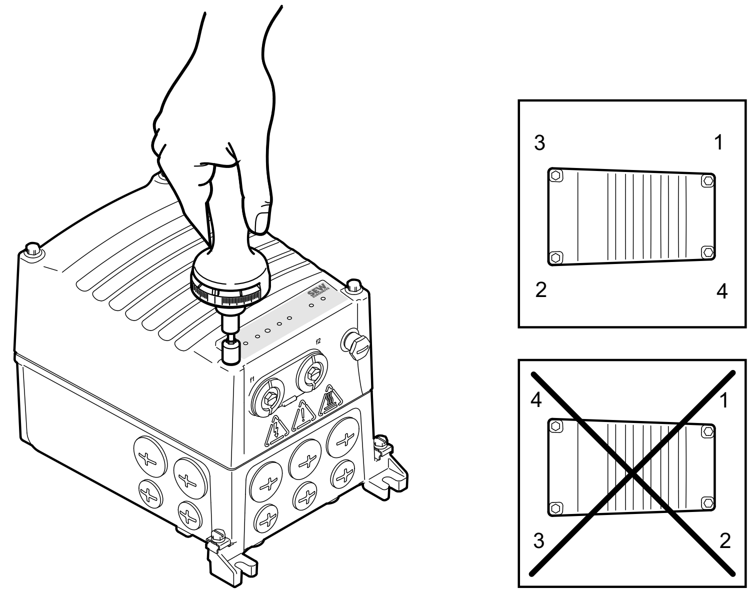
29490222347

4.8.3 Electronics cover

Proceed as follows when installing the electronics cover: Insert the screws and tighten them in diametrically opposite sequence **step by step** with a tightening torque of 6.0 Nm.

Design MMF1.

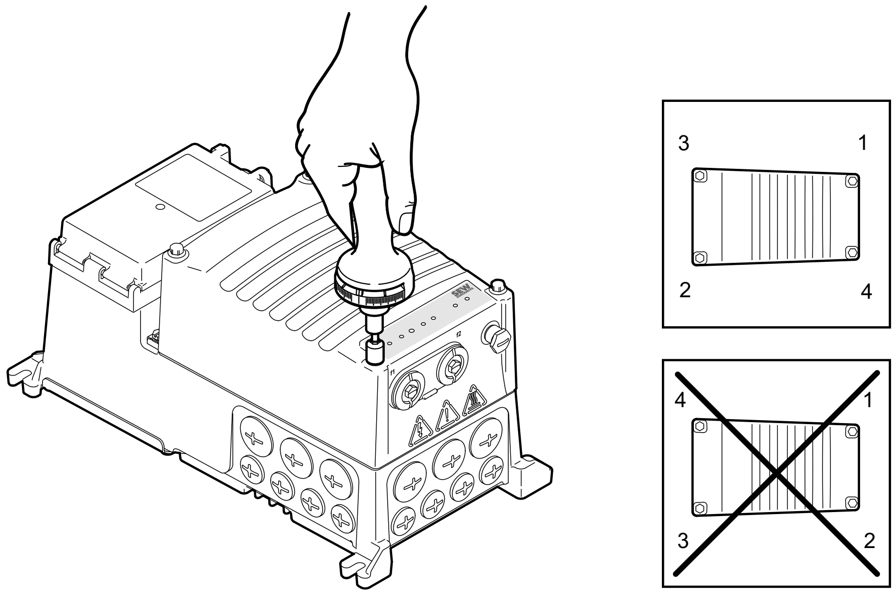
The following figure shows how to screw on the electronics cover:



29490225931

Design MMF3.

The following figure shows how to screw on the electronics cover:



29490229515

5 Electrical installation

INFORMATION

Adhere to the safety notes during installation.

5.1 Installation planning taking EMC aspects into account

5.1.1 Notes on arranging and routing installation components

The correct operation of decentralized inverters depends on selecting the correct cables, providing correct grounding, and on a properly functioning equipotential bonding.

Always adhere to the **relevant standards**.

Note the following information.

5.1.2 EMC-compliant installation

INFORMATION

This drive system is not designed for operation on a public low voltage supply system that supplies residential areas.

This is a product with restricted availability in accordance with IEC 61800-3. This product may cause EMC interference. In this case, it is recommended for the user to take suitable measures.

With respect to the EMC regulation, frequency inverters and compact drives cannot be seen as stand-alone units. They can only be evaluated in terms of EMC when they are integrated in a drive system. Conformity is declared for a described, CE-typical drive system. These operating instructions contain further information.

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5.1.3 Cable selection, routing and shielding

WARNING

Electric shock caused by faulty installation.

Severe or fatal injuries.

- Take the utmost care when installing the units.
- Observe the connection examples.

For more information on cable selection, routing and shielding, refer to chapter "Cable routing and shielding".

5.1.4 Equipotential bonding

Regardless of the PE connection, it is essential that **low-impedance, HF-capable equipotential bonding** is provided (see also EN 60204-1 or DIN VDE 0100-540):

- Provide for a connection over a wide area between the device and the mounting rail.
- To do so, use a ground strap (HF litz wire), for example, to connect the device and the grounding point of the system.
- Do not use the cable shields of data lines for equipotential bonding.

INFORMATION

For detailed information on equipotential bonding for decentralized inverters and drive units, refer to the publication "Equipotential Bonding of Decentralized Inverters" by SEW-EURODRIVE.

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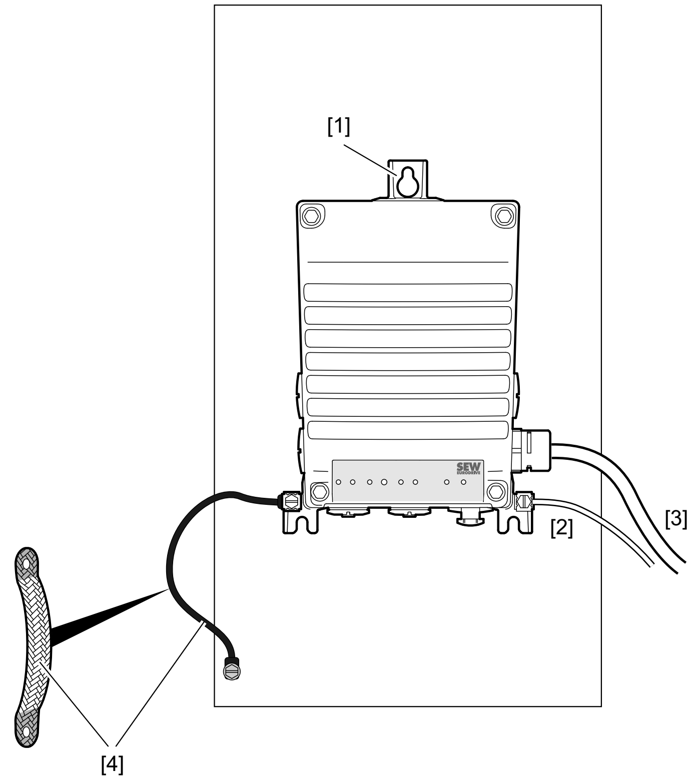
Design MMF1.

The following figure shows a connection over a wide surface area between the mounting plate and the device:



30583362571

[1] Conductive connection over a wide surface between the decentralized frequency inverter and the mounting plate, in case the entire contact surface is conductive (e.g. unpainted).
[2] Second PE conductor via separate terminals
[3] PE conductor in the supply system cable
[4] EMC-compliant equipotential bonding, for example using a ground strap (HF litz wire). The contact surfaces must be conductive (free of paint).

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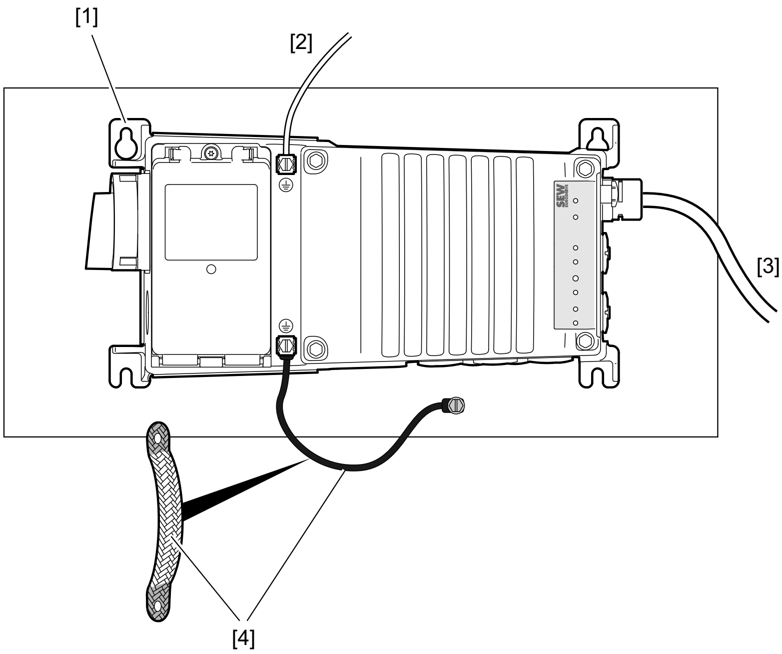
Design MMF3.

The following figure shows a connection over a wide surface area between the mounting plate and the device:

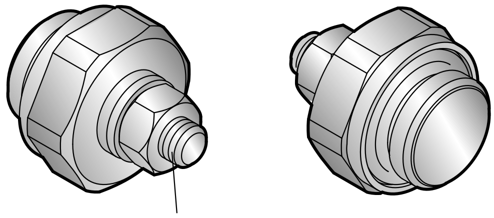


30583397003

[1] Conductive connection over a wide surface between the decentralized frequency inverter and the mounting plate, in case the entire contact surface is conductive (e.g. unpainted).
[2] Second PE conductor via separate terminals
[3] PE conductor in the supply system cable
[4] EMC-compliant equipotential bonding, for example using a ground strap (HF litz wire). The contact surfaces must be conductive (free of paint).

5.2 Equipotential bonding at the connection box

Another option for HF-capable equipotential bonding at a connection box is the following cable gland with M6 stud bolt:



3884960907

	Tightening torque of the cable gland	Tightening torque of the M6 nut for stud bolt	Part number
M16 cable gland with M6 stud bolt	4.0 Nm	3.0 Nm	08189234
M25 cable gland with M6 stud bolt	7.0 Nm	3.0 Nm	08192685

You can install this cable gland at a connection box that still has a free cable entry of size M16 or M25.

Screw the cable gland into the free cable entry and install the grounding cable (with ring cable lug) or the HF litz wire at the M6 stud bolt.

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5.3 Installation instructions

5.3.1 Permitted voltage systems

Information on voltage systems	Information on permissibility
TN and TT systems – voltage systems with directly grounded star point	Use is possible without restrictions.
IT systems – voltage systems with non-grounded star point	Use is only permitted with electronics cover in IT system design (...-513-....). • For use in IT systems, SEW-EURODRIVE recommends using insulation monitors with pulse-code measurement. Using such devices prevents false tripping of the insulation monitor due to the earth capacitance of the inverter. • No EMC limits are specified for interference emission in IT systems. The EMC limits for interference emission specified in chapter "Technical data" do not apply to IT system designs.
Voltage systems with grounded outer conductor	Not permitted.

5.3.2 Connecting supply system cables

- The nominal voltage and frequency of the device must correspond with the data of the supply system.
- Dimension the cable cross section according to the input current I_{line} for nominal power (see chapter "Technical data and dimension sheets").
- Install safety equipment F11/F12/F13 for line fuses at the beginning of the power supply cable behind the supply bus junction, see chapter "Connection diagram".

  Dimension the safety features according to the cable cross section.
- Use only copper conductors with a minimum temperature range of 90 °C as connection cable.

5.3.3 Permitted cable cross section of terminals

Line terminals X1

Observe the permitted cable cross sections for installation:

Line terminals X1	Without conductor end sleeve	With conductor end sleeve (with or without plastic collar)
Connection cross section (mm^2)	0.5 mm^2 – 6 mm^2	0.5 mm^2 – 6 mm^2
Stripping length	13 mm – 15 mm	

Terminals X2_A for motor, brake and temperature sensor

Observe the permitted cable cross sections for installation:

Terminals X2_A for motor, brake and temperature sensor	Without conductor end sleeve	With conductor end sleeve (without plastic collar)	With conductor end sleeves (with plastic collar)
Connection cross section	0.08 mm^2 – 2.5 mm^2	0.08 mm^2 – 1.5 mm^2	0.08 mm^2 – 1.5 mm^2
Stripping length	8 mm – 9 mm		

Terminals X3 for braking resistor

Observe the permitted cable cross sections for installation:

Terminals X3 for braking resistor	Without conductor end sleeve	With conductor end sleeve (with or without plastic collar)
Connection cross section	0.08 mm^2 – 4.0 mm^2	0.25 mm^2 – 2.5 mm^2
Stripping length	8 mm – 9 mm	

Control terminals X9

Observe the permitted cable cross sections for installation:

Control terminals X9	Without conductor end sleeve	With conductor end sleeve (without plastic collar)	With conductor end sleeves (with plastic collar)
Connection cross section	0.08 mm^2 – 2.5 mm^2	0.25 mm^2 – 2.5 mm^2	0.25 mm^2 – 1.5 mm^2
Stripping length	5 mm – 6 mm		

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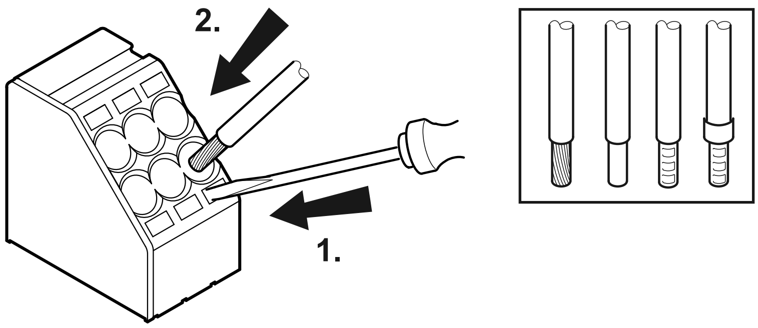
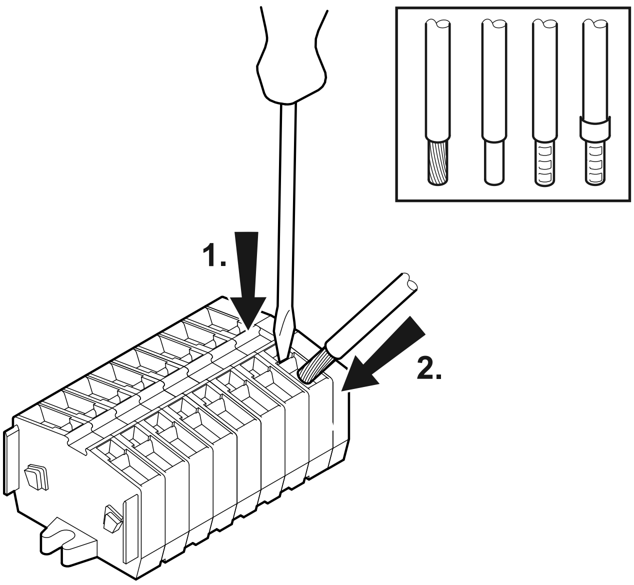
5.3.4 Activating line terminals X1

Adhere to the following sequence when you activate the line terminals X1:

Line terminals X1 (the following figure shows a schematic illustration)
 25649924107

5.3.5 Activating terminals X2_A for motor, brake and temperature sensor

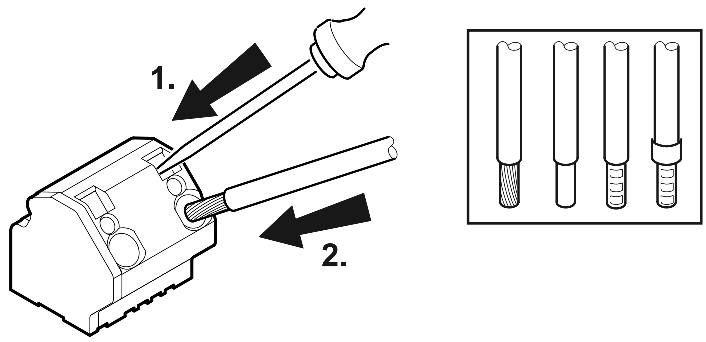
Adhere to the following sequence when you activate the terminals X2_A for motor, brake and temperature sensor:

Terminals X2_A for motor, brake and temperature sensor (the following figure shows a schematic illustration)
 9007225066726923

5.3.6 Activating terminals X3 for the braking resistor

Adhere to the following sequence when you activate the terminals X3 for the braking resistor:

Terminals X3 for the braking resistor (the following figure shows a schematic illustration)

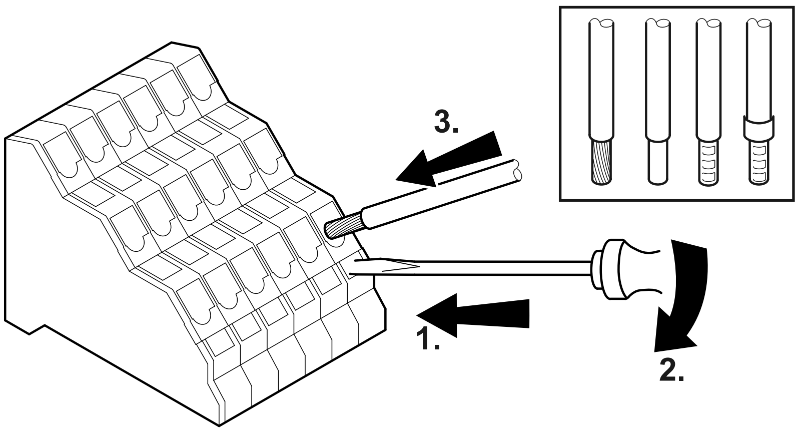


25650172171

5.3.7 Activating control terminals X9

Adhere to the following sequence when actuating the X9 control terminals:

X9 control terminals (the following figure shows a schematic illustration)



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5.3.8 Residual current device

⚠ WARNING

No protection against electric shock if an incorrect type of residual current device is used.

Severe or fatal injuries.

- The product can cause direct current in the PE conductor. If a residual current device (RCD) or a residual current monitoring device (RCM) is used for protection in the event of a direct or indirect contact, only a type B RCD or RCM is permitted on the supply end of the product.

- If the use of a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not to use a residual current device.

5.3.9 Line contactor

NOTICE

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

Damage to the device.

- Keep the supply system switched off for 10 s before switching the power back on.
- Do not switch the supply system off and on more than once per minute.

- Use only a contactor of utilization category AC-3 (EN 60947-4-1) as a line contactor.

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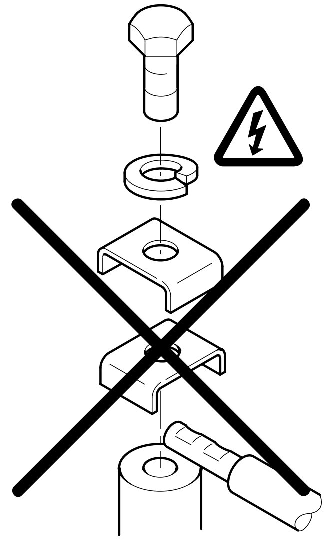
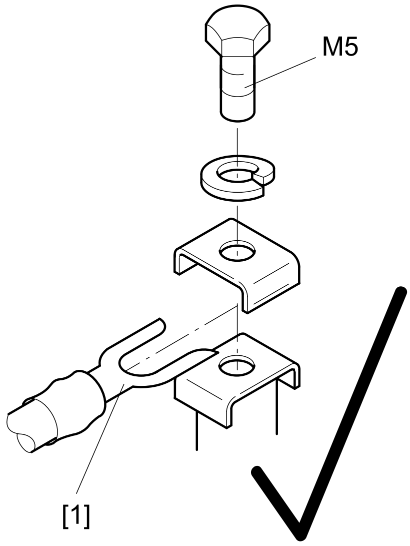
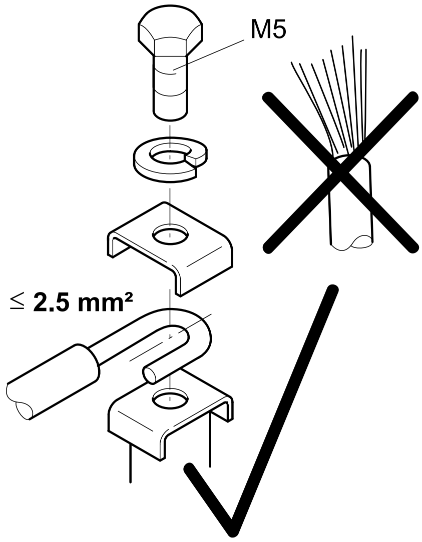
5.3.10 Notes on PE connection

⚠ WARNING

Electric shock due to incorrect connection of PE.

Severe or fatal injuries.

- The permitted tightening torque for the screw is 2.0 to 2.4 Nm.
- Observe the following notes regarding PE connection.

Impermissible assembly	Recommendation: Assembly with cable lug[1)] Permitted for all cross sections	Assembly with solid connecting wire[1)] Permitted for cross sections up to max. 2.5 mm²
	 9007201632429067	 9007201632413579

1) Use the specified material for the assembly that is included in the accessory bag.

[1] Forked cable lug suitable for M5 PE screws

Leakage currents

Earth-leakage currents ≥ 3.5 mA can occur during normal operation. In order to fulfill EN 61800-5-1, observe the following notes:

- The protective earth (PE) connection must meet the requirements for systems with high earth-leakage currents.
- This usually means
  - installing a PE connection cable with a minimum cross section of 10 mm^2 (copper conductor)
  - or installing a second PE connection cable in parallel with the original PE connection.

    The second PE connection is not required according to DIN EN 61800-5-1, if the line connection is equipped with a plug connector for industrial applications (according to IEC 60309) and if the supply system cable has a diameter of ≥ 2.5 mm^2.

INFORMATION

The round M23 plug connectors of the 723 series by TE Connectivity - Intercontec products meet the requirements according to IEC 60309 "Plug connectors for industrial applications".

5.3.11 Installation with protective separation

The electronics cover meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits and the DC 24 V voltage supply must meet the 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.

5.3.12 Installation above 1000 m asl

You can install the drive units at altitudes from 1000 m to a maximum of 3800 m above sea level provided the following conditions are met.[1)]

- The nominal motor current I_N is reduced due to the reduced cooling above 1000 m (see chapter "Technical data and dimension sheets").
- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage category II. If the installation requires overvoltage category III, you will have to install additional external overvoltage protection to limit overvoltage peaks to 1.5 kV phase-to-phase and 2.5 kV phase-to-ground.
- If safe electrical disconnection is required, it must be implemented outside the unit for altitudes of 2000 m above sea level and higher (safe electrical disconnection in accordance with EN 61800-5-1).
- At installation altitudes between 2000 m and 3800 m above sea level, the permitted rated power supply voltages are reduced as follows:
  - By 6 V per 100 m

1) The maximum altitude is limited by the reduced electric strength due to the lower air density.

5.3.13 Protection devices

- The units come equipped with integrated protection devices against overload.
- Cable protection for the power cable must be implemented using external overload devices.
- Observe the relevant standards concerning the cable cross section, voltage drop and installation type.

5.3.14 UL-compliant installation (in preparation)

The UL and cUL approval for the MOVIFIT® flexible device series is in preparation.

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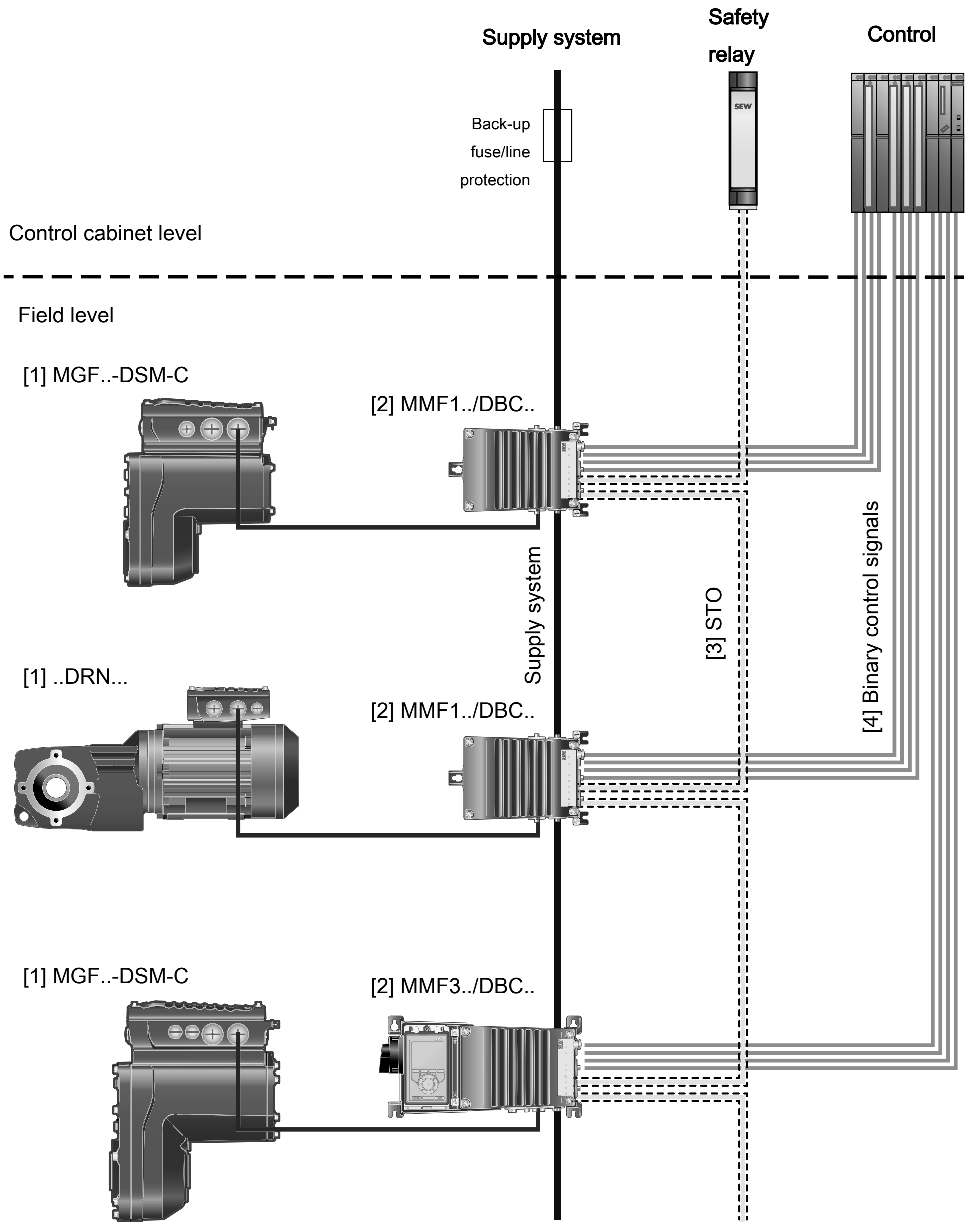
5.4 Installation topology (example: standard installation)

The following figure shows a basic installation topology with the device:



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[1] Connected drive units with/without digital interface
[2] MOVIMOT® flexible with DBC.. electronics cover
[3] The STO cable between the safety relay and the last decentralized frequency inverter may not be longer than 100 m.
[4] Control using up to 4 binary signals and 1 analog signal

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5.5 Terminal assignment

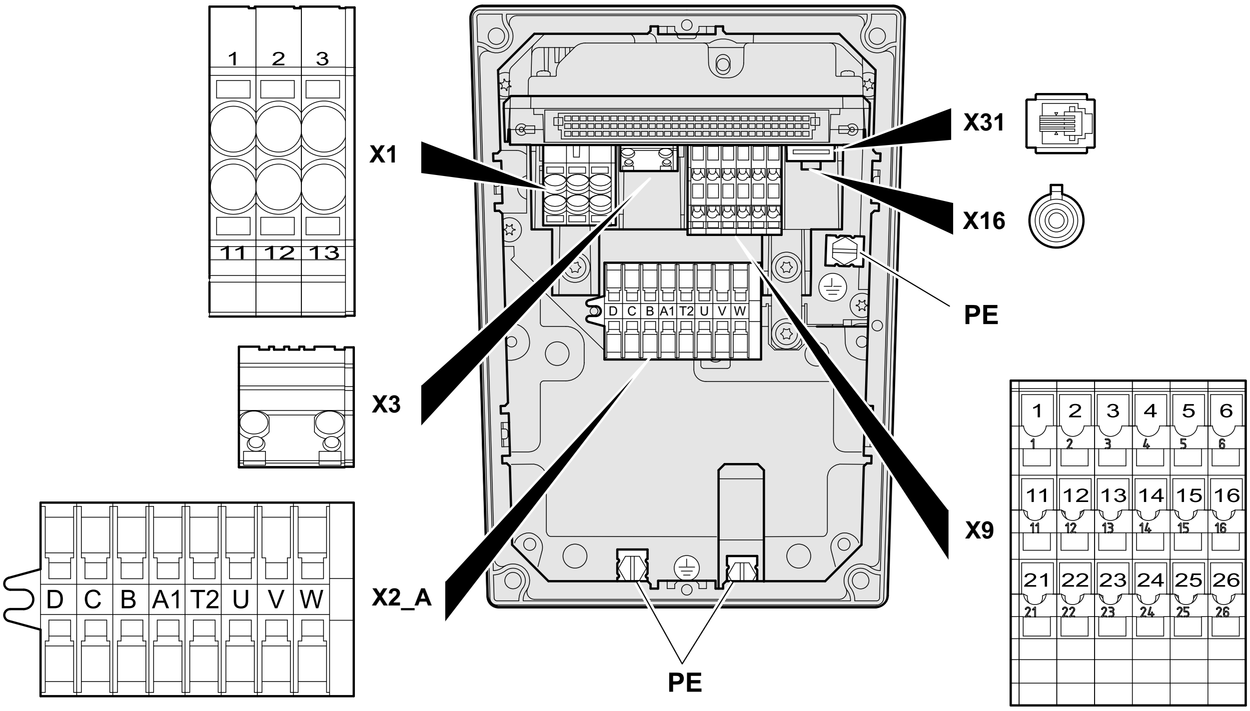
INFORMATION

The terminals X3 for connecting the braking resistor can be connected to an optional, internal braking resistor. As an alternative, you an connect an external braking resistor if the power rating of this braking resistor is not sufficient.

Proceed as follows to do so:

- Loosen the connections of the internal braking resistor.
- Insulate and fasten the connections of the internal braking resistor. Make sure all connections leading to other components are electrically insulated.
- Connect the external braking resistor again. Observe the installation instructions of the device and of the external braking resistor.

The following figure shows the terminal assignment in the connection box of the device:



30531827851

Assignment				
Terminal	**No.**	**Name**	**Marking**	**Function**
X1 line terminals	1	L1	Brown	Line connection, phase L1 – IN
	2	L2	Black	Line connection, phase L2 – IN
	3	L3	Gray	Line connection, phase L3 – IN
	11	L1	Brown	Line connection, phase L1 – OUT
	12	L2	Black	Line connection, phase L2 – OUT
	13	L3	Gray	Line connection, phase L3 – OUT
⏚	–	PE	–	PE connection

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Assignment				
Terminal	**No.**	**Name**	**Marking**	**Function**
X3 braking resistor terminals	1	BR	–	Braking resistor connection
	2	BR	–	Braking resistor connection
X9 control terminals	1	F_STO_P1	Yellow	Input STO+
	2	F_STO_P1	Yellow	Input STO+ (to loop through)
	3	0V24_OUT	–	0V24 reference potential for DC 24 V output
	4	24V_OUT	–	DC 24 V output
	5	DI01	–	Digital input DI01
	6	DI02	–	Digital input DI02
	11	F_STO_M	Yellow	Input STO_ground
	12	F_STO_M	Yellow	Input STO_ground (to loop through)
	13	24V_IN	–	DC 24 V supply
	14	DOR-C	–	Relay output DO R, common contact
	15	DI03	–	Digital input DI03
	16	DI04	–	Digital input DI04
	21	F_STO_P2	Yellow	Input STO+
	22	F_STO_P2	Yellow	Input STO+ (to loop through)
	23	0V24_IN	–	0V24 reference potential for DC 24 V supply
	24	DOR-NO	–	Relay output DO R, NO contact
	25	0V24_OUT	–	0V24 reference potential for DC 24 V output
	26	24V_OUT	–	DC 24 V output
X31 engineering interface	1	0V24_OUT	–	0V24 reference potential for DC 24 V auxiliary output
	2	CAN_L	–	CAN Low connection
	3	CAN_H	–	CAN High connection
	4	24V_OUT	–	DC 24 V auxiliary output
X16 MOVILINK® DDI interface	1	DDI	–	MOVILINK® DDI supply/communication
	2	DDI_GND	–	MOVILINK® DDI reference potential

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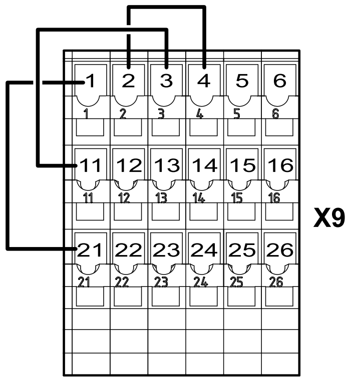
Assignment					
Terminal	**No.**	**Name**	**Marking**	**Function**	
				Connection depending on the connection unit[1]	
				Option /CO[2]	**Option /DI**
X2_A Terminals for motor, brake and temperature sensor	D	Brake D	White	Connection Brake D	Connection Brake 14
	C	Brake C	White	Connection Brake C	Connection Brake 13
	B	Brake B	White	Connection Brake B	Connection Brake 15
	A1	Brake A	White	Connection Brake A	Connection Temperature sensor (Temp+)
	T2	–	White	Reserved	Connection Temperature sensor (Temp-)
	U	U	Gray	Motor connection, phase U	
	V	V	Gray	Motor connection, phase V	
	W	W	Gray	Motor connection, phase W	

1) See chapter "Type designation of the connection unit".
2) For more information refer to chapter "Bulk cables" > "Brakemotor cables for motors with digital interface (MOVILINK® DDI)" > "Connecting the bulk cables".

The following figure shows the factory-installed jumpers at the X9 terminals:



29006177419

These jumpers are not present in the following designs:

- Designs with plug connectors with STO function.

For additional information, refer to chapter "Functional safety".

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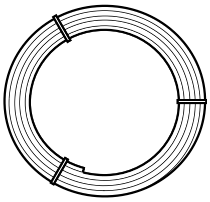
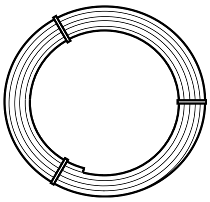
5.6 Bulk cables

5.6.1 Brake motor cables for motors with digital interface (MOVILINK® DDI)

Connection cable 1.5 mm²

Connection cables	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	30 m 100 m 200 m 	LEONI LEHC® 005796 Halogen-free	1.5 mm² 28123336
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	30 m 100 m 200 m 	LEONI LEHC® 005775	1.5 mm² 28123395

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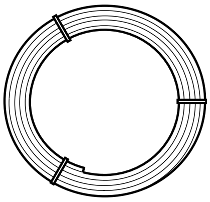
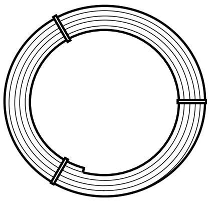
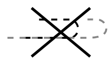
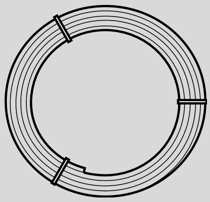
Connection cable 2.5 mm²

Connection cables	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	30 m 100 m 200 m 	LEONI LEHC® 005770 Halogen-free	2.5 mm² 28123344
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	30 m 100 m 200 m 	LEONI LEHC® 005776	2.5 mm² 28123409

Connection of bulk cables

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28123336, 28123344, 28123395, 28123409

Connection description					
Bulk cable			**Motor connection depending on brake control**		
			**Without brake**	**3-wire brake AC 110-500 V**	**2-wire brake DC 24 V**
				(BE/BZ brake)	**(BK/BP brake)**
Core color/ Core cross section	**Identi-fication**	**Signal**	**Description**		
Black 1.5 mm^2 2.5 mm^2	U/L1	U	Motor connection, phase U		
Black 1.5 mm^2 2.5 mm^2	V/L2	V	Motor connection, phase V		
Black 1.5 mm^2 2.5 mm^2	W/L3	W	Motor connection, phase W		
Green/yel-low 1.5 mm^2 2.5 mm^2	–	PE	PE connection		
Purple coaxial cable	–	DDI	MOVILINK® DDI connection		
Yellow 1.0 mm^2	A	Brake A	Reserved[1)]	Reserved[1)]	Brake-
Orange 1.0 mm^2	B	Brake B	Reserved[1)]	Brake 15	Reserved[1)]
Pink 1.0 mm^2	C	Brake C	Reserved[1)]	Brake 13	Reserved[1)]
Purple 1.0 mm^2	D	Brake D	Reserved[1)]	Brake 14	Brake+

1) Reserved wires must be isolated and fixed in the connection box.

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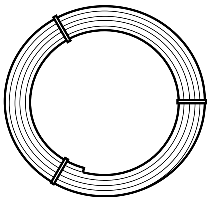
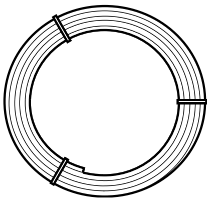
5.6.2 Brake motor cables for motors without digital interface

Connection cable 1.5 mm²

Connection cables	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection without MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	100 m 200 m 	LEONI LEHC® 005272 Halogen-free	1.5 mm² 19150067

Connection cable 2.5 mm²

Connection cables	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection without MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	100 m 200 m 	LEONI LEHC® 005275 Halogen-free	2.5 mm² 19150075

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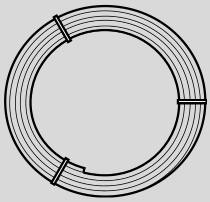
Connection of bulk cables

The following table shows the conductor assignment of cables with the following part numbers:

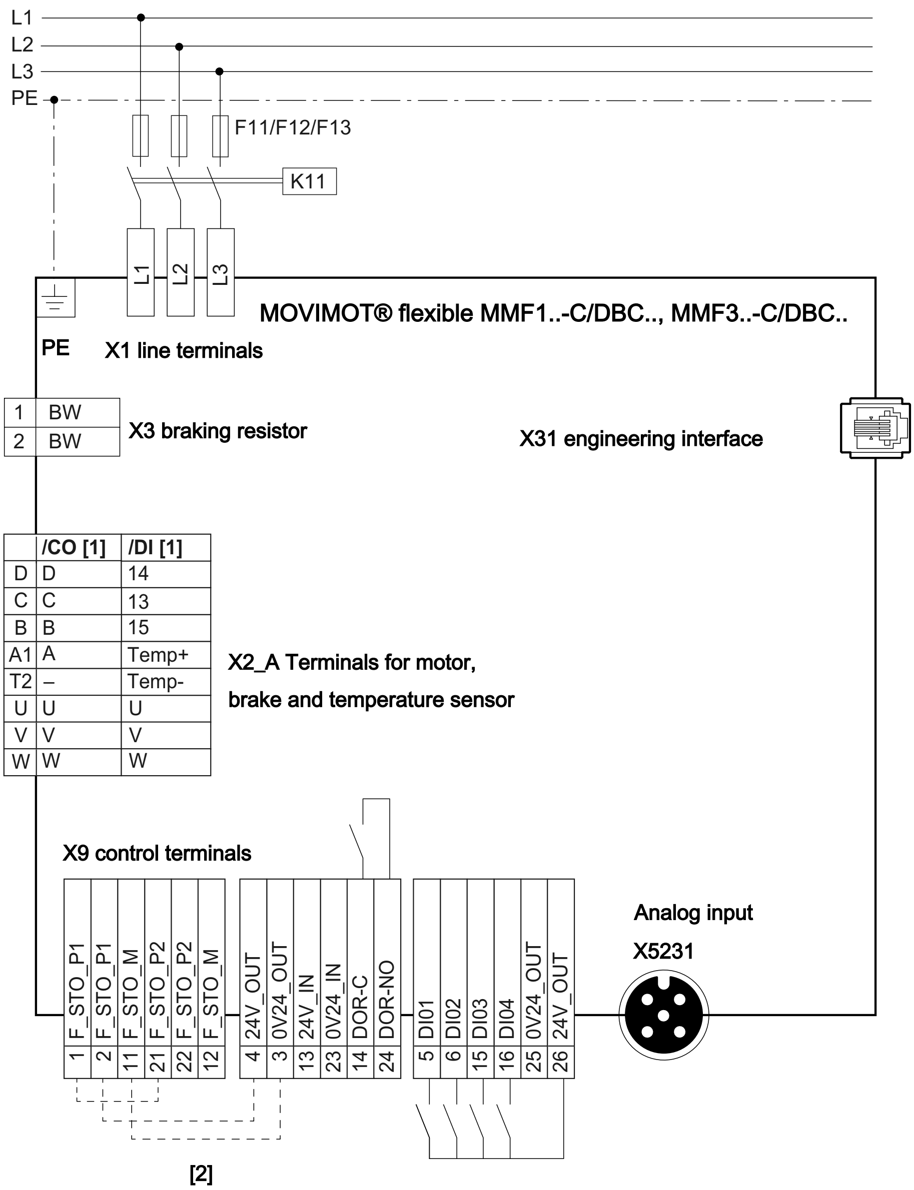
Part numbers
19150067, 19150075

Connection description					
Bulk cable			**Motor connection depending on brake control**		
			**Without brake**	**3-wire brake AC 110 - 500 V (BE/BZ brake)**	**2-wire brake DC 24 V (BK/BP brake)**
Core color/ Core cross section	**Identific-ation**	**Signal**	**Description**		
Black 1.5 mm² 2.5 mm²	U/L1	U	Motor connection, phase U		
Black 1.5 mm² 2.5 mm²	V/L2	V	Motor connection, phase V		
Black 1.5 mm² 2.5 mm²	W/L3	W	Motor connection, phase W		
Green/yel-low 1.5 mm² 2.5 mm²	–	PE	PE connection		
Black 1.0 mm²	1	Brake 13	Reserved[1)]	Brake 13	Brake+
Black 1.0 mm²	2	Brake 14	Reserved[1)]	Brake 14	Reserved[1)]
Black 1.0 mm²	3	Brake 15	Reserved[1)]	Brake 15	Brake−
Black 0.75 mm²	4	Temp+	Temperature sensor+ connection		
Black 0.75 mm²	5	Temp−	Temperature sensor connection−		

1) Reserved wires must be isolated and fixed in the wiring space.

5.7 Connection diagram

The following figure shows the connections of the device:



30534403083

[1] Connection unit option, see chapter "Type designation connection unit"
[2] Jumpers installed at the factory for designs without plug connectors with STO function. For additional information, refer to chapter "Functional safety".

For terminal assignment, refer to chapter "Terminal assignment".

For plug connector assignment, refer to chapter "Plug connectors".

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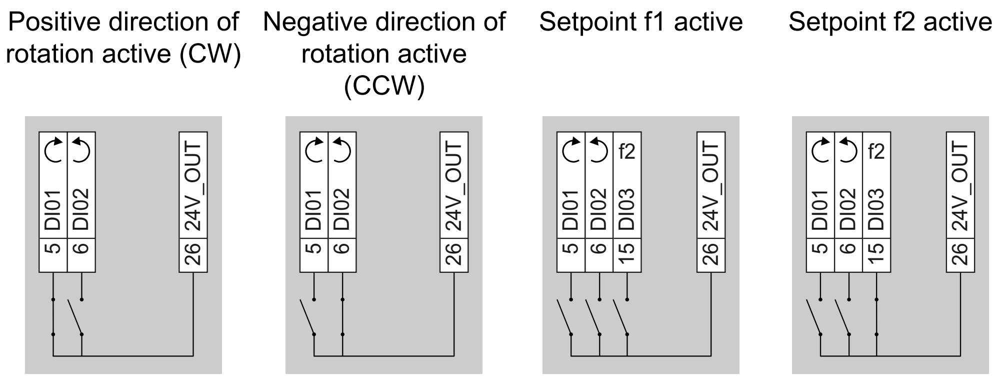
5.7.1 Terminal functions in Easy mode (delivery state)



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5.8 Cable routing and cable shielding

5.8.1 Installation with separately routed Ethernet cable

Notes on cable routing and shielding – Recommended cable routing

Note the following when routing and shielding the cables:

- Cable selection
  - For cable selection, note chapter "Technical data and dimension sheets / connection cables" in the operating instructions.
  - You can use unshielded connection cables for the supply system connection.
- Cable shielding
  - Connect the cable shields to the optionally available EMC cable glands, see chapter "EMC cable glands".
- External braking resistor
  - Also observe the notes in chapter "Terminal assignment".
- Observe the permitted bending radii of the installed cables for cable routing.

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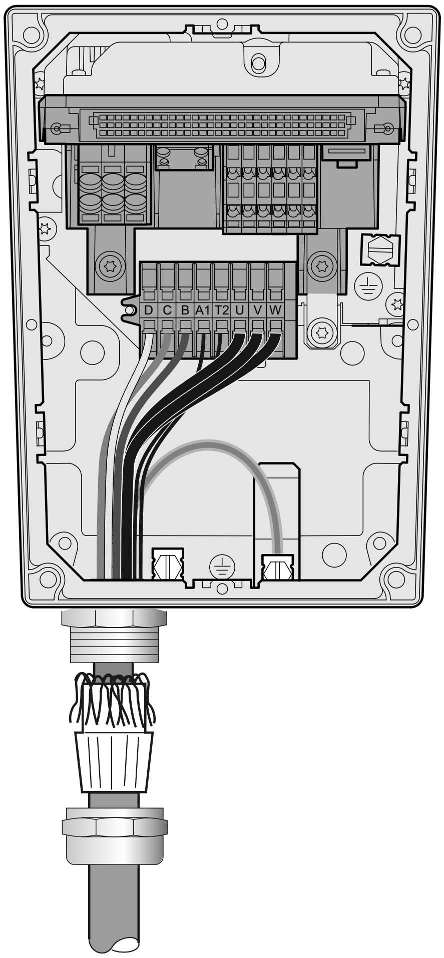
Motor connection for motors without digital interface

(Connection unit with /DI option)

The following figure shows the motor connection with hybrid cable for motors without digital interface:



30566940171

[1] Motor connection for motors without digital interface

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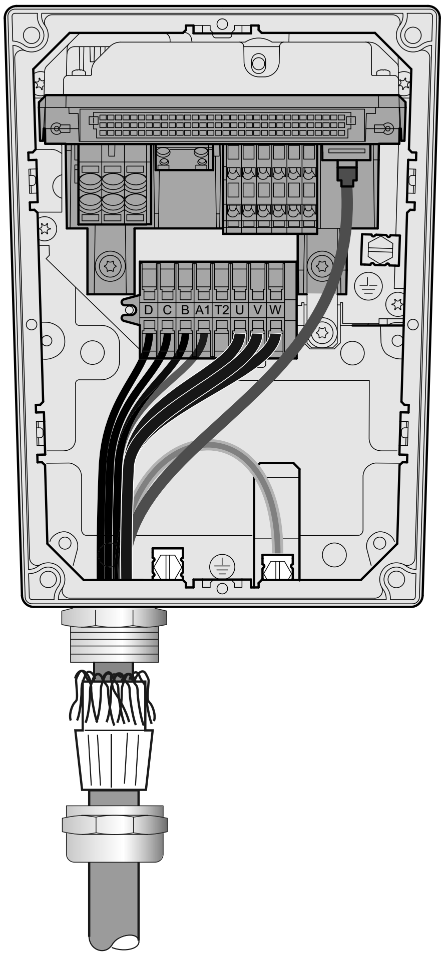
Motor connection for motors with digital interface (MOVILINK® DDI)

(Connection unit with /CO option)

The following figure shows the motor connection with hybrid cable for motors with digital interface:



30566960139

[1] Motor connection for motors with digital interface (MOVILINK® DDI)

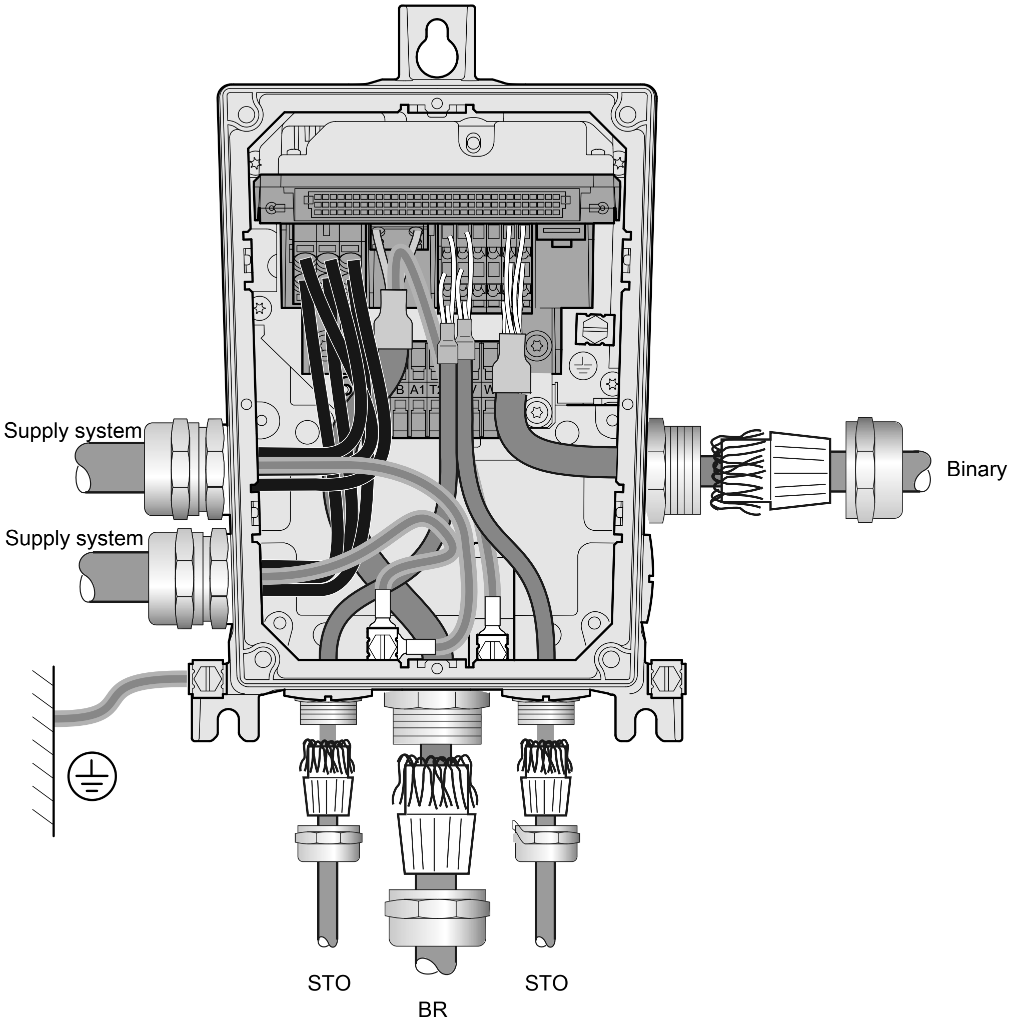
Other connections

Design MMF1.

The following figure shows the connections of the device without motor connection:

INFORMATION

Motor connection is shown in another figure, see chapter "Cable routing and cable shielding" > "Installation with separately routed Ethernet cable" > "Motor connection...".



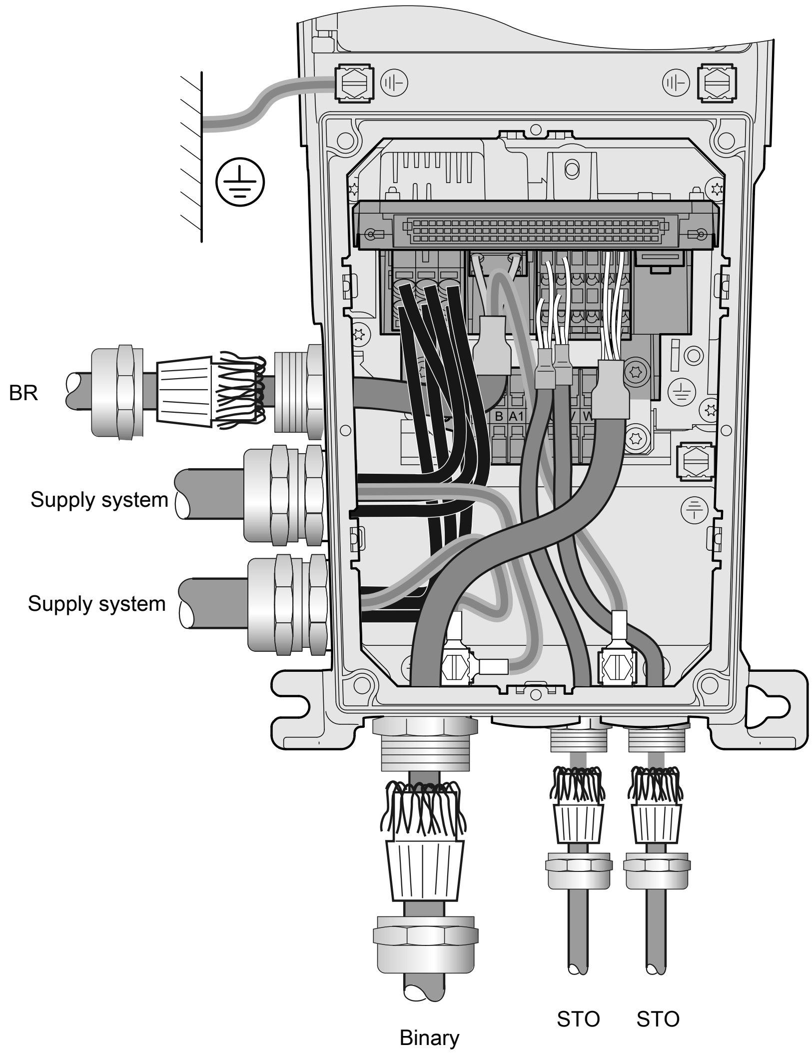
30720281227

Design MMF3.

The following figure shows the connections of the device without motor connection:

INFORMATION

Motor connection is shown in another figure, see chapter "Cable routing and cable shielding" > "Installation with separately routed Ethernet cable" > "Motor connection...".

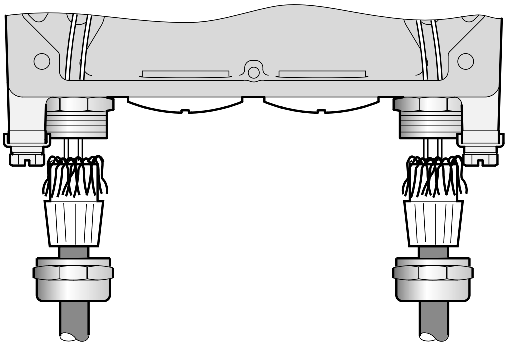


30722349323

5.9 EMC cable glands

5.9.1 Cable shielding

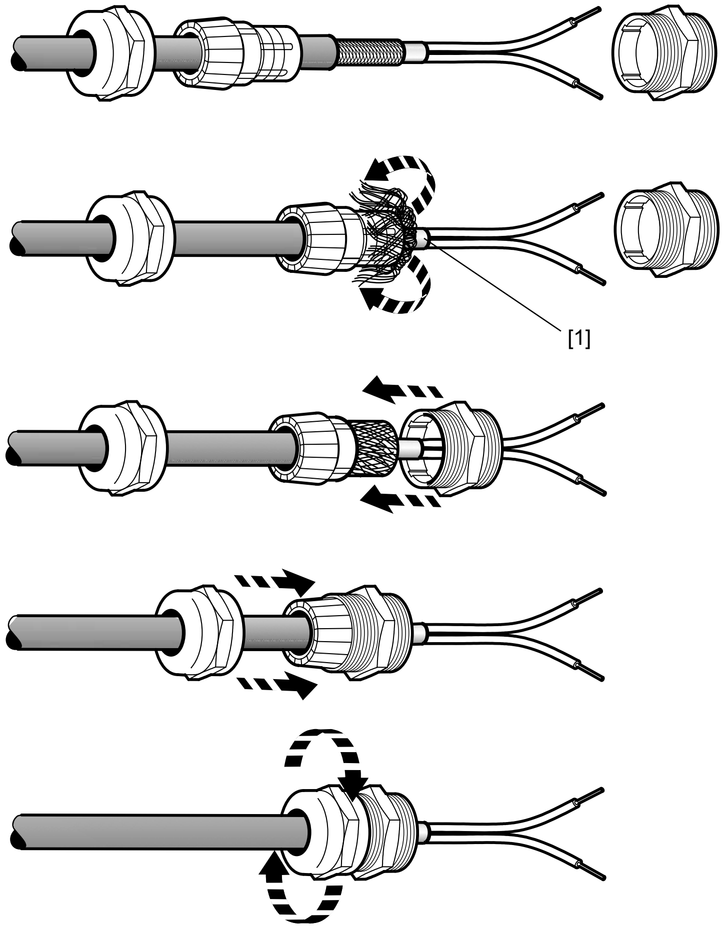
For shielded cables, it is best to use EMC cable glands to connect the shield. EMC cable glands are available as option.



25216680843

5.9.2 Assembly of EMC cable glands

Assemble the EMC cable glands supplied by SEW-EURODRIVE according to the following figure:



18014401170670731

[1] Cut off insulation foil and fold it back.

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5.10 Plug connectors

5.10.1 Representation of connections

The wiring diagrams of the plug connectors depict the contact end of the connections.

5.10.2 Designation key

The designation of plug connectors is specified according to the following key:

X	**Terminal**
2	**Group** 1 = Power input 2 = Power output 3 = Encoder 4 = Bus 5 = Inputs and outputs
01	**Function** Function of the plug connector within a group
2	**Type** Wiring diagram of the plug connector within a function
–	
	Group number (optional) for several plug connectors with the same function
	Sequence number (optional) In case of several plug connectors in one group

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5.10.3 Connection cables

INFORMATION

For more information on cable types, refer to chapter Technical data."

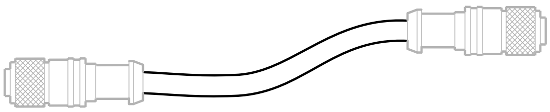
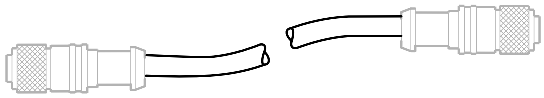
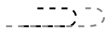
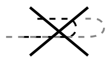
Connection cables are not included in the scope of delivery.

Prefabricated cables for connecting SEW-EURODRIVE components can be ordered. For each connection, the available prefabricated cables are listed. Specify the part number and length of the required cable in your order.

The number and design of the required connection cables depend on the type of the device and the components to be connected. This is why you do not need all listed cables.

Cable types

The table below shows the depiction and what they mean:

Representation	Meaning
	Fixed length
	Variable length
	Suitable for cable carriers
	Not suitable for cable carriers

Cable routing

Observe the permitted bending radii of the installed cables for cable routing. For detailed information, refer to chapter "Technical data" > "Dimension sheets" > "Plug connectors including mating connectors".

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Using prefabricated cables with plug connectors

SEW-EURODRIVE uses prefabricated cables for certifications, type tests and approval of the units. The cables available from SEW-EURODRIVE meet all the requirements necessary for the functions of the unit and the connected components. The devices under consideration are always the basic devices including all connected components and corresponding connection cables.

This is why SEW-EURODRIVE recommends to use only the prefabricated cables specified in the documentation.

When using units with integrated safety functions according to EN ISO 13849, you also have to adhere to all the conditions and requirements for the installation and routing of cables described in the documentation for the units concerning functional safety.

Using third-party cables with plug connectors

If third-party cables are used – even if these cables are technically adequate – SEW-EURODRIVE does not accept any liability and cannot guarantee unit properties or functions.

If you use third-party cables for connecting the device and connected components, ensure their compliance with applicable national regulations. Note that the technical features of the device or unit network might be affected inadvertently when using third-party cables. This concerns in particular the following properties:

- Mechanical properties (e.g. IP degree of protection, cable carrier suitability)
- Chemical properties (e.g. silicone and halogen free, resistance to substances)
- Thermal properties (e.g. thermal stability, increase in device temperature, flammability class)
- EMC behavior (such as interference emission limit values, compliance with interference immunity values stipulated in standards)
- Functional safety (approvals according to EN ISO 13849-1)

Third-party cables not explicitly recommended by SEW-EURODRIVE must meet at least the requirements of the following standards and have been permitted according to these plug connector standards:

- IEC 60309
- IEC 61984

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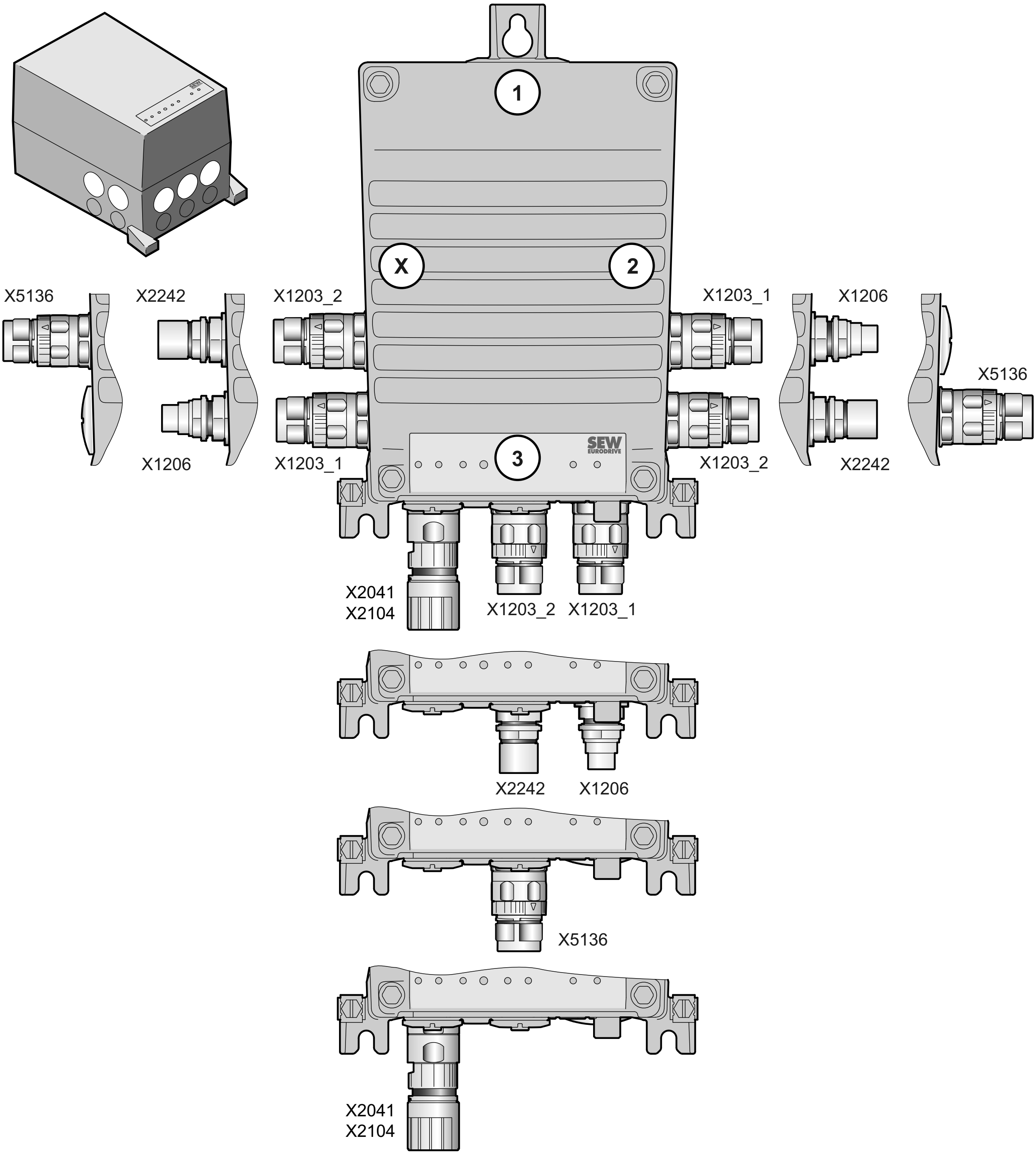
5.10.4 Plug connector positions connection box

Design MMF1.

Cable entries M25

The following figure depicts the possible plug connector positions for the M25 cable entries:



31248119947

Plug connector				Not together at a position with the plug connector:
Designation	**Coding ring/ color**	**Function**	**Position**	
X1203_1	Black	AC 400 V connection[1)]	X, 2 or 3	• X1206
X1203_2	Black	AC 400 V connection	X, 2 or 3	• X5136 • X2242
X1206	–	AC 400 V connection (IN)[2)]	X, 2 or 3	• X1203_1
X2242	–	AC 400 V connection (OUT)	X, 2 or 3	• X5136 • X1203_2
X2041	Brown	Connection for motors without digital interface	3	• X2104
X2104	None	Connection for motors with digital interface (MOVILINK® DDI)	3	• X2041
X5136	None	Digital inputs/outputs	X, 2 or 3	• X1203_2 • X2242

1) Plug connector X1203_1 can also be ordered individually (i.e. without plug connector X1203_2).
2) Plug connector X1206 can be ordered separately (i.e. without plug connector X2242).

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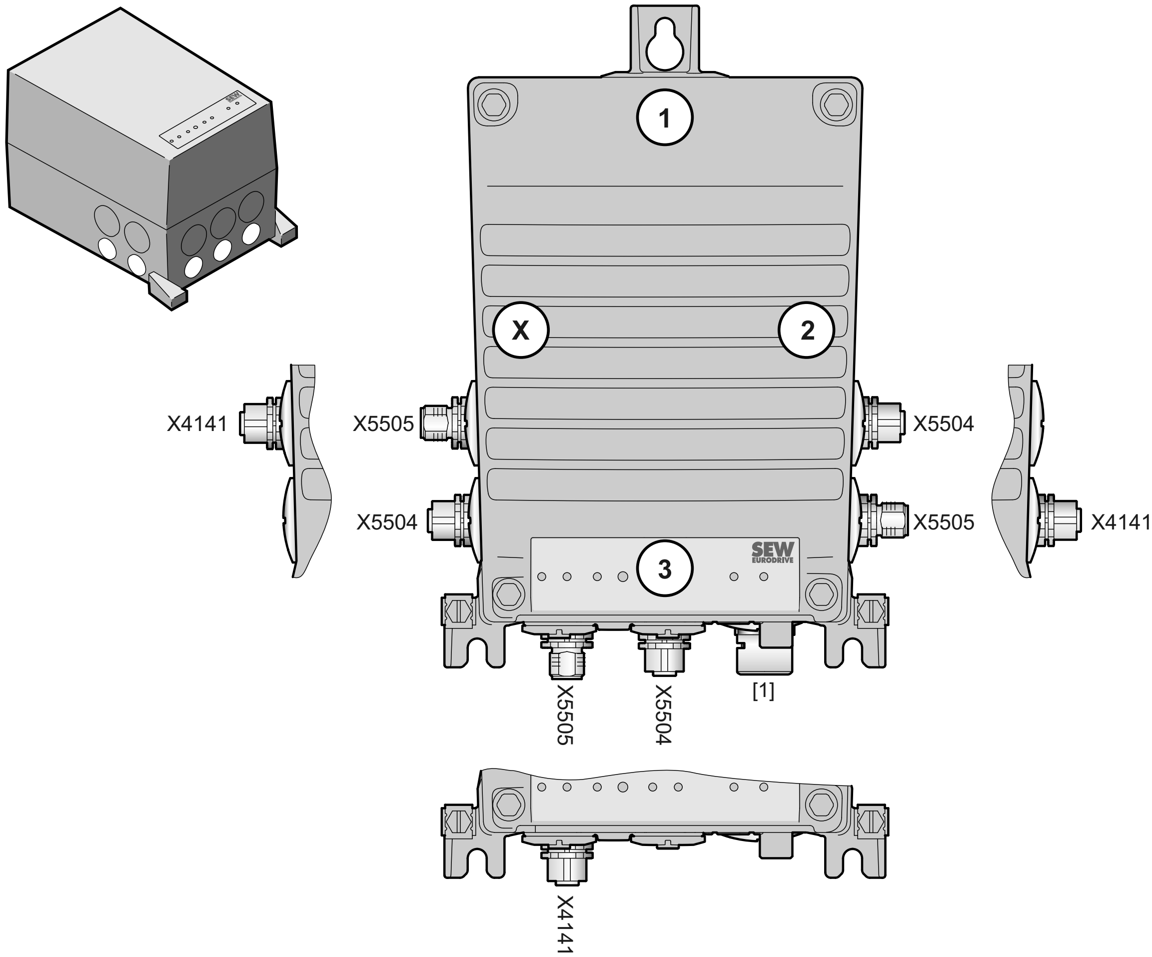
Cable entries M16

The following figure depicts the possible plug connector positions for the M16 cable entries:



30566386443

Plug connector				Not together at a position with the plug connector:
Designation	**Coding ring/ color**	**Function**	**Position**	
X5504	Yellow	STO (3-core connection)[1]	X, 2 or 3	–
X5505	Yellow	STO (3-core connection)[1]	X, 2 or 3	X4141
X4141	Black	Engineering interface	X, 2 or 3	X5505
–	–	[1] Optional pressure compensation	3	–

1) Plug connectors X5504 and X5505 can only be ordered together.

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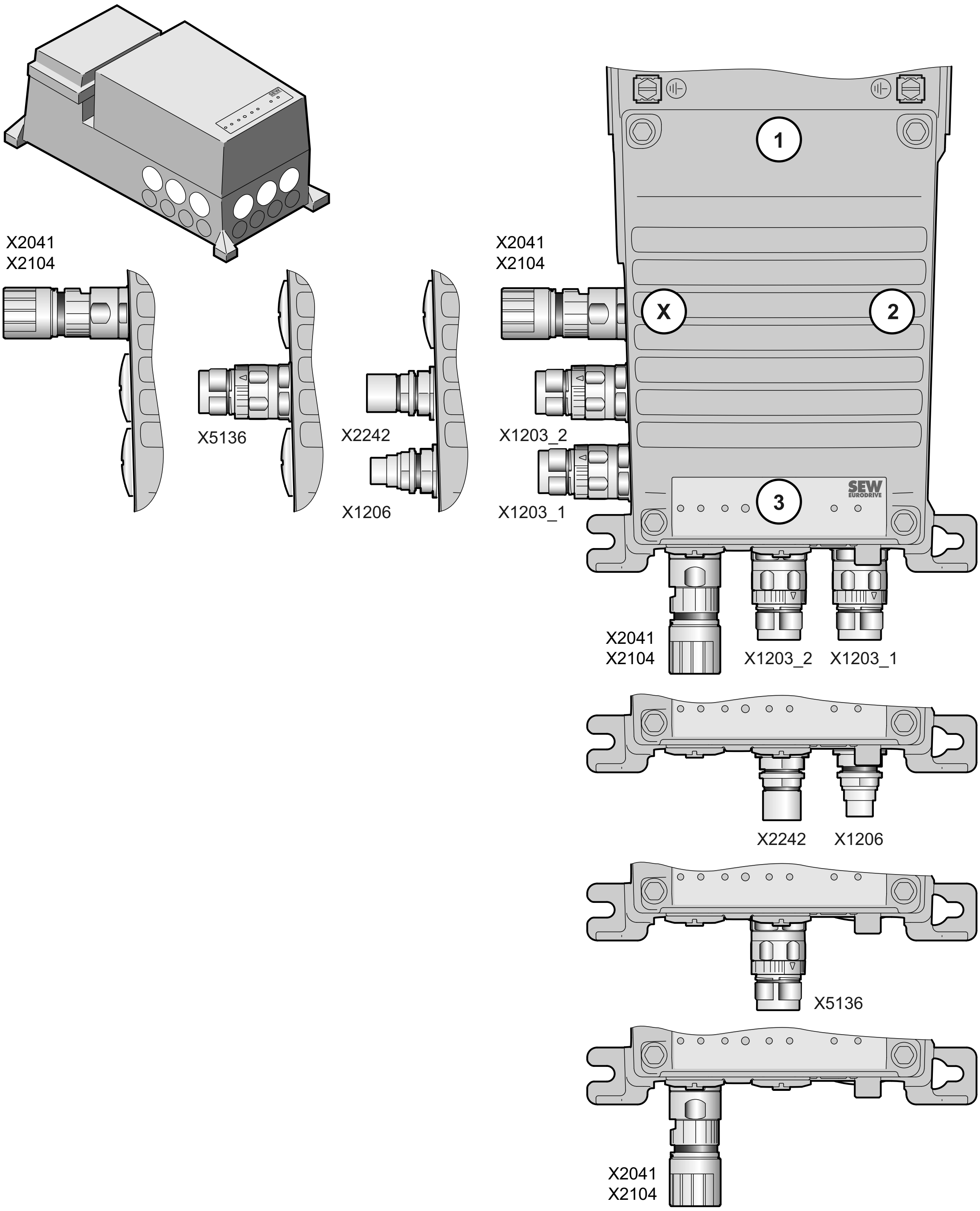
Design MMF3.

Cable entries M25

The following figure depicts the possible plug connector positions for the M25 cable entries:



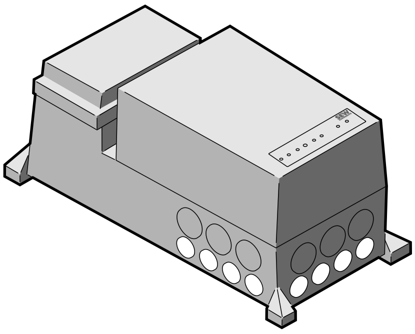
31248925451

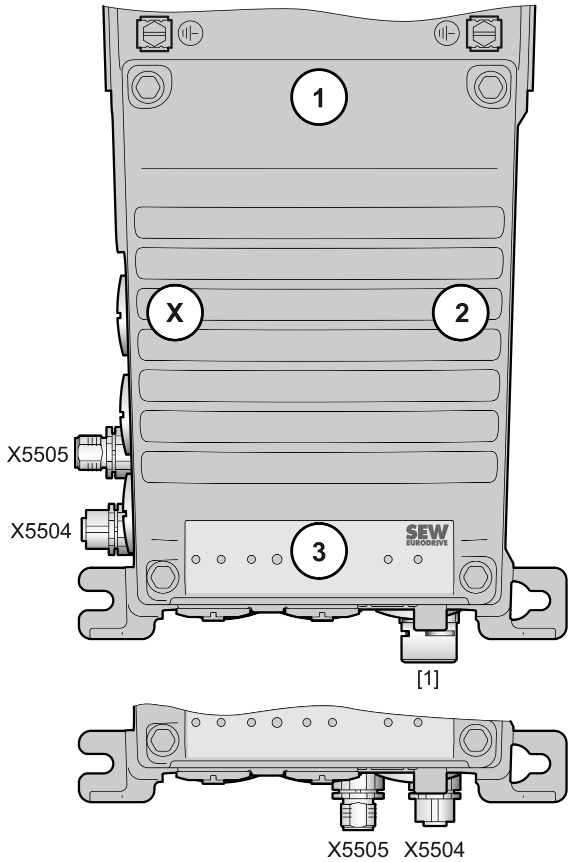
Plug connector				Not together at a position with the plug connector:
Designation	Coding ring/ color	Function	Position	
X1203_1	Black	AC 400 V connection[1)]	X or 3	• X1206
X1203_2	Black	AC 400 V connection	X or 3	• X5136 • X2242
X1206	–	AC 400 V connection (IN)[2)]	X or 3	• X1203_1
X2242	–	AC 400 V connection (OUT)	X or 3	• X1203_2 • X5136
X2041	Brown	Connection for motors without digital interface	X or 3	• X2104
X2104	None	Connection for motors with digital interface (MOVILINK® DDI)	X or 3	• X2041
X5136	None	Digital inputs/outputs	X or 3	• X1203_2 • X2242

1) Plug connector X1203_1 can also be ordered individually (i.e. without plug connector X1203_2).
2) Plug connector X1206 can be ordered separately (i.e. without plug connector X2242).

Cable entries M16

The following figure depicts the possible plug connector positions for the M16 cable entries:





30566670347

Plug connector				Not together at a position with the plug connector:
Designation	**Coding ring/ color**	**Function**	**Position**	
X5504	Yellow	STO (3-core connection)1)	X or 3	Optional pressure compensation
X5505	Yellow	STO (3-core connection)1)	X or 3	–
–	–	[1] Optional pressure compensation	3	X5504

1) Plug connectors X5504 and X5505 can only be ordered together.

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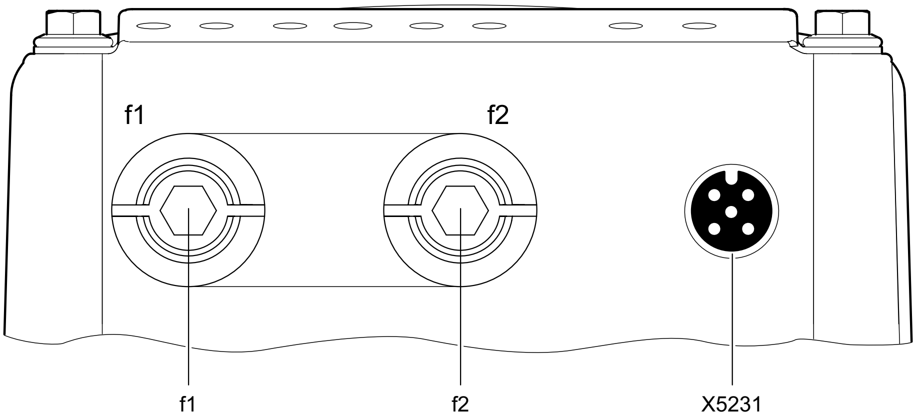
5.10.5 Plug connector positions at the electronics cover

The following figure shows the positions of the potentiometers and plug connectors:



9007228262316171

Designation	Function
f1	Potentiometer f1 (underneath the screw plug)
f2	Potentiometer f2 (underneath the screw plug)
X5231	Analog input

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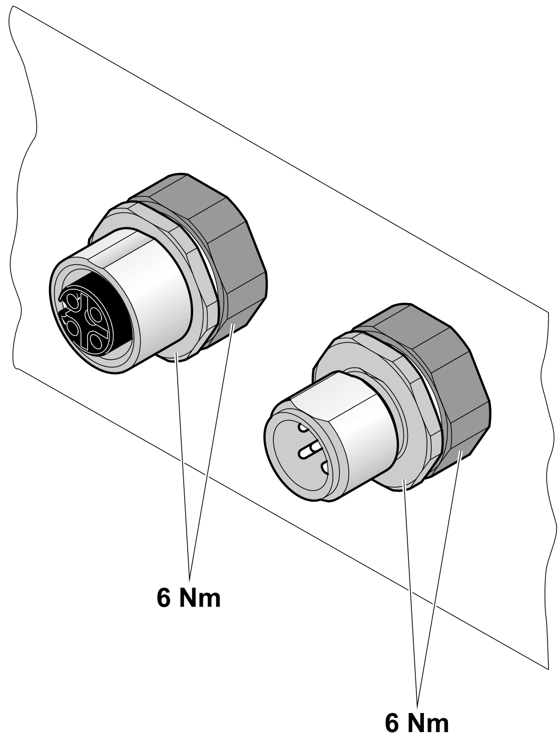
5.10.6 Plug connector variants

M12 plug connector at the connection box

M12 plug connectors at the connection box are pre-installed so they match the connection cables provided by SEW-EURODRIVE. Customers can adjust the orientation of plug connectors if required.

The following figure shows a schematic illustration with the permitted tightening torques:



19443420299

M23 plug connector

⚠ CAUTION

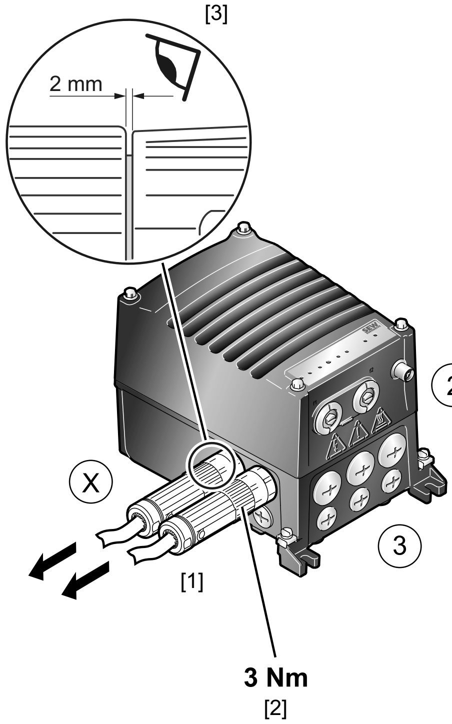
Loss of the guaranteed degree of protection.

Potential damage to property.

- Remove the union nut from the M23 plug connector using 3 Nm.
- Between plug connector and bushing is a gap of 2 mm.

M23 plug connectors are available in the plug connector design "Straight".

Design MMF1.

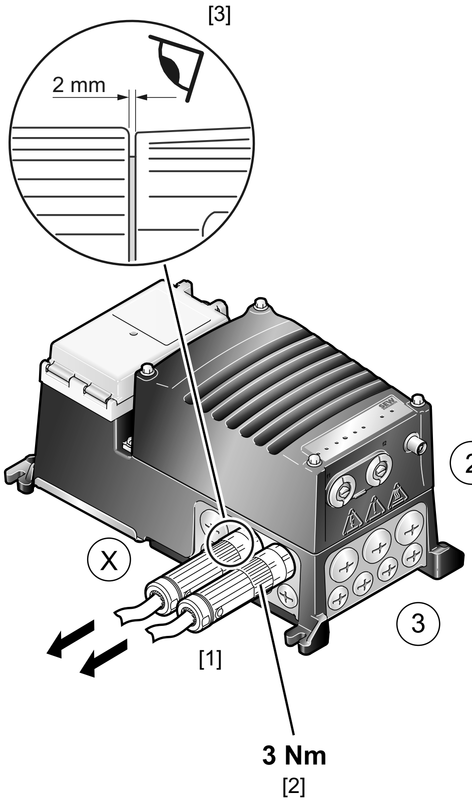


30568710027

[1] "Straight" design
[2] The tightening torque for the union nut is 3 Nm.
You can order suitable tools from TE Connectivity - Intercontec products using the following purchase order number:
- Torque wrench 3 Nm, 1/4" external square driver: C1.020.00
- Spanner wrench 1/4" square socket, suitable to the 923/723 series with SpeedTec equipment: C6.216.00

[3] There is a gap of 2 mm between plug connector and socket

Design MMF3.



30568715531

[1] "Straight" design
[2] The tightening torque for the union nut is 3 Nm
You can order suitable tools from TE Connectivity - Intercontec products using the following purchase order number:
- Torque wrench 3 Nm, 1/4" external square driver: C1.020.00
- Spanner wrench 1/4" square socket, suitable to the 923/723 series with SpeedTec equipment: C6.216.00

[3] There is a gap of 2 mm between plug connector and socket

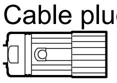
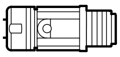
5.10.7 Using plug connectors assembled by yourself

The power plug connectors for assembling connection cables yourself, and the corresponding assembly tool set is available for order from TE Connectivity - Intercontec products.

Contact TE Connectivity - Intercontec products if the order designation is not available in the online order system of Intercontec.

Order information

The table below shows the order designations for connectors by TE Connectivity - Intercontec products with the matching coding for assembly by the customer:

Plug connector type		**Designation for order from the supplier TE Connectivity - Intercontec products**
Coding ring: Black	Cable plug (male) 	H 51 A 019 MR 02 42 0102 000
	Cable socket (female) 	H 52 A 013 FR 02 42 0102 000

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5.11 Assignment of the optional plug connectors

⚠ WARNING

Electric shock when disconnecting or connecting voltage-carrying plug connectors.

Severe or fatal injuries

- Switch off the line voltage.
- Never plug or unplug plug connectors while they are energized.

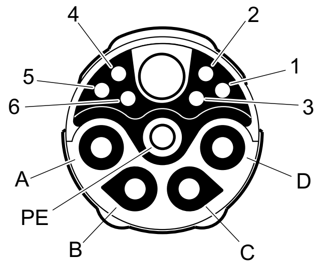
5.11.1 X1203_1 and X1203_2: AC 400 V connection

The following table shows information about this connection:

Function
AC 400 V connection for supplying the device/for looping through

Connection type
M23, SEW insert, 723 series, SpeedTec-capable, company: TE/Intercontec, female, coding ring: black, protected against contact

Connection diagram

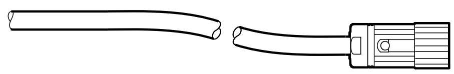
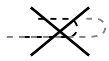


Assignment		
Contact	**Signal**	**Description**
A	L1	Line connection, phase L1
B	L2	Line connection, phase L2
C	L3	Line connection, phase L3
D	Res.	Reserved
PE	PE	PE connection
1	Res.	Reserved
2	Res.	Reserved
3	Res.	Reserved
4	Res.	Reserved
5	Res.	Reserved
6	Res.	Reserved

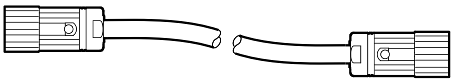
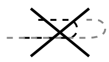
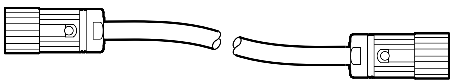
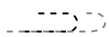
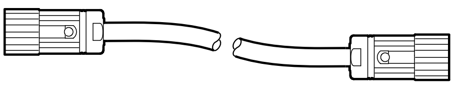
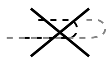
Connection cables

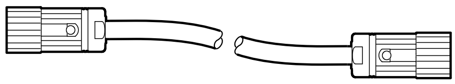
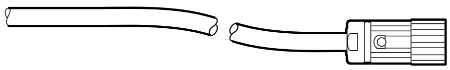
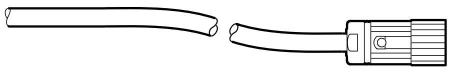
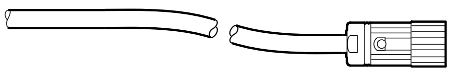
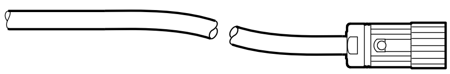
The following tables list the cables available for this connection:

Cable cross section 1.5 mm²

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open — M23, coding ring: black, male	CE: 18180094	HELUKABEL® JZ-600	Variable 	1.5 mm² / AC 500 V

Cable cross section 2.5 mm²

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18127460	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	2.5 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133959	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable 	2.5 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153267	HELUKABEL® – JZ-602	Variable 	2.5 mm² / AC 500 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153275	HELUKABEL® MULTIFLEX® – 512	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18127479	HELUKABEL® TOPFLEX® – 600-PVC	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18133967	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153283	HELUKABEL® – JZ-602	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153291	HELUKABEL® MULTIFLEX® – 512	Variable	2.5 mm² / AC 500 V

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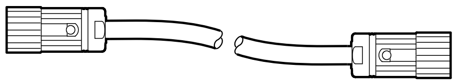
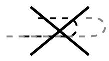
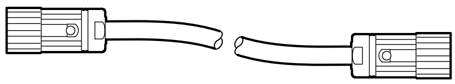
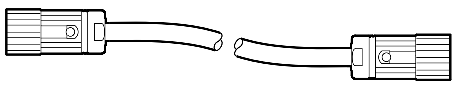
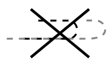
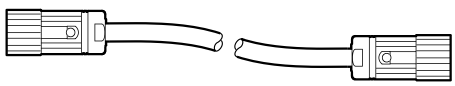
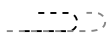
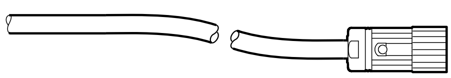
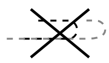
Cable cross section 4.0 mm²

Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross-section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18127487 CE: 18133975	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133975	HELUKABEL® TOPFLEX® – 611-PUR (Halogen-free)	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153305	HELUKABEL® – JZ-602	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153313	HELUKABEL® MULTIFLEX® – 512	Variable 	4 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18127495	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4 mm² / AC 500 V

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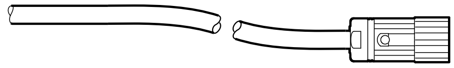
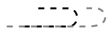
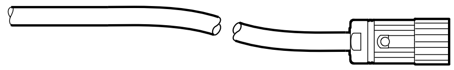
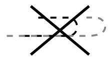
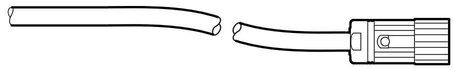
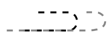
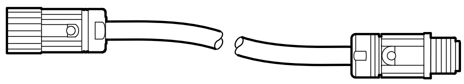
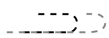
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross-section/operating voltage
 Open — M23, coding ring: black, male	CE: 18133983	HELUKABEL® TOPFLEX® – 611-PUR (Halogen-free)	Variable 	4 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153321	HELUKABEL® – JZ-602	Variable 	4 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153348	HELUKABEL® MULTIFLEX® – 512	Variable 	4 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, female	UL: 18166318	HELUKABEL® MULTIFLEX® – 512	Variable 	4 mm² / AC 500 V

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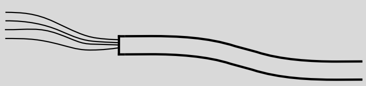
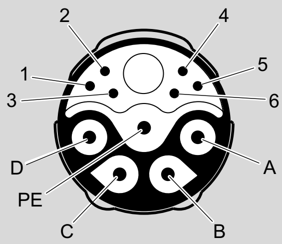
Connection of cables with open end

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
18180094, 18127479, 18133967, 18153283, 18153291, 18127495, 18133983, 18153321, 18153348

Assembly					
Open cable end			**Description**	**Prefabricated plug connectors**	
					
Core color/ Core cross section	**Identi- fication**	**Assembly**		**Signal**	**Contact**
Black 1.5 mm² 2.5 mm²	1	Not pre- fabricated	Line connection, phase L1	L1	A
Black 1.5 mm² 2.5 mm²	2	Not pre- fabricated	Line connection, phase L2	L2	B
Black 1.5 mm² 2.5 mm²	3	Not pre- fabricated	Line connection, phase L3	L3	C
Green/yel- low 1.5 mm² 2.5 mm²	–	Not pre- fabricated	PE connection	PE	PE

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5.11.2 X5504: STO (3 cores)

⚠ WARNING

No safe disconnection of the device.

Severe or fatal injuries.

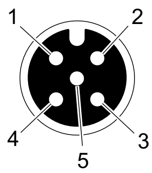
- Do not use the 24 V output (pins 1 and 3) for safety-related applications.
- Only jumper the STO connection with 24 V if the device does not have to fulfill any safety function.

The following table shows information about this connection:

Function
Connection for safe torque off (STO, 3 cores)

Connection type
M12, 5-pin, female, A-coded, color: yellow

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	24V_OUT	DC 24 V auxiliary output
2	F_STO_P2	F_STO_P2 connection
3	0V24_OUT	0V24 reference potential for DC 24 V auxiliary output
4	F_STO_P1	F_STO_P1 connection
5	F_STO_M	F_STO_M connection

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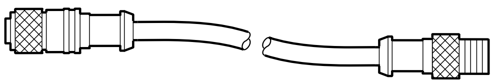
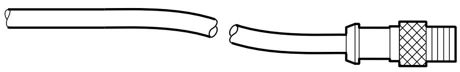
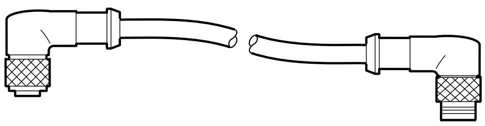
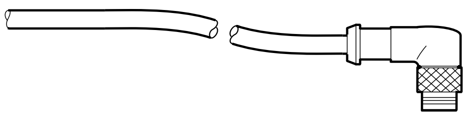
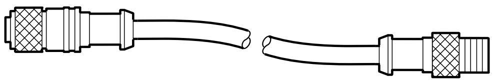
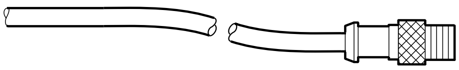
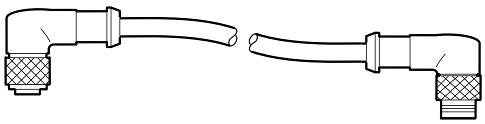
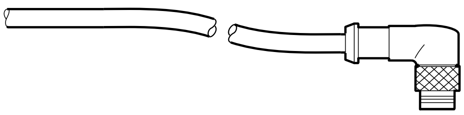
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table provides an overview of the cables available for this connection:

Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female M12, 5-pin, A-coded, male	CE/UL: 28110935	HELUKABEL® LiYCY	Variable	3 × 0.75 mm^2 / DC 60 V
 Open M12, 5-pin, A-coded, male	CE/UL: 28110943	HELUKABEL® LiYCY	Variable	3 × 0.75 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL® LiYCY	Variable	3 × 0.75 mm^2 / DC 60 V
 Open M12, 5-pin, A-coded, male	CE/UL: 28110978	HELUKABEL® LiYCY	Variable	3 × 0.75 mm^2 / DC 60 V

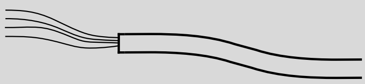
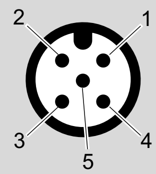
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female / M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V
 Open / M12, 5-pin, A-coded, male	CE/UL: 28111001	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female / M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V
 Open / M12, 5-pin, A-coded, male	CE/UL: 28111036	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V

Connection of cables with open end

HELUKABEL

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28110978, 28110943

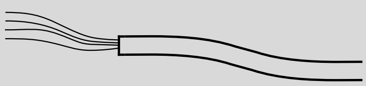
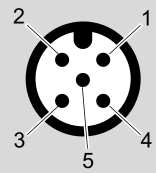
Assembly					
Open cable end			Description	Prefabricated plug connectors	
					
Core color/ Core cross section	Identification	Assembly		Signal	Contact
1)	–	Not prefabricated	DC 24 V auxiliary output	24V_OUT	1
White 0.75 mm^2	–	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not prefabricated	0V24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Brown 0.75 mm^2	–	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Green 0.75 mm^2	–	Not prefabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

igus chainflex

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28111001, 28111036

Assembly					
Open cable end			**Description**	**Prefabricated plug connectors**	
					
Core color/ Core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
1)	–	Not prefabricated	DC 24 V auxiliary output	24V_OUT	1
Black 0.75 mm^2	1	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not prefabricated	0V24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Black 0.75 mm^2	2	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.75 mm^2	3	Not prefabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

5.11.3 X5505: STO (3 cores)

⚠ WARNING

Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

Severe or fatal injuries.

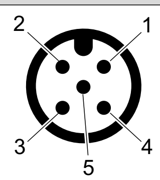
- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

The following table shows information about this connection:

Function
Connection for safe torque off (STO, 3 cores)

Connection type
M12, 5-pin, male, A-coded, color: yellow

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	Res.	Reserved
2	F_STO_P2	F_STO_P2 connection
3	Res.	Reserved
4	F_STO_P1	F_STO_P1 connection
5	F_STO_M	F_STO_M connection

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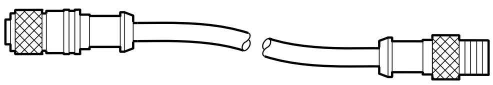
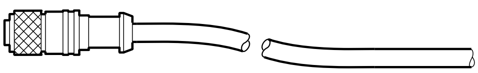
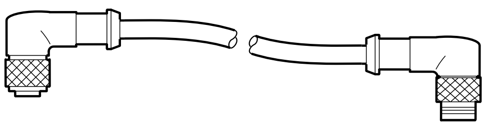
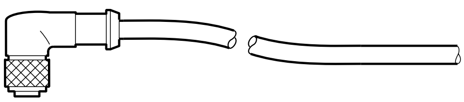
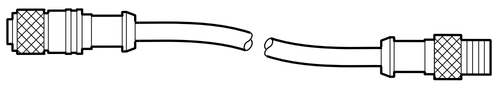
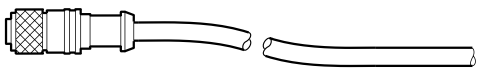
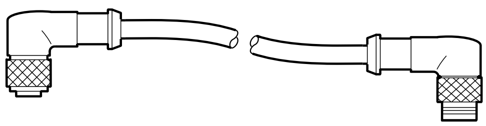
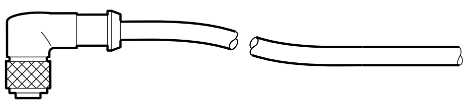
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table provides an overview of the cables available for this connection:

Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110935	HELUKABEL® LiYCY	Variable	3 × 0.75 mm² / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28117808	HELUKABEL® LiYCY	Variable	3 × 0.75 mm² / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL® LiYCY	Variable	3 × 0.75 mm² / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28110986	HELUKABEL® LiYCY	Variable	3 × 0.75 mm² / DC 60 V

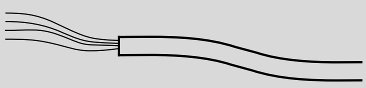
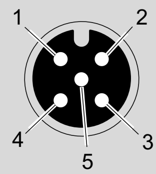
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female / M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female / Open	CE/UL: 28117816	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female / M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female / Open	CE/UL: 28111044	igus chainflex CF78.UL	Variable	4 × 0.5 mm^2 / DC 60 V

Connection of cables with open end

HELUKABEL

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28117808, 28110986

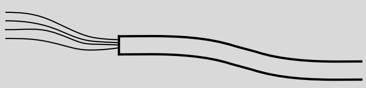
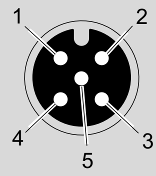
Assembly					
Open cable end			Description	Prefabricated plug connectors	
					
Core color/ Core cross section	Identification	Assembly		Signal	Contact
1)	–	Not prefabricated	DC 24 V auxiliary output	24V_OUT	1
White 0.75 mm²	–	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
1)	–	Not prefabricated	0V24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Brown 0.75 mm²	–	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.75 mm²	–	Not prefabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

igus chainflex

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28117816, 28111044

Assembly					
Open cable end			**Description**	**Prefabricated plug connectors**	
					
Core color/core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
[1]	–	Not prefabricated	DC 24 V auxiliary output	24V_OUT	1
Black 0.75 mm^2	1	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
[1]	–	Not prefabricated	0V24 reference potential for DC 24 V auxiliary output	0V24_OUT	3
Black 0.75 mm^2	2	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.75 mm^2	3	Not prefabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these cores in the plug connector.

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5.11.4 STO jumper plug (3-core)

⚠ WARNING

Safe disconnection of the device is not possible when using the STO jumper plug.

Severe or fatal injuries.

- Only use use the STO jumper plug if the device is not used to fulfill any safety function.

⚠ WARNING

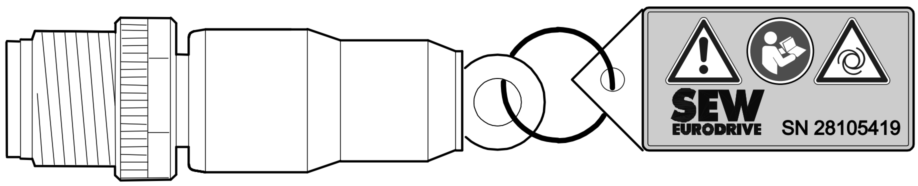
Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

Severe or fatal injuries.

- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

The STO jumper plug can be connected to the STO plug connector X5504 of the device. The STO jumper plug deactivates the safety functions of the device.

The following figure shows the STO jumper plug with the printed **red** tag, part number 28105419:



25247142411

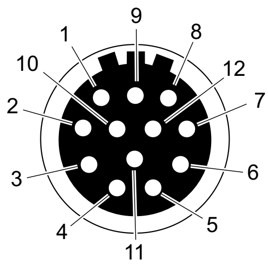
5.11.5 X5136: Digital inputs, relay output

The following table shows information about this connection:

Function
Digital inputs, relay output

Connection type
M23, female, male thread, TE Connectivity - Intercontec products, P insert, SpeedTec equipment, 12-pin, 0°-coded, coding ring: without, protected against contact

Connection diagram



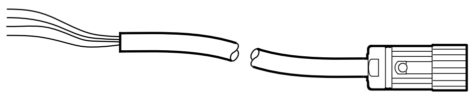
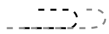
Assignment		
Contact	**Signal**	**Description**
1	DI01	Digital input DI01
2	DI02	Digital input DI02
3	DI03	Digital input DI03
4	DI04	Digital input DI04
5	Res.	Reserved
6	DOR-C	Relay output DO R, common contact
7	DOR-NO	Relay output DO R, NO contact
8	+24V_O	DC 24 V output
9	0V24_O	0 V 24 reference potential
10	Res.	Reserved
11	+24V_O	DC 24 V output
12	FE	Functional earth

Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

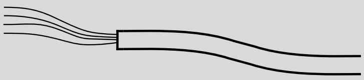
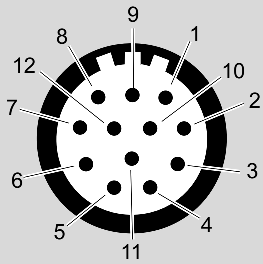
The following table provides an overview of the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open M23, 12-pin, 0°-coded	CE/UL: 11741457	HELUKABEL Li9Y91YC11Y -HF	Variable 	6 × 2 × 0.25 mm² / DC 60 V

Connection of cables with open end

The following table shows the conductor assignment of cables with the following part number:

Part numbers
11741457

Assembly					
Open cable end			Description	Prefabricated plug connectors	
				 	
Core color/ Core cross section	Identification	Assembly		Signal	Contact
Pink 0.25 mm²	–	Not prefabricated	Digital input DI01	DI01	1
Gray 0.25 mm²	–	Not prefabricated	Digital input DI02	DI02	2
Red 0.25 mm²	–	Not prefabricated	Digital input DI03	DI03	3
Blue 0.25 mm²	–	Not prefabricated	Digital input DI04	DI04	4
Yellow 0.25 mm²	–	Not prefabricated	Reserved	Res.	5
Green 0.25 mm²	–	Not prefabricated	Relay output DO R, common contact	DOR-C	6
Purple 0.25 mm²	–	Not prefabricated	Relay output DO R, NO contact	DOR-NO	7
Black 0.25 mm²	–	Not prefabricated	DC 24 V output	+24V_O	8
Brown 0.25 mm²	–	Not prefabricated	0 V 24 reference potential	0V24_O	9
White 0.25 mm²	–	Not prefabricated	Reserved	Res.	10
Gray/pink 0.25 mm²	–	Not prefabricated	DC 24 V output	+24V_O	11
Green/yellow 0.25 mm²	–	Not prefabricated	Functional earth	FE	12

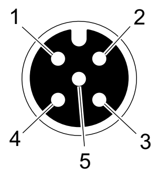
5.11.6 X4141: Engineering interface

The following table shows information about this connection:

Function
Engineering interface (CAN)

Connection type
M12, 5-pin, female, A-coded, color: black

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	Res.	Reserved
2	24V_OUT	DC 24 V auxiliary output[1)]
3	0V24_OUT	0V24 reference potential[1)]
4	CAN_H	CAN High connection
5	CAN_L	CAN Low connection

1) Only use this output to supply components by SEW-EURODRIVE.

Connection cables

The following table provides an overview of the cables available for this connection:

Connection cable	Conformity/ part number	Length/installation type	Operating voltage
Connection to interface adapter USM21A:  M12, 5-pin, A-coded, male — RJ10	CE: 28111680	3.0 m	DC 60 V
Connection to CBG.. keypad:  M12, 5-pin, A-coded, male — D-sub, 9-pin, male, angled	CE: 28117840	3.0 m	DC 60 V

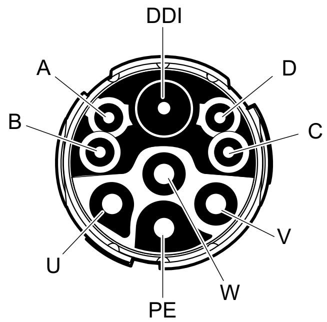
5.11.7 X2104: Inverter output for connecting motors with digital interface (MOVILINK® DDI)

The following table shows information about this connection:

Function
Inverter output for connecting motors with digital interface (MOVILINK® DDI)

Connection type
M23, female, union nut with female thread, TE Connectivity - Intercontec Products, series 723, SEW insert, SpeedTec equipment, coding ring: without, protected against contact

Connection diagram



Assignment			
Contact	**Signal**	**Description**	
		Connection depending on brake control	
		Standard design for 2-wire and 3-wire brakes AC 110 – 500 V	**Design with brake rectifier 24 V (/BGx) for 2-wire brakes**
U	U	Motor connection, phase U	
V	V	Motor connection, phase V	
W	W	Motor connection, phase W	
PE	PE	PE connection	
1	DDI	MOVILINK® DDI	
A	Brake A	Reserved	Brake connection-
B	Brake B	Brake connection 15	Reserved
C	Brake C	Brake connection 13	Reserved
D	Brake D	Brake connection 14	Brake connection+

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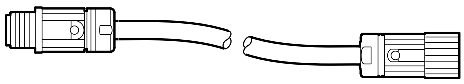
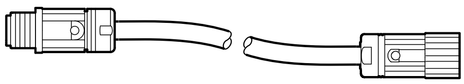
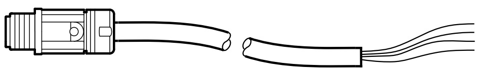
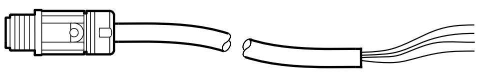
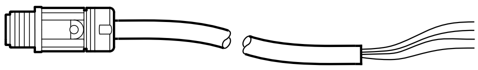
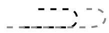
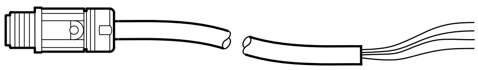
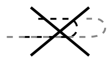
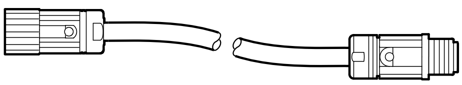
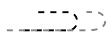
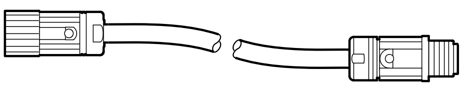
Connection cables

The following tables list the cables available for this connection:

Cable cross section 1.5 mm²

Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without encoding ring, male — M23, without encoding ring, female	CE/UL: 28123905	LEONI LEHC® 005775	Variable	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without encoding ring, male — M23, without encoding ring, female	CE/UL: 28123859	LEONI LEHC® 005769	Variable	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without encoding ring, male — Open	CE/UL: 28124332	LEONI LEHC® 005769	Variable	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without encoding ring, male — Open	CE/UL: 28124367	LEONI LEHC® 005775	Variable	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V

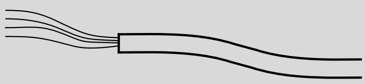
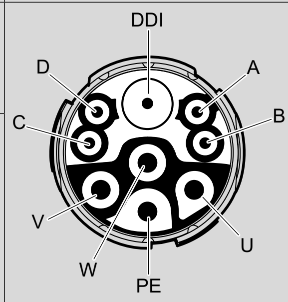
Cable cross section 2.5 mm²

Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without encoding ring, male — Open	CE/UL: 28124340	LEONI LEHC® 005770	Variable 	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without encoding ring, male — Open	CE/UL: 28124375	LEONI LEHC® 005776	Variable 	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without encoding ring, female — M23, without encoding ring, male	CE/UL: 28123867	LEONI LEHC® 005244	Variable 	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without encoding ring, female — M23, without encoding ring, male	CE/UL: 28123913	LEONI LEHC® 005244	Variable 	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V

Connection of cables with open end

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28124332, 28124367, 28124340, 28124375

<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Prefabricated plug connectors</th></tr>
<tr><td colspan="3" rowspan="2"></td><th rowspan="2">Without brake</th><th>3-wire brake AC 110 – 500 V</th><th>2-wire brake DC 24 V</th><td colspan="2" rowspan="2">
</td></tr>
<tr><th>(BE/BZ brake)</th><th>(BK/BP brake)</th></tr>
<tr><th>Core color/ Core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td>Black 1.5 mm^2 2.5 mm^2</td><td>U/L1</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>U</td></tr>
<tr><td>Black 1.5 mm^2 2.5 mm^2</td><td>V/L2</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>V</td></tr>
<tr><td>Black 1.5 mm^2 2.5 mm^2</td><td>W/L3</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>W</td></tr>
<tr><td>Green/yellow 1.5 mm^2 2.5 mm^2</td><td>–</td><td>Not prefabricated</td><td colspan="3">PE connection</td><td>PE</td><td>PE</td></tr>
<tr><td>Purple coaxial cable</td><td>–</td><td>Coaxial connector</td><td colspan="3">MOVILINK® DDI connection</td><td>DDI</td><td>1</td></tr>
<tr><td>Yellow 1.0 mm^2</td><td>A</td><td>Not prefabricated</td><td>Reserved[1]</td><td>Reserved[1]</td><td>Brake-</td><td>Brake A</td><td>A</td></tr>
<tr><td>Orange 1.0 mm^2</td><td>B</td><td>Not prefabricated</td><td>Reserved[1]</td><td>Brake 15</td><td>Reserved[1]</td><td>B brake</td><td>B</td></tr>
<tr><td>Pink 1.0 mm^2</td><td>C</td><td>Not prefabricated</td><td>Reserved[1]</td><td>Brake 13</td><td>Reserved[1]</td><td>Brake C</td><td>C</td></tr>
<tr><td>Purple 1.0 mm^2</td><td>D</td><td>Not prefabricated</td><td>Reserved[1]</td><td>Brake 14</td><td>Brake+</td><td>Brake D</td><td>D</td></tr>
</table>

1) Reserved wires must be isolated and fixed in the connection box.

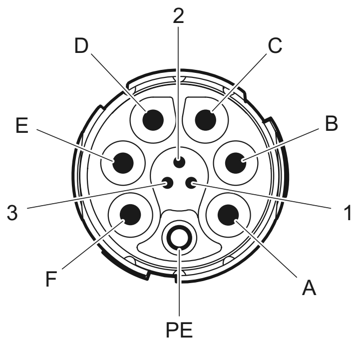
5.11.8 X2041: Inverter output for connecting motors without digital interface

The following table shows information about this connection:

Function
Inverter output for connecting motors without digital interface

Connection type
M23, female, union nut with female thread, TE Connectivity - Intercontec Products, series 723, SEW insert, SpeedTec equipment, coding ring: brown, protected against contact

Connection diagram

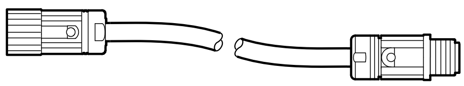
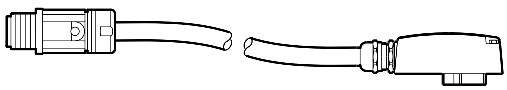
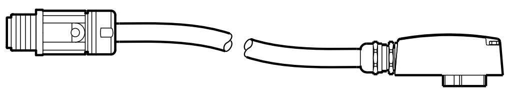
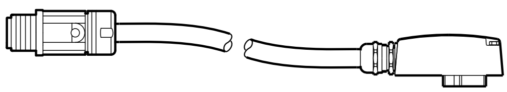


Assignment		
Contact	**Signal**	**Description**
A	U	Motor connection, phase U
B	V	Motor connection, phase V
C	W	Motor connection, phase W
D	13	Brake connection 13
E	14	Brake connection 14
F	15	Brake connection 15
PE	PE	PE connection
1	Temp+	Connection temperature sensor+
2	Res.	Reserved
3	Temp−	Connection temperature sensor −

Connection cables

The following tables list the cables available for this connection:

Cable cross section 1.5 mm²

Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, female — M23, coding ring: brown, male	CE/UL: 28128710	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — IS2, female, △	CE/UL: 28125932	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — IS2, female, ⅄	CE/UL: 28125940	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — IS1, female, △	CE/UL: 28125959	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V

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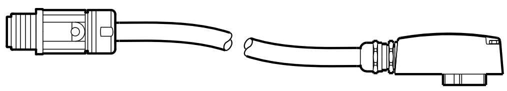
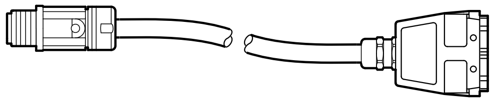
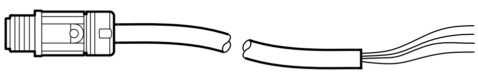
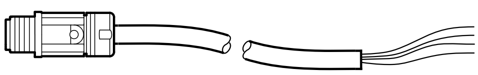
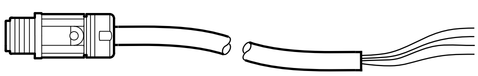
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, male — IS1, female, ⅄	CE/UL: 28125967	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — HAN® 10E, female, ASB4	CE/UL: 28125975	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — Open, M5 ring cable lug, conductor end sleeves	CE/UL: 28125983	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — Open, M4 ring cable lug, conductor end sleeves	CE/UL: 28125991	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — Open, conductor end sleeves	CE/UL: 28126009	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V

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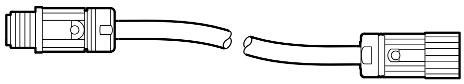
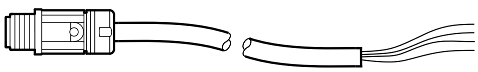
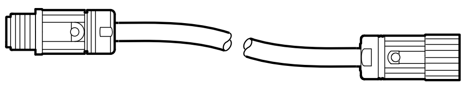
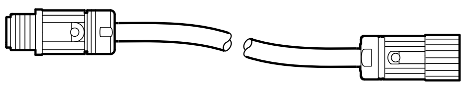
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, male — M23, without encoding ring, female (SH1/ KH1)	CE/UL: 28128451	LEONI LEHC® 000749	Variable	1.5 mm² / AC 500 V

Cable cross section 2.5 mm²

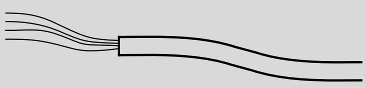
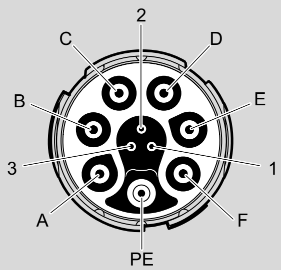
Connection cables	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, male — Open	CE/UL: 28135369	LEONI LEHC® 005275	Variable	2.5 mm² / AC 500 V
 M23, coding ring: brown, male — M23, without encoding ring (SH1/KH1) female	CE/UL: 28128443	LEONI LEHC® 005275	Variable	2.5 mm² / AC 500 V
 M23, coding ring: brown, male — M23, coding ring: brown, female	CE/UL: 28128478	LEONI LEHC® 005275	Variable	2.5 mm² / AC 500 V

Connection of cables with open end

28128435

The following table shows the conductor assignment of cables with the following part number:

Part numbers
28128435

<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end, not prefabricated</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Prefabricated plug connectors</th></tr>
<tr><td colspan="3"></td><th>Without brake</th><th>3-wire brake AC 110 – 500 V
(BE/BZ brake)</th><th>2-wire brake DC 24 V
(BK/BP brake)</th><td colspan="2"></td></tr>
<tr><th>Core color/ Core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td>Black 2.5 mm^2</td><td>U1</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>A</td></tr>
<tr><td>Black 2.5 mm^2</td><td>V2</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>B</td></tr>
<tr><td>Black 2.5 mm^2</td><td>W3</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>C</td></tr>
<tr><td>Black 1.0 mm^2</td><td>1</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Brake 13</td><td>Brake+</td><td>Brake 13</td><td>D</td></tr>
<tr><td>Black 1.0 mm^2</td><td>2</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Brake 14</td><td>Reserved[1)]</td><td>Brake 14</td><td>E</td></tr>
<tr><td>Black 1.0 mm^2</td><td>3</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Brake 15</td><td>Brake−</td><td>Brake 15</td><td>F</td></tr>
<tr><td>Green/yellow 2.5 mm^2</td><td>–</td><td>Not prefabricated</td><td colspan="3">PE connection</td><td>PE</td><td>PE</td></tr>
<tr><td>Black 0.75 mm^2</td><td>4</td><td>Not prefabricated</td><td colspan="3">Connection temperature sensor+</td><td>Temp+</td><td>1</td></tr>
<tr><td>–</td><td>–</td><td>–</td><td colspan="3">–</td><td>Res.</td><td>2</td></tr>
<tr><td>Black 0.75 mm^2</td><td>5</td><td>Not prefabricated</td><td colspan="3">Connection temperature sensor−</td><td>Temp−</td><td>3</td></tr>
</table>

1) Reserved wires must be isolated and fixed in the connection box.

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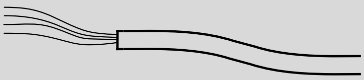
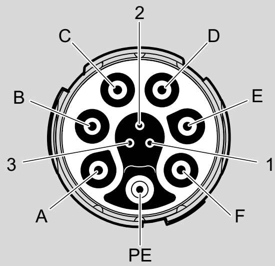
SEW EURODRIVE

28125991, 28125983

The following table shows the conductor assignment of cables with the following part numbers:

Part numbers
28125991, 28125983

Assembly							
Open cable end, conductor end sleeves, ring cable lugs			**Motor connection depending on brake control**			**Prefabricated plug connectors**	
			**Without brake**	**3-wire brake AC 110 – 500 V (BE/BZ brake)**	**2-wire brake DC 24 V (BK/BP brake)**		
Core color/ Core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm² 2.5 mm²	U1	Ring cable lug M4, M5	Motor connection, phase U			U	A
Black 1.5 mm² 2.5 mm²	V2	Ring cable lug M4, M5	Motor connection, phase V			V	B
Black 1.5 mm² 2.5 mm²	W3	Ring cable lug M4, M5	Motor connection, phase W			W	C
Black 1.0 mm²	1	Conductor end sleeve	Reserved[1]	Brake 13	Brake+	Brake 13	D
Black 1.0 mm²	2	Conductor end sleeve	Reserved[1]	Brake 14	Reserved[1]	Brake 14	E
Black 1.0 mm²	3	Conductor end sleeve	Reserved[1]	Brake 15	Brake−	Brake 15	F
Green/yellow 1.5 mm² 2.5 mm²	–	Conductor end sleeve	PE connection			PE	PE
Black 0.75 mm²	4	Conductor end sleeve	Connection temperature sensor+			Temp+	1
–	–	–	–			Res.	2
Black 0.75 mm²	5	Conductor end sleeve	Connection temperature sensor−			Temp−	3

1) Reserved wires must be isolated and fixed in the connection box.

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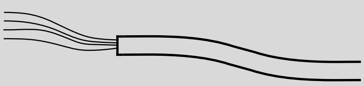
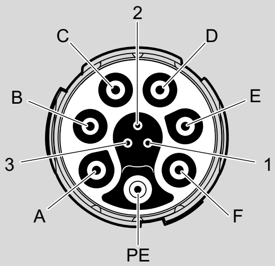
28126009

The following table shows the conductor assignment of cables with the following part number:

Part numbers
281286009

Assembly							
Open cable end, conductor end sleeves			**Motor connection depending on brake control**			**Prefabricated plug connectors**	
			**Without brake**	**3-wire brake AC 110 – 500 V (BE/BZ brake)**	**2-wire brake DC 24 V (BK/BP brake)**		
Core color/ Core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm^2	U1	Conductor end sleeve	Motor connection, phase U			U	A
Black 1.5 mm^2	V2	Conductor end sleeve	Motor connection, phase V			V	B
Black 1.5 mm^2	W3	Conductor end sleeve	Motor connection, phase W			W	C
Black 1.0 mm^2	1	Conductor end sleeve	Reserved[1)]	Brake 13	Brake+	Brake 13	D
Black 1.0 mm^2	2	Conductor end sleeve	Reserved[1)]	Brake 14	Reserved[1)]	Brake 14	E
Black 1.0 mm^2	3	Conductor end sleeve	Reserved[1)]	Brake 15	Brake−	Brake 15	F
Green/yellow 1.5 mm^2	–	Conductor end sleeve	PE connection			PE	PE
Black 0.75 mm^2	4	Conductor end sleeve	Connection temperature sensor+			Temp+	1
–	–	–	–			Res.	2
Black 0.75 mm^2	5	Conductor end sleeve	Connection temperature sensor−			Temp−	3

1) Reserved wires must be isolated and fixed in the connection box.

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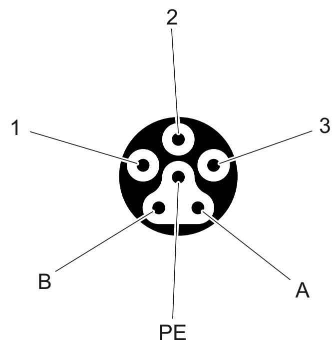
5.11.9 X1206: AC 400 V connection (IN)

The following table shows information about this connection:

Function
AC 400 V connection (IN)

Connection type
MQ15-X-Power, male, plug connector without union nut, MURR Elektronik, (current load max. 16 A)

Connection diagram


Assignment		
Contact	**Signal**	**Description**
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	PE connection
A	Res.	Reserved
B	Res.	Reserved

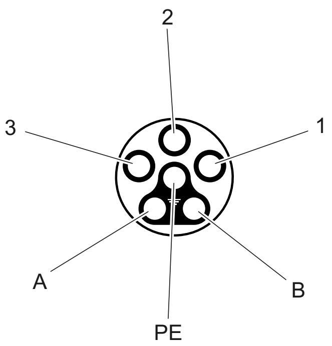
5.11.10 X2242: AC 400 V connection (OUT)

The following table shows information about this connection:

Function
AC 400 V connection (OUT)

Connection type
MQ15-X-Power, female, plug connector with union nut, MURR Elektronik, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Signal**	**Description**
1	L1	Line connection, phase L1 (OUT)
2	L2	Line connection, phase L2 (OUT)
3	L3	Line connection, phase L3 (OUT)
PE	PE	PE connection
A	Res.	Reserved
B	Res.	Reserved

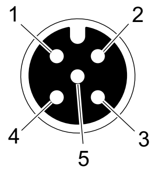
5.12 Plug connector assignment at the electronics cover

5.12.1 X5231: Analog input

The following table shows information about this connection:

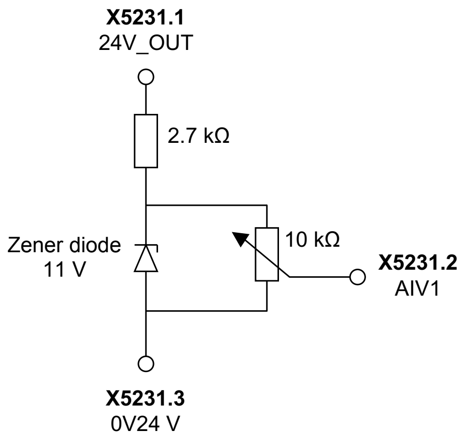
Function
Analog input

Connection type
M12, 5-pin, female, A-coded, color: black

Connection diagram


Assignment		
Contact	**Signal**	**Description**
1	24V_OUT	DC 24 V output
2	AIV1	Analog voltage input AI1
3	0V24	0V24 reference potential / Reference potential of the analog input
4	AIC1	Analog current input AI1
5	FE	Functional earth

SEW-EURODRIVE recommends using the following connection type for connecting a potentiometer to the voltage input AIV1:



30249539851

5.13 PC connection

Connect the PC to the drive unit before you start the engineering software MOVISUITE®.

You have several options to connect a PC to the device.

5.13.1 Connection via interface adapter USM21A

The USM21A interface adapter is used to connect the PC and the engineering interface of the device.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number
USM21A interface adapter The following connection cables are included in the delivery: • USB 2.0 connection cable – USB type A/USB type B, – Length: 1.5 m • RJ10/RJ10 connection cable For connection to the engineering interface X31 – With 2 RJ10 plug connectors – Length: 3 m	28231449
Connection cable RJ10/M12 For connection to the X4141 engineering interface or to the M12 optional engineering interface at the MMF3... front module: • With RJ10 plug connector • With M12 plug connector, 5-pin, male, A-coded • Length: 3 m	28111680
RJ10/SUB-D9 connection cable For connection to the SUB-D9 optional engineering interface at the front module of MOVIMOT® flexible MMF3...2.. or MMF3...3..: • With RJ10 plug connector • With Sub-D9 plug connector, female • Length: 1.5 m	18123864
Retrofit set M12 engineering interface X4141	28258185

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Connection to X4141 (M12 at the connection box)

The engineering interface X31 in the connection box is assigned to the internal wiring of plug connector X4141.

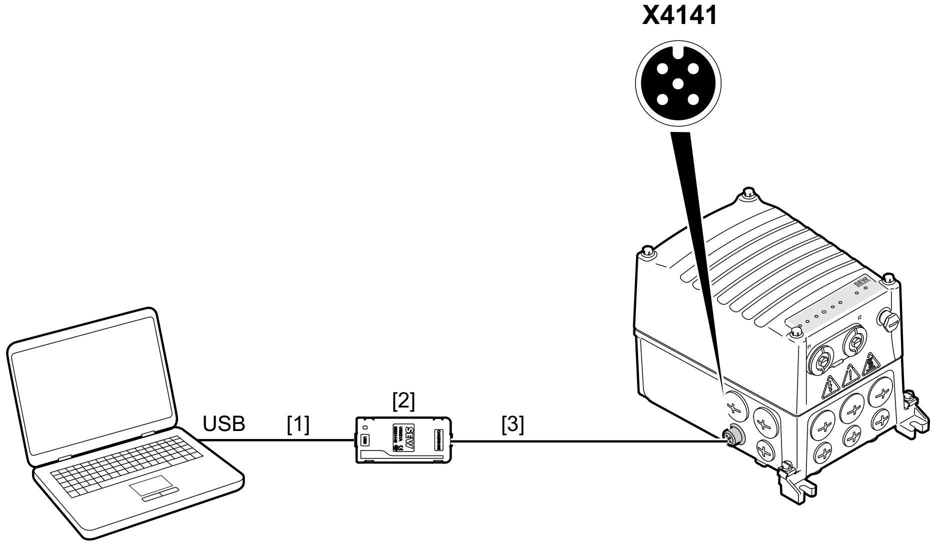
NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

The following illustration shows how to connect the PC to the device:



30551277195

[1] USB 2.0 connection cable
(commercial, included of the USM21A delivery)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12
(available for delivery from SEW-EURODRIVE, part number: 28111680)

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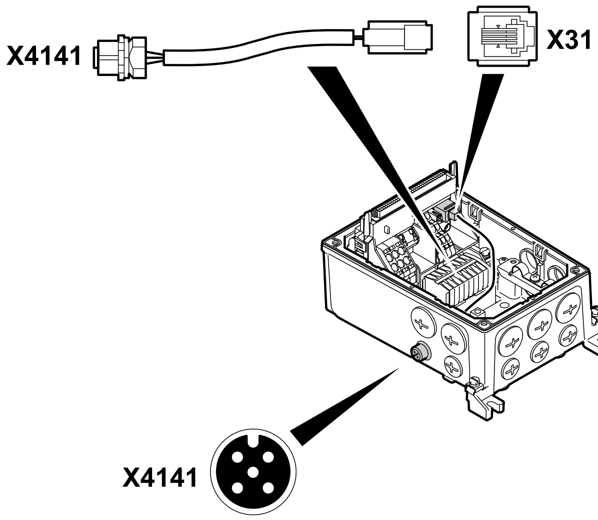
Installing the included engineering plug connector X4141

In some cases, the X4141 engineering plug connector is provided in an accessory bag (part number: 28258185) included in the decentralized frequency inverter delivery from SEW-EURODRIVE. In this case, install the engineering plug connector X4141 to the connection box of the decentralized frequency inverter as follows:

1. It is essential that you observe the startup instructions.
2. Switch off the voltage supply and wait for at least 5 minutes.
3. Loosen the screws and remove the electronics cover from the connection box.
4. Plug in the plug connector RJ10 from outside through a permitted cable entry (for the permitted positions, see chapter "Plug connector positions"). Push the cable completely into the connection box.
5. Screw plug connector M12 into the cable entry bore. Fasten the nut of the M12 plug connector (tightening torque: 6 Nm).
6. Insert the RJ10 plug connector into plug connector X31 in the connection box. The following figure shows an example of the cable routing:



25832156299

7. Plug the electronics cover onto the connection box. Screw on the electronics cover with 4 screws (tightening torque: 6 Nm).

Connection to X31 (RJ10 in the connection box)

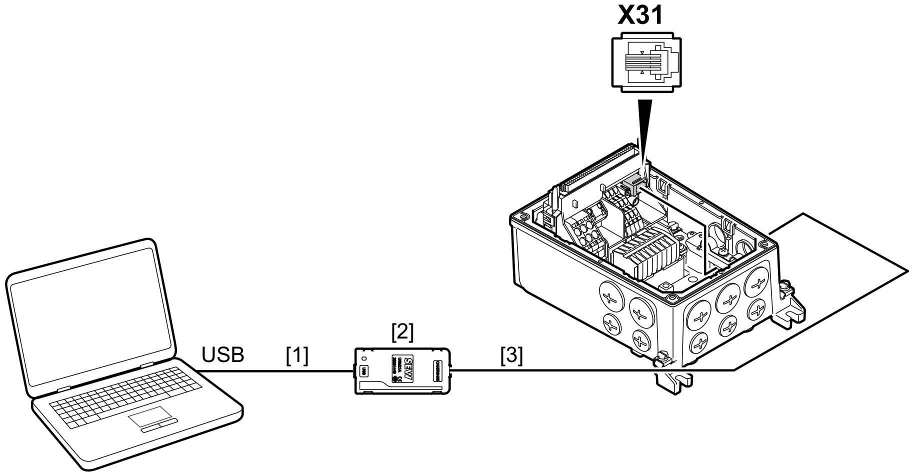
NOTICE

Connector X31 provides a 24 V supply voltage for operating the connected options.

Damage to connected options with low nominal voltage.

- Only connect options with a nominal voltage of 24 V to connector X31, such as:
  – Interface adapter USM21A,
  – CBG.. keypad
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  – Interface adapters USB11A, UWS11A, UWS21A
  – Keypads DBG.., GBG21A.

The following illustration shows how to connect the PC to the device:

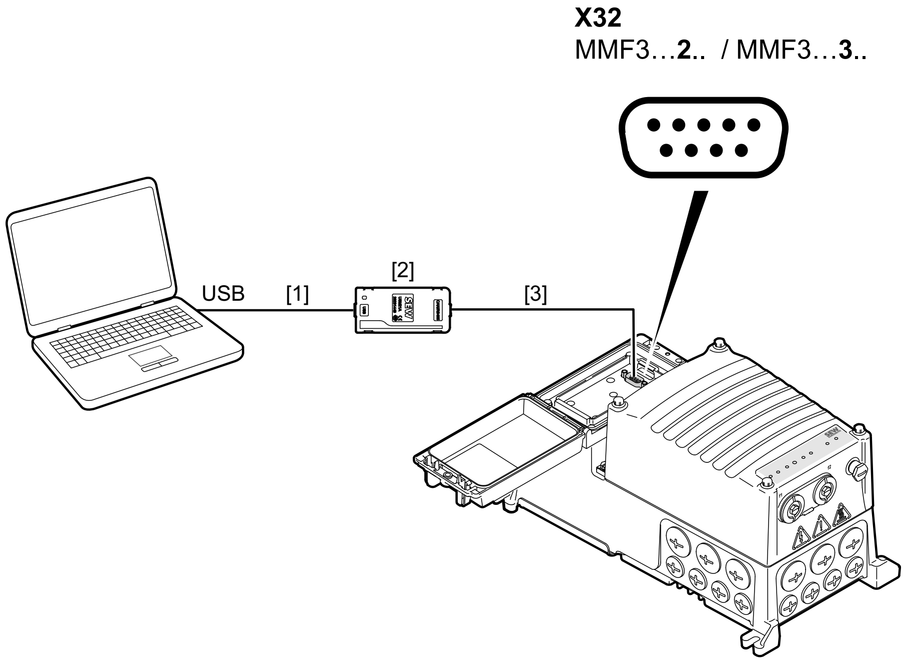


25824402315

[1] USB 2.0 connection cable
(commercial, included in the USM21A interface adapter delivery)
[2] USM21A interface adapter
[3] RJ10/RJ10 connection cable (included in the USM21A interface adapter delivery)

Connection to X32 at the front module of MMF3.

The following figure shows how to connect the PC to the X32 optional engineering interface at the front module of MOVIMOT® flexible MMF3...2.. or MMF3...3..:



30551451147

[1] USB 2.0 connection cable
(commercial, included in the USM21A interface adapter delivery)
[2] USM21A interface adapter
[3] RJ10/Sub-D9 connection cable
(available for delivery from SEW-EURODRIVE, part number: 18123864)

Connection to X4141 at the front module of MMF3.

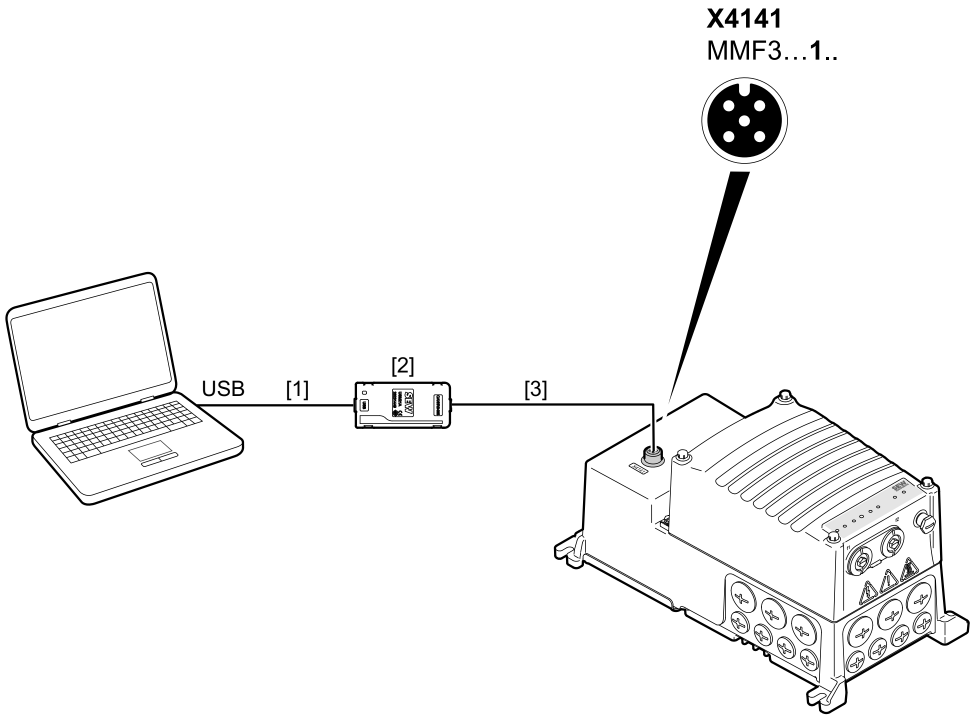
NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

The following figure shows how to connect the PC to the X4141 optional engineering interface at the front module of MOVIMOT® flexible MMF3...1..:



30551533963

[1] USB 2.0 connection cable
(commercial, included in the USM21A interface adapter delivery)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12
(available for delivery from SEW-EURODRIVE, part number: 28111680)

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5.13.2 Connection via CBG21A or CBG11A keypad

Use the CBG21A or CBG11A keypad to connect the PC and the engineering interface of the device.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number
CBG21A keypad	28238133
CBG11A keypad	28233646
CBG.. connection cable D-sub/M12 For connecting the X4141 engineering interface to the 24 V supply voltage • With D-sub plug connector 9-pin, male • With M12 plug connector, 5-pin, male, A-coded • Length: 3 m	28117840
CBG.. connection cable D-sub/RJ10 For connecting the X31 engineering interface to the 24 V supply voltage • With D-sub plug connector 9-pin, male • With RJ10 plug connector • Length: 3 m	28117832
USB connection cable USB A/USB 2.0 Mini B For connecting the CBG.. keypad to the USB interface of the PC • With USB A plug connector • With USB 2.0 Mini B plug connector • Length: 3 m	25643517

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Connection to X4141 (M12 at the connection box)

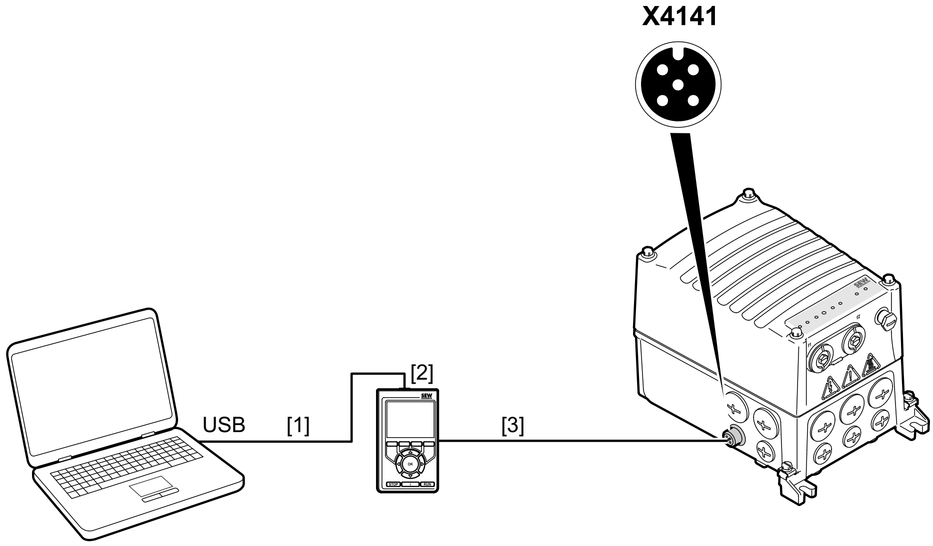
NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

The following illustration shows how to connect the PC to the device:



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[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] CBG21A or CBG11A keypad
[3] D-Sub/M12 connection cable
(available for delivery from SEW-EURODRIVE, part number: 28117840)

Connection to X31 (RJ10 in the connection box)

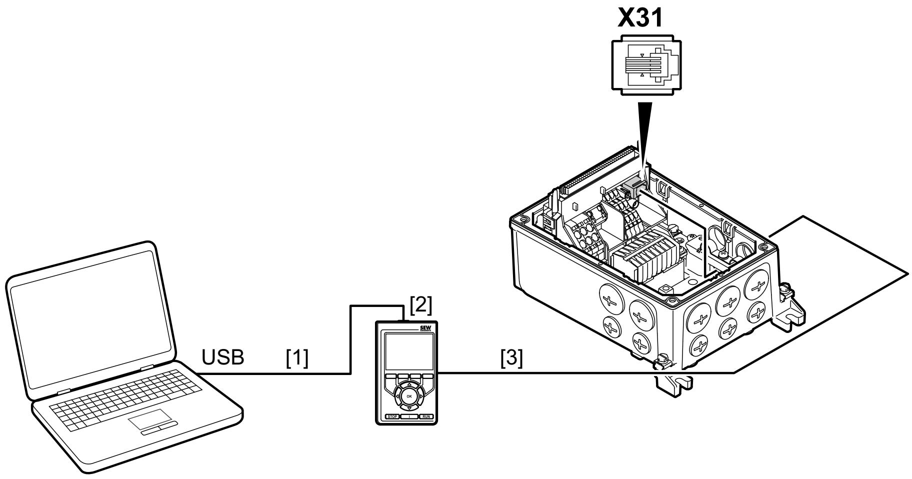
NOTICE

Connector X31 provides a 24 V supply voltage for operating the connected options.

Damage to connected options with low nominal voltage.

- Only connect options with a nominal voltage of 24 V to connector X31, such as:
  – Interface adapter USM21A,
  – CBG.. keypad
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  – Interface adapters USB11A, UWS11A, UWS21A
  – Keypads DBG.., GBG21A.

The following illustration shows how to connect the PC to the device:



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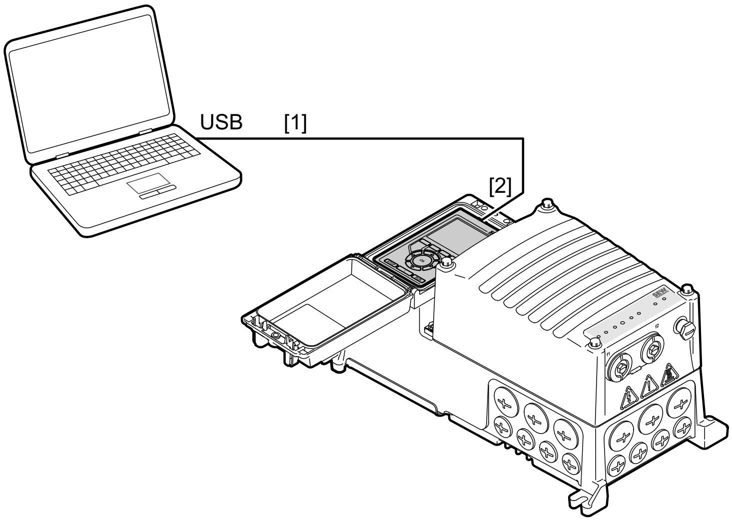
[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] CBG21A or CBG11A keypad
[3] Sub-D9/RJ10 connection cable
(available for delivery from SEW-EURODRIVE, part number: 28117832)

Connection to the front module of MMF3.

The following illustration shows how to connect the PC to the front module of MOVIMOT® flexible MMF3.:



30551665419

[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)

[2] CBG21A or CBG11A keypad

6 Startup

6.1 Startup notes

INFORMATION

It is essential to comply with the safety notes during startup.

⚠ WARNING

Risk of injury due to missing or defective protective covers.

Severe or fatal injuries.

- Install the protective covers of the system according to the instructions.
- Never start the device if the protection covers are not installed.

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box. Dangerous voltages can still be present for up to 5 minutes after disconnection from the power supply system.

Severe or fatal injuries.

- Before removing the electronics cover, de-energize the device via a suitable external disconnection device.
- Secure the device against unintended re-connection of the voltage supply.
- Secure the output shaft against rotation.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

⚠ WARNING

Device malfunction due to incorrect device setting.

Severe or fatal injuries.

- Observe the startup instructions.
- Always have the installation carried out by trained specialists.
- Only use settings that are correct for the function.

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NOTICE

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

Irreparable damage to the inverter or unforeseen malfunctions.

- You must observe a minimum switch-off time of 10 s after switching off the voltage supply.
- Do not switch the voltage supply on or off **more often than once per minute**.

INFORMATION

- Before startup, remove the paint protection cap from the LED displays.
- Before startup, remove the paint protection film from the nameplates.

INFORMATION

- To ensure fault-free operation, do not disconnect or connect signal cables during operation.

6.1.1 Lifting applications

⚠ WARNING

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- In case of products used in lifting applications, additional monitoring systems or mechanical protection devices must be used.

NOTICE

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.

Startup notes for lifting applications

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

This can result in severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When DynaStop® is used on inclining/downward slopes or for vertical conveyors without free hanging loads, adhere to the basic safety and health requirements (e.g. the EG Machinery Directive 2006/42/EG).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application, that determines the required safety measures.

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⚠ WARNING

Risk from falling loads.

This can result in severe or fatal injuries.

- Do **not** use the function "Releasing the brake / deactivating DynaStop® with FCB 01" for hoist applications and applications with potentially falling loads.
- Inhibit the function via the following steps:
  – Deactivate the function of the DIP switch S1/2 using the parameter *Deactivation* = **"1"** (path: *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Releasing the brake / deactivating DynaStop® with FCB 01 – enable*)
  – Inhibit the functions using the parameter *Releasing the brake / deactivating DynaStop® with FCB 01 – enable* = **"0"** (path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit*).

INFORMATION

The recommended settings and procedures must be matched to the requirements of the application and its safety assessment, and adjusted accordingly.

SEW-EURODRIVE recommends the following settings and procedures for lifting applications:

- Set parameter *Apply brake/activate DynaStop® in STO state (8501.3)* **= "1"** (Yes), see chapter "DynaStop® in conjunction with STO".
- Set parameter *Integrator mode (8404.9)* = **"0"** (hold).

  Path: *Optimization DT1* > *Set controller dynamics* > *Advanced settings*.

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6.2 Startup requirements

Startup is only required when you need to change the factory set parameterization.

In this case, the following conditions apply to startup:

- You have installed the device correctly both mechanically and electrically.
- You have performed a correct project planning for the device.
- Safety measures prevent accidental startup of devices.
- Safety measures prevent danger to persons or machines.

Required hardware components:

- PC or laptop as specified in chapter "PC connection".

Required software:

- Engineering software MOVISUITE® standard by SEW-EURODRIVE.

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6.3 Parameterization mode

The following parameterization modes are available to perform the device startup:

Easy mode

Easy startup with predefined control interface.

- Setting parameters, setpoints, and additional functions can only be set using the mechanical setting elements (potentiometer and DIP switch) at the device.
- Startup does not require any software or keypads.
- When you switch to Easy mode, all parameters are reset to the delivery state.
- All device parameters are write-protected.

Exception:

- The parameter *Startup mode* in also be changed in Easy mode.

Expert mode

Expert mode is a parameterization mode that allows full access to all device functions via the MOVISUITE® engineering software or the CBG.. keypad.

- The predefined connection interfaces of the device can be adjusted to the requirements of the application.
- You can deactivate the mechanical setting elements. Doing so, you will activate the (parameterizable) replacement values of the mechanical setting elements.
- You can set the device parameters.

The parameterization mode can be set via the MOVISUITE® engineering software or the CBG.. keypad.

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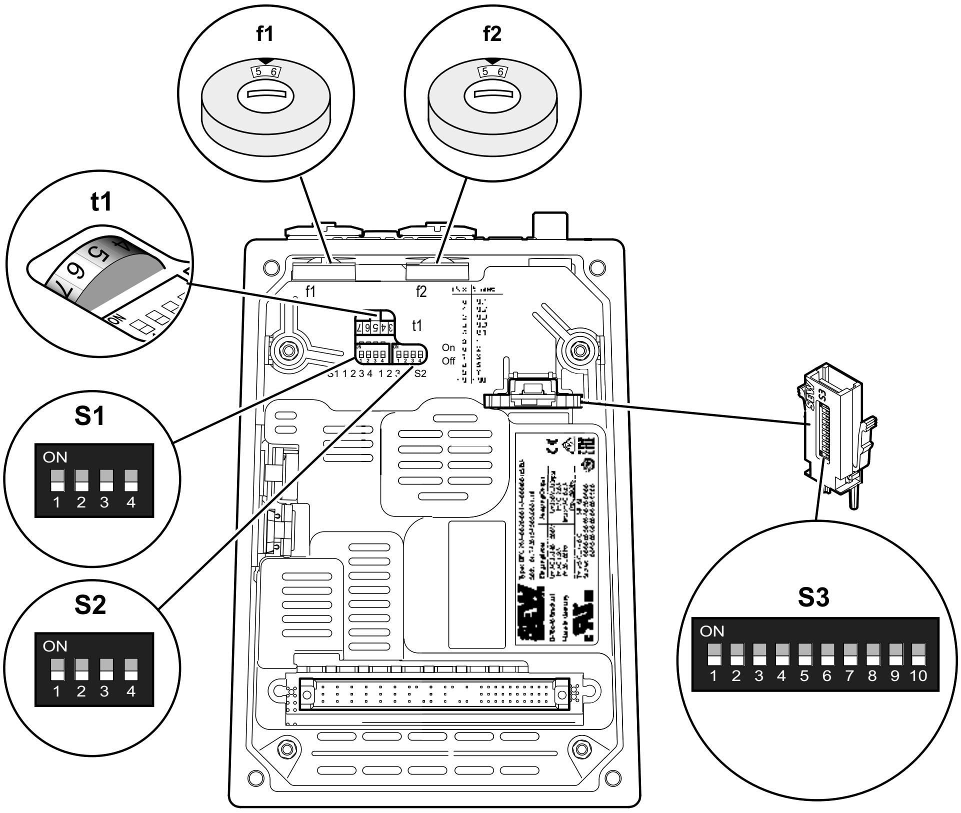
[1] Basic settings > Permissions > Parameter setting mode > Expert mode

6.4 Control elements

6.4.1 Overview

The following figure gives an overview of the control elements at the electronics cover:



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f1 Potentiometer f1 (underneath the screw plug)
f2 Potentiometer f2 (underneath the screw plug)
t1 Potentiometer t1
S1 DIP switch S1
S2 DIP switch S2
S3 DIP switch S3

6.4.2 Potentiometer f1

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

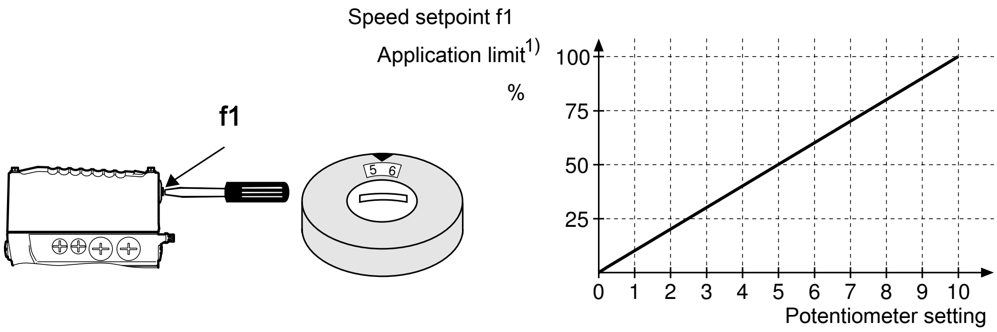
Damage to the device.

- After setting the setpoint, make sure the screw plug of the potentiometer has a seal and screw it in.

Use the f1 potentiometer to adjust speed setpoint f1.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer f1.
- The potentiometer f1 can be deactivated in Expert mode. In this case, the parameterizable replacement value is activated as speed setpoint f1.

The following figure shows how to scale the speed setpoint f1 using potentiometer f1:



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1) Depending on the selected direction of rotation, the parameter *Application limit – positive speed* or the parameter *Application limit – negative speed* are used to scale the speed setpoint f1.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

6.4.3 Potentiometer f2

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

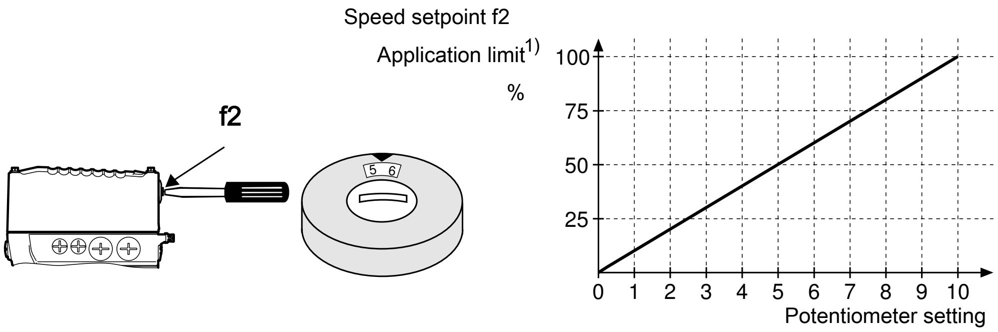
Damage to the device.

- After setting the setpoint, make sure the screw plug of the potentiometer has a seal and screw it in.

Use the potentiometer f2 to adjust speed setpoint f2.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer f2.
- The potentiometer f2 can be deactivated in Expert mode. In this case, the parameterizable replacement value is activated as speed setpoint f2.

The following figure shows how to scale the speed setpoint f2 using potentiometer f2:



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1) Depending on the selected direction of rotation, the parameter *Application limit positive* or the parameter *Application limit negative* are used to scale the speed setpoint f2.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

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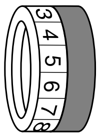
6.4.4 Potentiometer t1

Use the potentiometer t1 to set the acceleration/deceleration setpoint t1.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer t1.
- The potentiometer t1 can be deactivated in Expert mode.

  In this case, the parameters *Acceleration 1* and *Deceleration 1* of the fixed setpoint processing are activated.



The following table lists the scaling of acceleration/deceleration setpoint t1 depending on the setting of potentiometer t1:

Potentiometer t1											
Detent setting	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Acceleration/deceleration $min^{-1}s^{-1}$	30000	15000	10000	6000	4286	**3000**	1500	1000	600	429	300
Ramp time[1)] s	0.1	0.2	0.3	0.5	0.7	**1**	2	3	5	7	10

1) Alternative information on the equivalent ramp times for acceleration/deceleration based on a speed change of 3000 min-1.

6.5 DIP switch

6.5.1 Overview

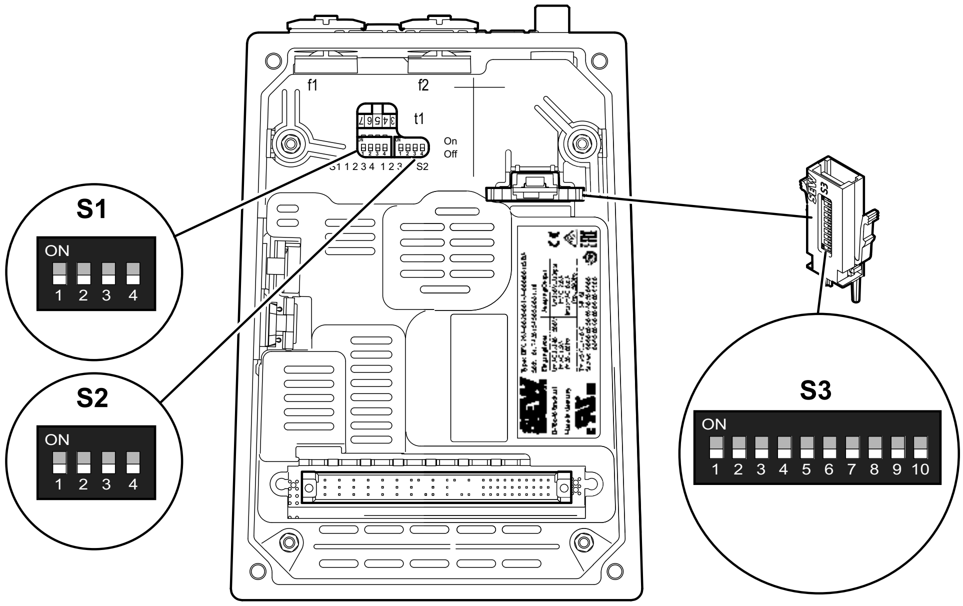
NOTICE

Damage to the DIP switches caused by unsuitable tools.

Possible damage to property.

- To set the DIP switches, use only suitable tools, such as a slotted screwdriver with a blade width of no more than 3 mm.
- The force used for setting the DIP switches must not exceed 5 N.

The following figure shows the DIP switches of the device:



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DIP switch S1

The following table shows the functions of DIP switch S1:

DIP switch	S1			
	1	2	3	4
Meaning	**Direction of rotation reversal**	**Releasing the brake / deactivating DynaStop® with FCB 01 – enable**	**Speed monitoring deactivation**	**Reserved**
ON	On	On	Speed monitoring Off	On
OFF	**Off**1)	**Off**1)	**Speed monitoring On**1)	**Off**1)

1) The factory settings are shown in boldface.

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You must not alter the factory setting of the S1/4 DIP switch = OFF.

DIP switch S2

The following table shows the functions of DIP switch S2:

DIP switch	S2			
	1	2	3	4
Meaning	**Reserved**	**Source setpoint f1**	**Reserved**	**Reserved**
ON	–	Analog input AI1	–	–
OFF	–	**Potentiometer f1**	**–**	**–**

You must not alter the factory setting of DIP switches S2/1, S2/3 and S2/4 = OFF.

DIP switch S3

Use the DIP switch S3 for starting up the drive train for motors without digital interface. Motor assignment depends on the nominal output current of the electronics cover via the DIP switches S3/3 and S3/4.

Startup via DIP switch S3 is only effective if the following requirements are met when using the memory module:

- The drive train has not been started up using MOVISUITE® or CBG...
- The drive train has not been started up via digital interface (DDI).
- The connected motor does not have a digital interface (DDI), and the connection unit of MOVIMOT® flexible has the option /DI.

The following table shows the functions of DIP switch S3:

DIP switch	S3									
	1	2	3	4	5	6	7	8	9	10
Meaning	**Brake type**	**Motor connection type**[1]	**Binary coding**							
			Motor assignment		**Motor protection**		**Motor series**			
			2^0	2^1	2^0	2^1	2^0	2^1	2^2	2^3
ON	Optional brake	△	1	1	1	1	1	1	1	1
OFF	**Standard brake**	⅄	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

1) If the motor connection type is changed via DIP switch S3/2, the motor connection type via DIP switch D3/3 and S3/4 must be checked and adapted if necessary.

6.5.2 Description of the DIP switches

DIP switch S1/1: Direction of rotation reversal

INFORMATION

The direction of rotation is reversed depending on the setting of the DIP switch and of the parameter drive train 1 > Controller > *Direction of rotation reversal*. If both settings are active, the speed setpoint is not inverted (logical XOR).

You can reverse the direction of rotation of the drive using this DIP switch.

- OFF (S1/1 = OFF): The drive turns clockwise for a positive setpoint and counterclockwise for a negative setpoint.
- ON (S1/1 = ON): The drive turns counterclockwise for a positive setpoint and clockwise for a negative setpoint.

DIP switch S1/2: Releasing the brake / deactivating DynaStop® with FCB01 – enable

⚠ WARNING

Risk from falling loads.

This can result in severe or fatal injuries.

- Do not enable the function "Releasing the brake / deactivating DynaStop®" for hoist applications and applications with potentially falling loads.

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active setting of the relevant parameter is maintained.

Use this DIP switch to enable the function "Releasing the brake / deactivating DynaStop® with FCB 01" even when the drive is disabled.

- OFF (S1/2 = OFF): The function "Releasing the brake / deactivating DynaStop® with FC B01" is inhibited.
- ON (S1/2 = ON): The function "Releasing the brake / deactivating DynaStop® with FC B01" is enabled.

  When the function block FC B01 is active, you can release the brake or deactivate DynaStop® using a digital input or an actuated process data bit.

INFORMATION

For more information about disabling DynaStop® without drive enable, refer to chapter "Operation".

DIP switch S1/3: Deactivating the speed monitoring

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active setting of the relevant parameter is maintained.

This DIP switch is used to disable speed monitoring.

- Speed monitoring OFF (S1/3 = ON): Speed monitoring is not active.
- Speed monitoring ON (S1/3 = OFF): Speed monitoring is active.

  Speed monitoring is used to protect the drive in case of blockage.

  When speed monitoring is active and the drive operates at the current limit for longer than 1 second (factory settings), the drive unit triggers the fault "Speed monitoring". The drive unit signals the fault, for example via the "DRIVE" status LED. The current limit must be reached permanently for the duration of the delay time before the monitoring function trips.

DIP switch S2/2: Source of setpoint f1

Use this DIP switch to select the source of the speed setpoint f1.

- Potentiometer f1 (S2/2 = OFF): The settings of potentiometer f1 define the speed of the drive unit when setpoint f1 is active (see chapter "Startup" > "Control elements" > "Potentiometer f1").
- Analog input AI1 (S2/2 = ON): The value of analog input AI1 determined the speed of the drive unit when setpoint f1 is active. (See chapter "Operation" > "Setpoint scaling of the analog input".

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DIP switch S3/1: Brake type

Use this DIP switch to select the brake type of the motor.

- **OFF (S3/1 = OFF): Use this setting to select the standard brake.**

  This setting corresponds to the brake type that is automatically assigned to the motor type.[1]

- ON (S3/1 = ON): Use this setting to select the optional brake.

  This setting corresponds to the brake type that is optionally assigned to the motor type.[1]

If no brake listed in the motor selection tables[1] matches the brake in the motor, perform startup of the drive train via MOVISUITE®. Startup via DIP switch S3 is not possible.

1) See chapter "Detailed motor selection table for startup via DIP switch S3".

DIP switch S3/2: Motor connection type

You can select the connection type of asynchronous motors at this DIP switch. When selecting synchronous motors, the switch does not have any function.

- **OFF (S3/2 = OFF): Use this setting to select the connection type of asynchronous motors ⅄.**
- ON (S3/2 = ON): Use this setting to select the connection type of asynchronous motors △.

If the motor connection type is changed via DIP switch S3/2, the motor connection type via DIP switch D3/3 and S3/4 must be checked and adapted if necessary, see chapter "Detailed motor selection table for startup via DIP switch S3".

DIP switch S3/3 – S3/4: Motor assignment

Use these DIP switches to select the relative motor power in relation to inverter power. The selection depends on the selected motor series, motor connection type, and the nominal output current of the electronics cover.

S3/3	S3/4	Motor assignment
0	**0**	**Adjusted**
1	0	1 stage smaller
0	1	2 stages smaller
1	1	3 stages smaller

DIP switch S3/5 – S3/6: Motor protection

Use these DIP switches to select the temperature sensor type for thermal protection of the motor.

S3/5	S3/6	Motor protection
		Temperature sensor type
0	**0**	**No temperature sensor**[1)]
1	0	PK (PT1000)
0	1	TF
1	1	TH

1) If no temperature sensor is selected, basic temperature protection of the motor is realized via the firmware function of the inverter.

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DIP switch S3/7 – S3/10: Motor series

Use these DIP switches to select the motor series (motor type).

Code	S3/7	S3/8	S3/9	S3/10	Motor series	
					Motor type	Nominal voltage Nominal frequency
1	**0**	**0**	**0**	**0**	**DRN.. 4-pole**	**230 V/400 V 50 Hz**
2	1	0	0	0	DRN.. 4-pole	266 V/460 V 60 Hz
3	0	1	0	0	DRN.. 4-pole	Wide-range voltage 50/60 Hz
4	1	1	0	0	DR2S.. 4-pole	230 V/400 V 50 Hz
5	0	0	1	0	DR2S.. 4-pole	266 V/460 V 60 Hz
6	1	0	1	0	DR2S.. 4-pole	Wide-range voltage 50/60 Hz
7	0	1	1	0	MOVIGEAR® classic	400 V –
8	1	1	1	0	Reserved	–
9	0	0	0	1	Reserved	–
10	1	0	0	1	Reserved	–
11	0	1	0	1	Reserved	–
12	1	1	0	1	Reserved	–
13	0	0	1	1	Reserved	–
14	1	0	1	1	Reserved	–
15	0	1	1	1	Reserved	–
16	1	1	1	1	Reserved	–

Nominal voltage range for wide-range voltage motors			
50 Hz		60 Hz	
△	⅄	△	⅄
220 – 240 V	380 – 420 V	254 – 277 V	440 – 480 V

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6.6 Detailed motor selection table for startup via DIP switch S3

The following detailed motor selection tables show how to perform startup via DIP switch S3 on the **standard memory module** (part no. 28242882).

6.6.1 DR2S.. motor series, 4-pole

DR2S.. motor series, 4-pole											
230/400 V, 50 Hz				266/460 V, 60 Hz				Wide-range voltage, 50/60 Hz			
DIP switch S3				DIP switch S3				DIP switch S3			
S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10
1	1	0	0	0	0	1	0	1	0	1	0

Motor protection		
Temperature sensor	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TH	1	1

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2S63M4			0020	2.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
	BE03/230 V	0	0025	2.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0032	3.2 A	⅄	0			
					△	1	1	1	3 stages smaller
	BE03/230 V	1	0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0			
					△	1			

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2S71MS4			0020	2.0 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
	BE05A/230 V	0	0025	2.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0032	3.2 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
	BE1A/230 V	1	0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0			
					△	1			
DR2S71M4			0020	2.0 A	⅄	0	0	0	Adjusted
					△	1			
	BE1A/230 V	0	0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
			0032	3.2 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
	BE05A/230 V	1	0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0			
					△	1			
DR2S80MK4			0020	2.0 A	⅄	0			
					△	1			
	BE1B/230 V	0	0025	2.5 A	⅄	0	0	0	Adjusted
					△	1			
			0032	3.2 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
	BE05B/230 V	1	0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0			
					△	1			

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2S80M4	BE2A/230 V	0	0020	2.0 A	⅄	0			
					△	1			
			0025	2.5 A	⅄	0			
					△	1			
	BE1B/230 V	1	0032	3.2 A	⅄	0	0	0	Adjusted
					△	1			
			0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0			
					△	1			

The motor cannot be started up using DIP switch S3. MOVISUITE® or CBG.. is required for startup.

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6.6.2 DRN.. motor series, 4-pole

DRN.. motor series, 4-pole											
230/400 V, 50 Hz				266/460 V, 60 Hz				Wide-range voltage, 50/60 Hz			
DIP switch S3				DIP switch S3				DIP switch S3			
S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10
0	0	0	0	1	0	0	0	0	1	0	0

Motor protection		
Temperature sensor	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TH	1	1

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DRN71MS4	BE03/230 V	0	0020	2.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0025	2.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0032	3.2 A	⅄	0			
	BE05A/230 V	1			△	1	1	1	3 stages smaller
			0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0			
					△	1			

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DRN71M4			0020	2.0 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
	BE05A/230 V	0	0025	2.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0032	3.2 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
	BE1A/230 V	1	0040	4.0 A	⅄	0			
					△	1	1	1	3 stages smaller
			0055	5.5 A	⅄	0			
					△	1			
DRN80MK4			0020	2.0 A	⅄	0	0	0	Adjusted
					△	1			
	BE1B/230 V	0	0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
			0032	3.2 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
	BE05B/230 V	1	0040	4.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0055	5.5 A	⅄	0			
					△	1	1	1	3 stages smaller
DRN80M4			0020	2.0 A	⅄	0			
					△	1			
	BE1B/230 V	0	0025	2.5 A	⅄	0	0	0	Adjusted
					△	1			
			0032	3.2 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
	BE05B/230 V	1	0040	4.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0055	5.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DRN90S4			0020	2.0 A	⅄	0			
					△	1			
	BE2B/230 V	0	0025	2.5 A	⅄	0			
					△	1			
			0032	3.2 A	⅄	0	0	0	Adjusted
					△	1			
	BE1C/230 V	1	0040	4.0 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
			0055	5.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
DRN90L4			0020	2.0 A	⅄	0			
					△	1			
	BE2B/230 V	0	0025	2.5 A	⅄	0			
					△	1			
			0032	3.2 A	⅄	0			
					△	1			
	BE1C/230 V	1	0040	4.0 A	⅄	0	0	0	Adjusted
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	1	0	0	Adjusted
DRN100LS4 (50 Hz) DRN100LM4 (60 Hz and 50/60 Hz)			0020	2.0 A	⅄	0			
					△	1			
	BE5A/230 V	0	0025	2.5 A	⅄	0			
					△	1			
			0032	3.2 A	⅄	0			
					△	1			
	BE2B/230 V	1	0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	0	0	0	Adjusted
					△	1			

(grey field)	The motor cannot be started up using DIP switch S3. MOVISUITE® or CBG.. is required for startup.

6.6.3 MOVIGEAR® classic motor series

Motor series			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
0	1	1	0

Motor protection		
Temperature sensor	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF[1]	0	1
TH[1]	1	1

1) MOVIGEAR® classic is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1[1]			S3/2[2]		S3/3	S3/4	Motor power
MGF..-1-..C	–	0	0020	2.0 A	⅄	0	0	0	Adjusted
			0025	2.5 A			1	0	1 stage smaller
			0032	3.2 A			0	1	2 stages smaller
			0040	4.0 A			1	1	3 stages smaller
			0055	5.5 A					
MGF..-2-..C	–	0	0020	2.0 A	⅄	0			
			0025	2.5 A			0	0	Adjusted
			0032	3.2 A			0	0	Adjusted
			0040	4.0 A			1	0	1 stage smaller
			0055	5.5 A			0	1	2 stages smaller
MGF..-4-..C	–	0	0020	2.0 A	⅄	0			
			0025	2.5 A					
			0032	3.2 A					
			0040	4.0 A			0	0	Adjusted
			0055	5.5 A			1	0	1 stage smaller
MGF..-4-..C/ XT	–	0	0020	2.0 A	⅄	0			
			0025	2.5 A					
			0032	3.2 A					
			0040	4.0 A					
			0055	5.5 A			0	0	Adjusted

(grey) The motor cannot be started up using DIP switch S3. MOVISUITE® or CBG.. is required for startup.

1) MOVIGEAR® classic is not available with brake. DIP switch S3/1 is ignored.
2) MOVIGEAR® classic is available only with star connection. DIP switch S3/2 must be set to 0 = STAR.

6.7 Startup procedure

6.7.1 Startup in Easy mode

In Easy mode (delivery state), startup is performed without a PC or keypad.

The device functions are predefined in Easy mode.

The setpoint is only set using mechanical setting elements (potentiometer, DIP switch).

The electronics cover controls the drive unit using the drive function FCB 05 Speed control.

6.7.2 Startup in Expert mode

In Expert mode, perform startup of the devices using the MOVISUITE® engineering software of SEW-EURODRIVE.

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The startup procedure is divided into segments. The following steps illustrate the startup procedure for a device by way of an example.

Drive train segment

Drive train		Configuring drive trains.

Interfaces segment

Standard interfaces		Basic settings of the standard interfaces • Standard I/O • Encoder 1

Functions segment

I/O configuration		• Standard I/O • I/O card DI/DO
Drive functions		• FCB 05 Speed control

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Advanced drive functions		• FCB 01 Output stage inhibit • FCB 02 Stop default • FCB 26 Stop at user limit
Monitoring functions		• Limit values 1 • Monitoring functions 1 • Energy-saving function

Information on the drive unit

Device data is available via the project node.

Device data		• Device identification • Main component • Subcomponent • Production label
Fault responses Overview		• Axis module • Power supply monitoring • Functions
Setup		• Access rights • Resetting device parameters.

Checklist for startup

The following checklist lists the necessary steps for complete startup.

Step	Startup step	Finished
1	Install the drive unit.	
2	Install the MOVI-C® component.	
3	Start MOVISUITE®.	
4	Start up the drive train.	
5	Parameterize the setpoints.	
6	Parameterize the function blocks (FCBs).	
7	Configure digital inputs and outputs.	
8	Configure the process data (PD).[1]	
9	Configure the software modules (MOVIKIT®).	
10	Test the drive unit/application.	

1) Not available with DBC designs.

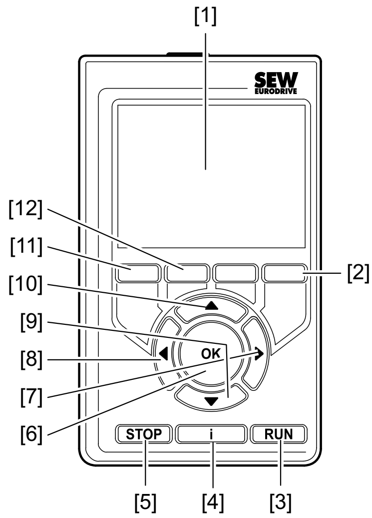
6.8 Startup with the CBG21A keypad

Using the CBG21A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

6.8.1 CBG21A keypad

The following figure shows the CBG21A keypad:

[1]	Color display	
[2]	Function keys (Function according to bottom line on color display)	
[3]	<RUN> key	(Start)
[4]	<I> key	(Information)
[5]	<STOP> key	(Stop)
[6]	<OK> key	(Acknowledgment)
[7]	<►> key	(Left)
[8]	<◄> key	(Right)
[9]	<▼> key	(Down)
[10]	<▲> key	(Up)
[11]	Function key <⇦>	(Back)
[12]	Function key <⇨>	(Next)

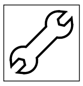
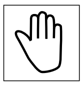
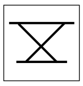
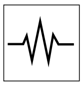
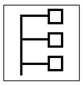
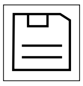
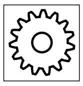


Operation

Activating a field	Select a field using the arrow keys <◄>/<►>/<▲>/<▼>. Use the <OK> key to activate the field.
Entering numbers	Use the arrow keys <◄>/<►> to change the digit within the number. The editable digit is highlighted. Change the value of the number using the arrow keys <▲>/<▼>. Confirm the number with the <OK> key.

Symbols used

The available functions are shown with pictograms in the keypad display.

	Startup
	Manual mode
	Optimization of the control mode
	Application
	Diagnostics
	Parameter
	Data management
	Settings
	Back
	Next

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6.9 Startup with the CBG11A keypad

Using the CBG11A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

INFORMATION

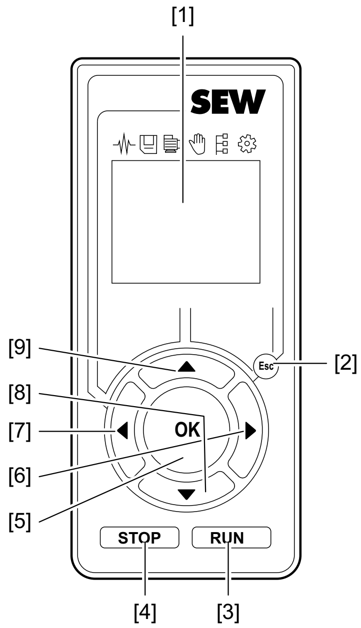
You cannot start up a motor with encoder using the CBG11A keypad.

You can carry out this particular startup with a CBG21A keypad or with the MOVISUITE® engineering software.

6.9.1 CBG11A keypad

The following figure shows the CBG11A keypad:

[1]	Color display	
[2]	<Esc> key	
[3]	<RUN> key	(Start)
[4]	<STOP> key	(Stop)
[5]	<OK> key	(Acknowledgment)
[6]	<►> key	(Left)
[7]	<◄> key	(Right)
[8]	<▼> key	(Down)
[9]	<▲> key	(Up)



All text on the color display is only available in English.

Operation

Select functions	Use the <Esc> key to return to the main menu.
	Select a function using the arrow keys <◄>/<►>/<▲>/<▼>.
	Confirm your selection with the <OK> key.
Entering numbers	Use the arrow keys <◄>/<►> to change the digit within the number. The editable digit is underlined.
	Change the value of the number using the arrow keys <▲>/<▼>.
	Confirm the number with the <OK> key.

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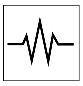
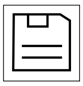
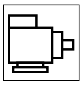
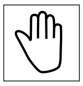
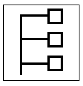
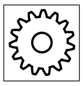
Symbols used

The available functions are shown with pictograms in the keypad display.

	Diagnostics
	Data management
	Startup
	Manual mode
	Parameter tree
	Keypad settings

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6.10 Configuring the digital inputs/outputs

Easy mode (delivery state)

In Easy mode, the following configuration of the digital inputs is active:

Digital inputs	
Function **(Configuration of the digital inputs)**	**Setting** **(CW/CCW/setpoint changeover)**
• DI01	Fixed setpoints, positive rotation direction
• DI02	Fixed setpoints, negative rotation direction
• DI03	Potentiometer f2
• DI04	Fault reset

Digital outputs	
Function	**Setting**
DOR (relay output)	Ready for operation

Expert mode

In Expert mode, you can assign other functions to the digital inputs and to the relay output, either individually or using predefined configurations of the digital inputs.

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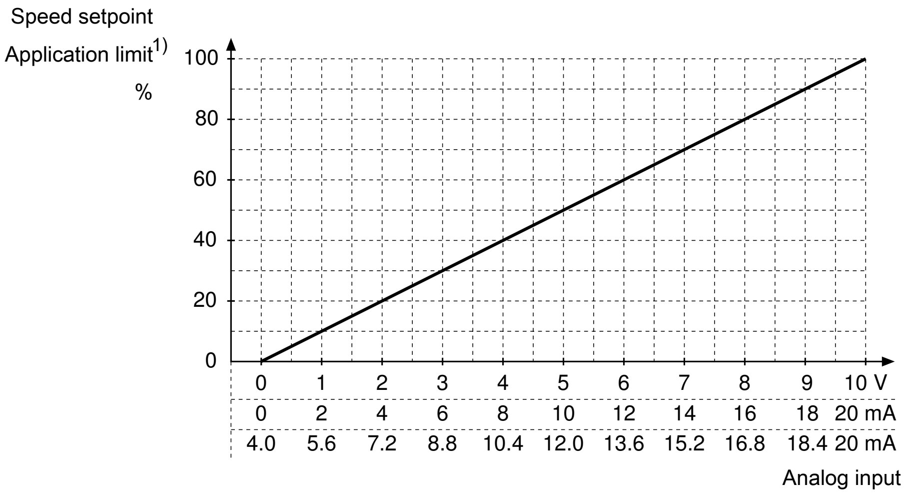
6.11 Setpoint scaling of the analog input

The setpoint scaling of analog input AI1 depends on the operating mode of the fixed setpoint processing.

Operating mode "Mechanical setting elements"

Setpoint scaling on the operating mode: "Mechanical setting elements":

The following figure shows the setpoint scaling of the analog input AI1:



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1) Depending on the selected direction of rotation, the parameter *Application limit – positive speed* or the parameter *Application limit – negative speed* are used to scale the speed setpoint f1.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

Additional operating modes

Setpoint scaling on the operating modes:

- "Unipolar/fixed setpoint"
- "Bipolar/fixed setpoint"
- "Fixed setpoint + analog setpoint"
- "Fixed setpoint × analog setpoint"

INFORMATION

In these operating modes, the setpoint scaling is only possible in Expert mode and with a free configuration of the digital inputs (configuration of the digital inputs = "0").

In these operating modes, the setpoints of the analog input can be adjusted using the following scaling parameters of the analog input:

- *Voltage offset scaling*
- *Current offset scaling*
- *Numerator scaling*
- *Denominator scaling*

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6.12 Disabling DynaStop® for startup purposes

6.12.1 Important notes on disabling DynaStop® (/DSP option)

⚠ WARNING

Removing the electronics cover will disable DynaStop®.

Severe or fatal injuries.

- If it is not permitted to deactivate the system, additional measures are required (e.g. mechanical stake-out)

⚠ WARNING

Electric shock due to regenerative energy created by moving system or machine. The regenerative energy can cause dangerous voltages at the terminals or plug connectors, even when the supply voltage is disconnected.

Severe or fatal injuries.

- Never touch the wiring space with wiring board and plug connector.
- If you cannot rule out that the wiring space is touched, provide for suitable protection covers.

NOTICE

Damage to the connector plug between drive unit and electronics cover due to regenerative energy created by movement of the system or machine.

Potential damage to property.

- To disable DynaStop®, you have to remove the electronics cover completely to prevent damage to the plug connector (destroyed contacts).

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6.12.2 Steps for disabling DynaStop®

INFORMATION

For more information on the DynaStop® function, refer to chapters "Operation" and the documentation of the connected drive unit.

Disabling DynaStop® by removing the electronics cover

Disable the DynaStop® function as follows:

1. Observe chapter "Startup notes"
2. Observe chapter "Important notes on disabling DynaStop®".
3. Disconnect all components from the voltage supply and use an external disconnecting device to avoid an unintentional re-connection.
4. Completely remove the electronics cover.

The DynaStop® function is disabled. The system/machine can now be moved mechanically observing the notes in chapter "Important notes on disabling DynaStop®".

Disabling DynaStop® using the control signal

As an alternative, you can disable the DynaStop® function using a control signal (process data or digital input). Observe the instructions in chapter "Operation" > "Disabling DynaStop® without drive enable. (FCB 01)".

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6.13 Configuring the drive behavior at standstill (FCB02, FCB13, FCB14)

The parameter *Behavior at standstill* defines the drive behavior in case the drive enable is revoked and the motor is at standstill (path: *Functions* > *Drive functions* > *FCB 02 Stop default*). This parameter is effective when the function blocks FCB 02, FCB 13 and FCB 14 are active.

The following table lists the drive behavior after motor standstill:

Index	Parameters	Setting	Behavior at motor standstill		
			Brake/ DynaStop®	**Motoring position hold control**	**Effect on the the motor shaft**
8563.1	*Behavior at standstill* (Path: *Functions* > *Drive functions* > *FCB02 Stop default*)	Drive energized (brake released / DynaStop® deactivated)	Brake released	Position hold control active	The motor shaft is regulated to rotational speed = "0" by the motor.
			DynaStop® is deactivated		
		Drive not energized (brake applied / DynaStop® activated)	Brake applied	Motor de-energized	Motor shaft is held by brake.
			DynaStop® is activated		The motion of the motor shaft is retarded by DynaStop®.
		Drive not energized (without brake/ DynaStop®)	Brake released	Motor de-energized	The motor shaft can rotate freely.
			DynaStop® is deactivated		

7 Operation

7.1 Switch disconnector

⚠ WARNING

Electric shock due to dangerous voltages at the line terminals.

The switch disconnector disconnects the electronics cover from the voltage supply. Voltage is still present at the terminals of the device.

- A correct installation includes that terminals of the device are protected against contact.
- Secure the device against unintended reconnection of the voltage supply.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

NOTICE

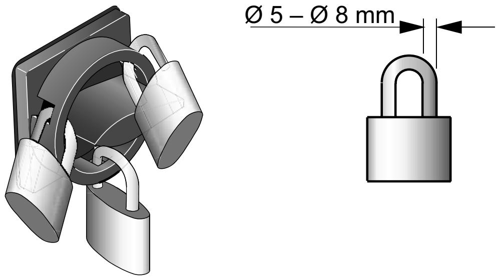
Increased wear of the switch contacts.

Destruction of the switch contacts.

- Do not operate the switch disconnector under load.

The switch disconnector of the device serves to interrupt the voltage supply of the electronics cover. The feedback contact (NC contact) of the switch disconnector affects the digital input DI08 of the device. If the device is connected to a DC 24 V backup voltage, the status of the switch disconnector can be retrieved via digital input DI08.

The switch disconnector can be secured with 3 locks.



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7.2 Binary control

The behavior of the drive unit depends on the following factors:

- Selected configuration of the digital inputs.
- Status of digital inputs.

The following table describes the control functions in conjunction with the predefined configurations of the digital inputs.

The following configurations of the digital inputs are available:

No.	Configuration of the digital inputs	Description
0	User-defined configuration	• The individual digital inputs can be configured separately. • The operating mode of the fixed setpoint processing can be freely configured.
1	**CW, CCW, setpoint changeover**	• Direction of rotation positive, negative • 2 Speed setpoints • Fault reset Fixed setpoint processing mode: • Mechanical setting elements
2	Enable, fixed setpoints	• Enable • 4 Speed setpoints The direction of rotation is prescribed by the sign of the setpoint. • Fault reset Fixed setpoint processing mode: • Mechanical setting elements
3	Enable, external fault, setpoint changeover	• Positive direction of rotation (clockwise rotation) • 2 Speed setpoints • External error input • Fault reset Fixed setpoint processing mode: • Mechanical setting elements
4	Motor potentiometer CW	• Positive direction of rotation (clockwise rotation) • Speed setpoint via the motor potentiometer function • Fault reset Fixed setpoint processing mode: • Mechanical setting elements

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No.	Configuration of the digital inputs	Description
5	Motor potentiometer CCW	• Negative direction of rotation (counterclockwise rotation) • Speed setpoint via the motor potentiometer function • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements
6	CW, CCW, primary frequency	• Direction of rotation positive, negative • Speed setpoint via the primary frequency input • Fault reset
		Fixed setpoint processing mode: • Mechanical setting elements

7.2.1 Configuration 0: User-defined configuration

Function of the digital inputs

- The digital inputs can be configured freely.
- In contrast to the predefined terminal configurations 1 – 6, the drive unit remains in the status "FCB 02 Stop default" once the enable signal is revoked. If you require the status "FCB 01 Output stage inhibit", you must assign this function to a digital input.

Configuring the fixed setpoint processing modes

- The fixed setpoint processing modes can be configured freely.

Fixed setpoint processing mode	Functions of the setpoint sources
• Unipolar fixed setpoint • Bipolar fixed setpoint • Fixed setpoint + analog setpoint • Fixed setpoint × analog setpoint	No function: • Potentiometer f1 • Potentiometer f2 • DIP switch S2/2
	Scaling of analog input AI1: • Scale the speed setpoint by setting the scaling factor of analog input AI1
• Primary frequency • Motor potentiometer	No function: • Potentiometer f1 • Potentiometer f2 • DIP switch S2/2
	Function of analog input AI1: • You cannot use analog input AI1 for the speed setpoint.
	Scaling of analog input AI1: • Scale the speed setpoint by setting the scaling factor of analog input AI1
• Mechanical setting elements	No function: • Scale the speed setpoint using the scaling parameter of analog input AI1
	Scaling of analog input AI1: • Set permanently to 0 – 100% of parameter *Application limit – positive/negative speed setpoint*

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7.2.2 Configuration 1: CW, CCW, setpoint changeover

Fixed setpoint processing mode: Mechanical setting elements (cannot be changed)

Configuration 1 is active in Easy mode and in the delivery state.

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Right	Left	Potentiometer f2	Reset	
The drive unit stops with deceleration setpoint t1.[1] FCB 01 Output stage inhibit is activated afterwards.	0	0	x	x	Lights up yellow
The drive unit operates in positive direction of rotation (clockwise rotation) with speed setpoint f1.[2] The acceleration setpoint t1 is active.[1]	1	0	0	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint f1. The acceleration setpoint t1 is active.[1]	0	1	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint f2. The acceleration setpoint t1 is active.[1]	1	0	1	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint f2. The acceleration setpoint t1 is active.[1]	0	1	1	x	Illuminated in green
The drive unit stops with deceleration setpoint t1.[1] After that, FCB 02 Stop default is activated.	1	1	x	x	Flashing green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.

2) If DIP switch S2/2 (Analog setpoint selection) is set to "ON", the speed setpoint of analog input AI1 is used instead of speed setpoint f1.

0 = No voltage 1 = 24 V x = Any

7.2.3 Configuration 2: Enable, fixed setpoints

Fixed setpoint processing mode: Mechanical setting elements (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Enable	Fixed setpoint 2^0	Fixed setpoint 2^1	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	x	x	x	Lights up yellow
The drive unit is running with the fixed speed setpoint 1. The direction of rotation is specified by the sign of the fixed setpoint. The acceleration setpoint t1 is active.[1)]	1	1	0	x	Illuminated in green
The drive unit is running with the fixed speed setpoint 2. The direction of rotation is specified by the sign of the fixed setpoint. The acceleration setpoint t1 is active.[1)]	1	0	1	x	Illuminated in green
The drive unit is running with the fixed speed setpoint 3. The direction of rotation is specified by the sign of the fixed setpoint. The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with the analog speed setpoint f1.[2)] The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) If DIP switch S2/2 (Analog setpoint selection) is set to "ON", the speed setpoint of analog input AI1 is used instead of speed setpoint f1.

0 = No voltage 1 = 24 V x = Any

7.2.4 Configuration 3: Enable, external fault, setpoint changeover

Fixed setpoint processing mode: Mechanical setting elements (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Enable	External fault	Potentiometer f2	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	1	x	x	Lights up yellow
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint f1.[2)] The acceleration setpoint t1 is active.[1)]	1	1	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint f2. The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is in state "External terminal fault".	1	0	x	x	Flashing red
The fault state has been reset.	0	1	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) If DIP switch S2/2 (Analog setpoint selection) is set to "ON", the speed setpoint of analog input AI1 is used instead of speed setpoint f1.

0 = No voltage 1 = 24 V x = Any

7.2.5 Configuration 4: Motor potentiometer CW

Fixed setpoint processing mode: Motor potentiometer (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Right	Motor potentiometer up	Motor potentiometer down	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	x	x	x	Lights up yellow
The drive unit is running in positive direction of rotation (clockwise rotation) with speed setpoint "Motor potentiometer". The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with **increasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Acceleration* of the motor potentiometer function.	1	1	0	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with **decreasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Deceleration* of the motor potentiometer function.	1	0	1	x	Illuminated in green
The drive unit is running in positive direction of rotation (clockwise rotation) with **constant** speed setpoint "Motor potentiometer". The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) The speed setpoint of the motor potentiometer can only be changed when the drive unit is enabled.

0 = No voltage   1 = 24 V   x = Any

7.2.6 Configuration 5: Motor potentiometer CCW

Fixed setpoint processing mode: Motor potentiometer (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Left	Motor potentiometer up	Motor potentiometer down	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	x	x	x	Lights up yellow
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint "Motor potentiometer". The acceleration setpoint t1 is active.[1)]	1	0	0	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the **increasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Acceleration* of the motor potentiometer function.	1	1	0	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the **decreasing** speed setpoint "Motor potentiometer".[2)] The change in speed is defined by the parameter *Deceleration* of the motor potentiometer function.	1	0	1	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the **constant** speed setpoint "Motor potentiometer".[1)] The acceleration setpoint t1 is active.[1)]	1	1	1	x	Illuminated in green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.
2) The speed setpoint of the motor potentiometer can only be changed when the drive unit is enabled.

0 = No voltage   1 = 24 V   x = Any

7.2.7 Configuration 6: CW, CCW, primary frequency

Fixed setpoint processing mode: Primary frequency setpoint (cannot be changed)

Behavior of the drive unit	Digital input				"DRIVE" LED
	DI01	DI02	DI03	DI04	
	Right	Left	Input frequency	Reset	
The drive unit stops with deceleration setpoint t1.[1)] FCB 01 Output stage inhibit is activated afterwards.	0	0	x	x	Lights up yellow
The drive unit is running in positive direction of rotation (clockwise rotation) with the speed setpoint defined in the primary frequency function. The acceleration setpoint t1 is active.[1)]	1	0	0 – 120 kHz	x	Illuminated in green
The drive unit is running in negative direction of rotation (counterclockwise rotation) with the speed setpoint defined in the primary frequency function. The acceleration setpoint t1 is active.[1)]	0	1	0 – 120 kHz	x	Illuminated in green
The drive unit stops with deceleration setpoint t1.[1)] After that, FCB 02 Stop default is activated.	1	1	x	x	Flashing green
The drive unit is in fault state.	x	x	x	x	Lights up or flashes red
The fault state has been reset.	0	0	0	1	Lights up yellow

1) If potentiometer t1 is deactivated using the parameter settings, the acceleration setpoint 1/ deceleration setpoint 1 of the fixed setpoint processing will be activated.

0 = No voltage 1 = 24 V x = Any

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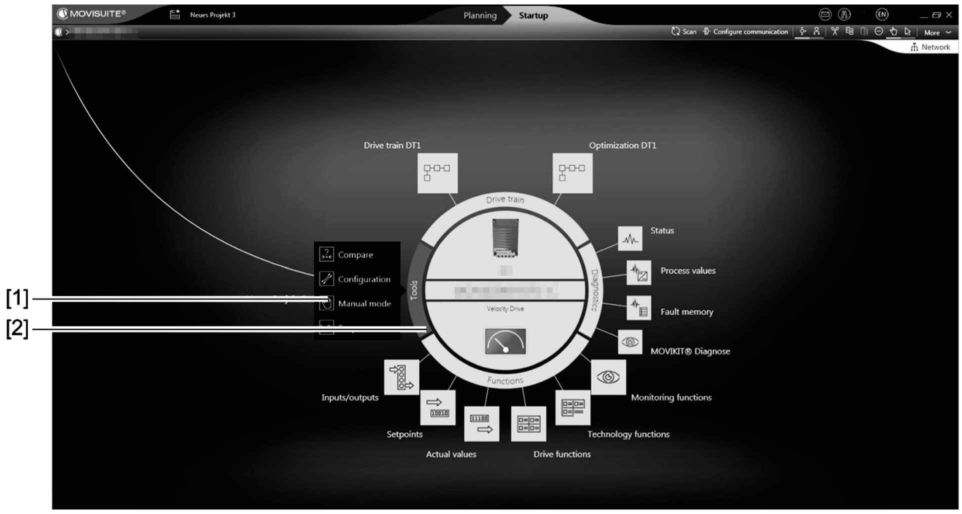
7.3 Manual mode with MOVISUITE®

For manual operation of the device, you can use the manual mode function of the MOVISUITE® engineering software.

1. First connect the PC to the device, see chapter "PC connection".
2. Start the MOVISUITE® engineering software and add the device to MOVISUITE®.
3. Next, click the "Tools" [2] choice box. Select the "Manual mode" [1] menu item.



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⇨ MOVITSUITE® opens the "Manual mode” window.

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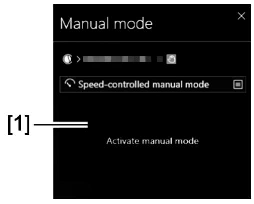
7.3.1 Activating/deactivating manual mode

Activation

Manual mode can only be activated when the device is inhibited.

To activate manual mode, click the [Activate manual mode] button [1].



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Manual mode remains active even after a fault reset.

Deactivation

⚠ WARNING

Risk of injury if the device starts up unintentionally.

Severe or fatal injuries.

- Before deactivating manual mode, take measures to prevent the device from starting up unintentionally.
- Take additional safety precautions depending on the application to avoid injury to people and damage to machinery.

Manual mode is deactivated:

- When you click on the [Deactivate manual mode] button
- Or when you close the "Manual mode" window.

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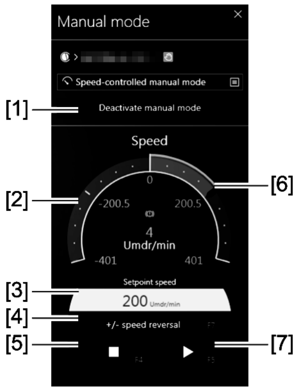
7.3.2 Control in manual mode

Manual operation window

Once manual mode has been successfully activated, you can control the device using the controls in the MOVISUITE® "Manual mode" window.



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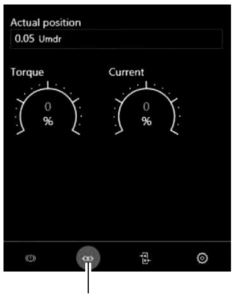
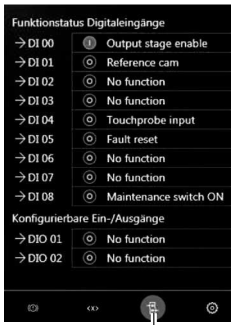
Controller

1. Set the setpoint speed using the edit box [3] or graphic input [6].
2. To specify the direction of rotation, click the button [4].
3. To enable the device, click the button [7].
4. To stop the device, click the button [5].

The "Speed" group [2] shows the actual speed of the device.

Advanced functions and displays of manual mode

The following functions are available in manual mode using MOVISUITE®:

Release brake Disable output stages	Actual values	Digital inputs and outputs	Acceleration Reference travel Timeout
 [1]	 [2]	 [3]	 [4]
Key [1]	Key [2]	Key [3]	Key [4]

7.4 Drive unit behavior in case of a voltage failure

The motor of the drive unit has the following function when the drive is in motion:

In case of a voltage failure, the drive unit uses the motion energy (energy recovery) to supply the electronics cover with voltage. The inverter in the electronics cover realizes a controlled motor deceleration.

If the regenerated energy is not sufficient, the inverter activates the holding function.

7.5 DynaStop®

7.5.1 Functional description

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

This can result in severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When DynaStop® is used on inclining/downward slopes or for vertical conveyors without free hanging loads, adhere to the basic safety and health requirements (e.g. the EG Machinery Directive 2006/42/EG).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application, that determines the required safety measures.

NOTICE

Setting the controller inhibit when the decentralized frequency inverter is running will activate DynaStop®. This can cause high torque loads, which may damage the inverter and the application.

Possible damage to property

- Activate the controller inhibit only when the speed is "0".

NOTICE

Impermissible use of DynaStop®.

Possible damage to property.

✓ Use DynaStop® with the following motor types **only**:

- CMP..
- CM3C..

The DynaStop® function allows for generating a speed-dependent torque that acts against the rotational movement.

Within the permitted operating range, this torque prevents an excessive acceleration of the motor shaft by an external force (e.g. lowering at inclining tracks).

7.5.2 DynaStop® torques

INFORMATION

Possible DynaStop® torques are specified in the documentation of the connected drive unit.

7.6 Function "Releasing the brake / deactivating DynaStop® with FCB01"

7.6.1 Information

INFORMATION

For information on how to disable the DynaStop® function for startup and assembly purposes, refer to chapter "Startup".

7.6.2 Activating the function

⚠ WARNING

Risk from falling loads.

This can result in severe or fatal injuries.

- Do **not** use the function "Releasing the brake / deactivating DynaStop® with FCB 01" for hoist applications and applications with potentially falling loads.
- Inhibit the function via the following steps:
  – Deactivate the function of the DIP switch S1/2 using the parameter *Deactivation* = **"1"** (path: *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Releasing the brake / deactivating DynaStop® with FCB 01 – enable*)
  – Inhibit the functions using the parameter *Releasing the brake / deactivating DynaStop® with FCB 01 – enable* = **"0"** (path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit*).

In case the output stage is inhibited, you can deactivate the DynaStop® function/release the brake by a control signal (digital input or process data bit) using the function "Releasing the brake / deactivating DynaStop® with FCB01". For example, this allows to move loads freely using a horizontal conveyor.

Now make the following settings:

1. **Enabling the function**:
   - **Via DIP switch S1/2**

     Set the DIP switch S1/2 "Releasing the brake / deactivating DynaStop® with FCB 01 – enable" = ON.
   - **Via parameter settings**

     Deactivate the DIP switch S1/2 by setting the parameter *Deactivation* = **"1"**.

     (Path: *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Releasing the brake / deactivating DynaStop® with FCB 01 – enable)*

     Enable the function "Releasing the brake / deactivating DynaStop® with FCB 01 – enable" by setting the parameter *Releasing the brake / deactivating DynaStop® with FCB 01 – enable* to **"1"** [1].

     (Path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit*)

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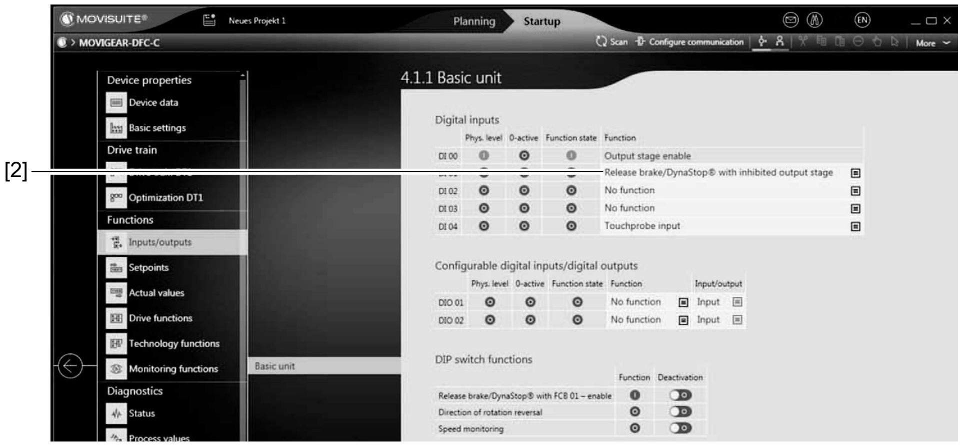
2. **Configuring the control signal**:
   - **Control via the digital input**

     Assign the function "Releasing the brake / deactivating DynaStop® with FCB 01" [2] to a digital input.



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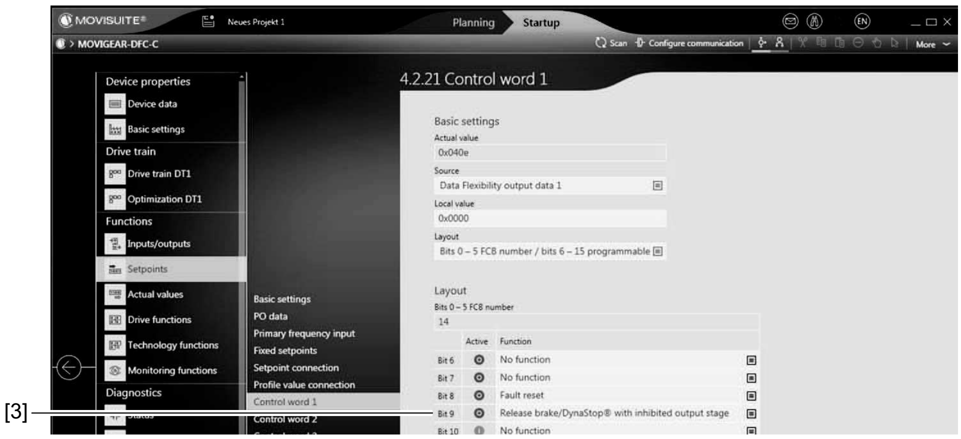
   - **Control via process data bit** (not available with DBC designs)

     Assign the function "Releasing the brake / deactivating DynaStop® with FCB 01" [3] to a process output bit.



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The set control signal can be used to release the brake/deactivate DynaStop® when the function block FCB01 is active.

7.7 DynaStop® in conjunction with STO

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

This can result in severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When DynaStop® is used on inclining/downward slopes or for vertical conveyors without free hanging loads, adhere to the basic safety and health requirements (e.g. the EG Machinery Directive 2006/42/EG).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application, that determines the required safety measures.

INFORMATION

Observe chapter "Functional safety" for using the STO function.

The optional DynaStop® function is not safety-related. It is not part of the safety functions described in chapter "Functional safety".

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7.7.1 Using the brake/DynaStop® in conjunction with STO

To use the DynaStop® function in connection with the STO function, SEW-EURODRIVE recommends control using the safety function SS1(c).

To do so, the parameter *Behavior at standstill* must be set to "Brake applied/drive not energized" (path: *Functions* > *Drive functions* > *FCB 02 Stop default*).

The following table shows the behavior of the DynaStop® function depending on the parameter setting:

Index	Parameter	Setting	Meaning
8563.1	*Behavior at standstill* (Path: *Functions > Drive functions > FCB 02 Stop default)*	Drive energized (brake released / DynaStop® deactivated)	If the enable signals are revoked, the drive decelerates according to the active deceleration setpoint. When the drive reaches speed "0", DynaStop® is **not** activated. Motor position control is active.
		Drive not energized (brake applied / DynaStop® activated)	If the enable signals are revoked, the drive decelerates according to the active deceleration setpoint. When the speed reaches "0", DynaStop® is activated. The motor is de-energized.
8501.3	*Apply brake/activate DynaStop® in STO state* (Path: *Functions > Drive functions > FCB 01 Output stage inhibit > Brake/DynaStop®*)	**0 (no)**	The DynaStop® status remains unchanged when STO is activated.
		1 (yes)	DynaStop® is activated (not safety-related) when STO is enabled. **Note:** Observe the permitted operating range of the DynaStop® function.

(dark grey)	Required settings
(light grey)	Recommended setting

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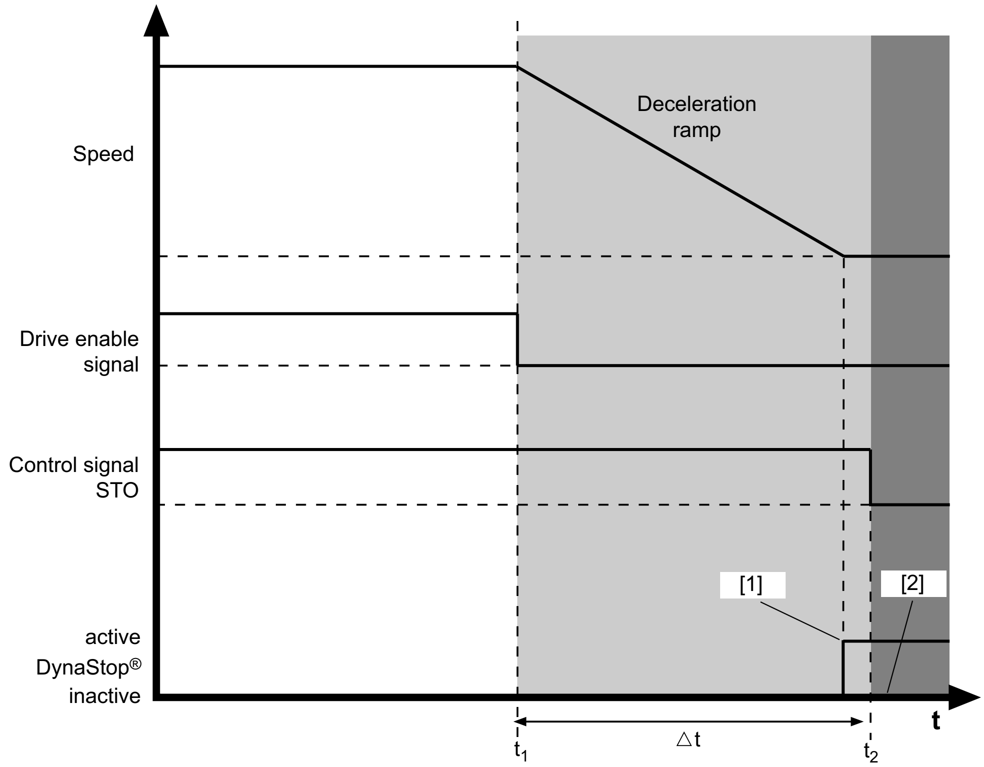
The following figure shows how to use the DynaStop® function in conjunction with the STO function and controller according to SS1(c):



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[1] Parameter:
Behavior at standstill = **"Drive not energized (brake applied / DynaStop® activated)"**
(factory setting)

[2] Parameter:
Behavior at standstill = **"Drive energized (brake released / DynaStop® deactivated)"**
(Path: *Functions* > *Drive functions* > *FCB02 Stop default)*

t Time

t_1 Point of time when deceleration ramp is initiated

t_2 Point of time when STO is triggered

Δt Time span between initiating the deceleration ramp and STO

Safe time delay range

Range with active STO function

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7.7.2 Drive behavior when STO is activated before rotational speed "0" is reached

NOTICE

Danger due to incorrect parameter settings

If the parameter *Apply brake/activate DynaStop®in STO state* is set to **"1"**, (path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit* > *Brake/DynaStop®*), the DynaStop® function can be activated outside of the permitted operating range. This can cause high torque loads / high motor currents, which may damage the drive unit and the application.

Possible damage to property.

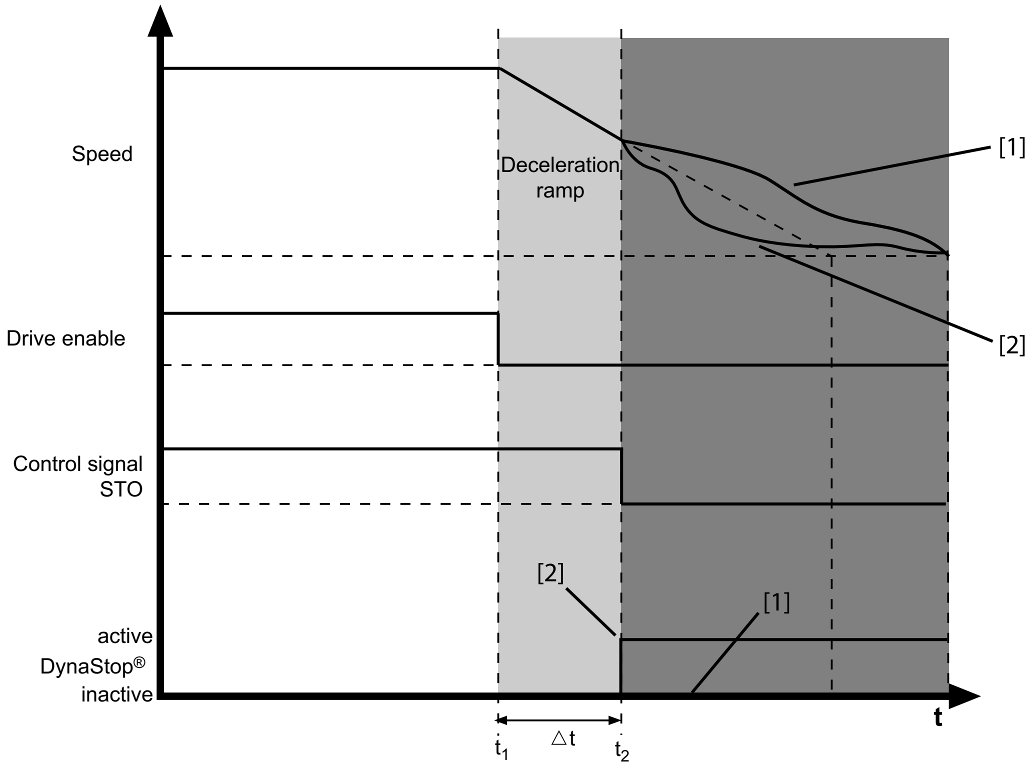
- Use the factory settings or recommended settings.

If STO is activated before the motor has come to standstill (rotational speed = 0), the DynaStop® function behaves as set in parameter *Apply brake/DynaStop® in STO state* (Path: *Functions* > *Drive functions* > FCB 01 *Output stage inhibit* > *Brake/DynaStop®*):

Index	Parameter	Setting	Meaning
8501.3	*Apply brake/activate DynaStop® in STO state* (Path: *Functions* > *Drive functions* > *FCB 01 Output stage inhibit* > *Brake/DynaStop®*)	**0 (no)**	The DynaStop® status remains unchanged when STO is activated. • Depending on the application, the motor coasts to a halt or even accelerates. • The stopping distance is not defined.
		1 (yes)	DynaStop® is activated (not safety-related) when STO is enabled. • In case DynaStop® is activated before the rotational speed has reached "0", high torques/motor currents can occur that may damage the drive and the application. • Evaluate the possible consequences. • The stopping distance is not defined.

Recommended setting/factory setting

The following figure shows the behavior when STO is activated before rotational speed "0" is reached:



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[1] Parameter:
Apply brake/activate DynaStop® in STO state = **"0"** (no) factory settings

[2] Parameter:
Apply brake/activate DynaStop® in STO state = **"1"** (yes)
(Path: *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > *Brake/ DynaStop®*)

t Time

t_1 Point of time when deceleration ramp is initiated

t_2 Point of time when STO is triggered

Δt Time span between initiating the deceleration ramp and STO

Safe time delay range

Range with active, safety-related STO function

Activating the STO function during the deceleration ramp aborts controlled deceleration:

Possible reasons for premature activation of STO:

- Deceleration time Δt too short
- Extension of the deceleration ramp when the current limit is reached, e.g. due to too high load

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7.8 Mechanical brake in connection with STO

7.8.1 Using the mechanical brake in connection with the STO function

The following table shows the behavior of the drive depending on the parameter settings:

Index	Parameters	Setting	Meaning
8563.1	*Behavior at standstill* (Path: *Functions > Drive functions > FCB02 Stop default*)	Drive energized (brake released / DynaStop® deactivated)	If the enable signals are revoked, the drive decelerates according to the active deceleration setpoint. When the speed is "0", the brake remains released. Motor position hold control is active.
		Drive not energized (brake applied / DynaStop® activated)	If the enable signals are revoked, the drive decelerates according to the active deceleration setpoint. When the speed is "0", the brake is applied. The motor is de-energized.
8501.3	*Apply brake/activate DynaStop® in STO state* (Path: *Functions > Drive functions > FCB01 Output stage inhibit > Brake/ DynaStop®*)	**0 (no)**	The brake state remains unchanged when STO is activated.
		1 (yes)	The brake is activated (not safety-related) when STO is activated.

Recommended setting

8 Service

8.1 Evaluating fault messages

8.1.1 MOVISUITE®

The following section shows a sample evaluation of a fault message in MOVISUITE®:

1. Open the parameter tree in MOVISUITE®.
2. In the parameter tree [6], select the "Status" node.
   - ⇨ The **current fault messages** can be found in the "Fault status" [5] group.
   - ⇨ **Additional information** on the causes for the "Not ready" status can be found in the "Device status" [4] group.
   - ⇨ Information on the **history of the fault messages** can be found in the "Fault memory" [7] node.

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[1] Fault status of the main component
[2] Fault status of the subcomponent
[3] Display of the status bits

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8.2 Switch-off responses

Fault response	Description
No response	The inverter ignores the event.
Warning with self-reset	The inverter sends a warning message with self-reset.
Warning	The inverter issues a warning message.
Application stop (with output stage inhibit)	The inverter stops with the deceleration set for the application limit. 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.
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.

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8.3 Fault messages with parameterizable response

Fault	Description	Index no.	Possible fault response
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 error	Here you can 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	Here you can 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	Here you can 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
Fieldbus – timeout	Here one can set how the device is to respond to a timeout on the EtherCAT®/SBus^{PLUS} (timeout period, 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

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Fault	Description	Index no.	Possible fault response
External synchronization	Here you can 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 current parameter set – prewarning.	8442.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Electromechanical capacity utilization – prewarning	Here you can set the device response to an exceeded prewarning threshold for electromechanical capacity 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		8572.1	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self-reset
SW limit switches – current parameter set		8572.2	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self-reset

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Fault	Description	Index no.	Possible fault response
Encoder – warning	Here you can 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	Here you can 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
Application heartbeat timeout (only with DSI designs)	Here you can 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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8.4 Resetting fault messages

⚠ WARNING

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

Severe or fatal injuries.

- Prevent unintended startup.

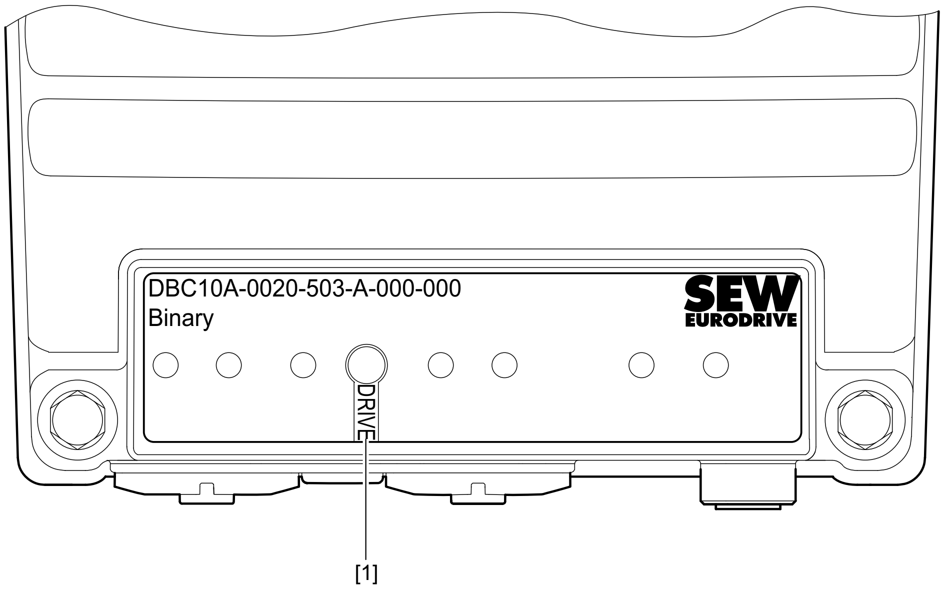
Acknowledge fault message by:

- Switch the supply system off and on again.
- Via the controller/PLC: Send "reset command".

8.5 Description of status and operating displays

8.5.1 LED displays of the binary control

The following figure shows the LEDs of the binary design:



18014427523368971

[1] "DRIVE" status LED

8.5.2 General LEDs

"DRIVE" status LED

LED	Operating status/ Fault code	Operating status/ Subfault code	Meaning	Measure
– **Off**	Not ready for operation		Line voltage absent.	Switch on the line voltage.
Yellow **Flashes very rapidly, 4 Hz**	Not ready for operation		Initialization phase	Wait for the initialization to be completed.
Yellow **Flashes 1 Hz**	Ready but unit inhibited		The "STO" signal is active.	Deactivate the "STO" signal.
Yellow **Flashes slowly, 0.5 Hz**	Ready for operation, but manual mode/local mode, device inhibited		Line voltage is OK.	–
Yellow **Flashes rapidly, 2 Hz**	Ready		Deactivation of DynaStop® without drive enable is active.	–
Yellow **Steady light**	Ready but unit inhibited		Line voltage is OK. The output stage is locked.	–
Green **Flashes slowly, 0.5 Hz**	Unit enabled, but condition manual mode/local mode		The output stage is enabled. The motor is in operation.	–
Green **Flashes very rapidly, 4 Hz**	Unit enabled, but current limit active.		The drive is at the current limit.	Reduce the load.
Green **Steady light**	Unit enabled.		The output stage is enabled. The motor is in operation.	–
Yellow/red **Flashes with changing colors, 1 Hz** **(2 × yellow, 2 × red)**	Ready		A displaying fault is present. The output stage is locked.	Consult the “Fault table” chapter for possible measures to be taken.
Green/red **Flashes with changing colors, 1 Hz** **(2 × green, 2 × red)**	Ready		A displaying fault is present. The output stage is enabled. The motor is in operation.	Consult the “Fault table” chapter for possible measures to be taken.

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LED	Operating status/ Fault code	Subfault code	Meaning	Measure
Red **Flashes 1 Hz**	3	1	Ground fault	Consult the "Fault table" chapter for possible measures to be taken.
	4	1	Brake chopper fault	
	6	1	Line fault	
	7	1	DC link fault	
	8	1, 2, 3	Speed monitoring fault	
	9	1, 2, 5, 6, 9, 10	Control mode fault	
	10	1, 3 – 11	Data Flexibility fault	
	11	1 – 6	Temperature monitoring fault	
	12	1, 2	Brake fault	
	13	5, 24	Encoder 1 fault	
	16	5 – 8, 10, 20 – 27	Startup fault	
	19	1 – 9	Process data fault	
	20	2, 11	Device monitoring fault	
	23	4	Power section fault	
	25	2 – 7, 20, 21, 30, 31, 61, 70	Parameter memory monitoring	
	26	1, 3	External fault	
	28	1 – 12, 14	FCB drive function fault	
	29	1 – 4	Hardware limit switch fault	
	30	1 – 3	Software limit switch fault	
	31	1 – 4, 7, 9	Thermal motor protection fault	
	32	2 – 6, 12	Communication fault	
	33	11, 12, 13	System initialization fault	
	34	1	Process data configuration fault	
	35	1 – 5	Function activation fault	
	42	1 – 3	Lag fault	
	44	2, 3, 4	Fault overcurrent phase U, V, W	
	46	2, 3, 50, 51, 52	Safety card fault	
	51	1	Analog processing fault	

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LED	Operating status/ Fault code	Subfault code	Meaning	Measure
Red **Steady light**	1	1, 2	Output stage monitoring fault	Contact SEW-EURODRIVE Service.
	4	2	Brake chopper fault	
	7	2	DC link fault	
	9	3, 4, 8	Control mode fault	
	10	2, 99	Data Flexibility fault	
	11	7, 8	Temperature monitoring fault	
	13	1, 3, 6, 7, 8, 9, 11, 13, 15, 22, 23	Encoder 1 fault	
	16	2, 11, 12. 30	Startup fault	
	17	7	Internal processor fault	
	18	1, 3,4, 7, 8, 9, 10, 12, 13	Software error	
	20	1.7	Device monitoring fault	
	21	1	S-Drive 1 fault	
	23	5, 6, 7, 8	Power section fault	
	25	10, 12 – 19, 50, 51, 81	Parameter memory monitoring	
	28	13	FCB drive function fault	
	33	1, 2, 6, 7, 8, 10	System initialization fault	
	46	1	Safety card fault	

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8.6 Fault/error table

8.6.1 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.

8.6.2 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.

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8.6.3 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 the supply cable to the 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.

8.6.4 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).

8.6.5 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 the deceleration ramps. – Check the supply cable to the braking resistor. – Check the technical data of the braking resistor.

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8.6.6 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 the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the 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 the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the deceleration values.
Encoder has incorrect direction of rotation.	– Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the deceleration values. – Check motor cable and motor. Check the 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 speed.

8.6.7 Fault 9 Control mode

Subfault: 9.1

Description: Magnetization of motor not possible

Response: Output stage inhibit

Cause	Measure
The user-defined current limit or output stage monitoring have reduced the possible maximum current to such a degree that the required magnetizing current cannot be set.	– Reduce the output stage utilization, e.g. by reducing the PWM frequency or reducing the load. – Increase the user-defined current limit.

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.	– Use a control mode that supports the required operating mode. Connect an 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 of 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.

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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 motors 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.

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8.6.8 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 the 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.

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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. Unauthorized write access to the program memory.

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 the SEW-EURODRIVE Service.

8.6.9 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.

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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 the 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 the SEW-EURODRIVE Service.

8.6.10 Fault 12 Brake

Subfault: 12.1 Description: Brake output		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	No brake connected.	Check the connection of the brake.
	Brake cable disconnected in switched-on state.	Check the connection of the brake.
	Overload due to overcurrent > 2 A	Check the sequential profile of brake control.
	Overload due to excessive connection (> 0.5 Hz)	Check the sequential profile of brake control.
	Monitoring works only with parameter setting "Brake installed" and "Brake applied".	Make sure that the connected brake is permitted.

Subfault: 12.2 Description: DC 24 V brake voltage		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	DC 24 V supply voltage not within permitted tolerance of ± 10%.	Check the DC 24 V supply voltage.
	Monitoring is only active with parameter settings “Brake installed” and “Brake applied”.	Check the parameter setting.

Subfault: 12.3 **Description: Temperature**		
	Response: Output stage inhibit	
	Cause	Measure
	Brake temperature outside permitted range (too high or too low).	Check the ambient conditions and the application.
	Brake temperature too high. When using decentralized devices, DC link overvoltage is reduced by the brake.	Check the application for how often generator mode occurs.

Subfault: 12.4 **Description: Brake control module missing**		
	Response: Output stage inhibit	
	Cause	Measure
	Brake control has been activated although the hardware is not equipped with the matching module.	Select another brake type or brake connection

Subfault: 12.5 **Description: Short circuit**		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the brake detected.	Check the brake connection.

Subfault: 12.6 **Description: Wear limit reached**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Brake worn	Replace the brake or readjust it

Subfault: 12.10 **Description: Digital motor integration fault – critical**		
	Response: Output stage inhibit	
	Cause	Measure
	The intelligent brake rectifier of "digital motor integration" signaled a critical component fault.	See subcomponent fault

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8.6.11 Error 13 encoder 1 fault

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 the area of EMC). – Replace encoder. – Replace the card. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.2 Description: Unknown encoder type		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder type not known and not supported by device.	– Check the encoder type. – Contact SEW-EURODRIVE Service. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.3 Description: Invalid data		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	– Check the startup parameters. – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.4 **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 the sensor.

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 the area of EMC). – Check the encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.7 **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. 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: 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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.9 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 the area of 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 the startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.11 Description: Data timeout		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder process data timeout.	– Check interference sources (e.g. from the area of EMC). – Check the startup parameters. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.12 Description: Emergency		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder signaled emergency.	– Check interference sources (e.g. from the area of EMC). – Check the startup parameters. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.13 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. 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: 13.14 Description: Communication		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Faulty communication with encoder.	– Check the voltage supply. – Check interference sources (e.g. from the area of EMC). – Check the wiring. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.15 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 configured path range. – Check the limits. – Check for correct settings of encoder numerator/denominator factors. – Check interference sources (e.g. from the area of EMC). – Check the startup parameters. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.16 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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.17		
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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.18		
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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.19		
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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.20		
Description: SSI error bit – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Error bit set in SSI protocol.	– Check the 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. Note: 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 the 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. Note: 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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.23 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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.24		
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. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.25		
Description: Error during encoder startup		
	Response: Output stage inhibit	
	Cause	Measure
	Fatal error during encoder startup.	Switch the device off and on again. Note: In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Subfault: 13.26		
Description: Digital motor integration fault – critical		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder of "Digital motor integration" signaled a component fault.	– Check interference sources. – Replace encoder.

Subfault: 13.27		
Description: Digital motor integration fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Encoder of "Digital motor integration" signaled a component fault.	– Check interference sources. – Replace encoder.

Subfault: 13.28		
Description: Digital motor integration warning		
	Response: Encoder – warning	
	Cause	Measure
	Encoder of "Digital motor integration" signaled a warning.	– Check interference sources.

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8.6.12 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 the 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.

Subfault: 16.7	
Description: PWM frequency not possible	
Response: Output stage inhibit	
Cause	Measure
Specified PWM frequency not allowed for this power output stage.	Choose another PWM frequency. For possible PWM frequencies, refer to the 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.

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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 a PWM frequency of "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.

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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 are 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 the SEW-EURODRIVE Service.
	Faulty EEPROM loading procedure.	Contact the SEW-EURODRIVE Service.
	Faulty EEPROM checksum.	Contact the SEW-EURODRIVE Service.

Subfault: 16.40		
Description: Data of selected motor not valid		
	Response: Output stage inhibit	
	Cause	Measure
	Startup data set on replaceable memory module not valid for this motor.	Replace the memory module.

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Subfault: 16.41		
Description: Data of selected motor does not exist		
	Response: Output stage inhibit	
	Cause	Measure
	No startup data set found on the replaceable memory module for the selected motor.	Check the selection and, if necessary, start up another motor or replace the memory module.

Subfault: 16.50		
Description: Brake parameters not initialized		
	Response: Output stage inhibit	
	Cause	Measure
	No brake data present	Check startup

8.6.13 Fault 17 Internal processor fault

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

8.6.14 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.

Subfault: 18.3		
Description: Task system warning		
	Response: Warning	
	Cause	Measure
	Error while processing 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.

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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.

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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.

8.6.15 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 the position setpoint.
	Position setpoint outside modulo range.	Check position setpoint.
	Position in user unit generates number overflow in the system unit.	Check the 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 permitted only 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.

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Subfault: 19.9 Description: Jerk setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Jerk values not plausible.	Adjust jerk setpoints.

8.6.16 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 connection. If required, correct. – Acknowledge the fault. – If the fault occurs repeatedly, replace the 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 the consumer that is 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
	Fault in the device hardware.	– 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: Warning with self-reset	
	Cause	Measure
	Fan function impaired.	Check the fan for proper functioning.

Subfault: 20.9 Description: Fan fault		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Fan defective.	Contact the 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 the STO wiring. – Check the STO wiring before acknowledging the fault, and make sure that both STO signals are switched to low level.

8.6.17 Fault 21 Digital motor integration 1

Subfault: 21.1 Description: Communication error		
	Response: Output stage inhibit	
	Cause	Measure
	Communication error detected on the interface of the "digital motor integration".	Check the cabling.

Subfault: 21.2 **Description: Slave required**		
	Response: Output stage inhibit	
	Cause	Measure
	Device started up with a drive with "digital motor integration" but no drive with "Digital motor integration" is connected.	Connect a drive with "digital motor integration" matching startup, or perform a new startup.

Subfault: 21.3 **Description: Incompatible driving motor**		
	Response: Output stage inhibit	
	Cause	Measure
	Connected drive not compatible with started-up drive.	Connect a drive that matches startup, or perform a new startup.

Subfault: 21.4 **Description: Invalid label**		
	Response: Output stage inhibit	
	Cause	Measure
	The connected drive contains invalid data.	Replace the drive.

Subfault: 21.5 **Description: Incompatible slave**		
	Response: Output stage inhibit	
	Cause	Measure
	The connected slave of "digital motor integration" cannot be used with this inverter firmware.	Update inverter or slave.

Subfault: 21.6 **Description: Overload/short circuit on the interface**		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the cabling of components of "Digital motor integration"	Check the cabling of the component of "digital motor integration".
	Voltage of "Digital motor integration" component too low.	Check the voltage supply of the component.

8.6.18 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 the current supply. – Increase the 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 the current supply. – Check the DC 24 V supply voltage.
	Fault at the gate driver of an IGBT.	Defect in the power output stage. Contact the SEW-EURODRIVE Service.
	Invalid process data configuration. Status of control section and power section are not compatible.	Contact the SEW-EURODRIVE Service.

Subfault: 23.5		
Description: Invalid process data configuration		
	Response: Output stage inhibit	
	Cause	Measure
	Invalid process data configuration.	Contact the 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 fault 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 fault 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 fault 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.

8.6.19 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 the 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 the 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 the 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 the SEW-EURODRIVE Service.

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Subfault: 25.13		
Description: Control electronics configuration data – CRC error		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty configuration data of control electronics.	Contact the 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 the 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 the 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 the 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 the 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 the SEW-EURODRIVE Service.

Subfault: 25.19 Description: Control electronics QA data – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of control electron-ics.	Contact the 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 the 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 the SEW-EURODRIVE Service.

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 default.
	Initialization error of replaceable memory module after delivery state.	Contact the 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 the SEW-EURODRIVE Service.

Subfault: 25.32 Description: Replaceable memory module not compatible		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The inserted replaceable memory module cannot be used.	Replace the memory module.

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 the 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 the SEW-EURODRIVE Service.

Subfault: 25.61 Description: Failure – 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".

8.6.20 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 (with output stage inhibit)).

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.

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 the travel cycle so that less regenerative operation energy arises.

8.6.21 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 perform 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.

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 the 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 the 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.

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

8.6.22 Fault 29 HW limit switches

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 the hardware limit switch at 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 the hardware limit switch at 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.

8.6.23 Fault 30 Software limit switches

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 at 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 at 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.

8.6.24 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 model 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.

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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: No response	
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: No response	
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.

8.6.25 Fault 32 Communication

Subfault: 32.2 **Description: EtherCAT®/SBus^{PLUS} process data timeout**		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Process data timeout during EtherCAT®/SBus^{PLUS} 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.

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.

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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: 32.11 Description: Local mode timeout		
	Response: Local mode – timeout response	
	Cause	Measure
	Communication connection to device interrupted in local mode.	– Increase the timeout setting in local mode.
	New Scope project created.	– Reset the fault. – Restart local operation.
	Scope measurement loaded from device.	– Reset the fault. – Restart local operation.

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 the fault. – Restart manual mode.
	Scope measurement loaded from device.	– Reset the fault. – Restart manual mode.

8.6.26 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 the 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 the SEW-EURODRIVE Service.

Subfault: 33.6 **Description: FPGA configuration**		
	Response: Output stage inhibit	
	Cause	Measure
	Error checking FPGA configuration.	Contact the SEW-EURODRIVE Service.

Subfault: 33.7 **Description: Function block compatibility error**		
	Response: Output stage inhibit	
	Cause	Measure
	Error checking compatibility of function block.	Contact the 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 the SEW-EURODRIVE Service.

Subfault: 33.9 **Description: Power section hardware compatibility fault**		
	Response: Output stage inhibit	
	Cause	Measure
	Firmware does not match hardware of power section.	Contact the SEW-EURODRIVE Service.

Subfault: 33.10 **Description: Run-up timeout**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system run-up.	Contact the SEW-EURODRIVE Service.

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Subfault: 33.11		
Description: Hardware compatibility error		
	Response: Output stage inhibit	
	Cause	Measure
	Firmware does not match device.	Contact the 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 the 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 the 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.

8.6.27 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.

8.6.28 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.

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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.

8.6.29 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 the acceleration ramps.
P component of the position controller too small.	Set P component of the position controller to a larger value.
Speed controller parameters set incorrectly.	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 the acceleration ramps.
P component of the position controller too small.	Set P component of the position controller to a larger value.
Speed controller parameters set incorrectly.	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.

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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 the acceleration ramps.
	P component of the position controller too small.	Set P component of the position controller to a larger value.
	Speed controller parameters set incorrectly.	Check controller parameters.
	Value of lag error tolerance too small.	Increase the lag error tolerance.

8.6.30 Fault 44 Subcomponent power section

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.

8.6.31 Fault 45 Fieldbus interface

Subfault: 45.1 Description: No response		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Basic device detects a plugged fieldbus interface. However, it is not starting properly and so cannot be addressed.	– Switch the power off and on again/perform a reset. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.2 Description: Option interface		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Basic device detects fault on internal interface for fieldbus connection.	– Switch the power off and on again/perform a reset. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.3 Description: Process output data timeout		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface detected timeout of process output data on fieldbus interface.	– Check master communication routine. – Check the communication connection between process data producer (master) and fieldbus interface. The data line might be interrupted. – Extend the fieldbus timeout time. – Switch off monitoring.

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Subfault: 45.5		
Description: Engineering interface		
	Response: Warning	
	Cause	Measure
	Engineering interface no longer works, or works only to a limited extent.	– Switch the power off and on again/perform a reset. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.7		
Description: Invalid process output data		
	Response: Fieldbus – timeout response	
	Cause	Measure
	– The producer of the process output data reports that the data is invalid. – Process data is exchanged via the fieldbus but the data is invalid.	– Check whether the PLC is in "Stop" state. – Restart the PLC.

Subfault: 45.9		
Description: Fieldbus interface – warning		
	Response: Warning	
	Cause	Measure
	Basic device detects non-critical fault on internal interface for fieldbus connection.	– Reset the fault. – If the fault occurs repeatedly, replace the fieldbus interface and send it to SEW-EURODRIVE together with the fault number. For further support, contact SEW-EURODRIVE Service.

Subfault: 45.50		
Description: Fieldbus interface – warning		
	Response: Warning with self-reset	
	Cause	Measure
	Fieldbus interface signals subcomponent fault of the type "Warning".	Refer to the subcomponent fault of the fieldbus interface and perform the action required for eliminating the fault.

Subfault: 45.51		
Description: Fieldbus interface – fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface signals subcomponent fault of the type "Standard".	Refer to the subcomponent fault of the fieldbus interface and perform the action required for eliminating the fault.

Subfault: 45.52		
Description: Fieldbus interface – critical fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface signals subcomponent fault of the type "Critical fault".	Refer to the subcomponent fault of the fieldbus interface and perform the action required for eliminating the fault.

8.6.32 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.

Subfault: 46.2		
Description: Invalid variant		
	Response: Output stage inhibit	
	Cause	Measure
	Plugged safety card design does not match inverter type.	– Remove the 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.

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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.

8.6.33 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 the input current.

8.6.34 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 while 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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8.7 Device replacement

8.7.1 Notes

⚠ WARNING

Removing the electronics cover will disable DynaStop®.

Severe or fatal injuries.

- If it is not permitted to deactivate the system, additional measures are required (e.g. mechanical stake-out)

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box. Dangerous voltages can still be present for up to 5 minutes after disconnection from the power supply system.

Severe or fatal injuries.

- Before removing the electronics cover, de-energize the device via a suitable external disconnection device.
- Secure the device against unintended re-connection of the voltage supply.
- Secure the output shaft against rotation.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

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8.7.2 Replacing the electronics cover

1. Observe the safety notes.
2. Loosen the screws and take off the electronics cover from the connection box.
3. Compare the data on the nameplate of the previous electronics cover with the data on the nameplate of the new electronics cover.

INFORMATION

Always replace the electronics cover with an electronics cover with the same type designation.

But it is permitted to use an electronics cover with a nominal output current that is up to 3 times higher or lower than what the old electronics cover had.

- However, if you use an electronics cover with a higher nominal output current, the power at the output shaft will not be increased.
- When you use an electronics cover with a lower nominal output current than the old electronics cover, the power at the output shaft may no longer be high enough to meet the requirements.

INFORMATION

In safety-related applications, replace an electronics cover only with an electronics cover with the same FS logo.

4. Set all the control elements (e.g. DIP switches, see "Startup" chapter) on the new electronics cover in the same way as the controls of the previous electronics cover.
5. Remove the replaceable memory module from the old electronics cover. Insert the replaceable memory module in the new electronics cover.

INFORMATION

If you perform startup of the electronics cover via DIP switch S3 and have changed the nominal output current of the electronics cover, adjust the motor assignment to the changed nominal output current of the electronics cover using DIP switches S3/3 and S3/4.

- To prevent malfunction in case motor assignment via DIP switches S3/3 and S3/4 has not been adjusted, motor startup (motor assignment) remains active until the position of the DIP switches has been changed.
- This might result in the position of the DIP switch S3 no longer corresponding to the saved motor assignment in connection with the nominal output current of the electronics cover. In this case, check motor startup via MOVISUITE® or CBG...

6. Place the new electronics cover onto the connection box and screw it on.
7. Supply the device with voltage.
8. Check the new electronics cover for proper functioning.

8.7.3 Replacing the memory module

1. Observe the safety notes.
2. Loosen the screws and take off the electronics cover from the connection box.
3. Remove the memory module from the old electronics cover.
4. Compare the type designation of the memory module.

INFORMATION

The new memory module must have the same type designation as the old memory module.

5. Set the DIP switches on the new memory module in the same way as the control elements of the previous memory module.
6. Insert the new memory module in the new electronics cover.
7. Place the electronics cover onto the connection box and screw it on.
8. Supply the device with voltage.
9. Check the startup of the device.
   - ⇨ If required, perform startup again or load the saved startup to the device.
   - ⇨ For devices with safety card, check the startup of the safety card. For more information, refer to the "MOVISAFE® CSB51A Safety Option" manual.
10. Check the new electronics cover for proper functioning.

8.7.4 Device replacement

⚠ WARNING

Electric shock due to dangerous voltages at the line terminals.

The switch disconnector disconnects the electronics cover from the voltage supply. Voltage is still present at the terminals of the device.

- A correct installation includes that terminals of the device are protected against contact.
- Secure the device against unintended reconnection of the voltage supply.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

1. Observe the safety notes.
2. When you replace the device including the electronics cover, you also have to carry out the steps described in chapter "Replacing the electronics cover".
3. Remove the defective device. Observe the notes in chapter "Mechanical installation".
4. Compare the data on the nameplate of the old device with the nameplate data of the new device.

INFORMATION

Always replace the decentralized frequency inverter with an inverter that has the same properties.

5. Install the device. Observe chapter "Mechanical installation".
6. Perform the installation according to chapter "Electrical installation".
7. Remove the memory module from the old electronics cover. Insert this memory module in the new electronics cover.
8. Place the electronics cover onto the connection box and screw it on.
9. Supply the device with voltage.
10. Check the new device for proper functioning.

8.8 SEW-EURODRIVE Service

8.8.1 Sending in a device for repair

If a fault cannot be repaired, please contact SEW-EURODRIVE Service (see "Address list").

Please always specify the digits of the status label when you contact the SEW electronics service so our Service personnel can assist you more effectively.

Provide the following information when sending the device in for repair:

- Serial number (see nameplate)
- Type designation
- Unit design
- Short description of the application (application, control type, etc.)
- Nature of the fault
- Accompanying circumstances
- Your own presumptions as to what has happened
- Any unusual events preceding the problem, etc.

8.9 Shutdown

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box. Dangerous voltages can still be present for up to 5 minutes after disconnection from the power supply system.

Severe or fatal injuries.

- Before removing the electronics cover, de-energize the device via a suitable external disconnection device.
- Secure the device against unintended re-connection of the voltage supply.
- Secure the output shaft against rotation.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

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

8.10 Storage

Observe the following instructions when shutting down or storing the device:

- If you shut down and store the device for a longer period, close open cable bushings and cover ports with protective caps.
- Make sure that the unit is not subject to mechanical impact during storage.

Observe the notes on storage temperature in chapter "Technical data".

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8.11 Extended storage

8.11.1 Storage conditions

Observe the storage conditions specified in the following table for extended storage:

Climate zone	Packaging[1]	Storage location[2]	Storage duration
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Packed in containers, with desiccant and moisture indicator sealed in plastic wrap.	Under roof, protected against rain and snow, no shock loads.	Up to 3 years with regular checks of the packaging and moisture indicator (relative humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors, no shocks.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check corrosion protection.
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	Packed in containers, with desiccant and moisture indicator sealed in plastic wrap. Protected against insect damage and mildew by chemical treatment.	Under roof, protected against rain and shocks.	Up to 3 years with regular checks of the packaging and moisture indicator (relative humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors, no shocks. Protected against insect damage.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check corrosion protection.

1) The packaging must be carried out by an experienced company using the packaging materials that have been explicitly specified for the particular application.

2) SEW-EURODRIVE recommends storing the drive according to the mounting position.

8.11.2 Electronics

INFORMATION

For electronics components, adhere to the following notes in addition to the notes in chapters "Extended storage" > "Drive" and "Extended storage" > "Storage conditions".

If the device is in extended storage, connect it to the supply voltage for at least 5 minutes every 2 years. Otherwise, the device's service life may be reduced.

Procedure when maintenance has been neglected

Electrolytic capacitors are used in the inverters. They are subject to aging effects when de-energized. This effect can damage the capacitors if the device is connected directly to the nominal voltage after a longer period of storage. 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 for an extended period with maintenance.

The following graduations are recommended:

AC 400/500 V units:

- Stage 1: AC 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

8.12 Waste disposal

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

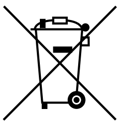
- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- Electronic parts
- Plastics

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

- Oil and grease

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

Waste disposal according to WEEE Directive 2012/19/EU



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

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

9 Inspection and maintenance

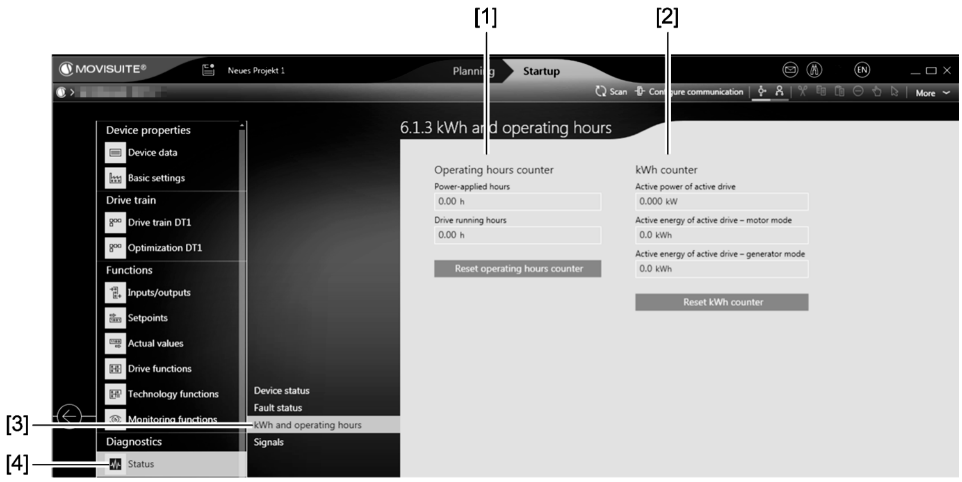
9.1 Determining the operating hours

9.1.1 About MOVISUITE®

The device allows for reading the operating hours performed in order to assist with inspection and maintenance work.

To determine the operating hours performed, proceed as follows:

1. In MOVISUITE®, open the parameter tree of the device.
2. In the parameter tree [4], select the "Status" node.
   ⇨ The **operating hours** performed can be found in the "kWh and operating hours" [3] group.



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[1] Display of operating and drive running hours performed
[2] Display of active power and active energy

9.2 Inspection and maintenance intervals

The following table shows the inspection and replacement intervals for the device:

Time interval	What to do?	Who is permitted to perform the work?
When the cover/electronics cover is opened after an operating period of ≥ 6 months	When the cover/electronics cover is opened after an operating period of ≥ 6 months, the gasket between the connection box and the cover/electronics cover must always be replaced. The 6-month period can be shortened by harsh ambient/operating conditions, e.g. cleaning with aggressive chemicals or frequent temperature variations.	Specialists at customer site

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Time interval	What to do?	Who is permitted to perform the work?
Each time the cover/ electronics cover is opened	Visual inspection of the gasket between connection box and cover/electronics cover: The gasket must be replaced in the event of damage.	Specialists at customer site

9.3 Inspection and maintenance work

9.3.1 Preliminary work regarding inspection and maintenance

Observe the following notes before you start with inspection/maintenance work:

⚠ WARNING

Risk of injury if the device starts up unintentionally, and danger of electrical voltage.

Dangerous voltages may still be present for up to 5 minutes after disconnection from the line voltage.

- Disconnect the device from the power supply with suitable external measures before you start working on the device and secure it against unintentional reconnection to the voltage supply.
- Secure the output shaft against rotation.
- Before removing the electronics cover, wait for at least the following time: **5 minutes.**

⚠ WARNING

Risk of burns due to hot surfaces.

Serious injuries.

- Let the devices cool down before touching them.

9.3.2 Connection cables

Observe the notes in chapter "Preliminary work for inspection and maintenance".

Check the connection cables for damage at regular intervals and replace if necessary.

9.3.3 Replacing the gasket between connection box and electronics cover

Spare part kit

The gasket is available as a spare part (1, 10 or 50 pieces) from SEW-EURODRIVE.

Content	Part number
1 piece	18187765
10 piece	28266161
50 piece	28266188

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Steps

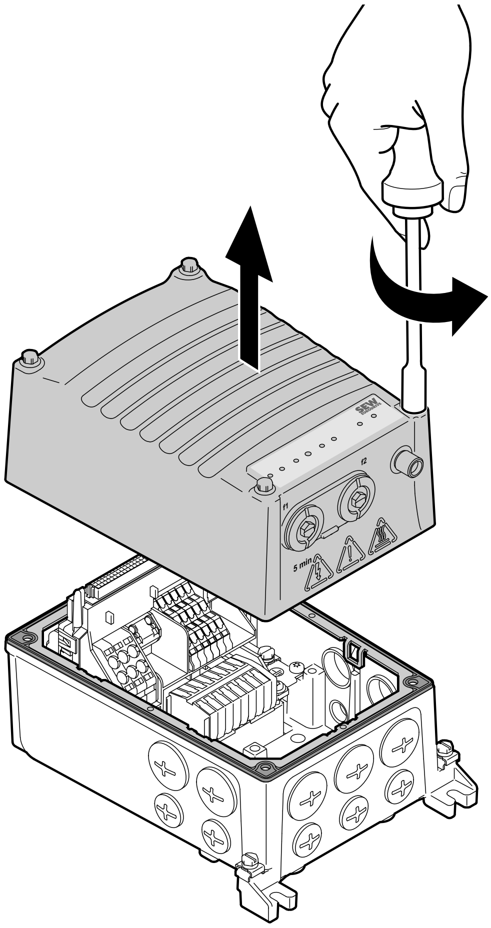
NOTICE

Loss of the guaranteed degree of protection.

Possible damage to property.

- When the cover is removed from the connection box, you have to protect the cover and the wiring space from humidity, dust or foreign particles.
- Make sure that the cover is mounted properly.

1. Observe the notes in chapter "Preliminary work for inspection and maintenance".
2. Loosen the screws of the electronics cover and remove it.



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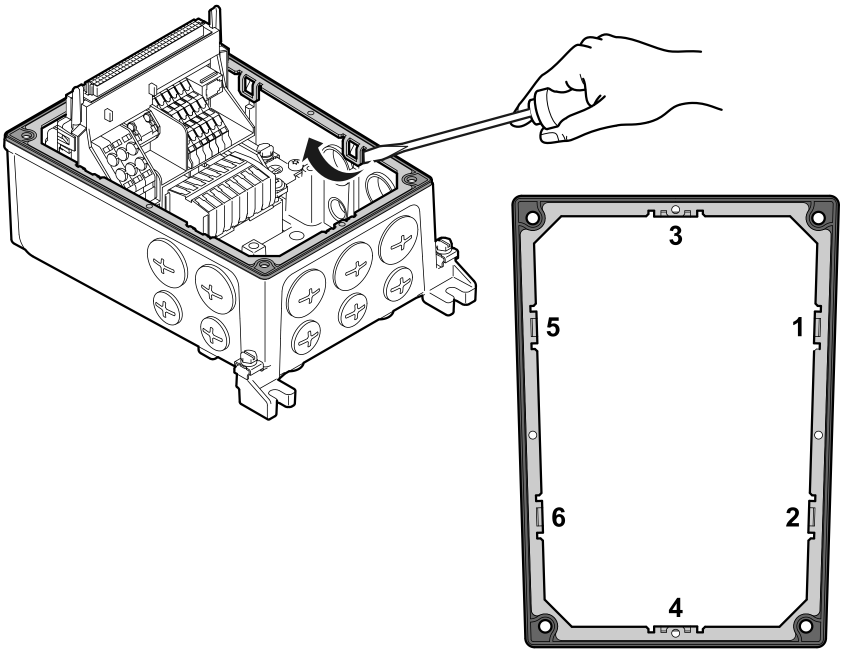
3. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property. Make sure not to damage the sealing surfaces when removing the gasket.
   Loosen the used gasket by levering it off the retaining cams.
   ⇨ Doing so will be easier if you adhere to the sequence shown in the figure below.



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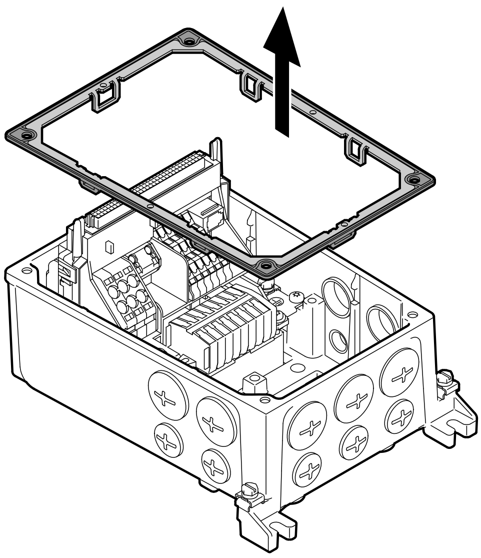
4. Remove the old gasket completely from the connection box.



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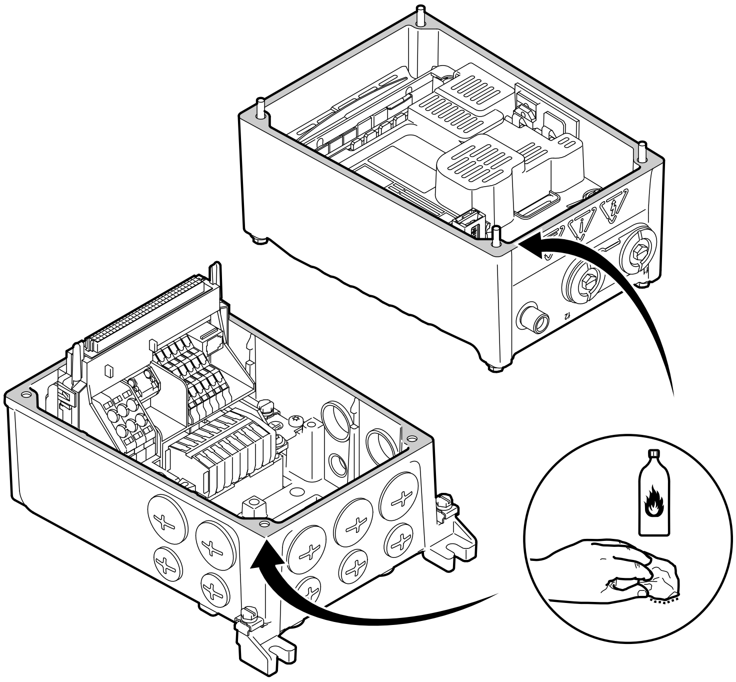
5. ⚠ **CAUTION!** Risk of injury due to sharp edges. Risk of cutting injuries. Use protective gloves for cleaning. Work may only be carried out by qualified personnel.
   Clean the sealing surfaces of the connection box and the electronics cover carefully.



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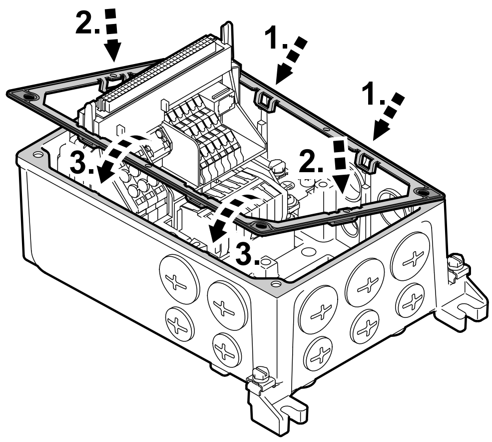
6. Place the new gasket on the connection box and fix it in position with the retaining cams. Doing so will be easier if you adhere to the sequence shown in the figure below.



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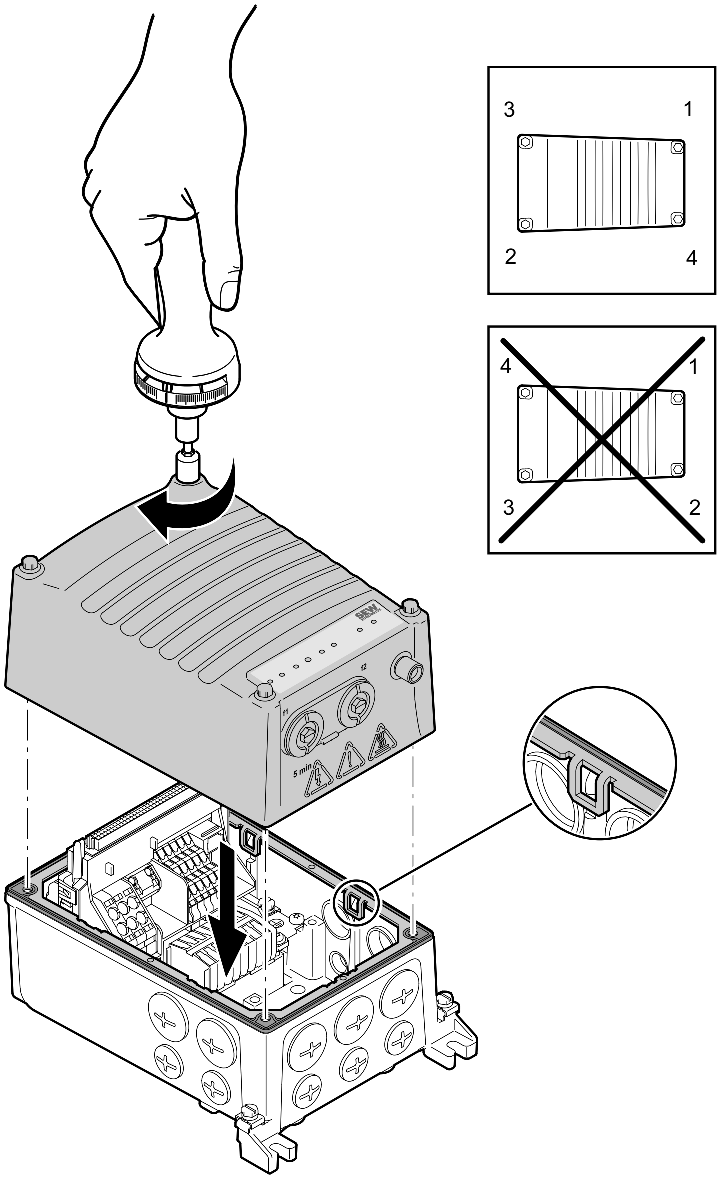
7. Check the installation and startup of the device using the applicable operating instructions.
8. Place the electronics cover on the connection box again and fasten it.
   ⇨ Proceed as follows when installing the electronics cover: Insert the screws and tighten them in diametrically opposite sequence step by step with a tightening torque of 6.0 Nm.



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10 Project planning

10.1 Preliminary information

INFORMATION

Data may differ due to continuous product development.

10.2 SEW-Workbench

The SEW-Workbench is the central configuration software for inverters from SEW-EURODRIVE.

All necessary configurations can be processed, from entering the application to gear unit, motor and inverter calculations. Other features are optimization of various axis cycles, including accessory selection, and a check for errors regarding dimensioning for the entire drive system.

Of course, the SEW-Workbench can also be used to select and dimension all other products from SEW-EURODRIVE, such as decentralized drives and gearmotors. This means the SEW-Workbench allows for dimensioning drive solutions from the entire range of products from SEW-EURODRIVE. The straightforward operation saves a great deal of time and minimizes complexity.

The key features of the SEW-Workbench are:

- Selection of the application
- Calculation of gear unit and motor
- Price-optimized configuration
- Comparison of different solutions
- Inverter calculation
- Multi-axis optimization
- Parameterization of cable and accessories selection
- Dimensioning error check
- Parts list generation
- Electronic catalog with all products

The planning and configuration software SEW-Workbench is available for download from the official SEW-EURODRIVE website.

To use SEW-Workbench, all you need to do is to register via the Online Support once you have downloaded and installed the software or received the data DVD. An Internet update service ensures that the products and functions are always up to date.

10.3 Schematic workflow for project planning

The following flow diagram illustrates the drive selection procedure for a positioning drive. The drive consists of a gearmotor that is supplied by a frequency inverter.

Necessary information regarding the machine to be driven
• Technical data and environmental conditions • Positioning accuracy • Speed setting range • Travel cycle calculation

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↓

Calculation of the relevant application data
- Travel diagram
- Rotational speeds
- Static, dynamic torques
- Regenerative power

↓

Gear unit selection
- Define gear unit size, gear unit ratio and gear unit type
- Check positioning accuracy
- Check gear unit utilization
- Check input speed

↓

Motor selection
- Maximum torque
- With dynamic drives: effective torque at medium speed
- Maximum speed
- Observe dynamic and thermal torque curves
- Motor equipment (brake, plug connector, thermal motor protection, etc.)

↓

Selecting the frequency inverter
- Specify control mode
- Check motor/inverter assignment
- Specify PWM frequency
- Check if the frequency inverters fulfill the duration and overload requirements

↓

Selecting the braking resistor
- Check if the braking resistor fulfills the duration and overload requirements
- Observe braking resistor assignment

↓

Selection of other system components
- Option cards
- Motor and supply system cables
- Signal and encoder cables
- EMC measures

↓

24 V voltage supply selection
- Determine the current demand of the 24 V voltage supply
- Observe the requirements for the voltage tolerance

↓

Ensure that all requirements have been met.

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10.4 Drive selection

For drive selection, in addition to the travel diagram that describes the exact travel cycle, a large number of additional specifications must be made about the operating and ambient conditions.

It is first necessary to have data for the machine to be driven such as mass, setting range, speed, information about the mechanical design and so on in order to select the drive correctly. The appropriate drive can be determined with the calculated torques and speeds of the drive while taking other mechanical requirements such as environmental and operating conditions into account.

For selecting the drive, a decision is to be taken if an asynchronous motor or a synchronous motor is to be used. The extensive product range of SEW-EURODRIVE is available for this purpose.

10.5 Recommendations for motor and inverter selection

The basis for motor selection are the limit characteristic curves of the motors in inverter operation. The limit characteristic curve states the torque characteristic of the motor depending on the speed.

The dynamic and thermal limits must be observed when selecting the motor.

10.5.1 Thermal limit characteristic curve

The mean motor speed and the effective torque are calculated during drive selection to determine the thermal utilization of the motor. The operating point of the motor must lie below the thermal limit characteristic curve of the motor; otherwise the motor will be thermally overloaded.

10.5.2 Dynamic limit characteristic curve

The dynamic limit characteristic curve depicts the maximum torque the motor can generate at a certain speed. Note that the inverter must supply sufficient current for the motor to reach its maximum torque.

The base speed is especially important for configuration. The base speed is the available speed up to the maximum motor torque. In inverter operation, the base speed indicates the beginning of field weakening. The motor torque is limited by the voltage limit characteristic curve in the field-weakening range, and decreases with increasing speed.

M_N is determined by the motor. M_{max} and n_{base} depend on the motor/inverter combination. For the values for M_{max} and n_{base} in control modes VFC^{PLUS}, CFC, and ELSM®, refer to the motor selection tables in chapter "Motor/inverter assignment".

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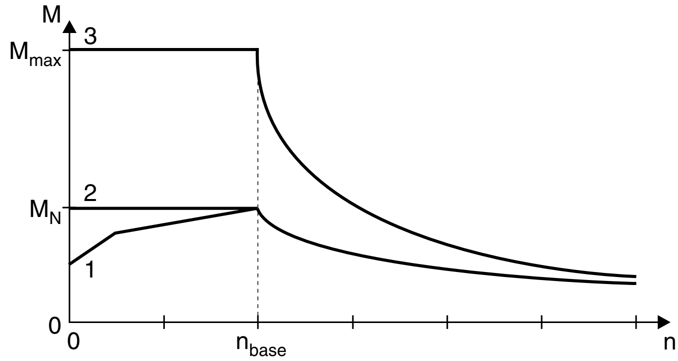
Typical characteristic curve of asynchronous motors



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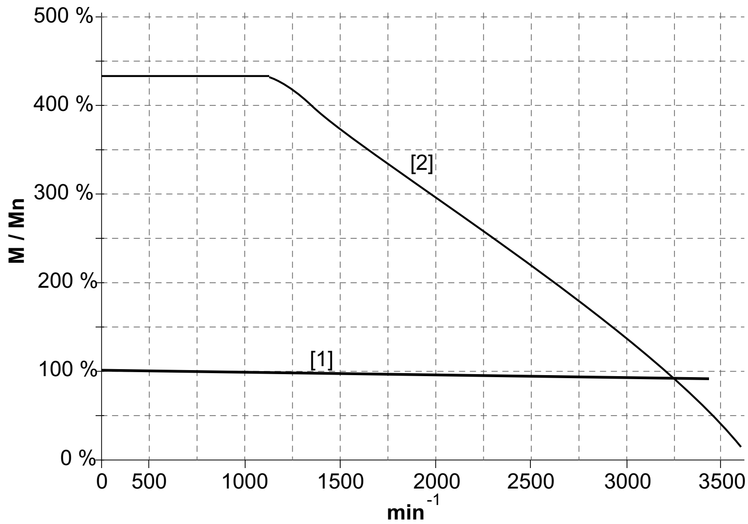
[1] S1 operation with self-cooling

[2] S1 operation with external cooling

[3] Mechanical limit for gearmotors

Typical characteristic curve of synchronous motors



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[1] Thermal limit characteristic curve S1 operation

[2] Dynamic limit torque

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10.5.3 Motor selection for asynchronous motors

The mechanical resistance of the motor against the overload, which might exceed the permitted limit values, must be strictly checked.

M_{pk} and n_{base} depend on the motor/inverter combination, as well as on the used control mode.

Asynchronous motors are mainly operated in control mode VFC^{PLUS}. The control mode efficiently adjusts the motor magnetization to the respective operating point. It simultaneously allows for dynamic responses to load shocks at the drive train.

10.5.4 Asynchronous motors in control mode VFC^{PLUS}

The control mode VFC^{PLUS} without encoder allows for dynamic use of the entire speed range of the drive. Reversing and moving through the rotational speed 0 are also possible.

However, continuous operation of asynchronous motors without encoder at low speeds is not possible. The minimum speeds that must not be permanently undercut during operation without encoder are:

- Motor mode: 1% of the asynchronous motor nominal speed.
- Regenerative operation: 10% of the asynchronous motor nominal speed.

INFORMATION

Lifting application with encoder

The control must be designed in such a way that the direction of rotation of the drive can only be reversed when it is at a standstill (with the brake applied).

If the direction of rotation should be changed without standstill, a motor encoder must be used.

The described restrictions do not apply in control mode VFC^{PLUS} with encoder. In comparison to operation without encoder, higher dynamic properties can be achieved with an encoder.

When determining the maximum speed, observe that the breakdown torque M_K is reduced in an quadratic relationship in the field weakening range.

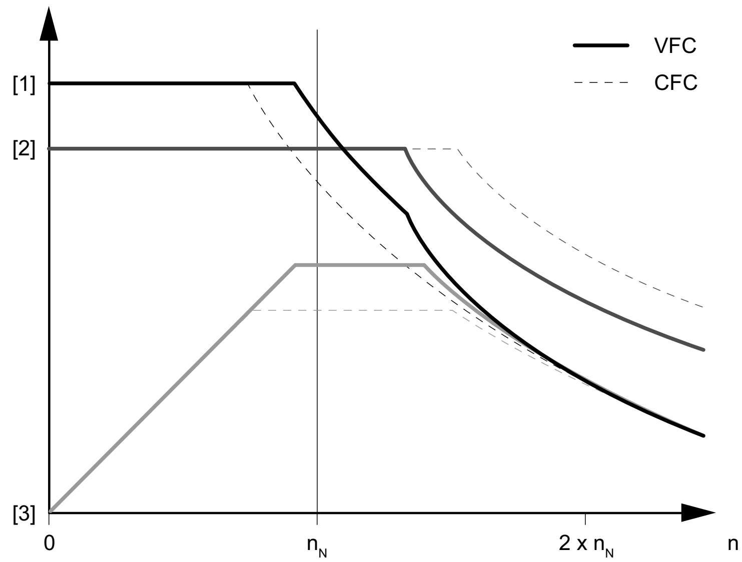
10.5.5 Asynchronous motors in control mode CFC

Either standard asynchronous motors (e.g. DRN.. motors) or asynchronous servomotors (e.g. DRL.. motors) can be used in control mode CFC. SEW-EURODRIVE recommends using asynchronous servomotors to achieve optimum benefit from the advantages of the control mode CFC.

Standard asynchronous motors in control mode CFC

In comparison to control mode VFC^PLUS, higher dynamic properties can be achieved using CFC. The full motor magnetization is maintained in each operating state, so that the highest requirements for dynamics are met. Due to the voltage reserves required for this, standard asynchronous motors are operated with a lower base speed in this operating mode than in operating mode VFC^PLUS. Power yield and energy efficiency are thus lower.

Speed/torque characteristic for VFC^PLUS and CFC in comparison.



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[1]	Torque	[2]	Current	[3]	Power rating

10.5.6 Synchronous servomotors in control mode CFC

In general, synchronous servomotors and the corresponding inverters are designed for a high short-time overload capacity. This allows a multiple of the nominal torque.

When using the following CMP.. motors in the higher speed ranges, it is recommended to only set the PWM frequencies 8 kHz or 16 kHz.

- CMP40 – 63 for speed class 6000 min^{-1},
- CMP71 – 100 for speed classes 4500 min^{-1} and 6000 min^{-1}.

SEW-EURODRIVE recommends the use of the following temperature sensors:

- KTY84 – 130 (SEW-EURODRIVE designation: KY/KTY)
- Pt1000 (SEW-EURODRIVE designation: PK)

10.5.7 Synchronous servomotors in control mode ELSM®

The control mode ELSM® allows for dynamic use of the entire speed range of the drive. Reversing and moving through the speed 0 are also possible. The speed must not permanently drop below the minimum speed of approx. 2% of the nominal motor speed.

The nominal output current of the inverter must not be lower than 1.5 × I_0 of the connected motor.

The maximum speed must not be dimensioned higher than the rated speed of the motor.

SEW-EURODRIVE recommends the use of the following temperature sensors:

- KTY84 – 130 (SEW-EURODRIVE designation: KY/KTY)
- Pt1000 (SEW-EURODRIVE designation: PK)

Using the ELSM® control mode for hoists and inclining tracks is not permitted.

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10.6 Motor/inverter assignments

The following motor/inverter assignments are valid for MOVIMOT® flexible.

10.6.1 Technical data DR.. motors

Key

P_N	Rated power
M_N	Rated torque
n_N	Rated speed
I_N	Rated current
cosφ	Power factor
IE	Short for "International Efficiency" (international efficiency class IE1 – IE4)
$\eta_{50\%}$	Efficiency at 50% of the rated power
$\eta_{75\%}$	Efficiency at 75% of the rated power
$\eta_{100\%}$	Efficiency at 100% of the rated power
I_A/I_N	Starting current ratio
M_A/M_N	Starting torque ratio
M_H/M_N	Ramp-up torque ratio
M_K/M_N	Breakdown torque ratio
m	Mass of the motor
J_{Mot}	Mass moment of inertia of the motor
BE..	Brake used
Z_0 BG	Switching frequency for operation with BG brake control
Z_0 BGE	Switching frequency for operation with BGE brake control
M_B	Braking torque
m_B	Mass of the brakemotor
J_{MOT_BE}	Mass moment of inertia of the brakemotor

IE1 DR2S.. motors. 400 V, 50 Hz, 4-pole

Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_{N2} 400 V A	cosφ	$η_{50\%}$ %	$η_{75\%}$ %	$η_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S56MR4[1)]	0.09	0.62	1380	0.35	0.61	43.9	51.4	54.8	3.0	2.8 2.8	2.9
DR2S56M4[1)]	0.12	0.89	1290	0.39	0.74	48.8	53.8	53.3	2.7	2.0 2.0	2.0
DR2S63MSR4	0.12	0.83	1380	0.4	0.64	55.6	61.0	61.9	3.6	2.7 2.6	2.7
DR2S63MS4	0.18	1.29	1330	0.59	0.71	52.1	57.1	57.0	2.9	2.0 2.0	2.1
DR2S63M4	0.25	1.79	1330	0.78	0.70	59.0	62.5	61.5	3.4	2.3 2.3	2.3
DR2S71MS4	0.37	2.6	1350	1.05	0.73	66.0	68.0	66.0	3.6	2.0 1.8	2.0
DR2S71M4	0.55	3.85	1360	1.52	0.72	69.6	71.7	70.0	4.1	2.4 2.2	2.4
DR2S80MK4	0.75	5.1	1410	1.81	0.76	73.6	75.9	75.3	5.2	2.4 2.0	2.6
DR2S80M4	1.1	7.4	1415	2.45	0.80	79.5	80.3	78.9	5.5	2.5 2.1	2.7

1) DR2S56.. motors will be available from spring 2019.

Further information for motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S56MR4[1)]	0.09	0.62	1380	[2)]	1.1	BE02	10000 -	0.8	[2)]	1.2
DR2S56M4[1)]	0.12	0.89	1290	[2)]	1.1	BE02	10000 -	1.2	[2)]	1.2
DR2S63MSR4	0.12	0.83	1380	4.9	2.95	BE03	10000 10000	1.7	6.8	3.63
DR2S63MS4	0.18	1.29	1330	4.9	2.95	BE03	10000 10000	2.7	6.8	3.63
DR2S63M4	0.25	1.79	1330	5.8	3.76	BE03	10000 10000	3.4	7.6	4.44
DR2S71MS4	0.37	2.6	1350	6.8	5.42	BE05	6200 9700	5	9.2	6.72
DR2S71M4	0.55	3.85	1360	8	7.14	BE1	5000 9000	10	11	8.44
DR2S80MK4	0.75	5.1	1410	11	17.1	BE1	3500 8500	10	14	18.6
DR2S80M4	1.1	7.4	1415	14	24.7	BE2	3200 8200	20	18	29.2

1) DR2S56.. motors will be available from spring 2019.

2) Only available as gearmotor

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IE3 DRN.. motors, 400 V, 50 Hz, 4-pole

Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$η_{50\%}$ %	$η_{75\%}$ %	$η_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.83	1380	0.4	0.64	58.3	63.9	64.8	3.6	2.7 2.6	2.7
DRN63M4	0.18	1.25	1375	0.57	0.65	65.1	69.4	69.9	3.7	2.6 2.6	2.6
DRN71MS4	0.25	1.7	1405	0.72	0.66	70.1	73.5	73.5	4.3	2.5 2.3	2.5
DRN71M4	0.37	2.5	1415	1.02	0.66	74.3	77.3	77.3	4.8	2.8 2.4	2.8
DRN80MK4	0.55	3.65	1435	1.29	0.75	78.6	81.0	80.8	6.1	2.7 2.1	3.1
DRN80M4	0.75	4.95	1440	1.75	0.74	80.7	82.9	82.9	6.7	3.1 2.7	3.4
DRN90S4	1.1	7.2	1455	2.55	0.73	83.5	85.0	84.5	6.9	2.7 2.1	3.3
DRN90L4	1.5	9.8	1461	3.4	0.74	84.6	86.1	85.6	7.5	2.7 2.0	3.3
DRN100LS4	2.2	14.5	1450	4.75	0.76	86.4	87.5	86.9	7.1	2.9 2.2	3.3
DRN100L4	3	19.7	1456	6.8	0.76	87.3	88.3	87.8	8.2	3.4 2.3	3.7

Further information on motors and brakemotors

Motor	P_N kW	M_N Nm	n_N 1/min	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE 1/h	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN63MS4	0.12	0.83	1380	4.9	2.95	BE03	1000 1000	1.7	6.8	3.63
DRN63M4	0.18	1.25	1375	5.8	3.76	BE03	1000 1000	2.7	7.6	4.44
DRN71MS4	0.25	1.7	1405	6.8	5.42	BE03	6200 9700	3.4	8.6	6.11
DRN71M4	0.37	2.5	1415	8	7.14	BE05	5000 9000	5	10	8.44
DRN80MK4	0.55	3.65	1435	11	17.1	BE1	3500 8500	7	14	18.6
DRN80M4	0.75	4.95	1440	14	24.7	BE1	3200 8200	10	18	26.2
DRN90S4	1.1	7.2	1455	20	54	BE2	2300 6000	14	24	58.7
DRN90L4	1.5	9.8	1461	23	67.2	BE2	2200 5800	20	27	71.9
DRN100LS4	2.2	14.5	1450	27	81.4	BE5	– 6100	28	33	87.4
DRN100L4	3	19.7	1456	34	112	BE5	– 3700	40	40	118

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10.6.2 Motor/inverter assignments DR2S motors, f_{PWM} = 4 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{eck}	Base speed of the motor

MOVIMOT® flexible – 400 V, 50 Hz, VFC^PLUS^

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
DR2S56MR4	M_{pk}	Nm	1.81				
	n_{base}	min^{-1}	744				
	I_{max}	%	31				
DR2S56M4	M_{pk}	Nm	1.78				
	n_{base}	min^{-1}	726				
	I_{max}	%	31				
DR2S63MSR4	M_{pk}	Nm	2.25				
	n_{base}	min^{-1}	925				
	I_{max}	%	41				
DR2S63MS4	M_{pk}	Nm	2.7				
	n_{base}	min^{-1}	858				
	I_{max}	%	49				
DR2S63M4	M_{pk}	Nm	4.15				
	n_{base}	min^{-1}	842				
	I_{max}	%	72				
DR2S71MS4	M_{pk}	Nm	5.19				
	n_{base}	min^{-1}	997				
	I_{max}	%	91				
DR2S71M4	M_{pk}	Nm	9.29				
	n_{base}	min^{-1}	927				
	I_{max}	%	151				
DR2S80MK4	M_{pk}	Nm	13.2				
	n_{base}	min^{-1}	1010				
	I_{max}	%	219				
DR2S80M4	M_{pk}	Nm	20	20			
	n_{base}	min^{-1}	1011	1032			
	I_{max}	%	300	257			

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10.6.3 Motor/inverter assignments DRN.. motors, f_{PWM} = 4 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{eck}	Base speed of the motor

MOVIMOT® flexible – 400 V, 50 Hz, VFC^{PLUS}

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
DRN63MS4	M_{pk}	Nm	2.25				
	n_{base}	min^{-1}	925				
	I_{max}	%	41				
DRN63M4	M_{pk}	Nm	3.25				
	n_{base}	min^{-1}	953				
	I_{max}	%	58				
DRN71MS4 (180 W)	M_{pk}	Nm	4.3				
	n_{base}	min^{-1}	1089				
	I_{max}	%	70				
DRN71MS4 (250 W)	M_{pk}	Nm	4.25				
	n_{base}	min^{-1}	1105				
	I_{max}	%	72				
DRN71M4	M_{pk}	Nm	6.99				
	n_{base}	min^{-1}	1078				
	I_{max}	%	111				
DRN80MK4	M_{pk}	Nm	11.3				
	n_{base}	min^{-1}	1076				
	I_{max}	%	182				
DRN80M4	M_{pk}	Nm	16.9				
	n_{base}	min^{-1}	1021				
	I_{max}	%	260				
DRN90S4	M_{pk}	Nm	21.7	24	24		
	n_{base}	min^{-1}	1140	1141	1141		
	I_{max}	%	300	274	214		
DRN90L4	M_{pk}	Nm			32.5	32.5	
	n_{base}	min^{-1}			1148	1148	
	I_{max}	%			291	233	
DRN100L4	M_{pk}	Nm					60.6
	n_{base}	min^{-1}					1142
	I_{max}	%					300
DRN100LS4	M_{pk}	Nm				43.6	48
	n_{base}	min^{-1}				1121	1101
	I_{max}	%				300	242

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10.6.4 Technical data of CMP.. motors

Key

n_N	Rated speed
M_0	Standstill torque (thermal continuous torque at low speeds)
I_0	Standstill current
M_{pk}	Dynamic limit torque
I_{max}	Maximum permitted motor current
M_{0VR}	Standstill torque with forced cooling fan
I_{0VR}	Standstill current with forced cooling fan
J_{mot}	Mass moment of inertia of the motor
J_{bmot}	Mass moment of inertia of the brakemotor
$M_{1m,100°C}$	Maximum dynamic braking torque in case of emergency off
M_{1max}	Minimal averaged dynamic braking torque in case of emergency off at 100 °C
$M_{2,\ 20\ °C}$	Nominal torque for slipping brake disk (relative speed between brake disk and friction surface: 1 m/s) at 20 °C
$M_{4,100\ °C}$	Minimum holding torque at 100 °C
W_{max1}	Maximum permitted braking work per braking operation
W_{max2}	Maximum permitted braking work per braking operation with optional braking torque
L_1	Inductance between connection phase and star point
R_1	Resistance between connection phase and star point
V_{p0} cold	Internal voltage at 1000 min^{-1}
m_{mot}	Mass of the motor
m_{bmot}	Mass of the brakemotor

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CMP40 – CMP112, 400 V system voltage

n_N	Motor	M_0	I_0	M_{pk}	I_{max}	M_{0VR}	I_{0VR}	m	J_{mot}
min^{-1}		Nm	A	Nm	A	Nm	A	kg	10^{-4} kgm^2
2000	CMP71S	6.4	3.4	19.2	17	8.7	4.6	7	3.04
	CMP71M	9.4	5	30.8	26	13.7	7.3	8.4	4.08
	CMP80S	13.4	6.9	42.1	33	18.7	9.5	12.8	8.78
3000	CMP40S	0.5	1.2	1.9	6.1	–	–	1.3	0.1
	CMP40M	0.8	0.95	3.8	6.0	–	–	1.6	0.15
	CMP50S	1.3	0.96	5.2	5.1	1.7	1.25	2.3	0.42
	CMP50M	2.4	1.68	10.3	9.6	3.5	2.45	3.3	0.67
	CMP50L	3.3	2.2	15.4	13.6	4.8	3.2	4.1	0.92
	CMP63S	2.9	2.15	11.1	12.9	4	3	4.0	1.15
	CMP63M	5.3	3.6	21.4	21.6	7.5	5.1	5.7	1.92
	CMP63L	7.1	4.95	30.4	29.7	10.3	7.2	7.5	2.69
	CMP71S	6.4	4.9	19.2	25	8.7	6.7	7	3.04
4500	CMP40S	0.5	1.2	1.9	6.1	–	–	1.3	0.1
	CMP40M	0.8	0.95	3.8	6.0	–	–	1.6	0.15
	CMP50S	1.3	1.32	5.2	7.0	1.7	1.7	2.3	0.42
	CMP50M	2.4	2.3	10.3	13.1	3.5	3.35	3.3	0.67
	CMP50L	3.3	3.15	15.4	19.5	4.8	4.6	4.1	0.92
	CMP63S	2.9	3.05	11.1	18.3	4	4.2	4.0	1.15
	CMP63M	5.3	5.4	21.4	32.4	7.5	7.6	5.7	1.92
	CMP71S	6.4	7.3	19.2	38	8.7	9.9	7	3.04
6000	CMP40S	0.5	1.2	1.9	6.1	–	–	1.3	0.1
	CMP40M	0.8	1.1	3.8	6.9	–	–	1.6	0.15
	CMP50S	1.3	1.7	5.2	9.0	1.7	2.2	2.3	0.42
	CMP50M	2.4	3	10.3	17.1	3.5	4.4	3.3	0.67
	CMP50L	3.3	4.2	15.4	26	4.8	6.1	4.1	0.92
	CMP63S	2.9	3.9	11.1	23.4	4	5.4	4.0	1.15
	CMP63L	7.1	9.3	30.4	55.8	10.3	13.5	7.5	2.69
	CMP71S	6.4	9.6	19.2	50	8.7	13.1	7	3.04

10.6.5 Motor/inverter assignments CMP.. motors, 400 V, f_{PWM} = 4 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{eck}	Base speed of the motor

MOVIMOT® flexible – 400 V, rated speed 2000 min^{-1}, f_{PWM} = 4 kHz, non-ventilated

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP71S	M_{pk}	Nm	10.9	13	15.3	17.2	19
	n_N	min^{-1}	1648	1496	1354	1243	1089
	I_{max}	%	300	300	300	300	300
CMP71M	M_{pk}	Nm			17	20.3	25
	n_N	min^{-1}			1620	1458	1295
	I_{max}	%			300	300	300
CMP71L	M_{pk}	Nm				23.9	31.4
	n_N	min^{-1}				1749	1509
	I_{max}	%				300	300
CMP80S	M_{pk}	Nm					29.9
	n_N	min^{-1}					1463
	I_{max}	%					300

MOVIMOT® flexible – 400 V, rated speed 3000 min^{-1}, f_{PWM} = 4 kHz, non-ventilated

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP40S	M_{pk}	Nm	1.89	1.9			
	n_N	min^{-1}	4157	4124			
	I_{max}	%	300	242			
CMP40M	M_{pk}	Nm	3.8				
	n_N	min^{-1}	937				
	I_{max}	%	298				
CMP50S	M_{pk}	Nm	5.2				
	n_N	min^{-1}	713				
	I_{max}	%	256				
CMP50M	M_{pk}	Nm	7.56	8.88	10.3		
	n_N	min^{-1}	1795	1468	1069		
	I_{max}	%	300	300	299		
CMP50L	M_{pk}	Nm	8.51	10.3	12.4	14.4	15.4
	n_N	min^{-1}	2067	1775	1437	1107	908
	I_{max}	%	300	300	300	300	246
CMP63S	M_{pk}	Nm	7.08	8.27	9.61	10.8	11.1
	n_N	min^{-1}	2179	1894	1578	1280	1174
	I_{max}	%	300	300	300	300	235
CMP63M	M_{pk}	Nm		10.5	12.8	15.2	18.7
	n_N	min^{-1}		2451	2173	1915	1550
	I_{max}	%		300	300	300	300
CMP63L	M_{pk}	Nm			13.4	16.2	20.9
	n_N	min^{-1}			2750	2504	2132
	I_{max}	%			300	300	300
CMP71S	M_{pk}	Nm			11.7	13.8	16.7
	n_N	min^{-1}			2415	2217	1993
	I_{max}	%			300	300	300
CMP71M	M_{pk}	Nm					19.1
	n_N	min^{-1}					2328
	I_{max}	%					300

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MOVIMOT® flexible – 400 V, rated speed 4500 min^{-1}, f_{PWM} = 4 kHz, non-ventilated (in preparation)

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP40S	M_{pk}	Nm	1.89	1.9			
	n_N	min^{-1}	4157	4124			
	I_{max}	%	300	242			
CMP40M	M_{pk}	Nm	3.8				
	n_N	min^{-1}	937				
	I_{max}	%	298				
CMP50S	M_{pk}	Nm	4.72	5.2			
	n_N	min^{-1}	2159	1818			
	I_{max}	%	300	283			
CMP50M	M_{pk}	Nm	5.89	7.07	8.51	9.83	10.3
	n_N	min^{-1}	3315	2943	2522	2140	1995
	I_{max}	%	300	300	300	300	237
CMP50L	M_{pk}	Nm	6.13	7.5	9.29	11.1	14
	n_N	min^{-1}	3884	3543	3135	2756	2217
	I_{max}	%	300	300	300	300	300
CMP63S	M_{pk}	Nm	5.42	6.47	7.74	8.95	10.6
	n_N	min^{-1}	3900	3530	3113	2746	2250
	I_{max}	%	300	300	300	300	300
CMP63M	M_{pk}	Nm			9.24	11.1	14.3
	n_N	min^{-1}			4127	3795	3284
	I_{max}	%			300	300	300
CMP63L	M_{pk}	Nm				12.1	15.9
	n_N	min^{-1}				4160	3703
	I_{max}	%				300	300

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10.6.6 Motor/inverter assignments CMP.. motors, 400 V, f_{PWM} = 8 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{eck}	Base speed of the motor

MOVIMOT® flexible – 400 V, rated speed 2000 min^{-1}, f_{PWM} = 8 kHz, non-ventilated

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP71S	M_{pk}	Nm	10.9	13	15.3	17.2	19
	n_N	min^{-1}	1648	1496	1354	1243	1089
	I_{max}	%	300	300	300	300	300
CMP71M	M_{pk}	Nm			17	20.3	25
	n_N	min^{-1}			1620	1458	1295
	I_{max}	%			300	300	300
CMP71L	M_{pk}	Nm				23.9	31.4
	n_N	min^{-1}				1749	1509
	I_{max}	%				300	300
CMP80S	M_{pk}	Nm					29.9
	n_N	min^{-1}					1463
	I_{max}	%					300

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MOVIMOT® flexible – 400 V, rated speed 3000 min^{-1}, f_{PWM} = 8 kHz, non-ventilated

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP40S	M_{pk}	Nm	1.89	1.9			
	n_N	min^{-1}	4157	4124			
	I_{max}	%	300	242			
CMP40M	M_{pk}	Nm	3.8				
	n_N	min^{-1}	937				
	I_{max}	%	298				
CMP50S	M_{pk}	Nm	5.2				
	n_N	min^{-1}	713				
	I_{max}	%	256				
CMP50M	M_{pk}	Nm	7.56	8.88	10.3		
	n_N	min^{-1}	1795	1468	1069		
	I_{max}	%	300	300	299		
CMP50L	M_{pk}	Nm	8.51	10.3	12.4	14.4	15.4
	n_N	min^{-1}	2067	1775	1437	1107	908
	I_{max}	%	300	300	300	300	246
CMP63S	M_{pk}	Nm	7.08	8.27	9.61	10.8	11.1
	n_N	min^{-1}	2179	1834	1578	1280	1174
	I_{max}	%	300	300	300	300	235
CMP63M	M_{pk}	Nm		10.5	12.8	15.2	18.7
	n_N	min^{-1}		2451	2173	1915	1550
	I_{max}	%		300	300	300	300
CMP63L	M_{pk}	Nm			13.4	16.2	20.9
	n_N	min^{-1}			2750	2504	2132
	I_{max}	%			300	300	300
CMP71S	M_{pk}	Nm			11.7	13.8	16.7
	n_N	min^{-1}			2415	2217	1993
	I_{max}	%			300	300	300
CMP71M	M_{pk}	Nm					19.1
	n_N	min^{-1}					2328
	I_{max}	%					300

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MOVIMOT® flexible – 400 V, rated speed 4500 min^{-1}, f_{PWM} = 8 kHz, non-ventilated (in preparation)

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP40S	M_{pk}	Nm	1.89	1.9			
	n_N	min^{-1}	4157	4124			
	I_{max}	%	300	242			
CMP40M	M_{pk}	Nm	3.8				
	n_N	min^{-1}	937				
	I_{max}	%	298				
CMP50S	M_{pk}	Nm	4.72	5.2			
	n_N	min^{-1}	2159	1818			
	I_{max}	%	300	283			
CMP50M	M_{pk}	Nm	5.89	7.07	8.51	9.83	10.3
	n_N	min^{-1}	3315	2943	2522	2140	1995
	I_{max}	%	300	300	300	300	237
CMP50L	M_{pk}	Nm	6.13	7.5	9.29	11.1	14
	n_N	min^{-1}	3884	3543	3135	2756	2217
	I_{max}	%	300	300	300	300	300
CMP63S	M_{pk}	Nm	5.42	6.47	7.74	8.95	10.6
	n_N	min^{-1}	3900	3530	3113	2746	2250
	I_{max}	%	300	300	300	300	300
CMP63M	M_{pk}	Nm			9.24	11.1	14.3
	n_N	min^{-1}			4127	3795	3284
	I_{max}	%			300	300	300
CMP63L	M_{pk}	Nm				12.1	15.9
	n_N	min^{-1}				4160	3703
	I_{max}	%				300	300
CMP71S	M_{pk}	Nm					13.1
	n_N	min^{-1}					3473
	I_{max}	%					300

MOVIMOT® flexible – 400 V, rated speed 6000 min^{-1}, f_{PWM} = 8 kHz, non-ventilated (in preparation)

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
CMP40S	M_{pk}	Nm	1.89	1.9			
	n_N	min^{-1}	4157	4124			
	I_{max}	%	300	242			
CMP40M	M_{pk}	Nm	3.51	3.8			
	n_N	min^{-1}	2089	1629			
	I_{max}	%	300	277			
CMP50S	M_{pk}	Nm	3.97	4.63	5.2		
	n_N	min^{-1}	3710	3204	2766		
	I_{max}	%	300	300	285		
CMP50M	M_{pk}	Nm	4.64	5.65	6.93	8.22	10.1
	n_N	min^{-1}	5077	4645	4131	3658	2998
	I_{max}	%	300	300	300	300	300
CMP50L	M_{pk}	Nm		5.77	7.23	8.79	11.4
	n_N	min^{-1}		5513	5053	4593	3914
	I_{max}	%		300	300	300	300
CMP63S	M_{pk}	Nm		5.33	6.48	7.63	9.36
	n_N	min^{-1}		5145	4634	4161	3517
	I_{max}	%		300	300	300	300
CMP63M	M_{pk}	Nm				9	11.7
	n_N	min^{-1}				5464	4862
	I_{max}	%				300	300
CMP63L	M_{pk}	Nm					12.3
	n_N	min^{-1}					5646
	I_{max}	%					300
CMP71S	M_{pk}	Nm					10.6
	n_N	min^{-1}					5102
	I_{max}	%					300

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10.6.7 Technical data MOVIGEAR® classic

Key

J_{mot}	Mass moment of inertia of the motor
n_N	Rated speed
n_{max}	Maximum permitted speed
PK limit	Maximum permitted motor temperature measured on PK
U_N	Nominal voltage
M_0	Standstill torque (thermal continuous torque at low speeds)
I_0	Standstill current
V_{p0} cold	Internal voltage
C_T	Torque constant
R_1	Resistance between connection phase and star point
L_1	Inductance between connection phase and star point
f_N	Frequency at rated speed
eff	Motor efficiency

MOVIGEAR® classic, 400 V, connection type of motor: ⅄

For the permitted values for I_{max}, refer to chapter "Technical data and dimension sheets" > "Permitted currents, speeds and torques" in the "MOVIGEAR® classic MGF..-DSM-C drive unit" operating instructions.

Motor	J_{mot}	n_N	n_{max}	PK limit	U_N	M_0	I_0	V_{p0} cold	V_{p0} cold	C_T	R_1	L_1	Number of poles Motor	f_N	eff
	kgm² × 10^{-4}	min^{-1}	min^{-1}	°C	V	Nm	A	V/ 1000 min^{-1}	V/ 2000 min^{-1}	Nm/A	Ω	mH		Hz	%
MGF..1-DSM-C	1.38	2000	2000	150	400	2.1	1.11	141	282	1.89	14.7	31.8	8	133.3	81.2 ≙ IE5
MGF..2-DSM-C	7.64	2000	2000	150	400	4.5	1.93	155	310	2.33	4.86	17.4	8	133.3	88.7 ≙ IE5
MGF..4-DSM-C	23.30	2000	2000	150	400	10	3.94	168	336	2.54	1.03	12.7	8	133.3	93.0 ≙ IE5
MGF..4-DSM-C/XT	30.4	2000	2000	150	400	14.3	5.2	181	362	2.75	0,796	10.3	8	133.3	93.7 ≙ IE5

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10.6.8 Motor/inverter assignments MOVIGEAR® classic, 400 V, f_{PWM} = 4/8 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{eck}	Base speed of the motor

MOVIGEAR® classic – 400 V, rated speed 2000 min^{-1}, f_{PWM} = 4/8 kHz, non-ventilated

Inverter			0020	0025	0032	0040	0055
	I_N	A	2	2.5	3.2	4	5.5
	I_{max}	A	6	7.5	9.6	12	16.5
Motor							
MGF..1-DSM-C	M_{pk}	Nm	6.3				
	n_N	min^{-1}	1646				
	I_{max}	%	166				
MGF..2-DSM-C	M_{pk}	Nm	13.5				
	n_N	min^{-1}	1726				
	I_{max}	%	286				
MGF..4-DSM-C	M_{pk}	Nm		19.2	24.2	30	
	n_N	min^{-1}		1904	1802	1670	
	I_{max}	%		300	300	300	
MGF..4-DSM-C/XT	M_{pk}	Nm			26	32.1	42.9
	n_N	min^{-1}			1787	1700	1530
	I_{max}	%			300	300	300

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10.7 Selecting an inverter

The selection of the inverter is based on the course of the output current over time. The required current has to be determined from the required torque characteristic of the connected motor.

The inverters are dimensioned for a nominal output current I_N. In many applications, there is a demand for short-time overload operation. For this purpose, the inverters can be operated with up to 300% of the nominal output current for a short period of time.

For overload operation, make sure that the inverter is not thermally overloaded. For protection of the power components, inverters have various monitoring mechanisms.

The following thermal monitoring functions are available:

- Dynamic utilization

  The periodic current load of the switching power semiconductors lets them heat and cool down cyclically. Due to the different thermal time constants, large temperature differences can occur between power semiconductor and heat sink. Dynamic utilization monitors the permitted temperature of the barrier layer of the power semiconductors.

- Thermal capacity utilization

  The power semiconductors are limited by the maximally permitted temperature during operation. Thermal utilization monitors the heat sink temperature of the power semiconductors.

- Electromechanical utilization (I^2t utilization)

  Electromechanical utilization protects the components that have a large thermal time constant compared to the power semiconductors.

Due to the complexity of the utilization curves, the calculation can only be performed using software. The SEW-Workbench project planning software offers supports for dimensioning an inverter.

For a rough selection of the inverter without using the project planning software, characteristic load cycles are given in the following section.

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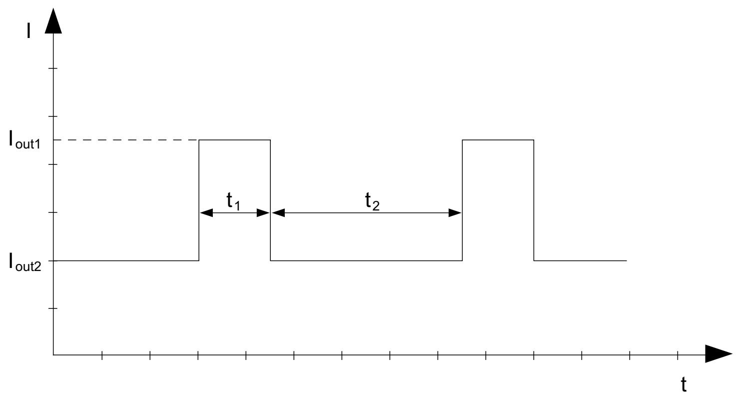
10.7.1 Overload capacity

Load cycle with base load current – typical for the selection of asynchronous and servomotors

The characteristic load cycle consists of a load and a load relief period. In the load relief period, the output current must not exceed the specified value. After this load relief period, overload is possible again.



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Overload capacity at f_{PWM} = 4 kHz, f_A ≥ 3 Hz

Overload current $I_{out\,1}/I_N$	Overload time t_1	Base load current $I_{out\,2}/I_N$	Required pause interval t_2
200%	3 s	50%	7 s
200%	3 s	100%	17 s
150%	60 s	100%	60 s
150%	60 s	50%	30 s

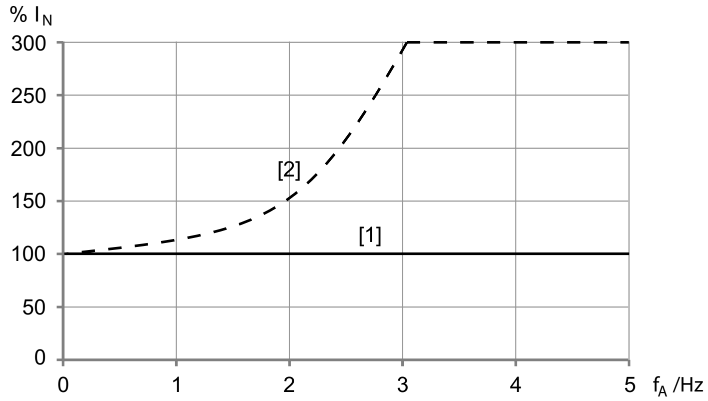
10.7.2 Derating

Due to the following operating and ambient conditions, a reduction of the output current may be necessary.

Derating due to the rotary field frequency

The specified nominal output current I_N of the inverter is the rms value. The increased load on the power semiconductors has to be considered especially for slow rotating fields and rotating fields at standstill. In case of a rotating field at standstill, direct current that can correspond to the peak value of the sine current depending on the phase position is flowing.

It is particularly important to consider output frequencies f_A < 3 Hz.



31277066635

[1] Continuous output current at f_{PWM} = 4 kHz
[2] Temporary overload current

Derating depending on the installation altitude

Observe the derating according to chapter "Mechanical installation" > "Setting up the device" > "Derating depending on the installation altitude".

Derating depending on the ambient temperature

Also observe derating as specified in chapter "Technical data and dimension sheets" > "Technical data" > "Derating factors" > "Derating depending on the ambient temperature".

10.8 Selecting the braking resistor

10.8.1 Information on ambient temperature

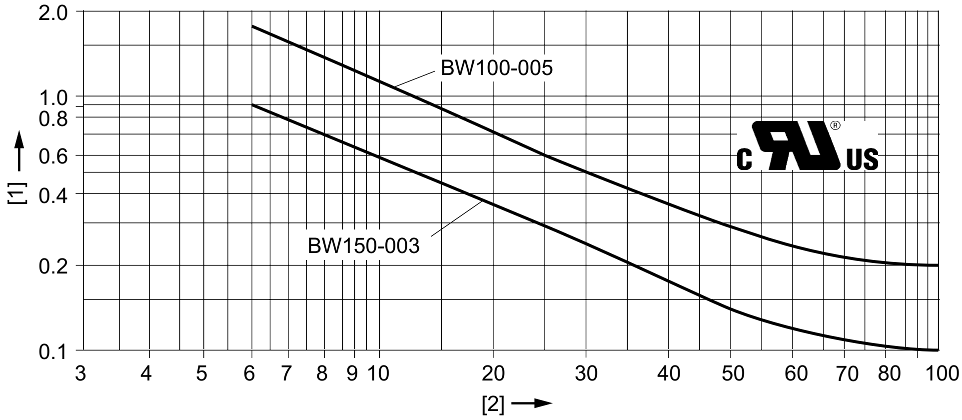
For ambient temperatures of more than +40 °C, the continuous power must be reduced by 4% for every 10 K. The tripping current must be reduced by 2% for every 10 K.

Do not exceed a maximum ambient temperature of 80 °C.

10.8.2 Technical data of BW100-005/K-1.5 and BW150-003/K-1.5

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW100-005/K-1.5, BW150-003/K-1.5:



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[1] Power in KW
[2] Cyclic duration factor cdf in %

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10.8.3 Selection criteria

The selection of the braking resistor takes place via the SEW-Workbench. The required selection parameters for the braking resistor are calculated during the project planning procedure. Depending on these selection parameters, a braking resistor is selected from the table.

The following selection parameters are the basis for selecting the braking resistor.

Continuous braking power

The minimum required continuous braking power (braking power at 100% cdf) of the braking resistor for load cycles can be calculated using the relative cyclic duration factor cdf and the overload factor k.

If the cyclic duration factor cdf is unknown, it can be calculated from the cycle duration t_{tot} and the braking time t_B using the following formula:

$$ED = \frac{t_B}{t_{tot}}$$

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ED Cyclic duration factor
t_B Braking time
t_{tot} Cycle duration

INFORMATION

The cycle duration must not exceed 120 s.

The overload factor OF can be determined using the diagrams in chapter "Overload factor OF" and the cyclic duration factor cdf.

The value of the average braking power P_B is taken from the project planning data of the application:

$$P_B = \frac{|P_1| \times t_1 + |P_2| \times t_2 + ... + |P_n| \times t_n}{t_1 + t_2 + ... + t_n}$$

20179436555

P_B Average braking power
P_n Braking power section n
t_n Braking time section n

The minimum required braking power at 100% cdf is calculated using the following formula:

$$P_{100\%ED} = \frac{P_B}{k}$$

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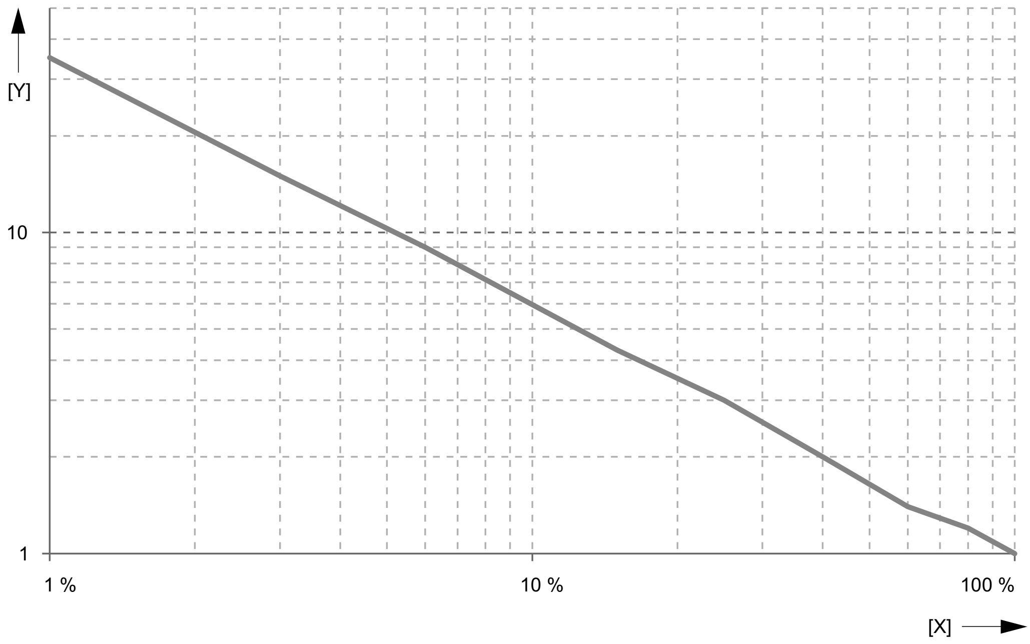
$P_{100\%cdf}$ Braking power at 100% cdf
P_B Average braking power
k Overload factor

The braking power required by the application at 100% cdf must be smaller than or equal to the typical braking power at 100% cdf (continuous braking power) of the braking resistor.

Overload factor OF

Flatpack resistors



20532478731

..% ED	1	3	6	15	25	40	60	80	100
OF	35	15	9	4.3	3	2	1.4	1.2	1

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Peak braking power

The maximum permitted peak braking power is specified by the resistance value and the DC link voltage.

The maximum peak braking power required by the application is calculated from the regenerative parts within a cycle.

The peak braking power required by the application must be lower than the maximum permitted peak braking power of the braking resistor.

The permitted peak braking power of the braking resistor is calculated as follows:

$$P_{\max} = \frac{U_{ZK\,max}^{2}}{R \times 1.4}$$

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P_{max} Maximum peak braking power that the braking resistor can absorb
U_{DCL_max} Maximum DC link voltage
R Braking resistance value

The peak braking power for each braking resistor is specified in chapter "Braking resistors".

Current-carrying capacity of the brake chopper

The resistance value of the braking resistor R_{BR} must not be lower than the minimum permitted braking resistance R_{BRmin}. This ensures that the brake chopper is not damaged.

$$R_{BR} \geq R_{BRmin}$$

The continuous braking power toward the braking resistor must not exceed the apparent output power of the frequency inverter.

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10.8.4 Calculation example

Given

- Peak braking power: 1 kW
- Average braking power: 0.4 kW
- Braking time: 7 s
- Cycle duration: 28 s

Required

- Braking resistor BW...

Calculation

1. **Determining the cyclic duration factor**
   - Cyclic duration factor cdf = braking time/cycle duration
   - Cyclic duration factor cdf = (7 s/28 s) × 100% = 25%

   When selecting the braking resistor, observe the assignment of inverter and braking resistor, see chapter "Technical data and dimension sheers" > "Braking resistors".
2. **Determine the overload capacity**

   Determining the overload factor, e.g. for a flatpack resistor at a cyclic duration factor cdf of 25% from the respective diagram.
   - Overload factor OF = 3.0
3. **Calculating the braking power at 100% cdf**
   - Braking power 100% cdf = average braking power/overload factor
   - Braking power 100% ED = 0.4 W/3.0 = 0.133 kW
   - The braking power of the braking resistor at 100% cdf must be ≥ 0,133 kW.
4. **Selecting the braking resistor**
   - For MOVIMOT® flexible, the minimum permitted braking resistance value = 100 Ω, see chapter "Technical data and dimension sheets".
   - Selected braking resistor: BW100-005/K1.5
   - Resistance value R_{BW} = 100 Ω
   - Peak braking power: 1.8 kW
   - Current-carrying capacity at 100% cdf: 0.2 kW

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10.8.5 Supply cable for braking resistor

Use only shielded cables.

The cable cross section depends on the tripping current I_F.

The nominal voltage of the cable must amount to at least V_0/V = 300 V / 500 V.

10.8.6 Protection against thermal overload of the braking resistor

To avoid thermal damage of the braking resistor as well as subsequent damage, the braking resistor has to be thermally monitored. SEW-EURODRIVE suggests the following options:

- TCB thermal circuit breaker

  The TCB thermal circuit breaker is installed in the control cabinet, connected to the supply cable to the braking resistor and set to the tripping current of the braking resistor. If the measured mean current exceeds the tripping current, an NC contact switches and reports an overload of the braking resistor. The connection of braking resistor and inverter is separated simultaneously, thus ending the generator mode.

- Integrated temperature switch –T

  Braking resistors with the label –T are equipped with an integrated temperature switch. The temperature switch is thermally coupled to the braking resistor and switches an NC contact in case of overtemperature of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated. SEW-EURODRIVE recommends shielding the connection cable of the temperature switch.

- Thermal overload relay

  A thermal overload relay is installed in the control cabinet, connected to the supply cable to the braking resistor and set to the tripping current of the braking resistor. If the measured mean current exceeds the tripping current, an NC contact switches and reports an overload of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated.

10.8.7 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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11 Technical data and dimension sheets

11.1 Conformity

11.1.1 CE marking

- Low voltage directive:

  The documented device series fulfills the regulations of the low voltage directive 2014/35/EU.

- Electromagnetic compatibility (EMC):

  The devices are designed for use as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives". Provided that the installation notes are followed, the requirements for CE marking of the entire machine/system equipped with these units on the basis of the EMC Directive 2014/30/EU are met. For detailed information about EMC-compliant installation, refer to the publication "Electromagnetic Compatibility in Drive Technology" from SEW-EURODRIVE.

The CE mark on the nameplate represents conformity with the low voltage directive 2014/35/EU and the EMC directive 2014/30/EU.

11.1.2 UL approval (in preparation)

The certification mark UL Listed on the nameplate confirms the UL and cUL approval (USA). cUL is equal to the approval according to CSA.

11.1.3 EAC (in preparation)

The documented device series fulfills the requirements of the technical regulations of the Customs Union of Russia, Kazakhstan, and Belarus.

The EAC marking on the nameplate certifies the conformity with the safety requirements of the Custom Union.

11.1.4 UkrSEPRO (Ukrainian Certification of Products)

The UkrSEPRO mark on the nameplate certifies adherence to the technical regulations of Ukraine for the documented unit series.

11.1.5 RCM approval

The RCM approval has been granted for the documented unit series.

The RCM mark on the nameplate certifies the conformity with ACMA (Australian Communication and Media Authority).

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11.2 General information

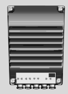
11.2.1 Air admission and accessibility

When installing the driven machine, make sure there is enough space in axial and radial direction for a sufficient supply of cooling air and unobstructed heat dissipation.

11.3 Technical data

11.3.1 General technical data

Input

MOVIMOT® flexible flange size electronics cover		**MMF.1..**				
Sizes of the electronics cover		**Size 1 without cooling fins** 			**Size 1 with cooling fins** 	
Type of electronics cover		**DFC...-0020...**	**DFC...-0025...**	**DFC...-0032...**	**DFC...-0040...**	**DFC...-0055...**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Nominal supply voltage AC (to EN 50160)	U_{line}	3 × AC 380 V – 500 V				
Nominal line current	I_{line}	1.8 A	2.25 A	2.88 A	3.6 A	4.95 A
	I_{max}	5.4 A	6.75 A	8.64 A	10.8 A	14.85 A
Line frequency	f_{line}	50 – 60 Hz ± 10%				

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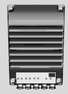
Output

MOVIMOT® flexible flange size electronics cover		MMF.1..				
Sizes of the electronics cover		**Size 1 without cooling fins** 			**Size 1 with cooling fins** 	
Type of electronics cover		**DFC...-0020...**	**DFC...-0025...**	**DFC...-0032...**	**DFC...-0040...**	**DFC...-0055...**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Motor power asynchronous motor	P_{Mot}	0.55 kW	0.75 kW	1.1 kW	1.5 kW	2.2 kW
Output voltage	U_A	0 – U_{line}				
Nominal output current f_{PWM} = 4 kHz	I_N	2.0 A	2.5 A	3.2 A	4.0 A	5.5 A
Apparent output power	S_N	1.4 kVA	1.7 kVA	2.2 kVA	2.8 kVA	3.8 kVA
Overload capacity of I_N at f_{PWM} = 4 kHz		300%			f_{aus} < 3 Hz: 220% $f_{aus} \geq$ 3 Hz: 300%	
PWM frequency	f_{PWM}	4/8/16 kHz (adjustable)				
Max. output frequency	f_{max}	U/f: 599 Hz VFC^{PLUS}: 250 Hz CFC: 500 Hz ELSM®: 500 Hz				
Max. permitted cable length		15 m				

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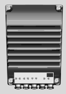
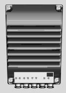
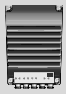
Brake chopper and braking resistor

MOVIMOT® flexible flange size electronics cover		MMF.1..				
Sizes of the electronics cover		**Size 1 without cooling fins** 			**Size 1 with cooling fins** 	
Type of electronics cover		**DFC...-0020...**	**DFC...-0025...**	**DFC...-0032...**	**DFC...-0040...**	**DFC...-0055...**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Minimum braking resistance	R_{BWmin}	100 Ω				
Brake chopper Continuous power		550 W	750 W	900 W	900 W	900 W
Brake chopper Peak power		300% × apparent output power S_N × 0.9				225% S_N × 0.9

Installation location

MOVIMOT® flexible flange size electronics cover		MMF.1..				
Sizes of the electronics cover		**Size 1 without cooling fins** 			**Size 1 with cooling fins** 	
Type of electronics cover		**DFC...-0020...**	**DFC...-0025...**	**DFC...-0032...**	**DFC...-0040...**	**DFC...-0055...**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Ambient temperature		See chapter "Environmental conditions"				
Degree of protection	IP	Standard: IP65 according to EN 60529 (housing closed and all cable bushings sealed)				
Pollution class		2 in accordance with IEC 60664-1				
Overvoltage category		III in accordance with IEC 60664-1				
Installation altitude	h	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 adhere to 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**.				
Proof of mechanical strength		**MMF1.**: 3M7/5M2 according to DIN EN 60721-3-3/-5 **MMF3.**: 3M5/5M1 according to DIN EN 60721-3-3/-5				

General

MOVIMOT® flexible flange size electronics cover		**MMF.1..**				
Sizes of the electronics cover		**Size 1 without cooling fins** 			**Size 1 with cooling fins** 	
Type of electronics cover		**DFC...-0020...**	**DFC...-0025...**	**DFC...-0032...**	**DFC...-0040...**	**DFC...-0055...**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Power section Nominal power loss	P_V	19 W	24 W	31 W	40 W	58 W
Permitted number of times power may be switched on/off		1 × per minute				
Minimum switch-off time for Power off		10 s				
Duty type		S1, DB according to EN 60034-1				
Type of cooling		Natural cooling to DIN 41751 and EN 61800-5-1				
Signaling functions		Display elements on the housing to indicate the device state				
Required preventive measure		Grounding the device				
Current carrying capacity of terminals		See chapter "Current carrying capacity of the terminals". For more information, refer to chapter "Electrical installation" > "Installation instructions" > "Permitted cable cross section of terminals"				
Interference immunity		EN 61800-3; 2. Environment (industrial environment)				
Interference emission		EN 61800-3 category C3 (with IT systems, **no** EMC category is specified)				
Mass		MMF1. = 3.5 kg MMF3. = 5.0 kg			MMF1. = 4.0 kg MMF3. = 5.5 kg	

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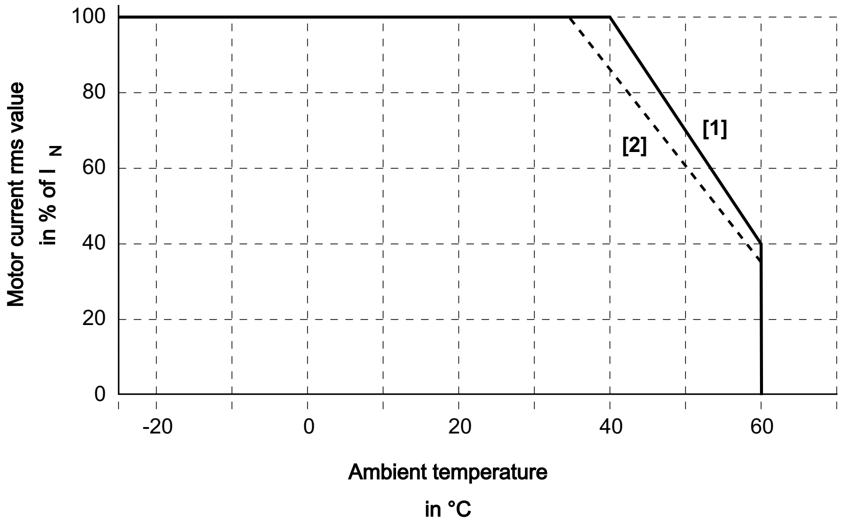
11.3.2 Environmental conditions

Environmental conditions	
Climatic conditions	• Extended storage: EN 60721-3-1 class 1K2 ambient temperature -25 °C to +70 °C • Transportation: EN 60721-3-2 class 2K3 ambient temperature -25 °C to +70 °C • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3K3 ambient temperature -25 °C to +60 °C Non-condensing, no moisture condensation. $I_{N\ motor}$ reduction: 3% I_N per K at 40 °C to 60 °C
Chemically active substances	• Extended storage: EN 60721-3-1 class 1C2 • Transportation: EN 60721-3-2 class 2C2 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3C2
Mechanically active substances	• Extended storage: EN 60721-3-1 class 1S1 • Transportation: EN 60721-3-1 class 2S1 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3S1

11.3.3 Derating factors

Derating depending on the ambient temperature

The following figure shows the $I_{N\ motor}$ reduction depending on the ambient temperature:



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[1] 3% I_N per K at 40 °C to 60 °C
[2] 2.5% I_N per K at 35 °C to 60 °C
Only for MOVIMOT® flexible with an electronics cover 5.5 A and option /B (brake control)

Derating depending on the installation altitude

Observe the derating according to chapter "Mechanical installation" > "Setting up the device" > "Derating depending on the installation altitude".

Notes

INFORMATION

Derating is based on typical operating conditions with a supply voltage of 24 V (sensor supply, input voltage of STO input).

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11.3.4 Current carrying capacity of terminals

Current carrying capacity of terminals		
Line terminals	X1	24 A (max. loop-through current)
Control terminals	X9	10 A (max. loop-through current)

11.3.5 DC 24 V supply

Input for the independent backup voltage supply of the electronics		
DC 24 V input	24V_IN	U_{IN} = DC 24 V -10%/+20% according to EN 61131-2
	0V24_IN	Current consumption: $I_E \leq$ 500 mA, typically 100 mA for electronics • Plus up to 100 mA, for sensor supply

11.3.6 DC 24 V output

Internal voltage supply for the sensors		
DC 24 V output **X9**	24V_OUT	U_{OUT} = DC 24 V -10%/+20% according to EN 61131-2
	0V24_OUT	External-voltage-proof and short-circuit proof Permitted output current: $I_{OUT} \leq$ 100 mA

11.3.7 Digital inputs

Digital inputs	
Number of inputs	4
Input type	PLC-compatible according to EN 61131-2 (digital inputs type 3) DI01 – DI04: $R_i \approx$ 4.5 kΩ, sampling cycle ≤ 2 ms Signal level DC +11 to +30 V = "1" = Contact closed DC -3 to +5 V = "0" = Contact open
Sensor/actuator supply	DC 24 V to EN 61131-2, External-voltage-proof and short-circuit proof
Maximum line length	30 m
Permitted total current for internal supply	100 mA (total of all connected sensors/actuators, maximum individual load: 100 mA)
Permitted total current for external supply	100 mA (total of all connected sensors/actuators, maximum individual load: 100 mA)

11.3.8 Relay output

Relay output	
Response time	≤ 15 ms
Contact details	DC 24 V/50 mA (DC 12 according to IEC 60947-5-1) (only SELV or PELV circuits)

11.3.9 Analog input

Analog input	
Number of inputs	1
Input type	Single-ended input (0V24)
Voltage input	V_{in} = DC 0 to +10 V Resolution 11 bit Internal resistance R_i >10 kΩ
Current input	I_{in} = DC 0 – 20 mA or DC 4 – 20 mA (selectable) Resolution 10 bit Internal resistance R_i = 250 Ω
24 V output (24V_OUT)	Can be used to supply the analog input. Permitted output current: 100 mA

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11.3.10 Electronics data – Drive safety functions

The table below shows the technical data for the drive unit relating to the integrated safety technology.

The safe digital inputs comply with type 3 according to IEC 61131-2.

Reference potential for the F_STO_P1 and F_STO_P2 is F_STO_M (contact at terminal X9:11).

		Terminal designation	General electronics data		
Safety contact STO		X9			
Electrical data of inputs F_STO_P1, F_STO_P2			**Minimum**	**Typical**	**Maximum**
Input voltage range		X9:1 and X9:21	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 deactivation of the rotating field			–	1.5 ms	10 ms 2 ms[2)]
Time from connecting the safety voltage until activation of the rotating field			–	–	110 ms

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

2) Only when a safety card by SEW-EURODRIVE is used

11.3.11 Technical data of encoder options /AZ1Z

Encoder option	Single-turn resolution (Position resolution per motor revolution)		Multi-turn resolution (Max. counter for complete motor revolutions)		Interface connection:
/AZ1Z Multiturn absolute encoder	12 bits	4096 inc.	16 bits	32 767 -32 768	MOVILINK® DDI, coaxial

11.3.12 Technical data of the CBG.. keypads

Keypad	**CBG11A**	**CBG21A**
Part number	28232646	28238133
Interfaces	D-sub, 9-pin, female (CAN interface)	
	USB 2.0 mini B, female (PC connection)	
Operating temperature	0 to 60 °C	
Degree of protection	IP40 according to EN 60529	
Dimensions H × W × D	100 × 45 × 20 mm	110 × 65 × 20 mm
Display size H × W	23 × 28.5 mm	37 × 49 mm
Screen diagonal	1.5" (38 mm)	2.4" (61 mm)
Display resolution H × W	64 × 78 pixels	240 × 320 pixels

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11.4 Brake control

INFORMATION

MOVIMOT® flexible has the following brake control types:

- HV brake control (integrated in the electronics cover, duty type option /B)
- DC 24 V brake control (integrated in the connection box of MOVIMOT® flexible, option /BES)

→ If you install an electronics cover with HV brake control onto a MOVIMOT® flexible with DC 24 V brake control, only the DC 24 V brake control is active.

Supported brakes	HV brake control[1)]	DC 24 V brake control[2)]
Brake types	Brakemotors from SEW-EURODRIVE with a 2 or 3-wire AC brake	Brakemotors from SEW-EURODRIVE with a 2-wire DC brake
	Third-party motors with 2 or 3-wire AC brake	Third-party motors with 2-wire DC brake
Nominal voltage of the brake	AC 110 V to AC 500 V	DC 24 V
Holding current of the brake (I_H)	max. 0.6 A	max. 3.0 A

Preferred brakes	HV brake control[1)]	DC 24 V brake control[2)]
Brake types Preferred brakes allow for extended functionality in combination with the HV brake control, see "Functions of the brake control with preferred brakes".	Brake from SEW-EURODRIVE: • BE.. • BZ..	For DC 24 V brake control, no preferred brakes are available.
	With nominal voltage: • AC 120 V • AC 230 V • AC 400 V	

Control modes	HV brake control[1)]	DC 24 V brake control[2)]
Control of the brake	PWM frequency from DC link of the inverter	DC 24 V brake control via integrated /BES brake rectifier. Voltage supply of the integrated /BES brake rectifier must be realized externally using the X1523 plug connector.
	Voltage level of the DC link: DC 540 V to DC 970 V	

Functions of the brake control	HV brake control[1)]	DC 24 V brake control[2)]
Standard functions	Voltage-controlled PWM control	Apply/release brake
	Apply/release brake	

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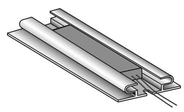
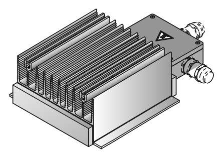
Functions of the brake control	HV brake control[1]	DC 24 V brake control[2]
Functions of the brake control with preferred brakes	Current-controlled PWM control	The integrated /BES brake rectifier does not extend the range of functions.
	Brake is released faster	
	Dissipating the regenerative energy	
	More functions (in preparation)	

1) See duty type /B on the nameplate of the electronics cover.
2) See /BES option on the nameplate of the MOVIMOT® flexible device.

11.5 Braking resistors

11.5.1 Overview

MOVIMOT® flexible is equipped with a brake chopper. The following table shows their possible use in regenerative mode:

Application	Inverter	Dissipation of regenerative energy
		Brake chopper
Small amount of regenerative energy	MOVIMOT® flexible	Integrated braking resistor 
Medium/large amount of regenerative energy	MOVIMOT® flexible	External braking resistor 

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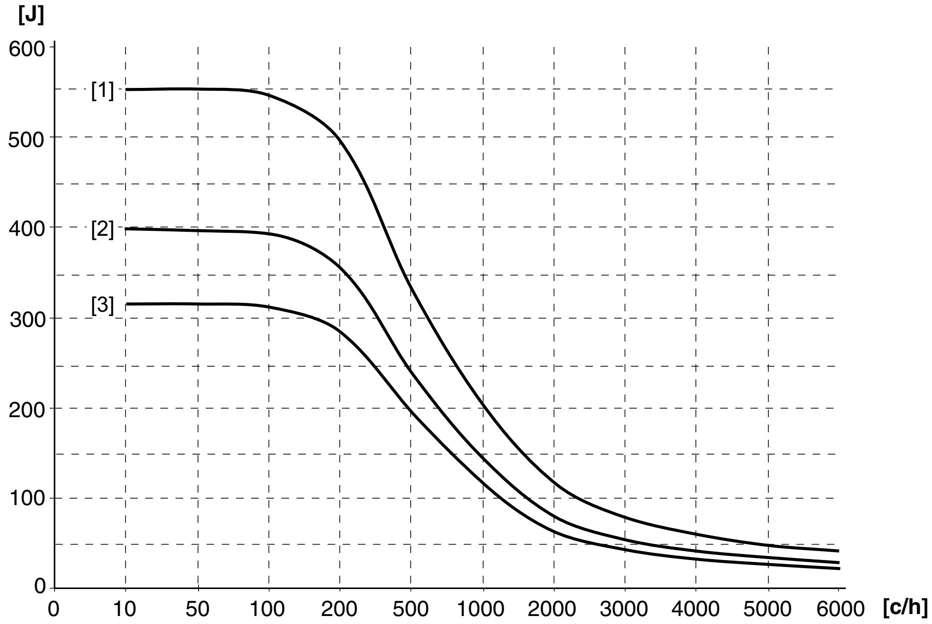
11.5.2 Integrated BW1 braking resistor

The following diagram shows the current-carrying capacity of the BW1 braking resistor per braking operation:



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[1] Deceleration ramp 10 s
[2] Deceleration ramp 4 s
[3] Deceleration ramp 0.2 s
c/h Cycles/hour

Calculation example

The known values are:

- Average braking power: 144 W
- Deceleration ramp: 2 s
- 200 brake applications per hour

Calculating the energy from the power of the deceleration ramp:

$$W = P \times t$$
$$W = 144\ W \times 2\ s$$
$$W = 288\ J$$

25296909835

For the deceleration ramp of 2 s, you can use deceleration ramp [3] (0.2 s) in the diagram. Use the characteristic curve with the shorter deceleration ramp because a shorter deceleration ramp means more braking energy.

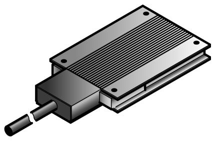
The diagram permits 290 J of braking energy for the 0.2 s deceleration ramp and 200 cycles per hour. In this case, the required 288 J can be dissipated via BW1.

11.5.3 External braking resistor

Operation with external braking resistor is necessary for applications with a large amount of regenerative energy.

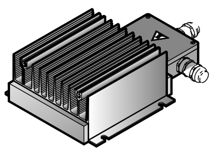
The following table shows the external braking resistors.

BW...-.../K-1.5



Type	BW100-005/K-1.5	BW150-003/K-1.5
Part number	08282862	08282927
Function	Dissipating the regenerative energy	
Degree of protection	IP65	IP65
Resistance	100 Ω	150 Ω
Power rating in S1, 100% cdf	200 W	100 W
Dimensions W × H × D	252 × 15 × 80 mm	146 × 15 × 80 mm
Cable length	1.5 m	1.5 m
Assigned grids	BS-005 (part number: 0813152X)	

BW...-...-T



Type	BW150-006-T	BW100-009-T
Part number	17969565	17969573
Function	Dissipating the regenerative energy	
Degree of protection	IP66	IP66
Resistance	150 Ω	100 Ω
Power rating in S1, 100% cdf	600 W	900 W
Dimensions W × H × D	285 × 75 × 174 mm	435 × 75 × 174 mm
Prescribed connection cables	Shielded cables with a temperature resistance of T_{amb} ≥ 90 °C (194 °F)	
Maximum permitted cable length	15 m	15 m

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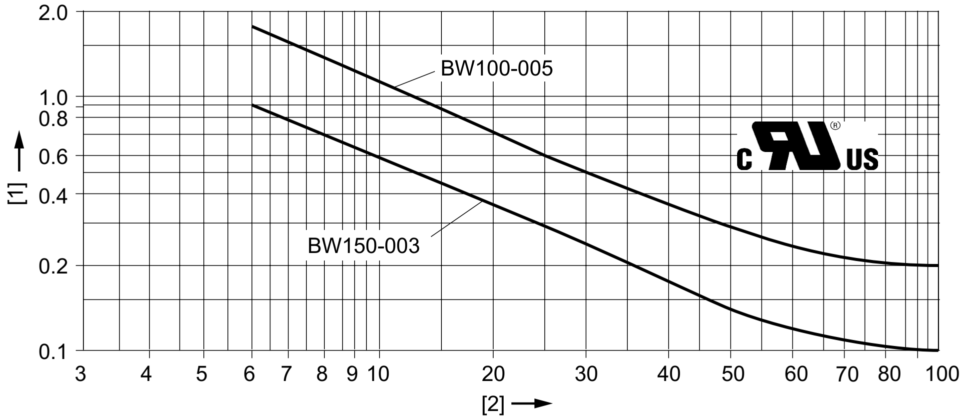
11.5.4 Technical data of BW100-005/K-1.5 and BW150-003/K-1.5

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW100-005/K-1.5, BW150-003/K-1.5:

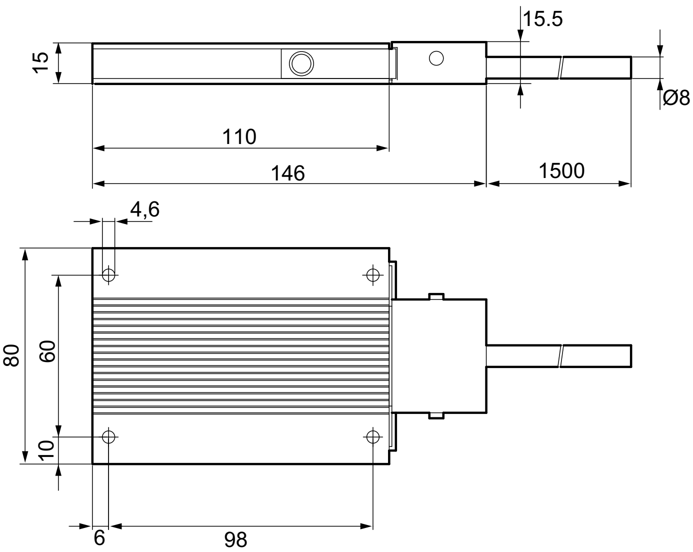


25298658059

[1] Power in KW
[2] Cyclic duration factor cdf in %

Dimension drawing of BW150-003/K-1.5

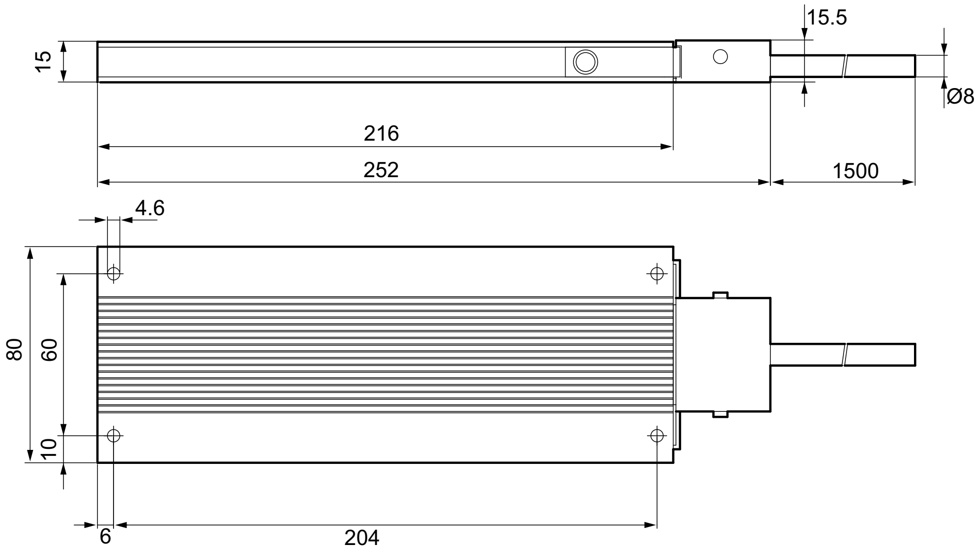
The following figure shows the dimensions of the external braking resistor BW150-003/K-1.5:



25298773259

Dimension drawing of BW100-005/K-1.5

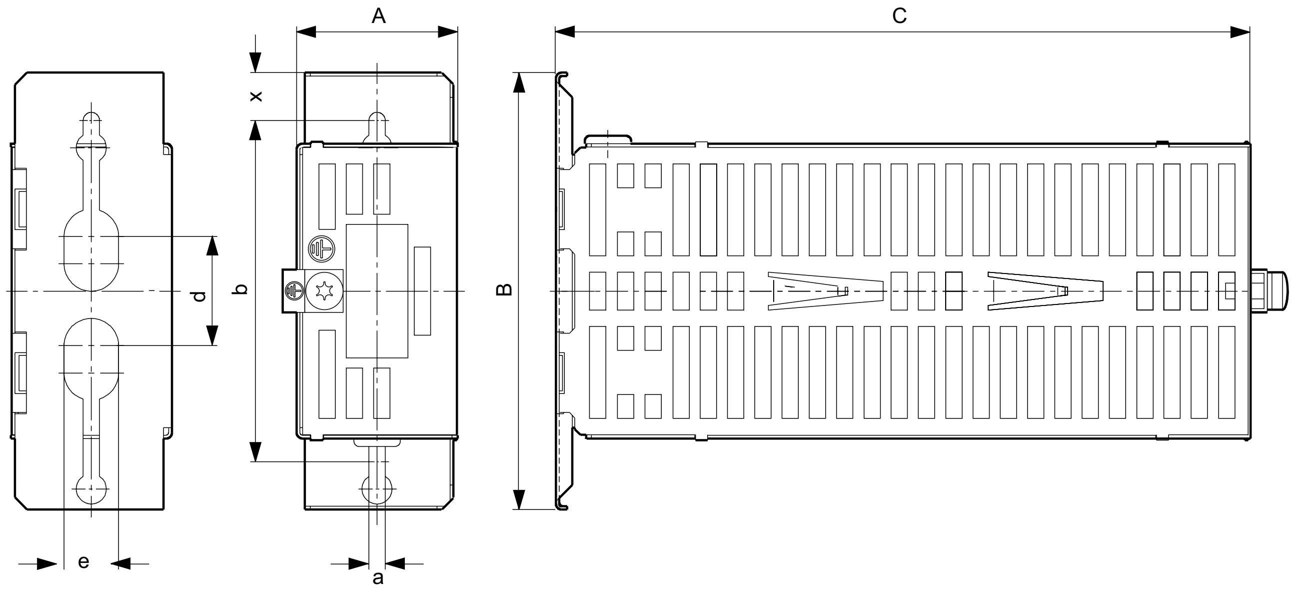
The following figure shows the dimensions of the external braking resistor BW100-005/K-1.5:



25298780043

Dimension drawing for the BS.. protective grid

The following figure shows the dimensions of the BS-005 protective grid:



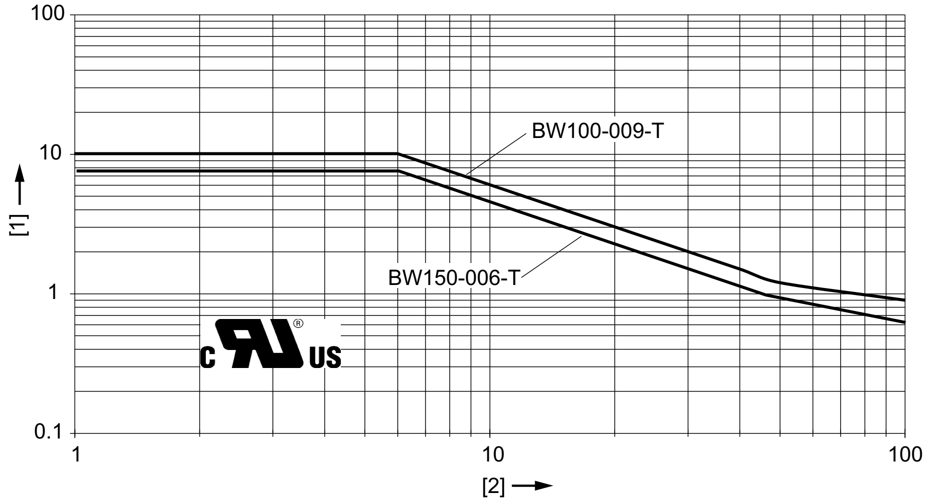
25842294795

Type	Main dimensions in mm			Mounting dimensions mm					Mass kg
	A	B	C	b	d	e	a	x	
BS-005	60	160	252	125	4	20	6	17.5	0.5

11.5.5 Technical data of BW150-006-T and BW100-009-T

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW150-006-T and BW100-009-T:

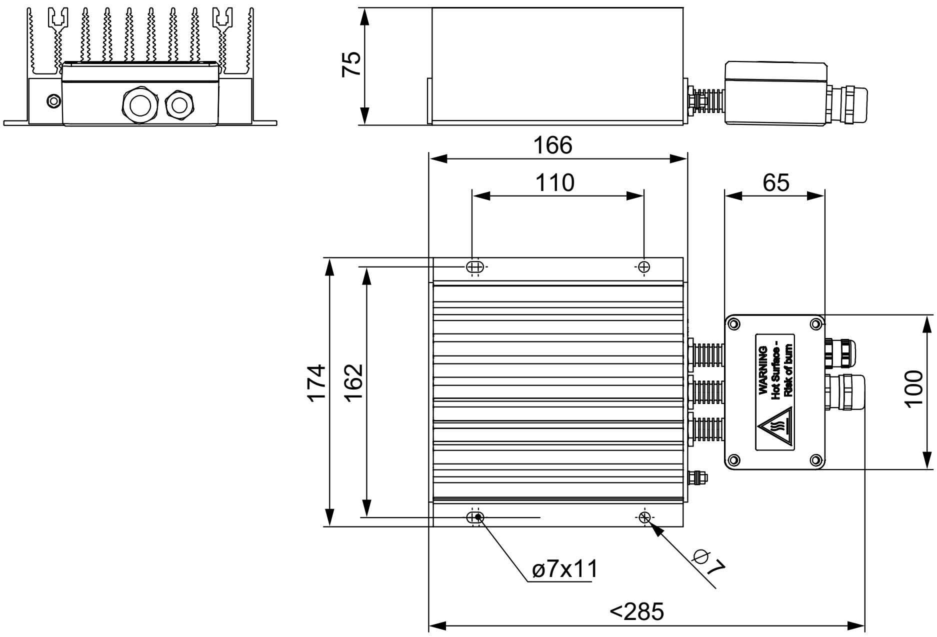


25298798219

[1] Power in KW
[2] Cyclic duration factor cdf in %
ED Cyclic duration factor of the braking resistor, based on a cycle time of 120 s.

Dimension drawing of BW150-006-T

The following figure shows the dimensions of the external braking resistor BW150-006-T:



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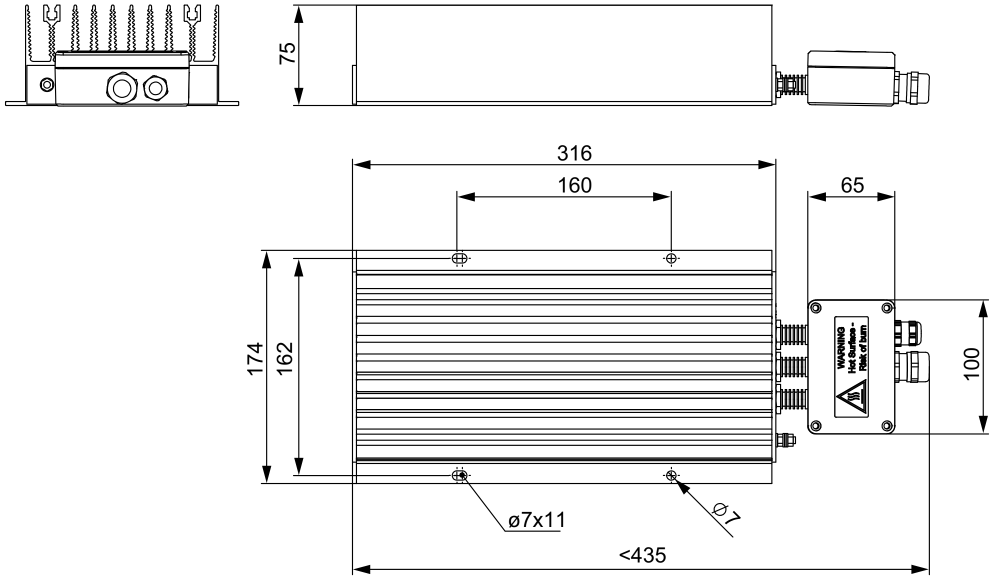
Dimension drawing of BW100-009-T

The following figure shows the dimensions of the external braking resistor BW100-009-T:



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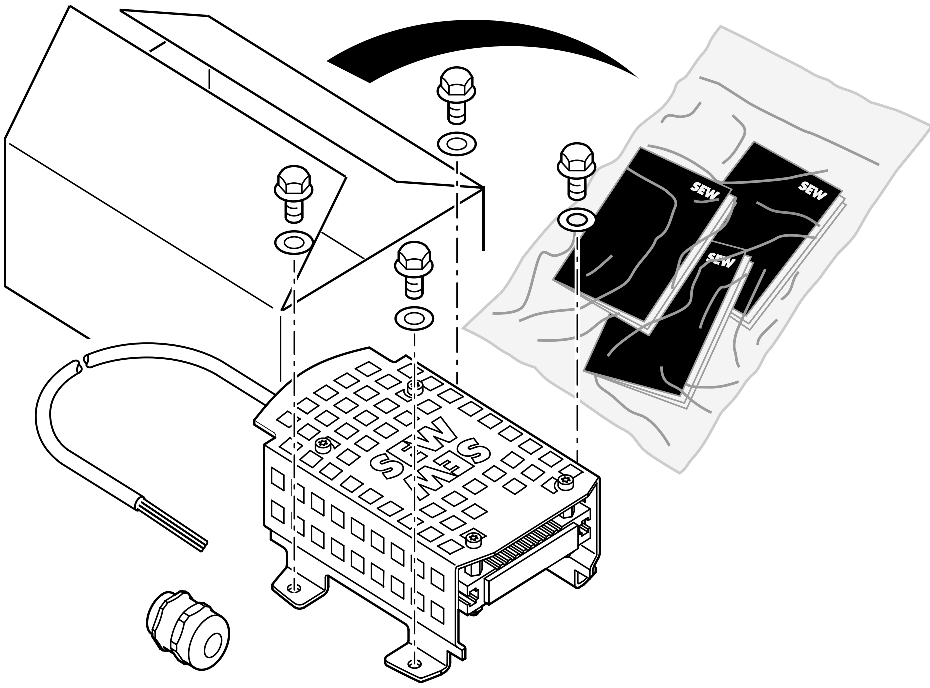
11.6 Mounting kit for braking resistor BW...-.../..C

INFORMATION

- The BW...-.../..C braking resistor must always be mounted and installed by the customer.
- Observe the installation instructions "Braking resistor BW...-.../..C".

The following figure shows the mounting kit for braking resistor BW...-.../..C:



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11.6.1 Assignment

Installation	Mounting kit	
	Part number	Type
Wall mounting	18272886	BW100-001/K-1.5/M2C
	18272908	BW100-002/K-1.5/M2C
	18272894	BW100-001/K-1.5/M4C
	18272916	BW100-002/K-1.5/M4C

11.6.2 Technical data

Type	BW100-001/.../...	BW100-002/.../...
Nominal continuous power at T_{amb}~40 °C	100 W	200 W
Resistance value R_{BW}	100 Ω ±10%	100 Ω ±10%
Design	Flat design	
Connections	3 × AWG 20 l = 150 cm	
Degree of protection (EN 60529)	IP66	
Operating temperature range	-25 °C to +40 °C	
Type of cooling	Natural convection	
Housing temperature at nominal continuous power at T_{amb}~40 °C	< 300 °C	
Conformity	CE/UL/CSA	
Derating at T_U> 40 °C	5% per 10 K to 60 °C	

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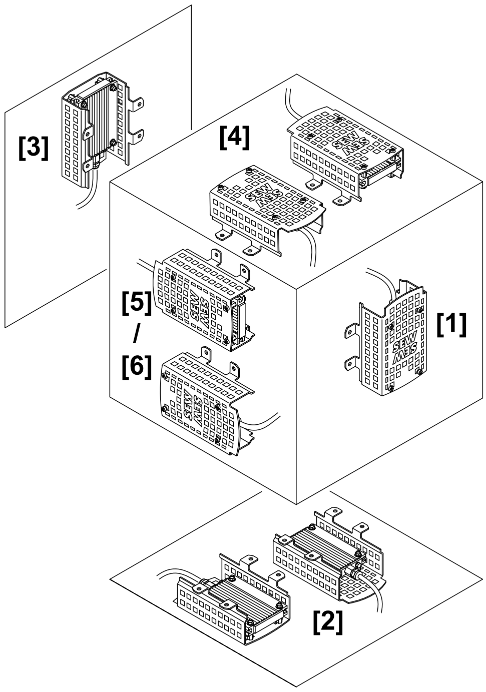
11.6.3 Current-carrying capacity



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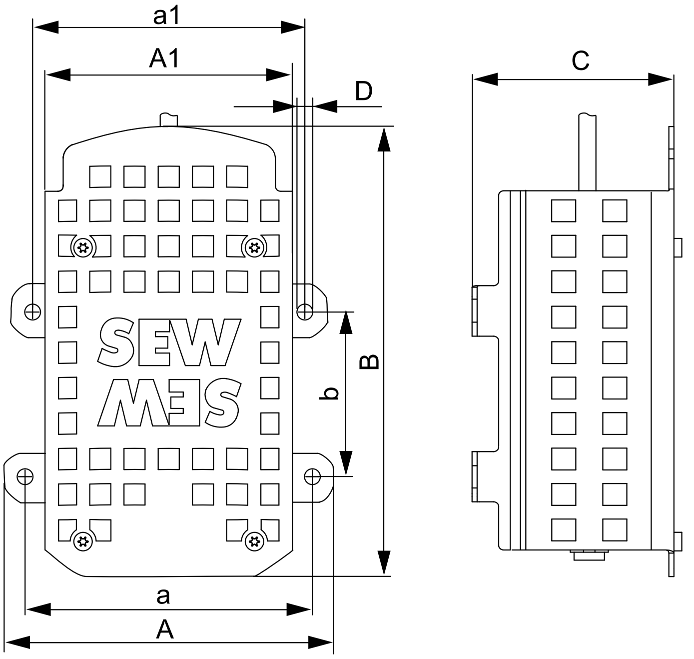
BW100-001/.../...	Current-carrying capacity at % cdf in W				
ED	**[1]**	**[2]**	**[3]**	**[4]**	**[5] / [6]**
100%	100	100	100	100	100
50%	150	150	150	150	150
25%	250	250	250	250	250
12%	300	300	300	300	300
6%	500	500	500	500	500
cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s					

BW100-002/.../...	Current-carrying capacity at % cdf in W				
ED	**[1]**	**[2]**	**[3]**	**[4]**	**[5] / [6]**
100%	200	200	200	160	160
50%	300	300	300	240	240
25%	500	500	500	400	400
12%	600	600	600	480	480
6%	1000	1000	1000	800	800
cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s					

11.6.4 Dimension drawing



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	A	A1	B	C	D	a	a1	b
	mm	mm	mm	mm	mm	mm	mm	mm
18272886 (BW100-001/K-1.5/M2C)	126.0	89.0	148.2	61.8	7	111.0	106.0	54.7
18272908 (BW100-002/K-1.5/M2C)								
18272894 (BW100-001/K-1.5/M4C)	158.0	94.0	149.0	61.8	7	144.0	142.0	82.0
18272916 (BW100-002/K-1.5/M4C)								

11.7 Line choke

The line choke can be used as an option:

- To support overvoltage protection
- To smoothen the line current
- For protection in the event of distorted line voltage
- To limit the charging current, for example, when several inverters are connected together in parallel on the input end (nominal current of line choke = total of nominal input currents)

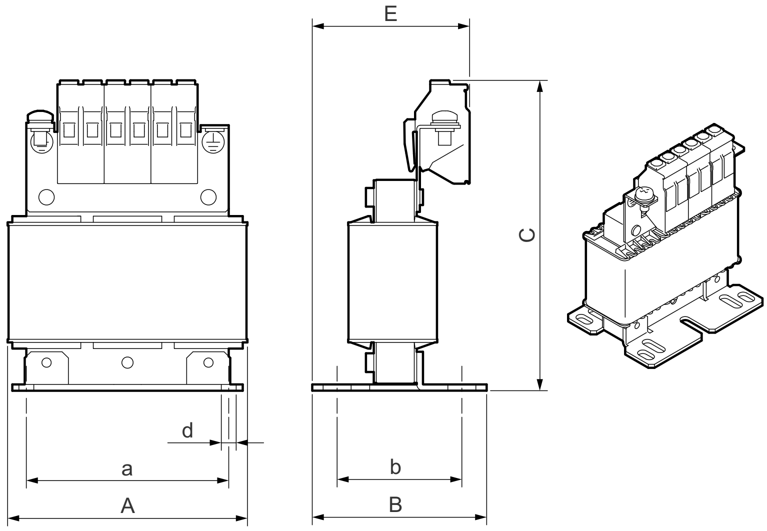
11.7.1 UL and cUL approval

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

11.7.2 Technical data

Line choke	ND0070-503	ND0160-503	ND0300-503	ND0420-503
Part number	17984173	17984181	17983800	17983819
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
Nominal inductance	0.36 mH	0.2 mH	0.1 mH	0.045 mH
Nominal power loss	4 W	9 W	11 W	13 W
Ambient temperature ϑ_{amb}	-10 °C – 45 °C (reduction: 3% I_N up to maximum 60 °C)			
Connection contacts L1/L2/L3 – L1'/L2'/L3'	0.2 – 4 mm^2		0.2 – 10 mm^2	2.5 – 16 mm^2
Tightening torque L1/L2/L3 – L1'/L2'/L3'	0.5 – 1 Nm		1.2 – 2 Nm	2.5 Nm
PE connection contact	M4		M5	
Tightening torque PE	1.5 Nm		3 Nm	
Degree of protection	IPXXB in accordance with EN 60529			
Mass	0.5 kg	1.3 kg	1.95 kg	1.82 kg

11.7.3 Dimension drawing



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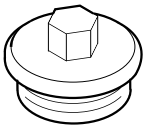
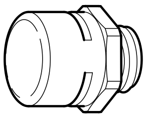
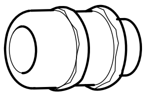
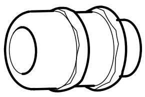
Line choke	Main dimensions in mm				Mounting dimensions in mm			Connection
	A	B	C	E	a	b	d	PE
ND0070-503	78	57	105	56	65	40	4.8	M4
ND0160-503	96	70	120	65	71	54	4.8	M4
ND0300-503	121	86	145	86	105	70	4.8	M5
ND0420-503	121	86	150	90	105	70	4.8	M5

11.8 Screw fittings

The following tables show the screw fittings available from SEW-EURODRIVE:

11.8.1 Cable glands / screw plugs / pressure compensation

Type of screw fitting	Figure	Content	Size	Tightening torque[1)]	Outer cable diameter	Part number
Screw plugs external hexagon (made of stainless steel)		10 pcs	M16 × 1.5	6.8 Nm	–	18247342
		10 pcs	M25 × 1.5	6.8 Nm	–	18247350
Pressure compensation screw fittings (made of stainless steel)		1 piece	M16 × 1.5	4 Nm	–	28214617
EMC cable gland (brass, nickel-plated)		10 pcs	M16 × 1.5	4 Nm	5 to 9 mm	18204783
		10 pcs	M25 × 1.5	7 Nm	11 to 16 mm	18204805
EMC cable gland (made of stainless steel)		10 pcs	M16 × 1.5	4 Nm	5 to 9 mm	18216366
		10 pcs	M25 × 1.5	7 Nm	11 to 16 mm	18216382

1) The specified torques must be adhered to with a tolerance of +/- 10%.

The cable retention in the cable gland must withstand the following removal force of the cable from the cable gland:

- Cable with outer diameter > 10 mm: ≥ 160 N
- Cable with outer diameter < 10 mm: = 100 N

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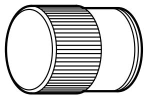
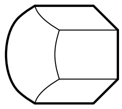
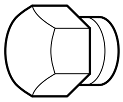
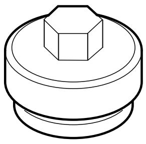
11.8.2 Screw fittings:Plug connectors

Type of screw fitting	Figure	Con-tent	Size	Tighten-ing torque[1)]	Part num-ber
M23 plug (made of stainless steel)		1 piece	M23 × 1.5	Tighten fully	19094558
M12 plug for plug con-nector with male thread (made of stainless steel)		10 pcs	M12 × 1.0	2.3 Nm	18202799
M12 plug for plug con-nector with female thread (made of stain-less steel)		10 pcs	M12 × 1.0	2.3 Nm	18202276

1) The specified torques must be adhered to with a tolerance of +/- 10%.

11.8.3 Screw fittings of the potentiometer

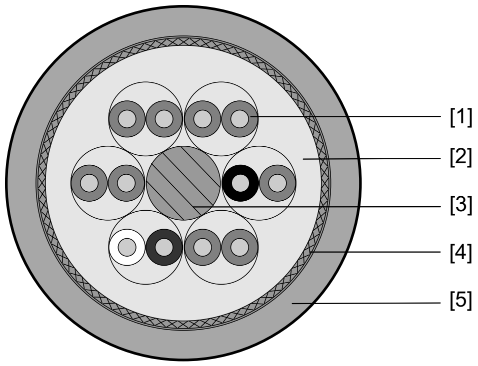
Type of screw fitting	Image	Con-tent	Size	Tighten-ing torque[1)]	Part num-ber
Hexagon head screw plug for potentiometer (stainless steel)		10 piece	M24 × 1.5	6.8 Nm	18241077

1) The specified torques must be adhered to with a tolerance of +/- 10%.

11.9 Connection cables

11.9.1 Specification of signal cables for digital inputs and relay output

Mechanical design

		HELUKABEL® Li9Y91YC11Y-HF
Mechanical design		 *29747895691*
[1]	**Cores**	6 conductor pairs, 2 × 0.25 mm^2 Copper
	Insulation	Polypropylene, 0.24 mm
	Colors	DIN 47100 yellow/green, pink/gray, blue/red, black/purple, pink-and gray/ red and blue, brown/white
[2]	**Inner sheath-ing**	TPE-O, halogen-free
	Color	Nature
[3]	**Filler**	–
[4]	**Shield**	Braided copper wires, tinned optical coverage min. 85%
[5]	**Outer cable jacket**	TPU, halogen-free
	Color	Green, similar to RAL 2018
	Label	SEW EURODRIVE 150665 Li9Y91YC11Y-HF 6x 2 x 0.25QMM E170315 AWM STYLE 20233 AWM I/II A/B 80 °C 300 V FT1 - DESINA - *week/year of production*
	Diameter	**15.6 mm**

Technical data

The following table shows the technical data of the signal cable:

Properties	Type: HELUKABEL® Li9Y91YC11Y-HF SEW EURODRIVE 150665
UL properties	UL758 (AWM) UL Style 20223 (sheath) UL Style 10493 (insulation)
RoHS conformity	Yes
Test voltage core/ core	AC 1.5 kV 50 Hz/1 min.
Test voltage core/ shield	AC 1.5 kV 50 Hz/1 min.
Operating voltage	Max. AC 300 V (UL)
Insulation resistance	≥ 500 MΩ/km
Operating temperature	-50 °C to +80 °C (fixed installation) -30 °C to +80 °C (cable carrier) -20 °C to +60 °C (cable carrier with mechanical load)
Outer diameter	**15.6 mm**
Bending radiuses	Min. 5 × outer diameter (fixed installation)
	Min. 8 × outer diameter (cable carrier)
Bending cycles	Min. 10 million
Acceleration	Max. 20 m/s^2
Torsion	Max. ±30 °/m
Chemical properties	• Oil resistance according to DIN 60811-404, HD 22.10 Appendix A
	• Flame retardant according to IEC 60332-1-2, UL758 cable flame test
	• Halogen-free according to DIN VDE 0472 T.815 • Silicon-free

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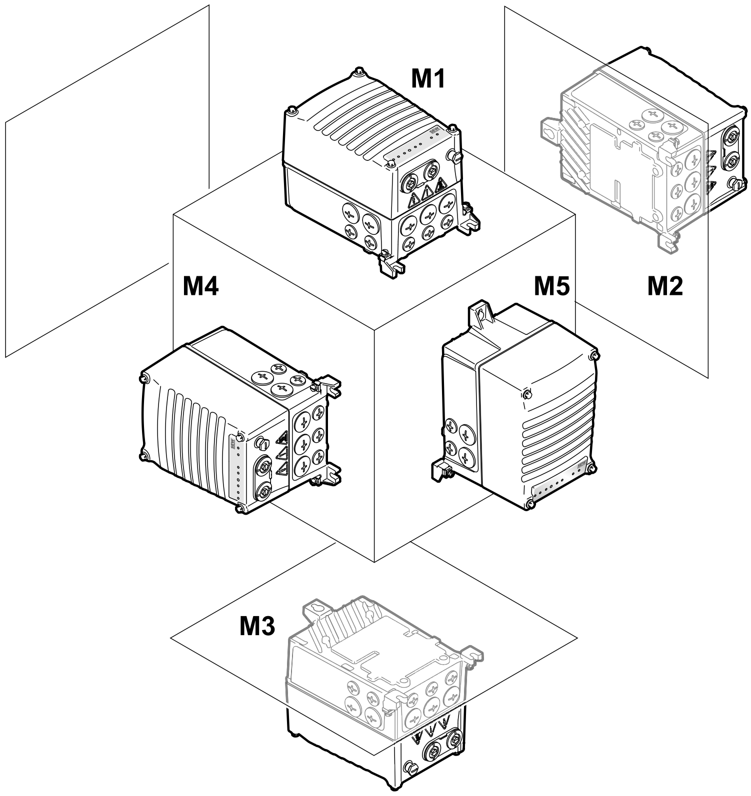
11.10 Mounting positions

11.10.1 Design MMF1.

The following mounting positions are possible for the device:



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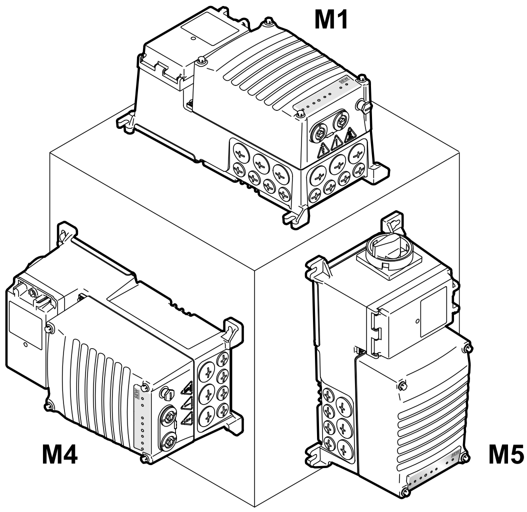
11.10.2 Design MMF3.

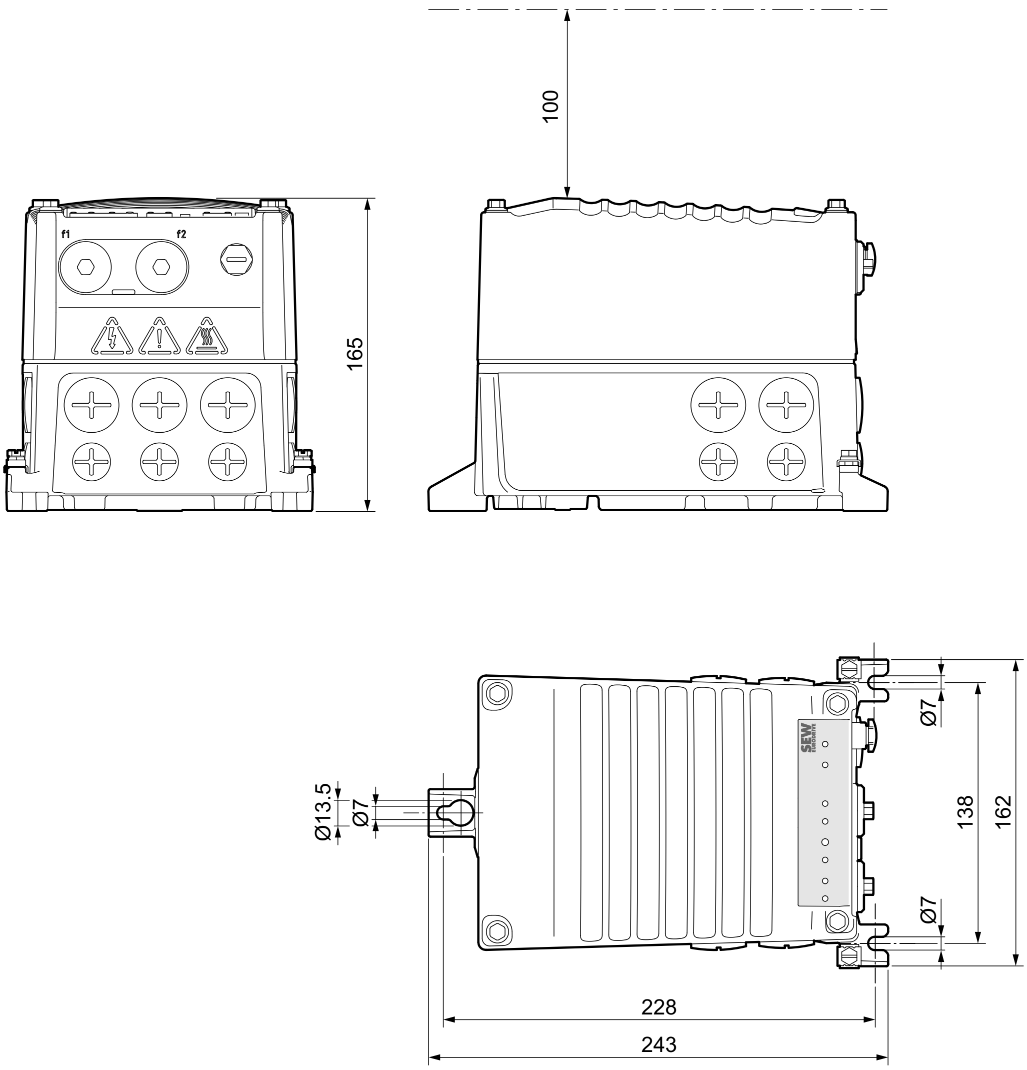
The following mounting positions are possible for the device:



30568739595

11.11 Device dimension drawings

11.11.1 Design MMF1.



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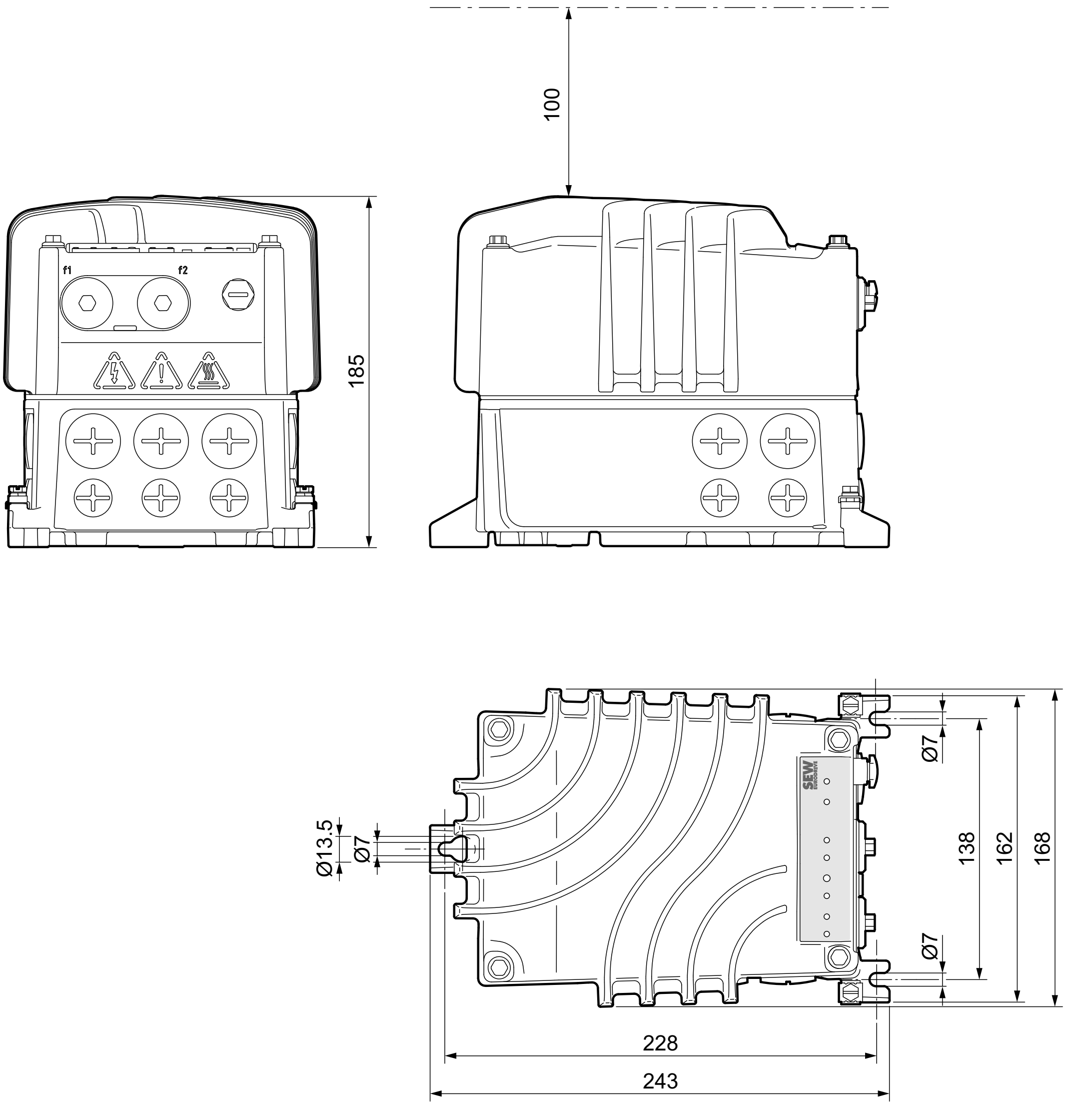
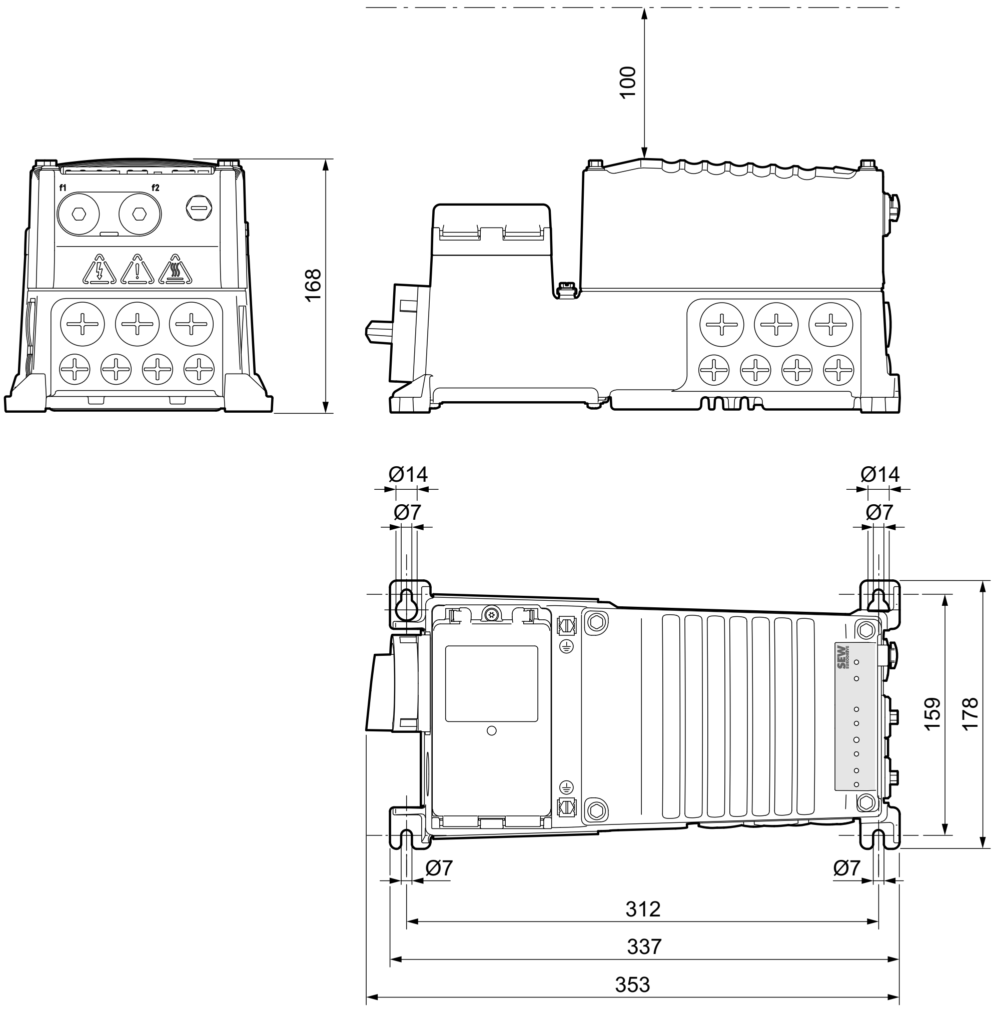
11.11.2 Design MMF1. with cooling fins



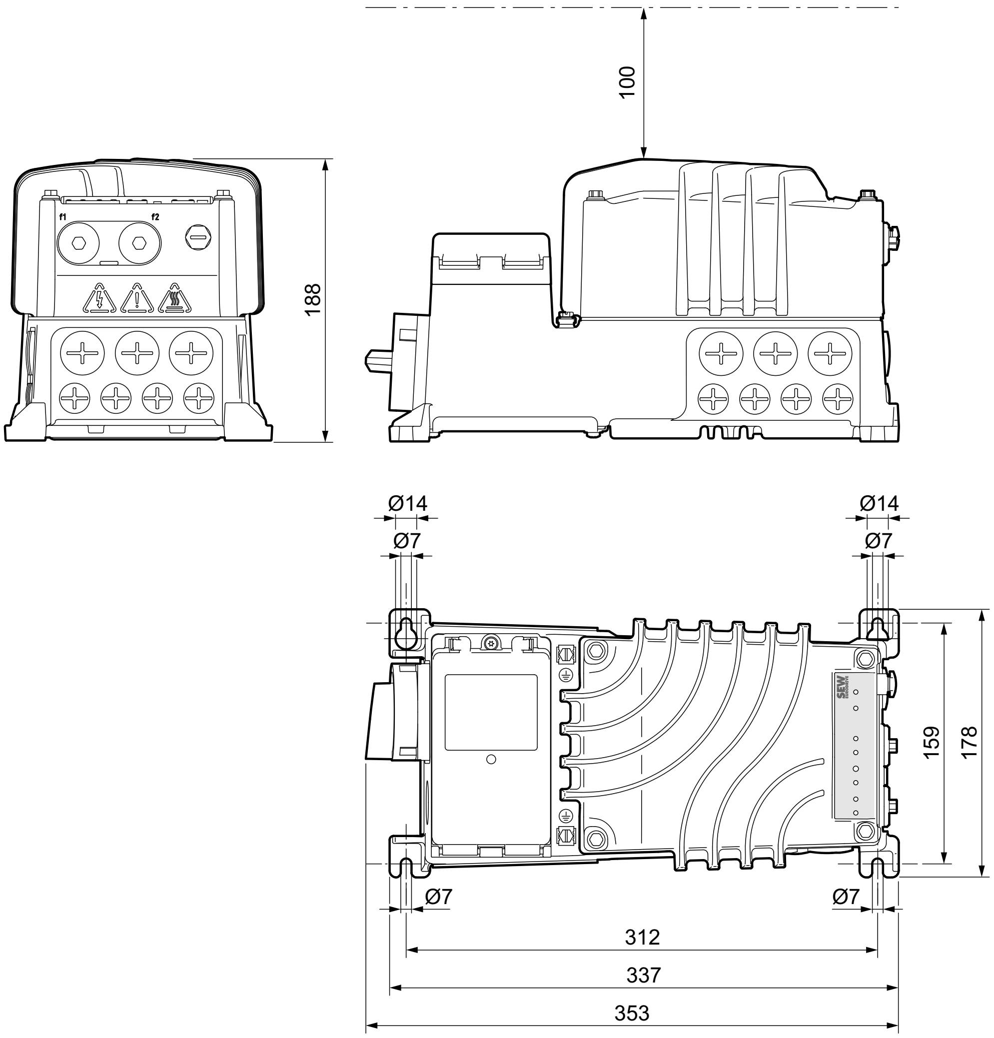
30564620171

11.11.3 Design MMF3.



30564628747

11.11.4 Design MMF3. with cooling fins



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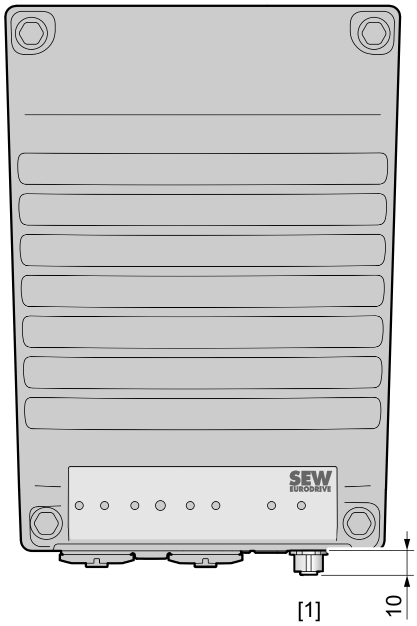
11.12 Dimension drawings of plug connectors in the electronics cover

The following figure shows the additional dimensions of the plug connector.



9007229877298059

[1] M12 plug connector, female

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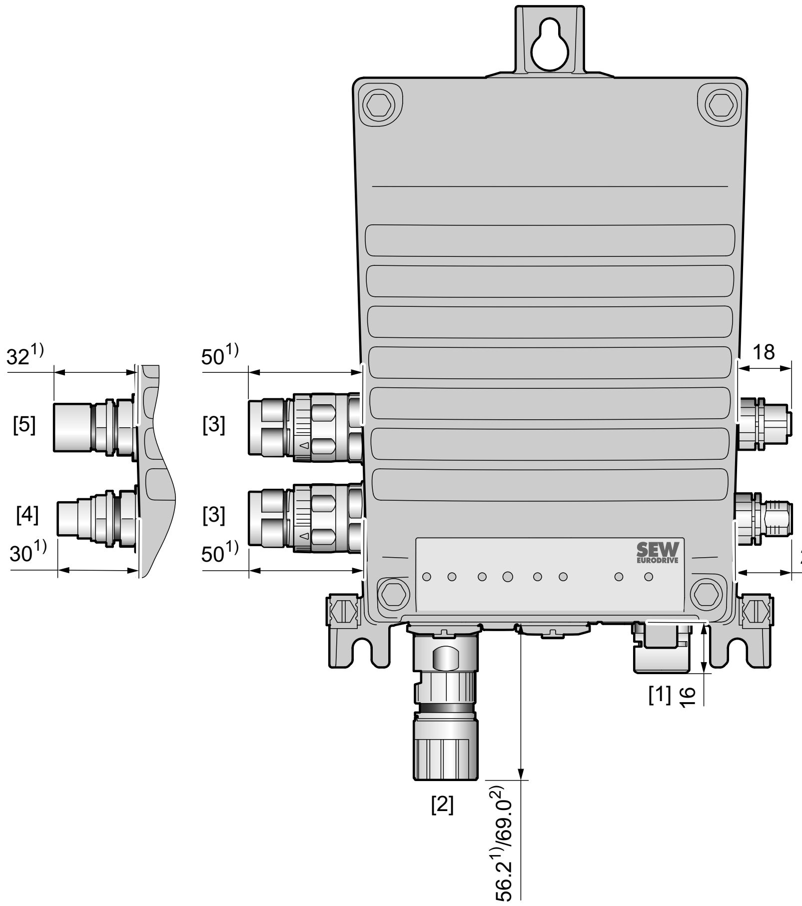
11.13 Dimension drawings of plug connectors in the connection box

11.13.1 Design MMF1.

Plug connectors

INFORMATION

- The following figure shows an example of the additional dimensions of the optional plug connectors for a possible plug connector configuration.
- For more information, refer to chapter "Plug connector positions".



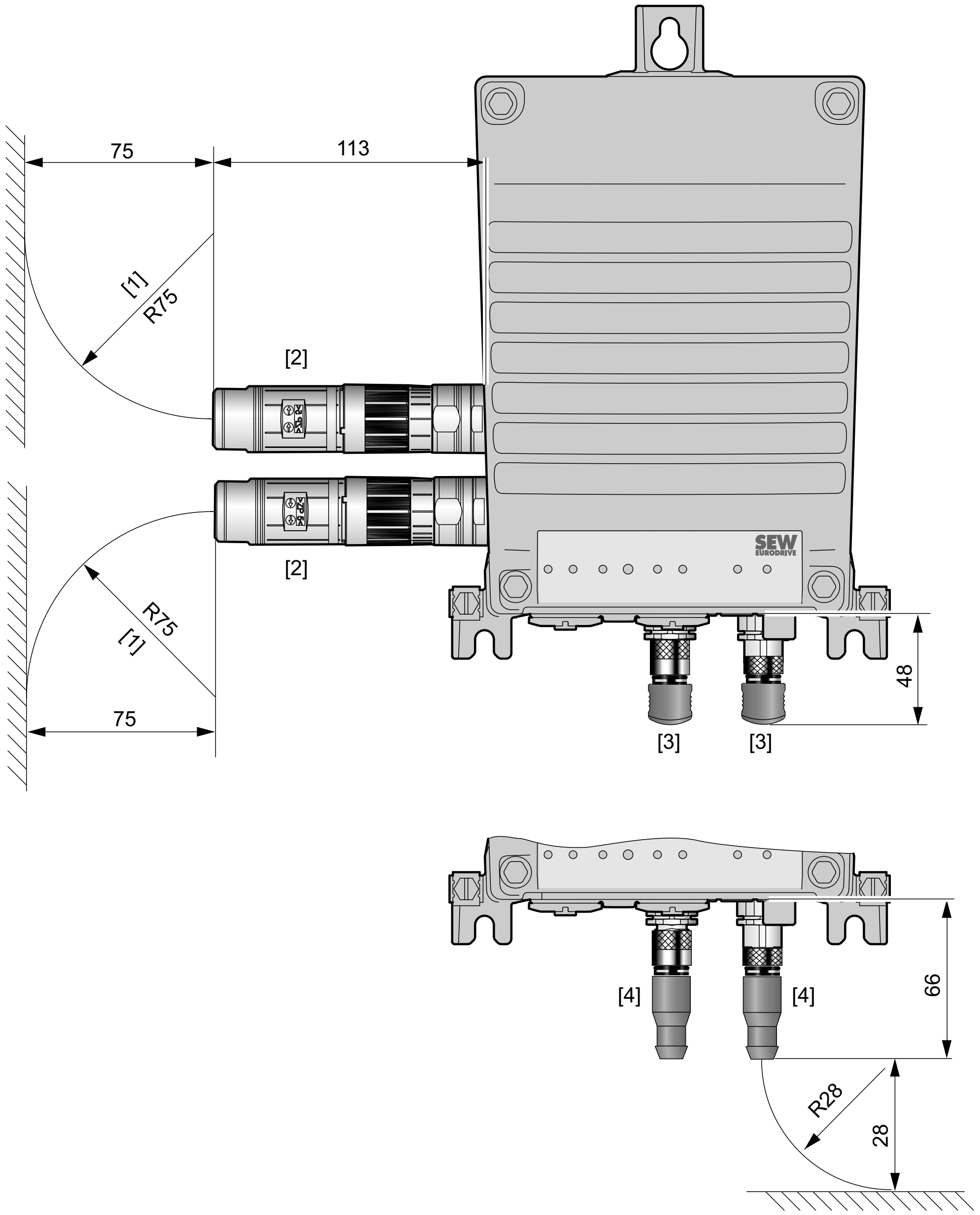
31249323659

1) "Straight" plug connector variant M23
2) "Right-angle" plug connector variant M23
[1] Optional pressure compensation
[2] Plug connector design M23, with union nut, female
[3] Plug connector design M23, without union nut, female
[4] Plug connector design MQ15-X-Power, without union nut, male
[5] Plug connector design MQ15-X-Power, with union nut, female
[6] M12 plug connector, female
[7] M12 plug connector, male

Plug connector including mating connector

INFORMATION

- The following figure shows the additional dimensions/bending radii of the optional plug connectors including mating connector in connection with prefabricated cables from SEW-EURODRIVE.
- For more information, refer to chapter "Plug connector positions".



30564785419

[1] Bending radius
[2] "Straight" plug connector variant M23
[3] "Right-angle" plug connector variant M12
[4] "Straight" plug connector variant M12

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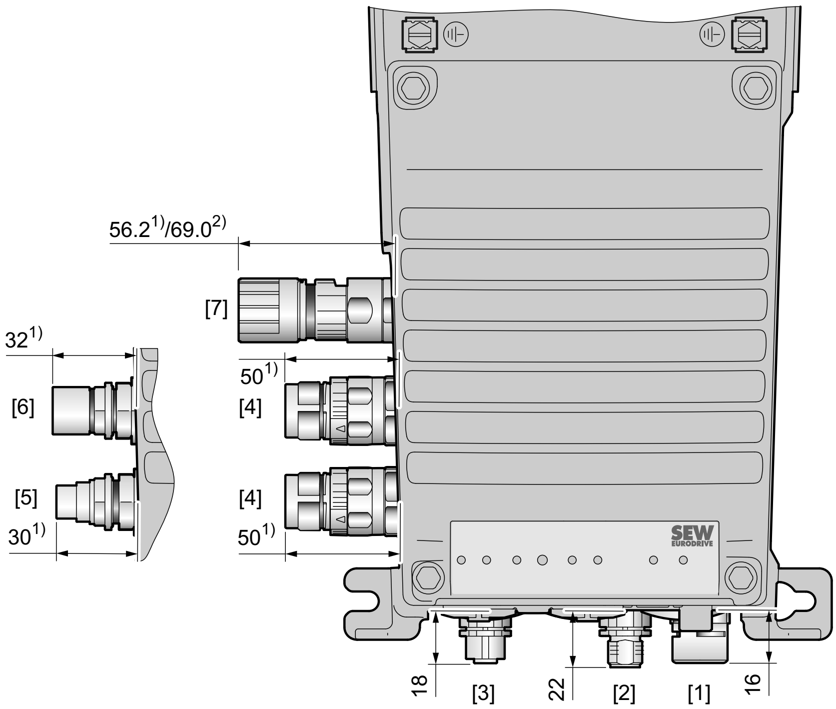
11.13.2 Design MMF3.

Plug connectors

INFORMATION

- The following figure shows an example of the additional dimensions of the optional plug connectors for a possible plug connector configuration.
- For more information, refer to chapter "Plug connector positions".



31249349515

1) "Straight" plug connector variant M23
2) "Right-angle" plug connector variant M23
[1] Optional pressure compensation
[2] M12 plug connector, male
[3] M12 plug connector, female
[4] Plug connector design M23, without union nut, female
[5] Plug connector design MQ15-X-Power, without union nut, male
[6] Plug connector design MQ15-X-Power, with union nut, female
[7] Plug connector design M23, with union nut, female

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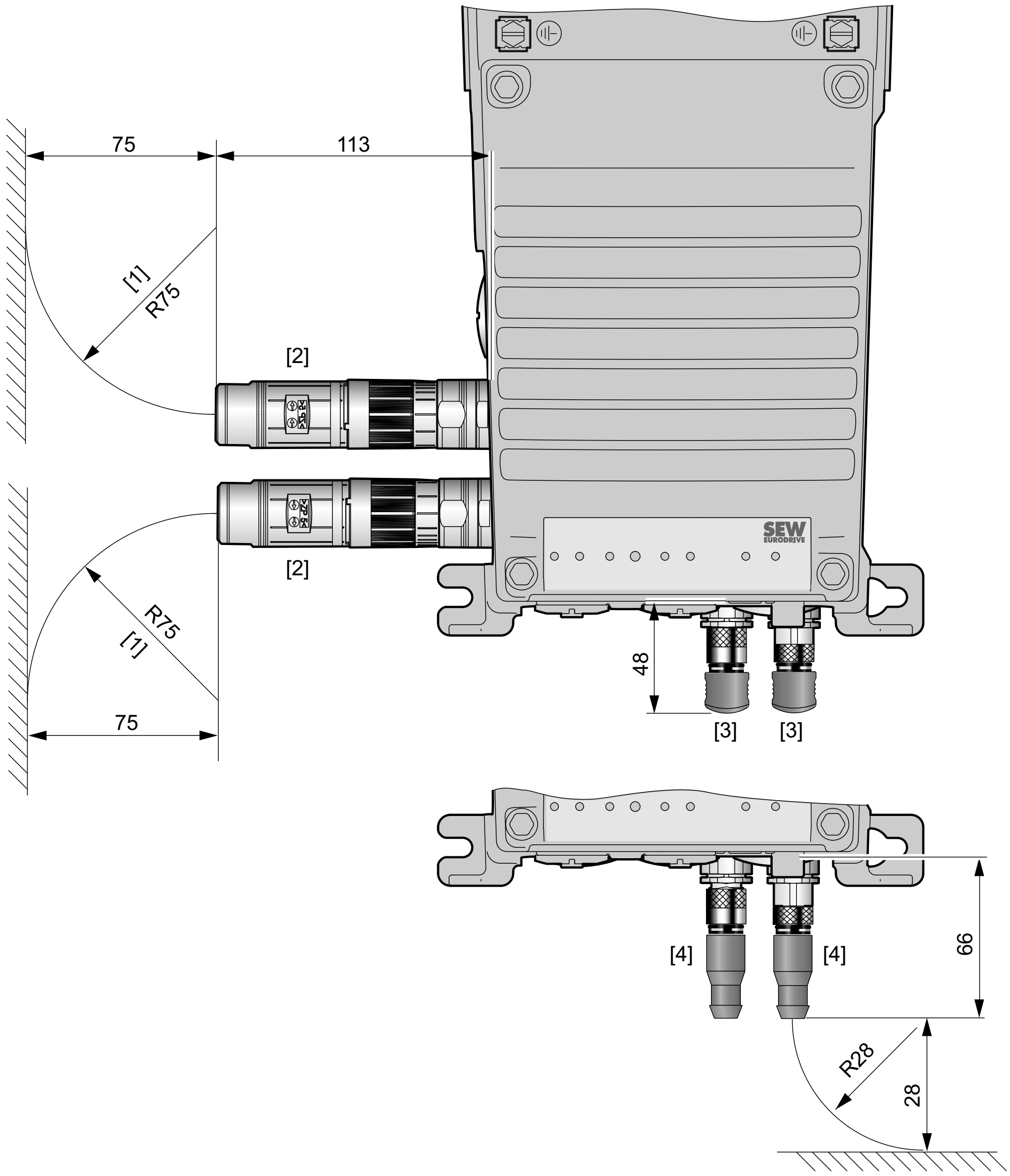
Plug connector including mating connector

INFORMATION

- The following figure shows the additional dimensions/bending radii of the optional plug connectors including mating connector in connection with prefabricated cables from SEW-EURODRIVE.
- For more information, refer to chapter "Plug connector positions".



30564797963

[1] Bending radius
[2] "Straight" plug connector variant M23
[3] "Right-angle" plug connector variant M12
[4] "Straight" plug connector variant M12

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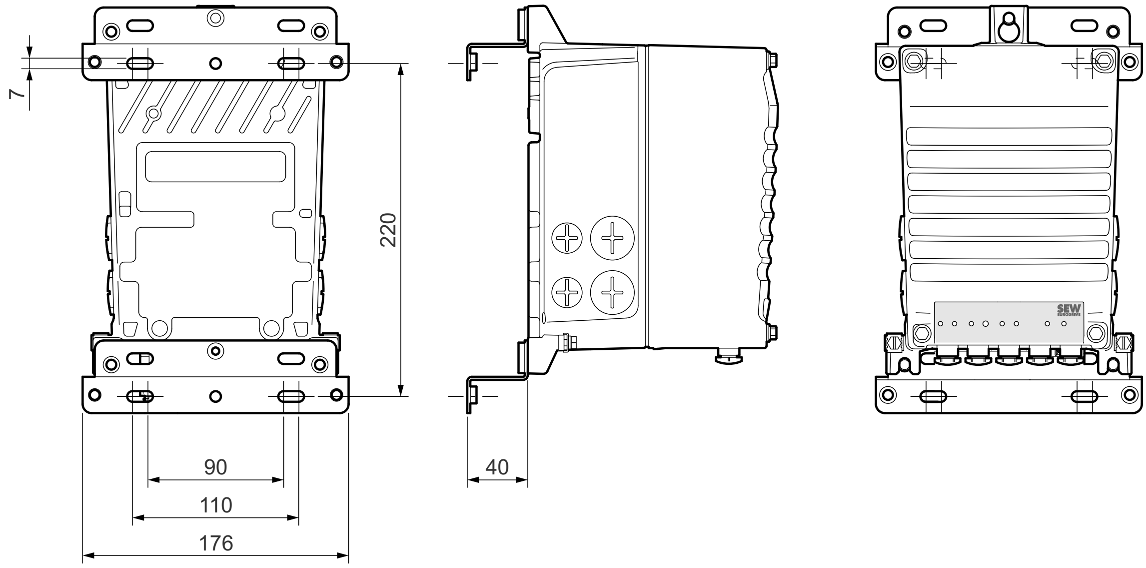
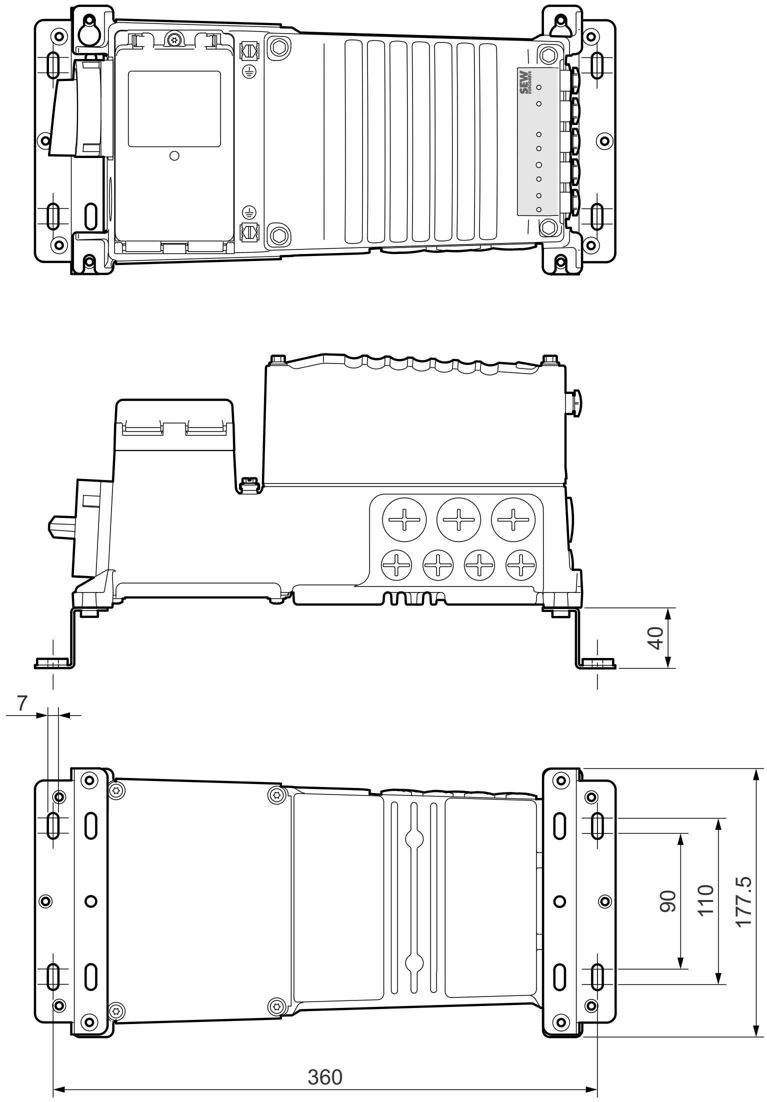
11.14 Spacer dimension drawings

11.14.1 Design MMF1.



31257836171

11.14.2 Design MMF3.



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12 Functional safety

12.1 General information

12.1.1 Underlying standards

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

Underlying standards	
Safety class/underlying standard	• Performance level (PL) according to EN ISO 13849-1:2015 • Safety Integrity Level (SIL) according to EN 61800-5-2:2017 • Safety Integrity Level Claim Limit (SIL_{CL}) according to EN 62061:2005/A1:2013

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12.2 Integrated Safety Technology

12.2.1 MOVIMOT® flexible

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

- Safety Integrity Level 3 according to EN 61800-5-2:2017, EN 61508:2010.
- PL e according to EN 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.

12.2.2 Safe condition

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

12.2.3 Safety concept

The drive unit is supposed to be able to perform the drive safety function "Safe Torque Off" according to EN 61800-5-2:

- The drive unit can be connected to an external safety controller or 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 drive unit.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT).
- Instead of 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 control 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 PWM signals generated by the drive unit are interrupted and not transmitted to the IGBTs.
- If the STO function detects a discrepancy between both channels, the PWM signals are inhibited. The inhibit can be revoked by a 24 V reset, or by a device reset if F_STO_P1 and F_STO_P2 are not controlled with 24 V.
- The STO drive safety function can be activated externally e.g. via an external safety device via the STO input.

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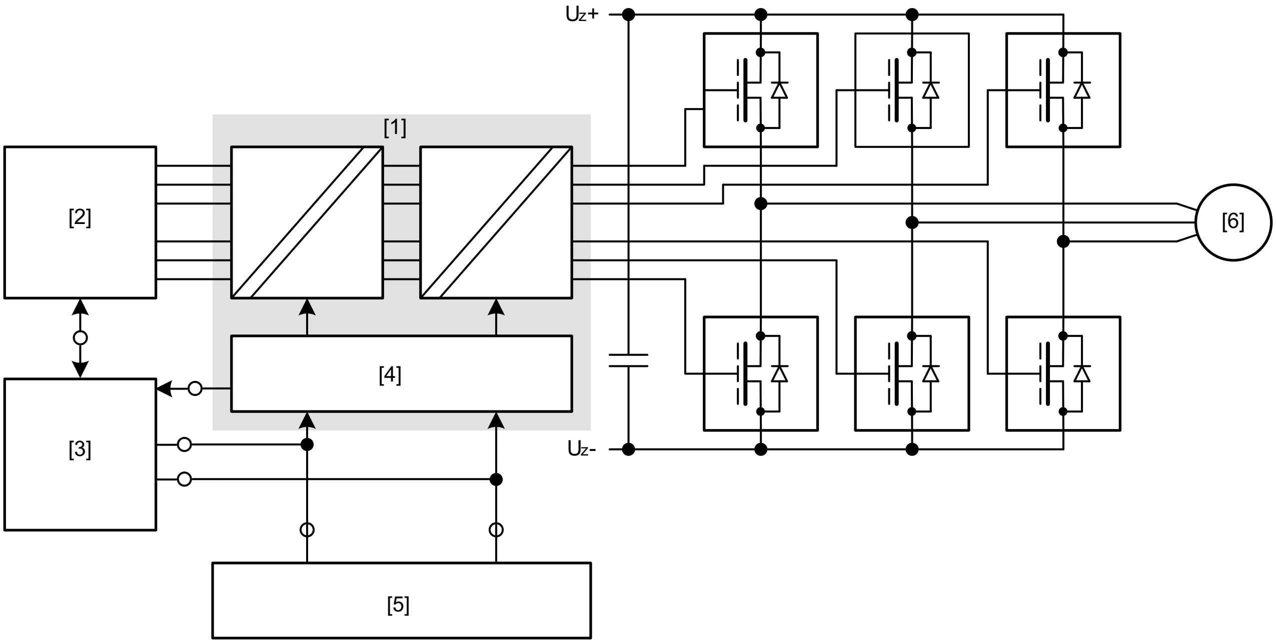
12.2.4 Schematic representation of the safety concept



23543720971

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

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12.2.5 Drive safety functions

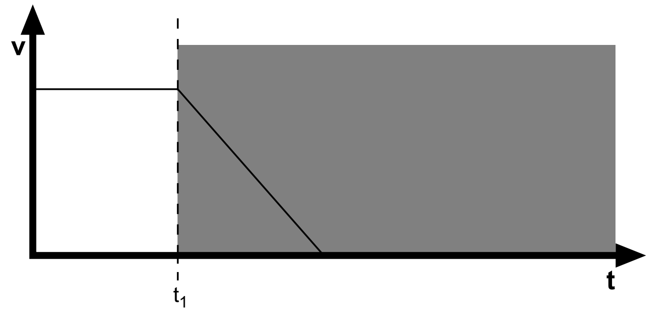
The following drive-related safety functions can be used:

- **STO** (Safe Torque Off according to EN 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:



2463228171

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

- **SS1(c) (SS1-t)** (safe stop 1, with time control according to EN 61800-5-2) by means of suitable external control (e.g. safety relay with delayed disconnection).

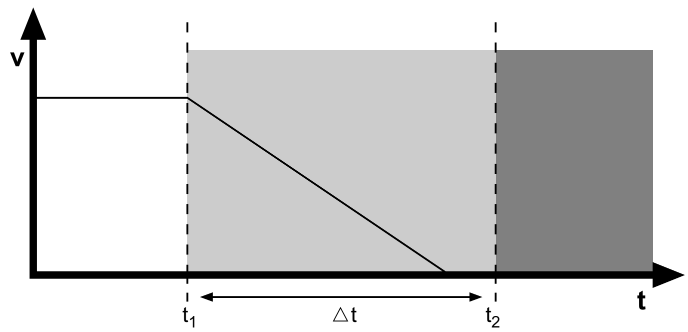
  The following sequence is mandatory:

  – Decelerate the drive using an appropriate deceleration 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 according to EN 60204-1, stop category 1.

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



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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12.2.6 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).

  The drive unit cannot be used without an additional brake system for application-specific drive safety functions that require active deceleration (braking) of the dangerous movement.
- When using the SS1(c) (SS1-t) function as described in chapter "Functional safety" > "Integrated safety technology" > "Drive safety functions", the brake deceleration 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 is only activated after the set time delay has expired. 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.

Severe or fatal injuries.

Hazardous voltages are present in the connection box when the STO signal is disconnected.

- 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 to the voltage supply.

⚠ WARNING

Electric shock due to incompletely discharged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time of 5 minutes after disconnecting the power supply.

INFORMATION

The brake and DynaStop® are not safety-related. If the parameter *Apply brake/ DynaStop® in STO state (Index 8501.3)* is enabled, the following happens when the STO function is triggered:

- The brake is applied.
- DynaStop® is activated.

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12.3 Safety conditions

The requirement for safe operation is that the drive safety functions of the drive unit are properly integrated into an application-specific higher-level drive safety function. A system/machine-specific risk assessment must be carried out by the system/machine manufacturer and taken into account for the use of the drive system with the drive unit.

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

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

- Approved devices.
- Installation requirements.
- Requirements on external safety controllers and safety relays.
- Startup requirements.
- Operation requirements.

12.3.1 Approved devices

The following device variants are permitted for safety-related applications:

Decentralized inverter	Nominal output current
MOVIMOT® flexible	2.0 – 5.5 A

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12.3.2 Requirements on the installation

- 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 have to be taken.
  - Adhere to the regulations in force for the application.
  - The sinking and sourcing cables from the external safety device to the axis 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 axis must have the same cable length. A difference in length ≤ 3% of the two cables is permitted.
  - Using suitable measures, the user must ensure that STO control cable is routed separately from the power lines of the drive. This does not apply to cables approved by SEW-EURODRIVE specifically for this case of application.
- The STO function does not detect short circuits or interference voltage in the supply line. For this reason, one of the following 2 requirements must always be met:
  - No parasitic voltages can occur in the STO control cables.
  - The external safety controller can detect a crossfault from an external potential to the STO control lines.
- Observe the values specified for safety components when designing the safety circuits.
- The STO signal (F_STO_P1, F_STO_P2, and F_STO_M) may not be used for feedback.
- For safety controller/safety relays, you must only use grounded voltage sources with protective electrical separation (PELV) according to 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 electronics cover.
- When the STO control cables are routed to Terminal X9 in the electronics cover, the cable ends must be covered with conductor end sleeves and the cables must be fixed close to the terminal X9 using cable ties. Other low-voltage signals can be bundled together with the STO signals.
- Do not use the port 24 V_OUT of the electronics cover for safety-related applications. This voltage is only permitted to supply the M12 plug connector X5504 when the STO jumper is plugged in.
- To use the drive unit in safety-related applications, remove the jumpers labeled with "Caution, remove jumper for safety operation" from the STO terminal X9. No labeled jumpers are available for those designs where the STO connection is performed using plug connectors. The installed jumper is relevant to the function.

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12.3.3 Requirements on the external safety controller

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 the safety class that 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 according to EN ISO 13849-1, SIL 2 according to EN 62062	Performance level d according to EN ISO 13849-1 SIL 2 according to EN 61508
Performance level e according to EN ISO 13849-1, SIL 3 according to EN 62061	Performance level e according to EN ISO 13849-1, SIL 3 according to EN 61508

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation). The STO input of the electronics cover can be switched with 2 poles (sourcing output, sourcing/sinking, or serial sourcing), or with 1 pole (sourcing).
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- Electro-sensitive protective equipment (such as light grid or scanner) according to EN 61496-1 and emergency stop buttons must not be directly connected to the STO input. The connection must be made using safety relays, safety controllers etc.
- To ensure protection against unintended restart 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. A restart may only be carried out after a manual reset of the safety circuit.
- If no fault exclusion is used for the STO wiring according to EN ISO 13849-2 or DIN EN 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)
  – 2-pole serial sourcing:

    Fault exclusion is mandatory
  – 1-pole sourcing output:

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

2-pole sourcing output:

- Test pulses can be used when the device is switched on or off.
  – The test pulses on both sourcing channels must be switched with a time delay. However, additional switch-off test pulses may occur simultaneously.

- The test pulses in both sourcing channels must not exceed 1 ms.
- The next switch-off test pulse in one sourcing channel must only occur after a 2 ms time period.
- A maximum 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 signal levels must be played back by the safety controller and compared to the expected value.

2-pole sourcing/sinking:

- Test pulses can be used when the device is switched on or off.
  - The test pulses in the sourcing and sinking channel must not exceed 1 ms.
  - The next switch-off test pulse in the sourcing or sinking channel must only occur after a 2 ms time period.
  - A maximum 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 signal levels must be played back by the safety controller and compared to the expected value.

2-pole serial sourcing:

- Fault exclusion in the connection lead is mandatory if no external test pulses are possible.

1-pole sourcing output:

- Test pulses can be used when the device is switched on or off.
  - The 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 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 signal levels must be played back by the safety controller and compared to the expected value.

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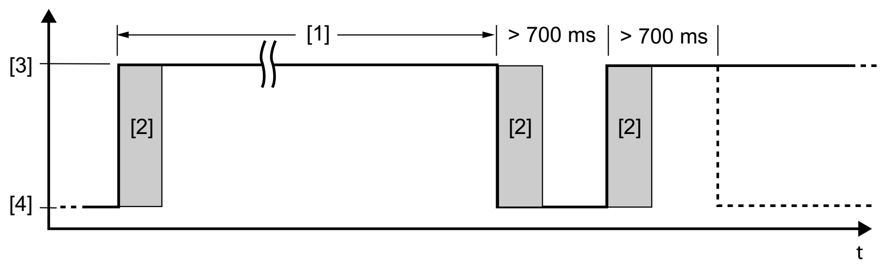
12.3.4 Requirements on startup

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

12.3.5 Requirements on operation

- Operation is only allowed within the limits specified in the data sheets. This principle applies to the external safety controller as well as to the drive unit.
- The built-in diagnostic function is limited in case of a permanently enabled or permanently disabled STO input. Only with a level change of the STO signal, extended diagnostic functions are performed. This is why the drive safety function via STO input must be triggered with connected line voltage at least once every 12 months for PL d according to EN ISO 13849-1 and SIL 2 according to EN 61800-5-2, and at least once every 3 months for PL e according to EN ISO 13849-1 and SIL 3 according to EN 61800-5-2 to achieve a complete test coverage. Adhere to the following test procedure.



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[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 test transition (STO active → not active) can only be started > 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 of the drive unit. 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 above mentions test procedure must be performed. If the fault occurs again, replace the device or contact the SEW-EURODRIVE Service.

12.4 Connections variants

12.4.1 General information

Generally, all the connection variants listed in this documentation are permitted for safety-relevant applications as long as the basic safety concept is met. This means you have to make sure that the DC 24 V safety inputs are operated by an external safety relay or a safety controller, in this way preventing an automatic restart.

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.

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12.4.2 Requirements

Using safety relays

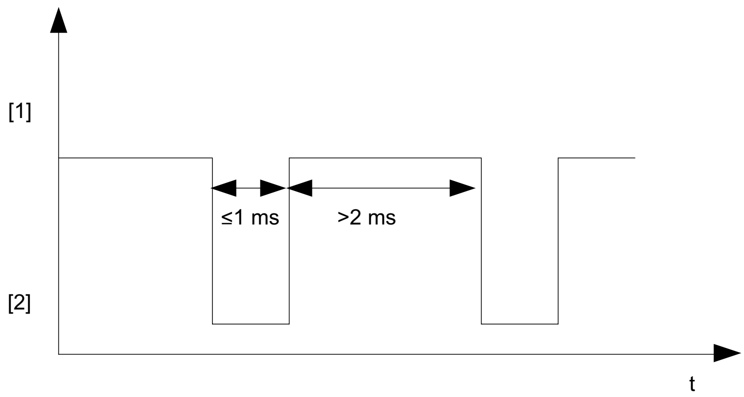
The requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or of other safety components must be strictly observed. For cable routing, the basic requirements apply as described in this documentation.

For connecting the drive unit with the safety relays, observe the installation requirements in chapter "Functional safety" > "Safety conditions" > "Installation requirements".

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

Using 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.



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[1] High

[2] Low

INFORMATION

If the safety-related control voltage plug at the STO input is switched off (STO activated), you must observe chapter "Functional safety" > "Safety conditions" > "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.

Switching off the STO signal for several drive units (STO group disconnection)

The STO signal for several drive units can be provided by a single safety relay. The following requirements must be met:

- The total cable length is limited to 100 m. 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.
- You must comply with the permitted signal levels at the STO input and all other technical data of the electronics cover. The routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety manufacturer (such as protecting the output contacts against welding) must be strictly observed. The basic cable routing requirements apply.
- A calculation based on the technical data of the electronics cover must be performed separately for each case of STO group disconnection.
- A maximum of 20 drive units must be used in an STO group disconnection.

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12.4.3 Connection variant 1: Terminal X9 in the connection box

For detailed information on terminal X9, refer to chapter "Electrical Installation" > "Terminal assignment".

12.4.4 Connection variant 2: M12 plug connector X5504/X5505 at the connection box

For further information on the connection of X5504/X5505, refer to chapter "Electrical installation" > "Assignment of optional plug connectors".

STO jumper plug

⚠ WARNING

Safe disconnection of the device is not possible when using the STO jumper plug.

Severe or fatal injuries.

- Only use use the STO jumper plug if the device is not used to fulfill any safety function.

⚠ WARNING

Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

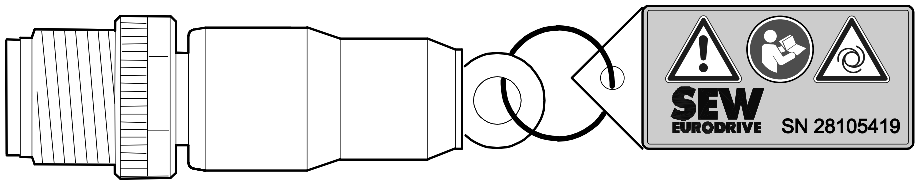
Severe or fatal injuries.

- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

A printed red tag is attached to the STO jumper plug.

The STO jumper plug can be connected to the STO plug connector X5504 of the device. The STO jumper plug deactivates the safety functions of the device.

The following figure shows the STO jumper plug with the printed **red** tag, part number 28105419:



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12.5 Safety characteristics

	Characteristic values according to	
	EN 61800-5-2	EN ISO 13849-1
Tested safety class/underlying standards	Safety integrity level 3	Performance level e
Probability of a dangerous failure per hour (PFH value)	2.5×10^{-9} 1/h	
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] according to EN 61800-5-2	

1) With suitable external control

INFORMATION

With 1-pole wiring, the realizable performance level according to EN ISO 13849 is reduced to PL d. For the wiring between safety relay and STO input, an fault exclusion is necessary.

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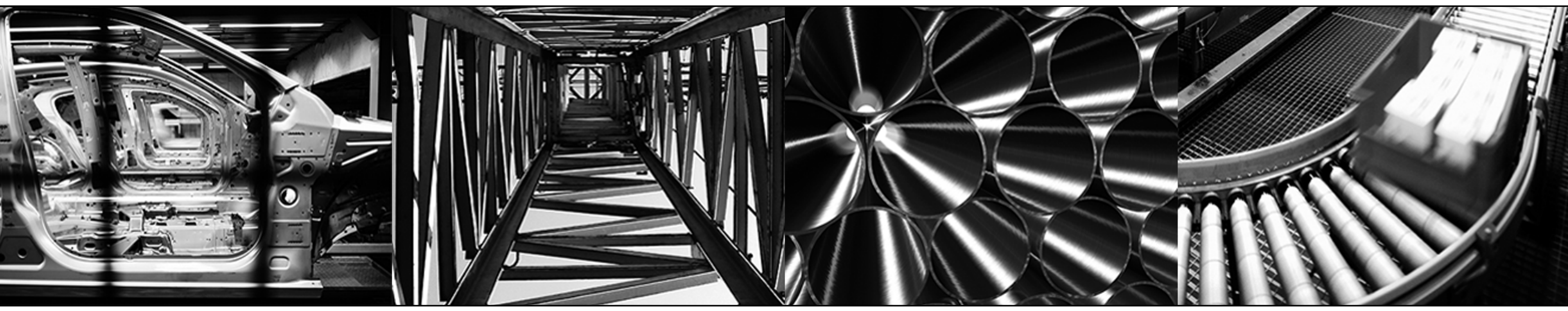

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