SEW EURODRIVE

Operating Instructions

Drive and Application Controller

MOVIPRO® PHE..B-A15-.1X0..B-00

Edition 02/2020

25981870/EN

Contents

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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. Observe the following documentation in addition to this documentation:

- "MOVIPRO® – Accessories" addendum to operating instructions
- "MOVIVISION® EMS basic parameterizable plant software" manual

Always use the latest edition of the documentation and the software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can also order printed and bound copies of the documentation from SEW-EURODRIVE.

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.	

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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 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

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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

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2 Safety notes

2.1 Preliminary information

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

2.2 Duties of the user

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

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

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

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

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

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

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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.

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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.

The product is designed for mobile use.

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

- AC asynchronous motors with squirrel-cage rotor

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

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

2.4.1 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.

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.

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2.6 Transport

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

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- 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.
- Always use all attachment points if available. The attachment points are designed to carry only the mass of the product. Severe or fatal injuries. Do not apply any additional loads.

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 according to the regulations in the documentation.

Protect the product from strong mechanical strain. The product and its mounting parts must never protrude into the path of persons or vehicles. Ensure that components are not deformed and insulation spaces are not changed, particularly during transportation and handling. Electric components must not be mechanically damaged or destroyed.

Observe the notes in chapter "Mechanical installation" (→ 🗎 33) 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 4000 m above sea level

The product can be used at altitudes above 1000 m above sea level up to 4000 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" (→ 🗎 96) 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.

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2.8 Electrical installation

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

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

2.8.1 Required preventive measure

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

2.9 Protective separation

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

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2.10 Startup/operation

Do not deactivate monitoring and protection devices of the machine or system, even for a test run.

If you use the product in a mobile application, you must ensure that it is not moved from a de-energized section to a section supplied with energy. The product must be in a de-energized section in order to actively connect it.

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

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

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

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

10 minutes.

Observe the corresponding information signs on the product.

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

Cover unused connections with the supplied protection caps during operation.

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.

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

This product may cause leakage current. If the PE connections with the housing are disconnected while the power supply is applied, electrical safety cannot be guaranteed. To prevent an electric shock due to live parts, implement special protective measures such as barriers in front of the housing.

Hot surfaces

The surfaces of components (e.g. heat sink, braking resistance, drives) can be very hot during operation. Observe the following information to avoid risk of burns:

- Do not touch the components during operation.
- Let the components cool down before you start working on the components.
- Observe the hazard symbols on the product.

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2.10.1 Operating switch

The operating switch switches off the internal 24 V supply for the inverter only at one pole. To prevent an electric shock due to live parts and a risk of injury due to an unintentional startup of the motor, observe the following notes:

- Use the operating switch only to stop the drive during operation.
- Do not use the operating switch for work on live parts.

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3 Functional safety

3.1 Integrated safety technology

3.1.1 Standards

For the versions of the standards valid during development and testing of the device, refer to the declaration of conformity.

3.1.2 Safe state

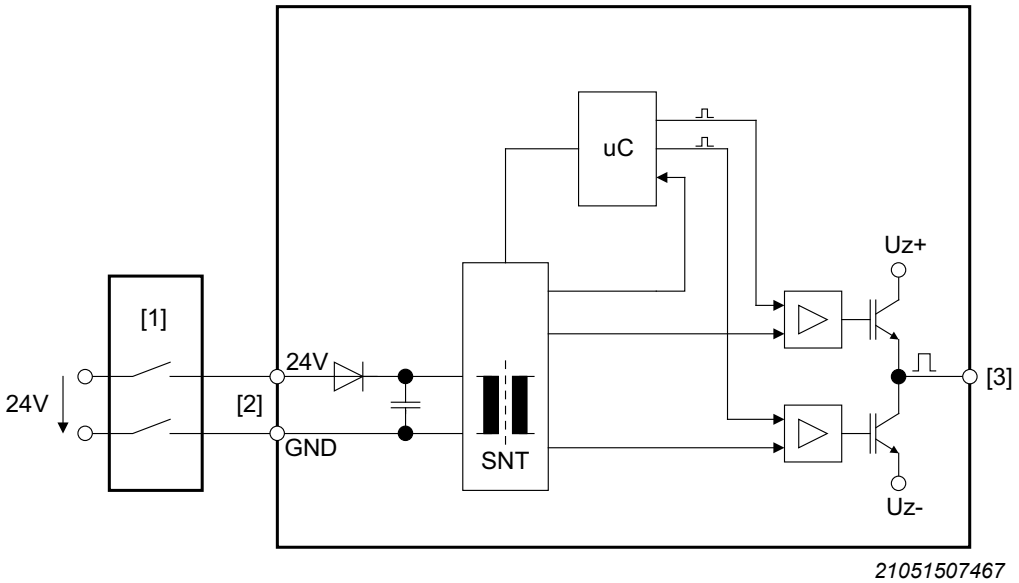
For safety-related operation of the device, safe torque off is defined as safe condition, see "STO – Safe Torque Off" (→ 🗎 19). The safety concept is based on this definition.

3.1.3 Safety concept

- The device allows for the connection of an external safety controller or an external safety relay. They de-energize all active elements that generate the pulse trains to the power output stage (IGBT) when a connected command device (e.g. emergency stop button with latching function) is activated. For this purpose, the safety-related DC 24 V supply is disconnected.

  This ensures that the frequency inverter no longer supplies power to the motor for generating torque.
- Disconnecting the safety-related DC 24 V supply voltage ensures that the voltage supplies required for operating the drive are safely interrupted.
- Instead of galvanic isolation of the drive from the supply system using contactors or switches, the disconnection of the safety-related DC 24 V supply described here safely prevents the gating of the power semiconductors in the frequency inverter. This means the rotary-field generation for the respective motor is deactivated even though the mains voltage is still present.

The following figure shows the safety concept:



21051507467

[1] Safety relay, external
[2] Safety-related 24 V voltage supply
[3] Motor phase

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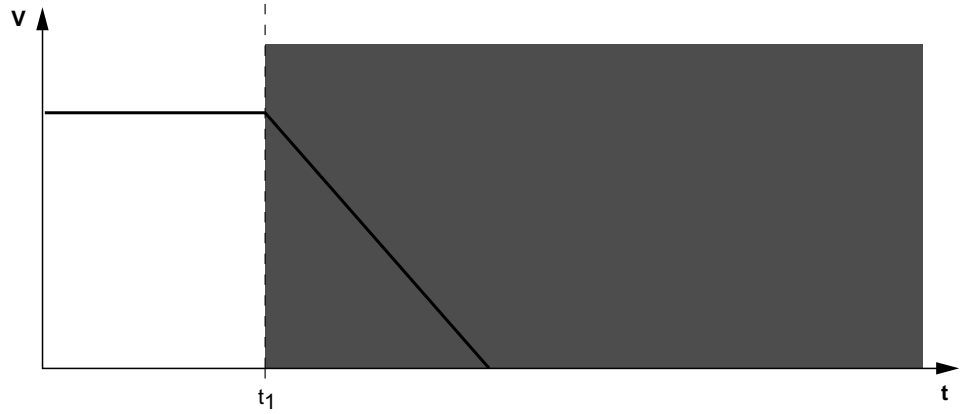
INFORMATION

Observe chapter "Restrictions" (→ 🗎 21).

3.1.4 Drive safety functions

STO – Safe Torque Off

If the STO function is activated, the drive inverter no longer supplies power to the motor. As a result, the drive cannot generate torque. This drive safety function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.



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■ = Drive safety function active
v = Speed
t = Time
t_1 = Point of time when STO is triggered.

INFORMATION

The motor coasts to a halt or is stopped mechanically.

Controlled standstill is preferred, if possible.

SS1(c) – Safe Stop 1 with time control

When the SS1(c) function is active, the inverter brings the motor to a standstill electrically. The drive safety function STO is triggered after a specified, safety-related time.

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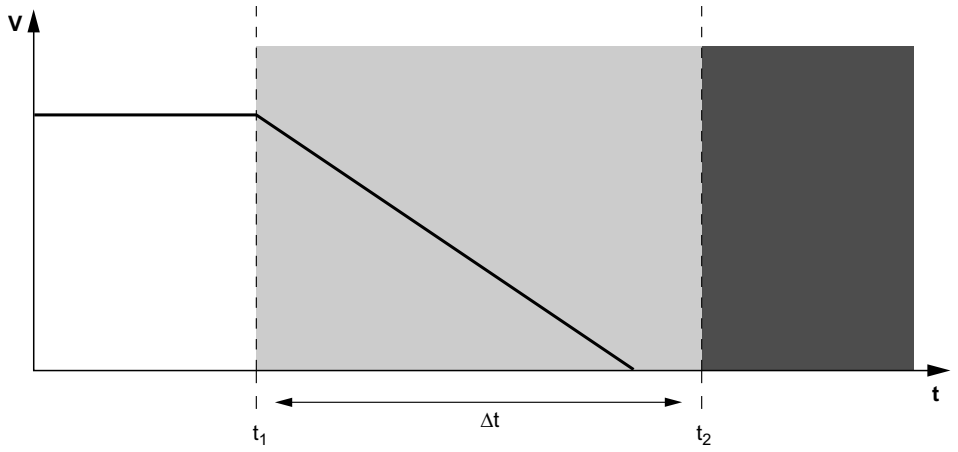
This drive safety function corresponds to a controlled stop of the drive according to EN 60204-1, stop category 1.



9007201225618443

= Drive safety function monitoring
= STO drive safety function active
v = Speed
t = Time
t_1 = Point of time when SS1(c) is activated and motor deceleration is triggered.
t_2 = Point of time when STO is triggered.
Δt = Safety-relevant period of time

INFORMATION

- The SS1(c) function does not monitor the stopping of the drive.
- The safety-related period of time Δt allows the drive to come to a stop. In the event of a fault, the drive does not come to a stop and becomes de-energized at the time t_2 (STO).

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3.1.5 Limitations

INFORMATION

The safety function STO does not provide galvanic isolation. It therefore does not provide any protection against electric shocks. As a result, it is not possible to implement an emergency off setup with the STO safety function in the normative sense. For that purpose, the entire system needs to be deactivated with a line disconnector.

- The brake controller integrated in this device and the standard brake integrated in brakemotors are not safety-related and therefore not part of the safety functions described in chapter "Drive safety functions". If the brake controller and/or the motor brake fails, the drive can coast for much longer depending on the application (i.e. the friction and inertia of the system). In the case of regenerative loads (e.g. lifting axes, declining conveying lines), the drive can even accelerate. This must be taken into account in the risk analysis of the system/machine. Additional safety measures will have to be implemented (e.g. safety brake system).
  - Use the device only with an additional brake system for application-specific safety functions that require active deceleration (braking) of the dangerous movement.
- When using the SS1(c) function as described in chapter "Drive safety functions", the brake ramp of the drive is not monitored with respect to safety. In the case of an error, the drive might not be decelerated during the delay time, or it might even be accelerated in the worst case. In this event, the safety-related deactivation via the "STO function" (→ 🗎 19) is only activated after the set time delay has passed. You must take the resulting danger into account in the risk analysis of the system/machine and you must implement additional safety measures.
- The system/machine manufacturer must perform a system/machine-specific risk analysis without fail. The use of the device must be taken into account.
- The safety concept is only suitable for performing mechanical work on driven system/machine components.
- If the 24 V supply voltage is disconnected, the supply voltage is still present at the frequency inverter DC link.
- To perform work on the electrical section of the drive system, you must disconnect the supply voltage using an external maintenance switch.

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3.2 Safety requirements

3.2.1 Supports

The safety functions of the device may only be used for safe operation of the system or machine if they are integrated correctly in an application-specific, higher-level safety function or safety system.

We recommend that the system/machine manufacturer performs a risk assessment.

The system/machine manufacturer should perform a functional test after successful startup. The system/machine manufacturer and the operator are responsible for compliance of the system or machine with applicable safety regulations.

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

3.2.2 Permitted device combinations

Only devices marked with the FS logo for functional safety on the nameplate may be used in safety applications.

3.2.3 Installation requirements

- You must not shorten hybrid cables from SEW-EURODRIVE. Use these hybrid cables with the original cable lengths and the prefabricated plug connectors. Ensure proper connections.
- Observe the following when routing the safety-related control cables and the cable to the temperature circuit breaker (TH):
  - Route these cables separately from power supply cables. The hybrid cables from SEW-EURODRIVE are excluded.
  - Route these lines in separate cables. The hybrid cables from SEW-EURODRIVE are excluded.
  - Ensure that there is no parasitic voltage.
  - Route these cables in an EMC-compliant manner.
  - Apply the shielding on both sides of the housing.
  - Route the cables permanently so that they are protected against external damage.
- Outside an electrical installation space, you must use shielded cables.
- Design the cabling in accordance with the standard EN 60204-1.
- Observe the values specified for safety components without fail when designing the safety circuits.
- The maximum length for the cable between the safety controller and the device is 30 m.
- Do not use the safety-related 24 V supply voltage for feedback.
- For all 24 V supply voltages of the inverter, the field distributor and all stations on the fieldbus, only voltage sources with safe disconnection (SELV/PELV) in accordance with EN 60204-1 and EN 61131-2 are permitted.

  In the event of a single fault, the voltage between the outputs or between any output and grounded parts may not exceed DC 60 V.
- For safety-related applications with the device, you must remove the jumper plug at X5502.

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- When planning the installation, observe the technical data of the device.
- A degree of protection of at least IP 54 must be guaranteed. This can be achieved only if unused connectors and covers are sealed correctly.

3.2.4 Requirements for the external safety controller

You can also use a safety relay as an alternative to a safety controller. In that case, observe the following requirements.

- For safety-relevant applications up to Performance Level d to EN ISO 13849-1, the safety controller and all other safety-related subsystems must be approved for at least Performance Level d to EN ISO 13849-1 or SIL 2 to EN 61508. To determine the performance level of the overall application, you can use the method described in EN ISO 13849-1 to combine several safety-related subsystems without a PFH-value calculation. However, SEW-EURODRIVE recommends determining the PFH value for the overall application. You can find the PFHd value for the device in chapter "Technical data" (→ 🗎 96).
- For safety-related applications up to SIL 2 to EN 62061, the safety controller and all other safety-related subsystems must be approved for at least SIL 2 to EN 61508 or Performance Level d to EN ISO 13849-1. You must also determine the probability of a dangerous failure per hour (PFHd value). The PFH value of the device applies when determining the PFHd value for the overall application.

Application	Safety controller requirements
Performance Level d to EN ISO 13849-1	Performance Level d to EN ISO 13849-1 SIL 2 to EN 61508
SIL 2 to EN 62061	Performance Level d to EN ISO 13849-1 SIL 2 to EN 61508

- The wiring with the external safety controller must be suitable for the required safety class (see manufacturer documentation). Safety circuits require 2-pole disconnection.
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- The switching capacity of the safety relays or the relay outputs of the safety controller must correspond at least to the maximally permitted, limited output current of the 24 V voltage supply.

  Observe the manufacturer's instructions concerning the permitted contact loads and fusing that may be required for the safety contacts. If the manufacturer provides no specific information, the contacts must be protected with 0.6 times the nominal value of the maximum contact load specified by the manufacturer.
- To ensure protection against unintended restart in accordance with DIN EN ISO 14118, you must design and connect the safety controllers in such a way that resetting the control device alone does not lead to a restart. A restart may be performed only after a manual reset of the safety circuit.

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3.2.5 Startup requirements

- Startup of the system/machine must be documented. The safety functions of the system/machine must be checked and verified.

  Observe the limitations for the safety functions of the device provided in chapter "Limitations" (→ 🗎 21) when verifying safety functions. If necessary, deactivate non-safety-related parts and components, such as the motor brake, that affect the result of the verification.
- For operating the device in safety-related applications, the disconnecting device and correct wiring must always be verified and documented during startup. A disconnecting device is, for example, a safety relay or a safety controller.
- During the startup procedure/function test, the correct assignment of the respective voltage supply must be checked by a measurement.
- The function test must be carried out in succession for all potentials, i.e. separately.

3.2.6 Requirements for operation

- Operation is only allowed within the limits specified in the data sheets. This applies to both the external safety relay and the device.
- To achieve performance level d, the STO function must be checked at least once a year. Depending on the process, the performance level can also be checked each time the machine/system is switched on.
- To prevent mechanical damage or crossfaults, control the cables regularly. Observe the information on intervals in the service plan of the system and plant manufacturer.

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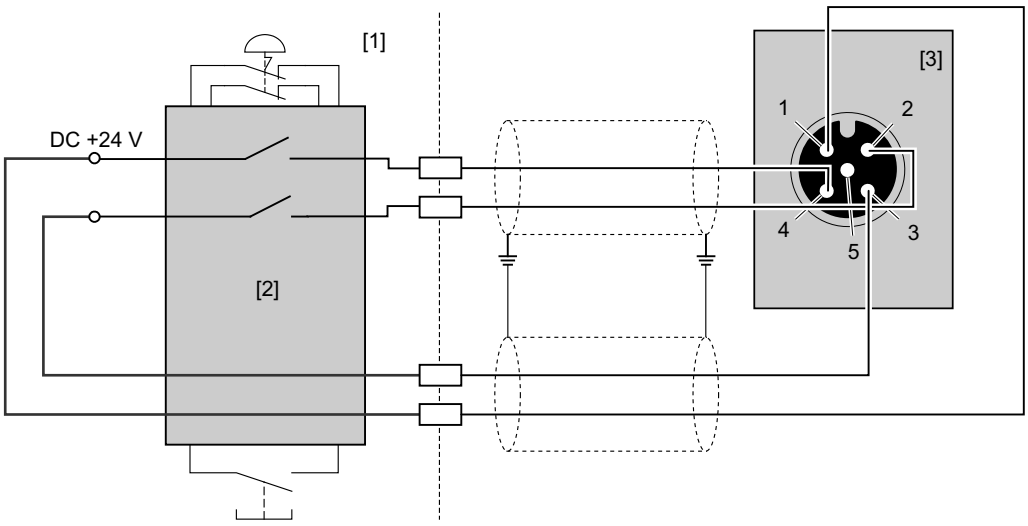
3.3 Connection variants

3.3.1 Basic considerations

- For group disconnection, several devices can be provided with 24 V by a single safety relay. The maximum number "n" of devices results from the maximum permitted contact rating of the safety relay and the maximum permitted voltage drop of the DC 24 V supply for these devices.
- Other requirements of the safety relay manufacturer (such as protecting the output contacts against welding) must be strictly observed. The basic conditions described in the conditions of the certification report for the device also applies to cable routing.
- For EMC reasons, the maximum cable length is limited to 30 m. Other instructions published by the manufacturer on the use of safety relays for specific applications must also be observed.
- A calculation based on the technical data for the device must be performed separately for each group disconnection.

3.3.2 Connection of an external safety relay for STO with M12 plug connector

The following figure shows a connection example with a safety relay and disconnection of all poles:



9007229923759243

[1] Installation space
[2] Safety relay
[3] Device with plug connector X5502 for STO

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4 Device structure

4.1 Type designation

PHE	MOVIPRO® drive and application controller
.	Motor connection: 1 = HAN® Q8/0 2 = HAN® 10E
.	Signal interfaces: 1 = Communication package 1 2 = Communication package 2 3 = Communication package 3 (STO)
B	basic
-	
A	Power supply: Three-phase current
15	Maximum S1 device power: 1.5 kW
-	
.	Brake control: 2 = Control for 2-wire brakes 3 = Control for 3-wire brakes from SEW-EURODRIVE
1	Design: with operation switch
X0	Auxiliary axis connection: without connection for an auxiliary axis
..	Communication type:
	X1 = 1 × half-wave input, reference phase L_X
	X2 = 2 × half-wave input, reference phase L_X
	Z1 = 1 × half-wave input, reference phase L_Z
	Z2 = 2 × half-wave input, reference phase L_Z
B-00	Generation B standard device

4.2 Scope of delivery

The scope of delivery includes the following components:

Component	Part number
Drive and Application Controller MOVIPRO® PHE..B-A15-.1X0..B-00	–
Protective covers for motor and signal connections and the braking resistor connection	–

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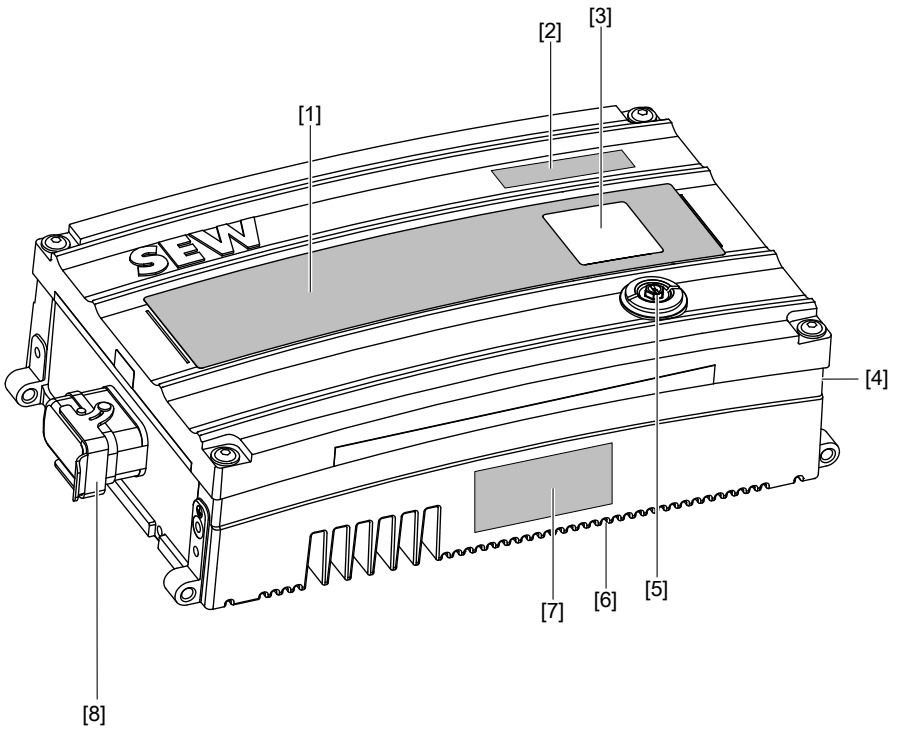
4.3 Short designation

The following short designations are used in this documentation:

Component	Short designation
Drive and Application Controller MOVIPRO® PHE..B-A15-.1X0..B-00	Device

4.4 Device overview

The following figure provides an example of an overview of the most important device components and the position of the labels on the device:



9007225931086091

[1] Status and error codes label
[2] Caution signs
[3] Status display and infrared interface
[4] Connection block (connections depend on the device design)
[5] Service interface
[6] PE connection
[7] Nameplate
[8] Motor connection (connection depends on the device design)

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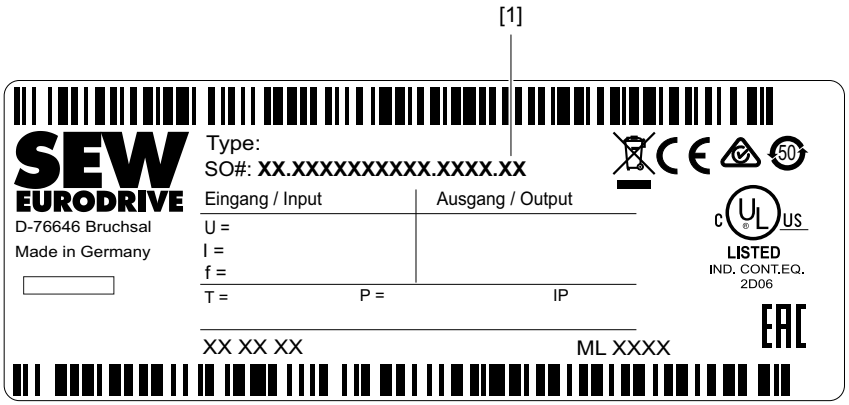
4.5 Information on switching voltage

As of 2019, the device is supplied with a maximum switching voltage (full wave) of AC 500 V at the signal output M. The last 2 digits of the production number SO# on the nameplate indicate the year of manufacture of the device:



18014428272494475

[1] Year of manufacture

Switching voltage (full wave) at signal output M	
[1] 18 or earlier	[1] 19 or later
Maximum AC 450 V	Maximum AC 500 V

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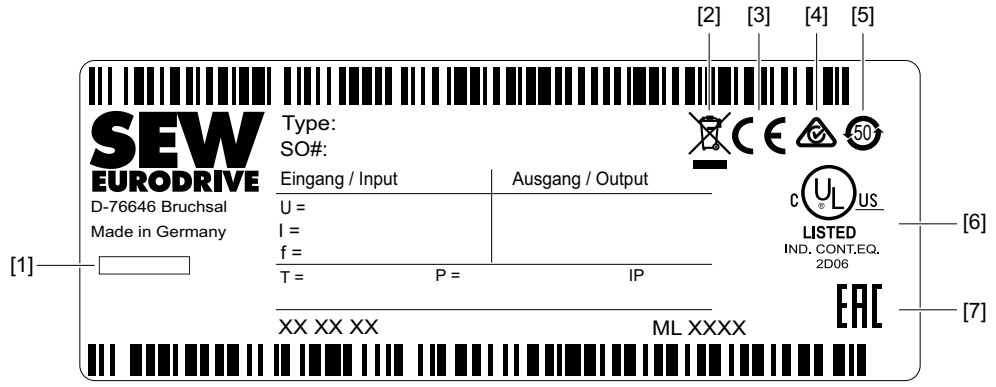
4.6 Nameplate

The nameplate lists information about the device type. The following figure shows an example of a nameplate:



18014427242789003

[1] Product name
[2] Designation in accordance with WEEE Directive
[3] CE marking
[4] RCM approval
[5] China RoHS-2 marking
[6] UL approval (depending on device certification)
[7] EAC marking

Depending on the device design, the following information is listed on the nameplate:

Value	Specification
Type	Type designation
SO#	Production number
U	Voltage
I	Current
f	Frequency
T	Ambient temperature
P	Rated output power
IP	Degree of protection
XX XX XX	Status line
ML XXXX	Production plant

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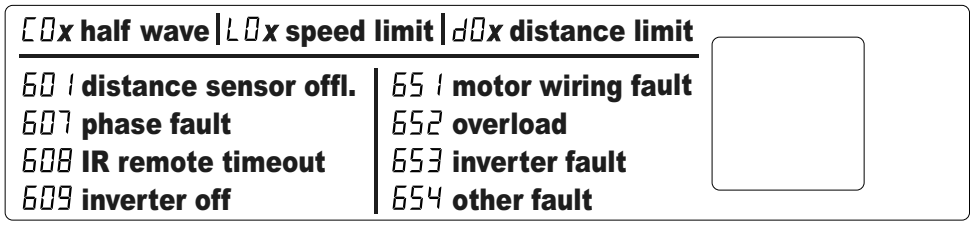
4.7 Designation plates

4.7.1 Status and error code plate

You will find the most important status and error codes on the status and error code plate. For further information, refer to chapter "Status and fault messages" (→ 🗎 82).



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4.8 Warning signs

Warning signs must be attached at various points on the device to warn about particular hazards. Ensure that the following warning signs for identifying hazardous areas are complete and legible:

Hazard symbol	Meaning
	Warning of hot surfaces
	General hazard
 10 min	Warning of dangerous electric voltage

4.9 Accessories

4.9.1 Available accessories

⚠ WARNING

If you use the jumper plug at the input X5502 in the communication package 3 (STO), a safety-related disconnection of the drive unit is not possible.

Severe or fatal injuries.

- You may only use the jumper plug if the drive unit is not used to fulfill any safety function.

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INFORMATION

The scope of delivery does not include accessories, such as installation and mounting material or connection cables.

If you are unsure about the accessories you require, contact SEW-EURODRIVE. For further information on accessories, refer to the following documentation: "MOVIPRO® – Accessories" addendum to operating instructions. The following accessories are available for the device:

Keypad For further information, refer to the following documentation: "MOVIPRO® Accessories – PZO00A-BFBIR0-01/.. Keypad" operating instructions.	
PZO00A-BFBIR0-01/L005	17976014
Braking resistors For detailed information, refer to chapters "Technical data" (→ 🗎 96) and "Use of braking resistors" (→ 🗎 32).	
BW200-003/k1.5	08282919
BW200-005/k1.5	08282838
Software	
	17125812
M12 parameter memory For further information, refer to the following documents: "MOVIVISION® EMS basic parameterizable plant software" manual.	
M12 parameter memory	17976340
Mounting accessories For further information, refer to chapter "Mechanical installation" (→ 🗎 33).	
EMS mounting kit angle brackets	28218248
For further information, refer to the following documentation: "MOVIPRO® EMS angle bracket mounting kit" information sheet.	
Connection component	
Jumper plug	11747099
Interface adapter	
USB11A interface adapter (USB to RS485)	08248311
USB/M12 adapter cable	19104979
Sensor/actuator box For further information, refer to chapter "Electrical connections" (→ 🗎 55).	
Sensor/actuator box 4/3-L-M12-M8	19111142
Connection cable sensor/actuator box 1 m	18161073
Connection cable sensor/actuator box 2 m	18151081
Connection cable sensor/actuator box 3 m	18161103
Connection cable sensor/actuator box 4 m	18161111
Connection cable sensor/actuator box 5 m	18161138

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Use of braking resistors

INFORMATION

For the device variant with control via a 3-wire brake (PHE..B-15-3..) in combination with a motor with 3-wire brake (e.g. motors from SEW-EURODRIVE), the brake coil is used as braking resistor. Do not connect any external braking resistor in this case.

If a motor without holding brake is connected to any of the two device variants, SEW-EURODRIVE recommends connecting a braking resistor.

	Motor + 3-wire brake	Motor + 2-wire brake	Motor without brake	External braking resistor
Control for 2-wire brake PHE..B-.15-2..	•[1]			Yes
		•		Yes
			•	Yes
Control for 3-wire brake PHE..B-.15-3..	•			No
		•[2]		No
			•	Yes

1) Not recommended by SEW-EURODRIVE.

2) Only possible if the option "Deactivate brake center tap" is set in the drive parameterization of the MOVI-VISION® software.

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5 Mechanical installation

5.1 Requirements

⚠ WARNING

Risk of crushing if the load falls.

Severe or fatal injuries.

- Do not stand under the load.
- Secure the area where loads can fall down.

NOTICE

Risk of collision.

Damage to plant and device components.

- Always position the device so that it will not collide with other components, design elements or persons along the travel path.

Comply with the following prerequisites:

- Trained specialists perform the installation.
- The information provided in the technical data and the permitted conditions for the operating location of the device are observed.
- The minimum clearance and the required gaps for using a mounting plate are complied with. For further information, refer to chapter "Minimum clearance" (→ 🗎 34).
- The device is only mounted using the intended mounting options.
- The selection and dimensioning of the mounting and locking elements are in line with the applicable standards, the technical data of the devices and the local requirements.
- The bore dimensions are calculated in line with the respective type of fixture. For further information, refer to chapter "Installation" (→ 🗎 36).
- The mounting and locking elements fit into the existing bores, threads and countersinks.
- All display and actuator elements are visible and accessible after installation.

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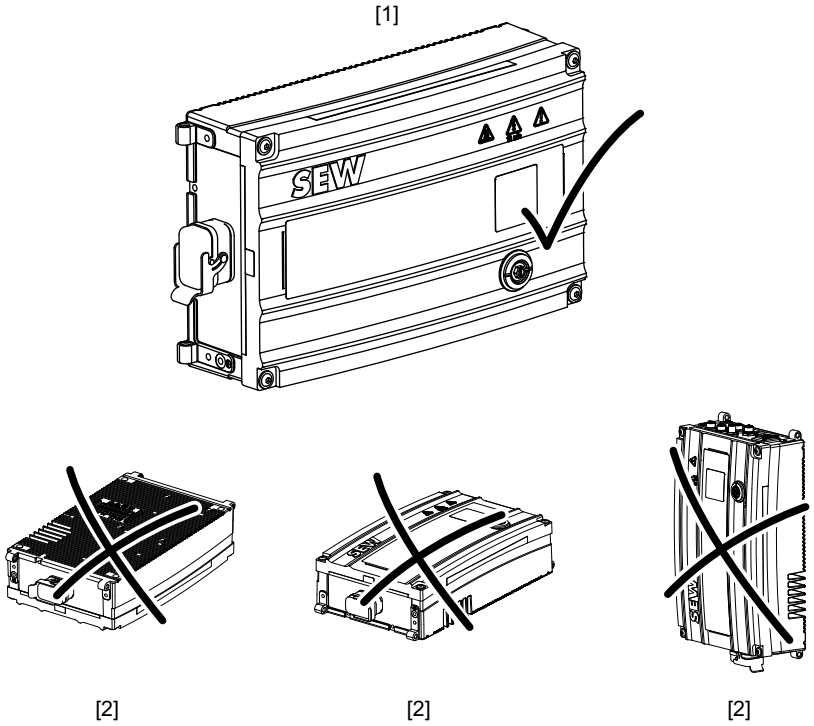
5.2 Mounting position

The following figure shows permitted and not permitted mounting positions:



[1] Permitted vertical mounting position
[2] Mounting positions that are not permitted

5.3 Minimum clearance

INFORMATION

- Observe the following minimum clearances during installation:
  - For connection of the cables and plug connectors
  - For handling the display, diagnostics and operating elements
  - For heat convection at the cooling fins if the device has cooling fins
- For more information on the required minimum clearances, refer to the dimension drawings in chapter "Technical data" (→ 🗎 96).

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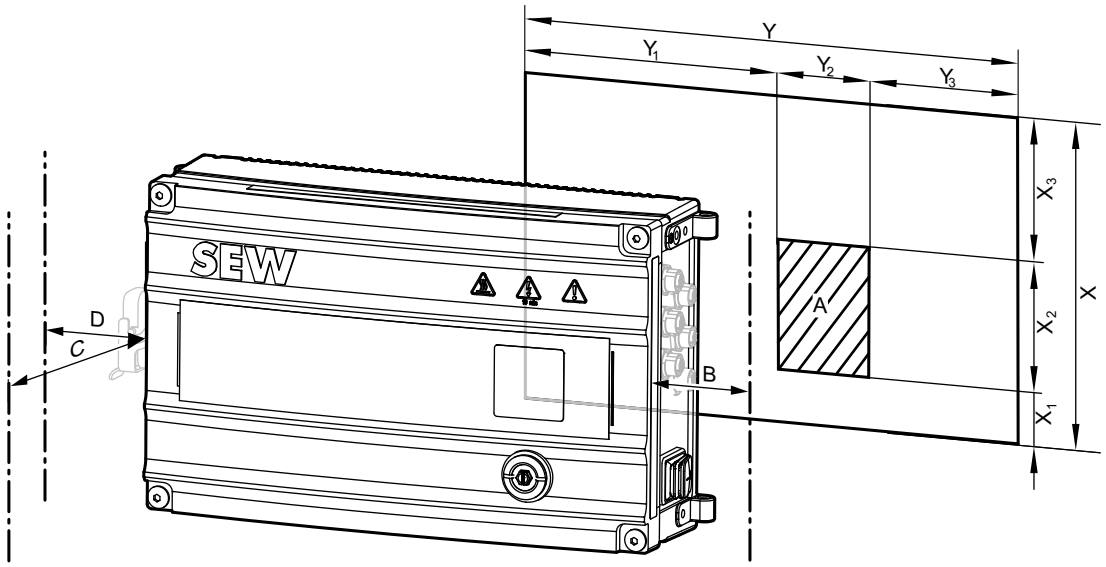

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The following table lists the minimum clearances. Housing dimensions are listed in chapter "Technical data" (→ 🗎 96).

Clearance	Function	Size
A: Back of the housing	Cut-out for contacts of the conductor rail	X_1 = 19.5 mm, X_2 = 81 mm, X_3 = 102.5 mm Y_1 = 175 mm, Y_2 = 57 mm, Y_3 = 91 mm
B: to the side on the right	Room for connection cables, plug connectors, mounted elements and actuator elements, e.g. maintenance switch	> 120 mm
C: Housing cover	Space for display elements, diagnostics elements and actuator elements, e.g. service unit	See dimension drawings in chapter "Technical data" (→ 🗎 96)
D: to the side on the left	Room for connection cables, plug connectors, mounted elements and actuator elements, e.g. maintenance switch	> 120 mm

5.4 Cooling

Observe the following:

- Avoid heat sources in the immediate proximity of the device.

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5.5 Installation

⚠ WARNING

Electric shock from live connections.

Severe or fatal injuries.

- Prevent contact with the feed plug X1261 at the rear of the device using design measures. For further information, refer to chapter "X1261: AC 400 V contact conductor connection" (→ 🗎 57).

NOTICE

External force too high.

Damage to the thread or the screw.

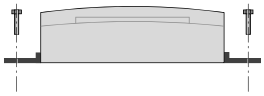
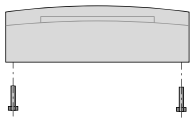
- Do not exceed the maximum tightening torque of 3.1 Nm – 3.5 Nm.

Use the accessories that are available from SEW-EURODRIVE for mounting:

- "Mounting kit with EMS angle brackets", part number 28218248

The included brackets are mounted to the narrow sides of the device.

Use one of the following mechanical mounting options:

Design			Fastening
1		Fixed angle brackets	• 4 × screwed
2		Tapped holes on the back of the device See chapter "Technical data" (→ 🗎 96)	• 4 × screwed

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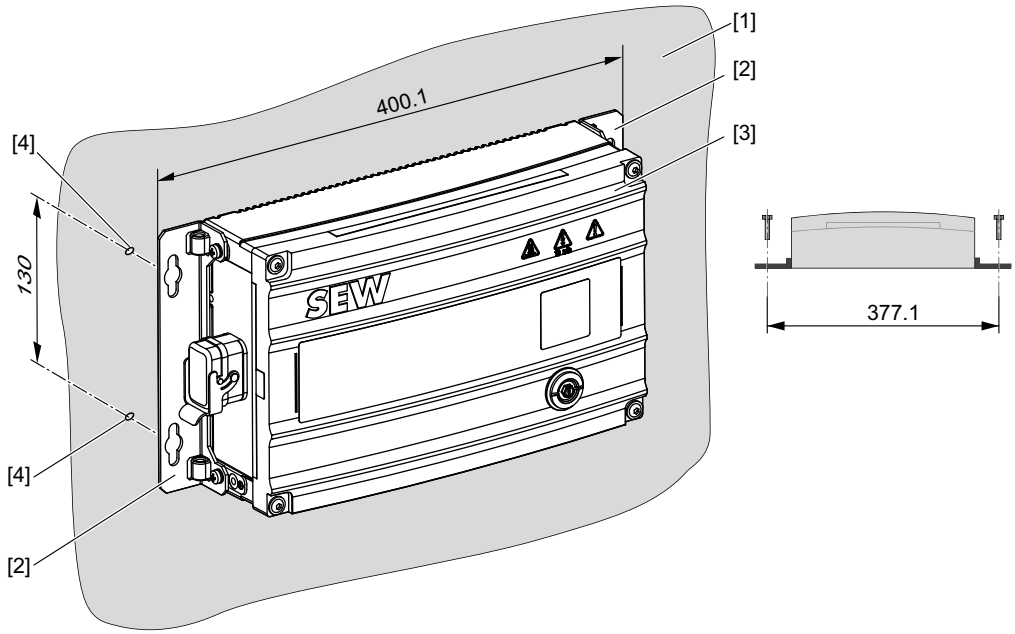
5.5.1 Fixed angle brackets

The following figure shows the main mounting elements and dimensions:



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[1] Mounting surface
[2] Angle bracket
[3] Device
[4] Tapped holes

Mounting angle bracket

To mount the angle brackets, use the EMS mounting kit (part number 28218248) with:

- ✓ 2 × angle bracket
- ✓ 4 × M5 × 16 screw

1. Mount the angle brackets to the connection sides of the device with the M5 screws via the available tapped holes on the housing.

Mounting the device

1. Refer to the dimension drawing for the distances regarding the boreholes for mounting the angle bracket.
2. Mark the boreholes at the installation location.
3. Cut 2 M5 threads at the marked locations on each side.
4. Use suitable locking devices, e.g. lock washers according to DIN 7980 and washers according to DIN EN ISO 7090.
5. Mount the device on the angle brackets with 2 suitable M5 screws with the required length on each side, e.g. cap screws according to DIN EN ISO 4762.

5.5.2 Tapped holes on the rear of the device

The device has 4 tapped holes on the rear of the device. Refer to the dimension drawing in chapter "Technical data" (→ 🗎 96) for information on the dimensions for mounting using tapped holes.

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6 Electrical installation

6.1 Installation notes

Observe the following points for electrical installation:

- Observe the general safety notes.
- Comply with all instructions referring to the technical data and the permissible conditions where the device is operated.

6.2 Motor types

INFORMATION

Unsuitable motor monitoring can lead to a malfunction. Only connect motors with thermostat (TH) to the device.

The device supports the following global motors from SEW-EURODRIVE. At this point, observe the possible brake voltage in chapter "Technical data" (→ 🗎 96).

Power rating	Motor types	Brake, standard	Brake, option
0.25 kW	DT63L4, 50 Hz, 400 V (IEC)	BR03	–
	DR63L4, 50/60 Hz (global)	BR03	–
	DRN71MS4, 50/60 Hz (global)	BE03	BE05
	DR63L4, 50 Hz, 400 V (IEC)	BR03	BR03
	DRE80S4, 50 Hz, 400 V (IEC)	BE05	BE1
	DRN71MS4, 50 Hz, 400 V (IEC)	BE03	BE05
	DRN71MS4, 60 Hz, 460 V (IEC)	BE03	BE05
	DRN71MS4, 60 Hz, 460 V (ABNT)	BE03	BE05
	DR2S63M4, 50 Hz, 400 V (IEC)	BE03	BE03
	DR2S63M4, 60 Hz, 460 V (IEC)	BE03	BE03
	DRU71SJ4, 50 Hz, 400 V (IEC)	BE05	BE1

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Power rating	Motor types	Brake, standard	Brake, option
0.37 kW	DT71D4, 50 Hz, 400 V (IEC)	BMG05	–
	DZ71D4, 60 Hz, 380 V (ABNT)	BE05	BMG05
	DRS71S4, 60 Hz, 380 V (ABNT)	BE05	BE1
	DRS71S4, 50/60 Hz (global)	BE05	BE1
	DRN71M4, 50/60 Hz (global)	BE05	BE1
	DRS71S4, 50 Hz, 400 V (IEC)	BE05	BE1
	DRS71S4, 60 Hz, 460 V (IEC)	BE05	BE1
	DRE80S4, 50 Hz, 400 V (IEC)	BE05	BE1
	DRN71M4, 50 Hz, 400 V (IEC)	BE05	BE1
	DRN71M4, 60 Hz, 460 V (IEC)	BE05	BE1
	DRN71M4, 60 Hz, 460 V (ABNT)	BE05	BE1
	DR2S71MS4, 50 Hz, 400 V (IEC)	BE05	BE1
	DR2S71MS4, 60 Hz, 460 V (IEC)	BE05	BE1
	DRE71SJ4, 50 Hz, 400 V (IEC)	BE05	BE1
	DRU71MJ4, 50 Hz, 400 V (IEC)	BE05	BE1
0.55 kW	DT80K4, 50 Hz, 400 V (IEC)	BMG1	–
	DZ80K4, 60 Hz, 380 V (ABNT)	–	BMG1
	DRS71M4, 60 Hz, 380 V (ABNT)	BE1	BE05
	DRS71M4, 50/60 Hz (global)	BE1	BE05
	DRN80MK4, 50/60 Hz (global)	BE1	BE05
	DRS71M4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRS71M4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRE80M4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRN80MK4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRN80MK4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRN80MK4, 60 Hz, 460 V (ABNT)	BE1	BE05
	DR2S71M4, 50 Hz, 400 V (IEC)	BE1	BE05
	DR2S71M4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRE71MJ4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRU80SJ4, 50 Hz, 400 V (IEC)	BE1	BE05

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Power rating	Motor types	Brake, standard	Brake, option
0.75 kW	DT80N4, 50 Hz, 400 V (IEC)	BMG1	–
	DZ80N4, 60 Hz, 380 V (ABNT)	–	BMG1
	DRE80S4, 60 Hz, 380 V (ABNT)	BE1	BE05
	DRE80M4, 50/60 Hz (global)	BE1	BE05
	DRN80M4, 50/60 Hz (global)	BE1	BE05
	DRS80S4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRS80S4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRE80M4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRE80M4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRN80M4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRN80M4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRN80M4, 60 Hz, 460 V (ABNT)	BE1	BE05
	DR2S80MK4, 50 Hz, 400 V (IEC)	BE1	BE05
	DR2S80MK4, 60 Hz, 460 V (IEC)	BE1	BE05
	DRE71MJ4, 50 Hz, 400 V (IEC)	BE1	BE05
	DRU80MJ4, 50 Hz, 400 V (IEC)	BE1	BE2
1.1 kW	DT90S4, 50 Hz, 400 V (IEC)	BMG2	–
	DZ90S4, 60 Hz, 380 V (ABNT)	–	BMG2
	DRE80M4, 60 Hz, 380 V (ABNT)	BE2	BE1
	DRE90M4, 50/60 Hz (global)	BE2	BE1
	DRN90S4, 50/60 Hz (global)	BE2	BE1
	DRS80M4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRS80M4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRE90M4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRE90M4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRN90S4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRN90S4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRN90S4, 60 Hz, 460 V (ABNT)	BE2	BE1
	DR2S80M4, 50 Hz, 400 V (IEC)	BE2	BE1
	DR2S80M4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRE80SJ4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRU90MJ4, 50 Hz, 400 V (IEC)	BE2	BE1

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Power rating	Motor types	Brake, standard	Brake, option
1.5 kW (star connection only)	DT90L4, 50 Hz, 400 V (IEC)	BMG2	–
	DZ90L4, 60 Hz, 380 V (ABNT)	–	BMG2
	DRE90M4, 60 Hz, 380 V (ABNT)	BE2	BE1
	DRE90L4, 50/60 Hz (global)	BE2	BE1
	DRN90L4, 50/60 Hz (global)	BE2	BE1
	DRS90M4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRS90M4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRE90L4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRE90L4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRN90L4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRN90L4, 60 Hz, 460 V (IEC)	BE2	BE1
	DRN90L4, 60 Hz, 460 V (ABNT)	BE2	BE1
	DRE80MJ4, 50 Hz, 400 V (IEC)	BE2	BE1
	DRU90LJ4, 50 Hz, 400 V (IEC)	BE2	BE5

6.3 Low-voltage supply systems

The device is only suitable and approved for operation on the following systems:

- TN and TT systems with directly grounded star point

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6.4 UL-compliant installation

INFORMATION

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

6.4.1 (Field wiring) Power terminals

Use 75 °C copper wire only.

6.4.2 Short circuit current rating

Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes when protected by 25 A, 600 V non-semiconductor fuses or 500 V minimum 25 A maximum inverse time circuit breakers.

Max. voltage is limited to 500 V.

6.4.3 Branch circuit protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

For maximum branch circuit protection see table below:

	SCCR: 5 kA/500 V **When protected by:**	
Model	**Non Semiconductor Fuses (currents are maximum values)**	**Inverse-Time Circuit Breaker (currents are maximum values)**
PHE1.B-A15-… PHE2.B-A15-…	25 A/600 V	25 A/500 V

6.4.4 Motor overload protection

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

The trip current is adjusted to 140 % of the rated motor current. For further information, refer to chapter "Technical data".

6.4.5 Environmental rating

Type 1

6.4.6 Wiring diagrams

For wiring diagrams, refer to chapter "Electrical installation".

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6.5 Electromagnetic compatibility (EMC)

INFORMATION

The device can cause EMC interference within the permitted limit range according to EN 61800-3.

The device is a drive system of the category C3 (see EN 61800-3).

For further information on EMC compliant installation, refer to the following documentation: "Drive Engineering – Practical Implementation, Electromagnetic Compatibility (EMC) in Drive Engineering".

6.5.1 EMC-compliant installation

Ensure that there is a HF-capable equipotential bonding for all drive components.

Use low-impedance, HF-capable connectors such as HF litz wire or ground straps. Standard PE does not achieve sufficient equipotential bonding regarding HF and EMC.

For further information, refer to chapter "Installing ground connection or equipotential bonding" (→ 🗎 45).

6.6 Cable routing

Observe the following when routing the cables:

- Use suitable cables to connect power supply and communication. For more information on connection descriptions, refer to chapter "Electrical connections" (→ 🗎 55).
- Route power cables and signal cables in separate cable ducts.
- Maintain the greatest possible distance between power cables and signal cables.
- Avoid using long cables running parallel to one another.

For further information on EMC compliant installation, refer to the following documentation: "Drive Engineering – Practical Implementation, Electromagnetic Compatibility (EMC) in Drive Engineering".

6.6.1 Shielding

Observe the following when shielding:

- Use shielded power and electronics cables
- Connect the shield and make sure it is grounded over a wide area at both ends. For cables with multiple shields, also connect the inner shield at both ends making sure it is grounded over a wide area.
- Use EMC-capable plug connectors
- For external bus connections, refer to the bus-specific installation instructions

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6.7 Protective measures against electrical hazards

6.7.1 Connection points for mobile applications

For mobile applications, the type of energy transfer determines how you have to apply preventive measure against electrical hazards.

Direct power supply

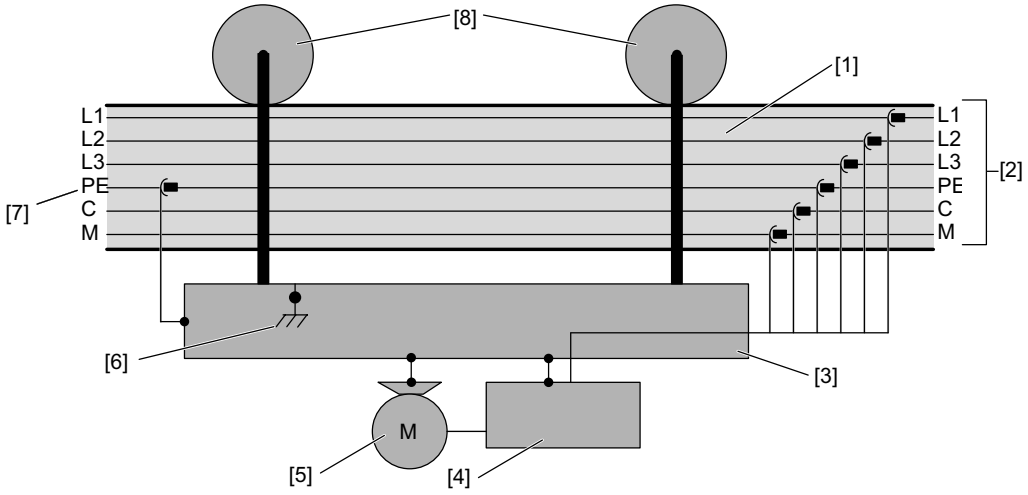
The ground connection protects mobile systems with direct power supply against electrical hazard according to IEC 60364-4-41.

Comply with the following rules:

- Ground the device with the shortest possible route (PE).
- Use a green/yellow grounding cable.

The ground connection must be ensured via 2 mobile contact outlets (sliding contacts).

The following figure shows a sample mobile system with direct power supply via sliding contacts:



9007208976704523

[1]	Stationary system section	[5]	Motor
[2]	Power supply	[6]	Vehicle GND
[3]	Vehicle support frame	[7]	PE
[4]	Application control	[8]	Wheels

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6.7.2 Installing ground connection or equipotential bonding

⚠ WARNING

Electric shock due to faulty ground connection or equipotential bonding.

Severe or fatal injuries.

- Make sure to install the ground connection and equipotential bonding correctly.

You have to protect all electrical operating resources such as the device or the motor using ground connection or equipotential bonding.

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Required material

- Short low-impedance HF-compatible cables with M5 crimp cable lug
- Grounding kit (included in the delivery):
  - 2 pan head screws, 5 × 14 (self-tapping)
  - 4 serrated lock washers
  - 2 terminal clips

Tools required

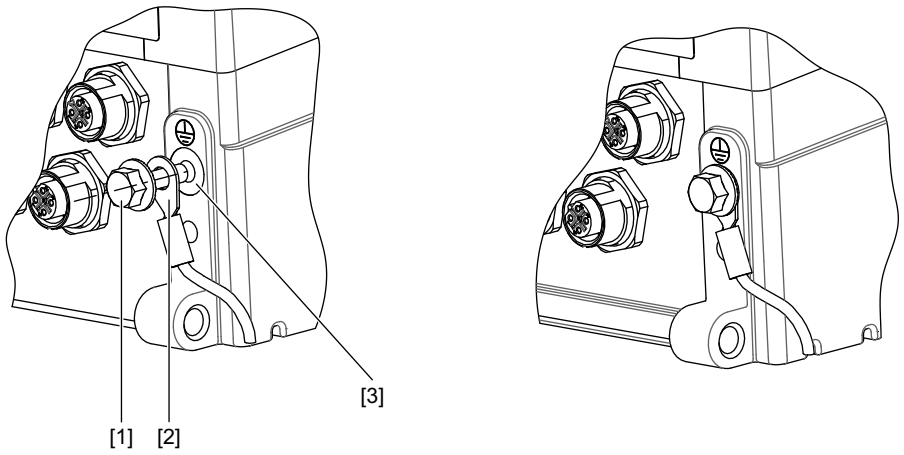
Socket wrench with wrench size 8 mm

Procedure

Device without braking resistor

Always ground the device using the shortest possible route.

The connection points for ground connection or equipotential bonding are on the narrow sides of the device. They are marked with a "ground" ⏚ icon.



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[1] M5 × 10 screw
[2] Crimp cable lug for M5
[3] Connection point

✓ Note the different cable cross section of the supply line during installation. For further information, refer to chapter "Required cable cross section" (→ 🗎 49).

1. Remove the screw.
2. Push the crimp cable lug onto the screw.
3. Tighten the screw with a maximum tightening torque of 2.5 Nm.

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Device with braking resistor

INFORMATION

For the device variant with control via a 3-wire brake (PHE..B-15-3..) in combination with a motor with 3-wire brake (e.g. motors from SEW-EURODRIVE), the brake coil is used as braking resistor. Do not connect any external braking resistor in this case.

If a motor without holding brake is connected to any of the two device variants, SEW-EURODRIVE recommends connecting a braking resistor.

Preparing the braking resistor cable

Proceed as follows to install the braking resistor cable:

1. Remove the plastic sheath of the braking resistor cable [6] over a length of at least 260 mm.
2. Remove the shield of the braking resistor cable [6] over a length of at least 30 mm.
3. Fold back the braided shield over the plastic sheath of the braking resistor cable [6].
4. Fix the braided shield in position with heat shrink tubing. Make sure that at least 20 mm of the braided shield remain blank.
5. Shorten the PE connection cable of the braking resistor [3] to at least 85 mm.
6. Crimp the ring cable lug for M5 to the PE connection cable of the braking resistor [3].
7. Crimp a suitable female push-on connector (6.3 mm) to each of the remaining conductors of the braking resistor [7].

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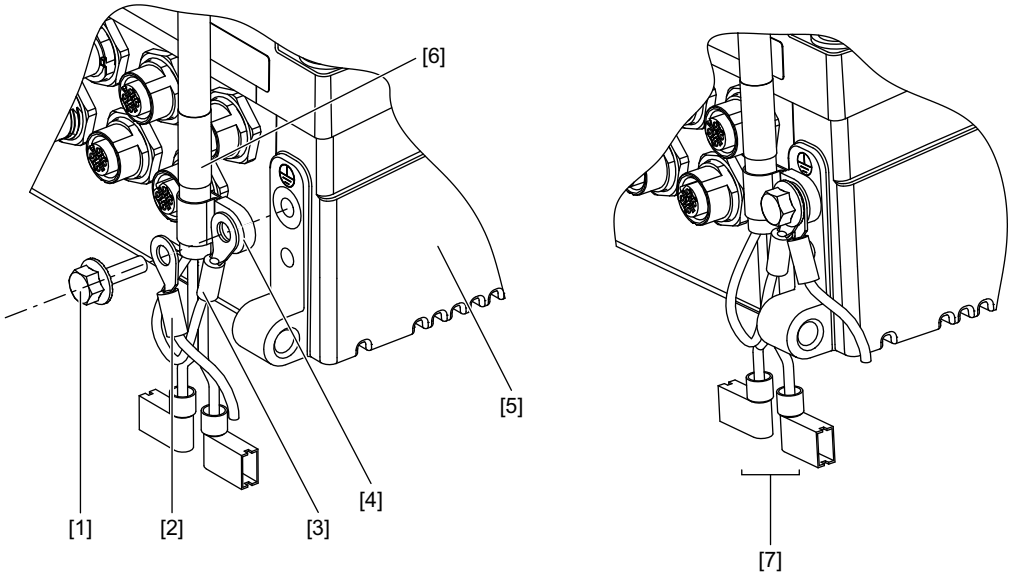
Installing the PE



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[1] M5 × 10 screw
[2] Crimp cable lug for M5 (PE connection cable of the device)
[3] Crimp cable lug for M5 (PE connection cable of the braking resistor)
[4] Shield terminal
[5] Housing
[6] Braking resistor cable
[7] Female push-on connector

✓ Note the different cable cross section of the supply line during installation. For further information, refer to chapter "Required cable cross section" (→ 🗎 49).

1. Guide the shield terminal [4] over the braking resistor cable [6].
2. Place the shield terminal [4] onto the braided shield. Ensure that the braided shield of the braking resistor cable is completely surrounded by the shield terminal.
3. Take a screw [1] and push the crimp cable lug [2], the crimp cable lug [3] and the shield terminal [4] onto it.
4. Tighten the screw [1] with a maximum tightening torque of 2.5 Nm.
5. Plug the brown conductor of the braking resistor into the push-on connector +R of the signal feed connector X1261.
6. Plug the white conductor of the braking resistor into the push-on connector -R of the signal feed connector X1261.

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Required cable cross section

Leakage currents ≥ AC 3.5 mA/DC 10 mA may occur during normal operation. Note that the required cable cross section of the PE conductor depends on the cable cross section of the supply cable. Select the cable cross section of the PE conductor according to the following requirements.

Supply cable < 10 mm²:

Install two PE conductors with a cable cross section corresponding to the supply cable. Both PE have to be connected to different connection points and routed in parallel.

Alternatively, use a copper PE conductor with a cable cross section of 10 mm².

Supply cable 10 mm²:

Route a copper PE conductor with a cable cross section corresponding to the supply cable.

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6.8 Using prefabricated cables

SEW-EURODRIVE uses prefabricated cables for certifications, type tests and approval of the devices. The cables provided by SEW-EURODRIVE fulfill all requirements necessary to ensure that the device and all connected components function properly. 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.

6.8.1 Use of third-party cables

If third-party cables are used – even if these cables are technically equivalent – SEW-EURODRIVE will not accept any liability and cannot guarantee compliance with device properties or that the device will function correctly.

When using third-party cables to connect the device and/or device components, make sure to comply with all applicable national regulations. Note that the technical features of the device or system of devices might be affected inadvertently when using non-SEW cables. This concerns in particular the following properties:

- Mechanical properties (such as IP protection class, cable carrier suitability)
- Chemical properties (such as the absence of silicone and halogen, resistance against substances)
- Thermal properties (e.g. temperature stability, heating of the device, 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)

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

- IEC 60309
- IEC 61984
- IEC 60204

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6.9 Line components

6.9.1 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.

6.9.2 Line fuses, fuse types

Install the fuses at the beginning of the supply line behind the supply bus junction.

Design the fuses according to the current carrying capacity of the conductor rail in use.

The following applies when using fuses on the vehicles:

Line protection types in utilization categories gL, gG:

- Nominal fusing voltage ≥ nominal line voltage
- Depending on the frequency inverter utilization, the nominal fusing current must be dimensioned for 100% of the frequency inverter nominal current.

Miniature circuit breaker with characteristics B, C:

- Miniature circuit breaker nominal voltage ≥ nominal line voltage
- The nominal current of the miniature circuit breaker must be 10% above the frequency inverter nominal current.

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6.10 Terminal strips

⚠ WARNING

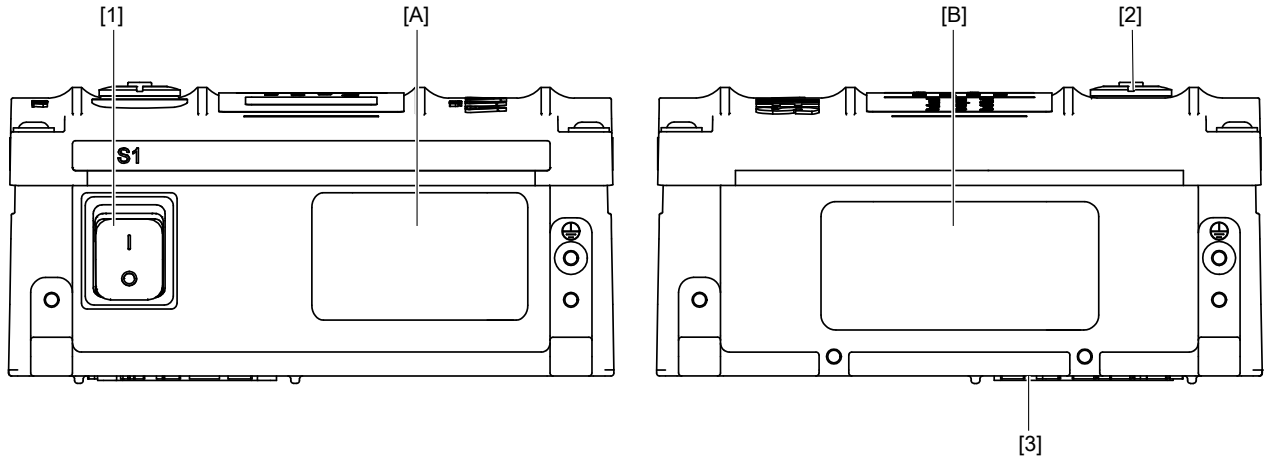
Electric shock when disconnecting or connecting voltage-carrying plug connectors.

This can result in severe or fatal injuries.

- Disconnect all supply voltages.
- Make sure that the device is de-energized.
- Never plug or unplug the plug connectors while they are energized.

INFORMATION

For further information on the individual connections and connection cables, refer to chapter "Electrical connections" (→ 🗎 55).



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[1]	S1	Operating switch
[2]	X4022	RS485 interface – service
[3]	X1261	AC 400 V contact conductor connection
[A]	→	Connection space for signal interfaces
[B]	→	Connection space for motor connection

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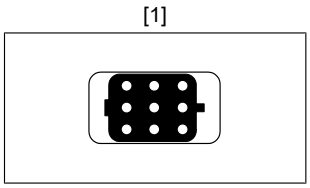
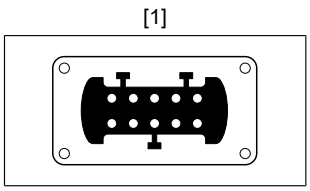
6.10.1 Connection site for motor connection

Motor connection HAN® Q8/0

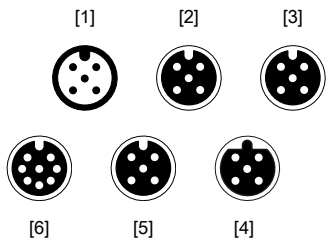
Connection			Function	Type designation
	[1]	X2011	Motor with brake control	PHE**1**.B-...-...-..

Motor connection HAN® 10E

Connection			Function	Type designation
	[1]	X2013	Motor with brake control	PHE**2**.B-...-...-..

6.10.2 Connection of signal interfaces

Communication package 1

Connection			Function	Type designation
	[1]	X4441	M12 parameter memory	PHE.**1**B-...-...-..
	[2]	X5002_2	Digital input – communication and control unit	
	[3]	X5002_1	Digital inputs/outputs – communication and control unit	
	[4]	X4011	RS485 interface – external (with DC 24 V)	
	[5]	X1551	DC 24 V connection for external operating switches	
	[6]	X5003	Digital input – communication and control unit	

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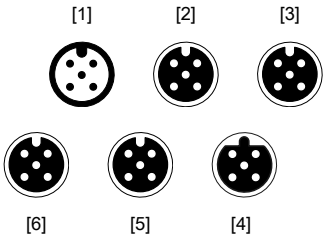
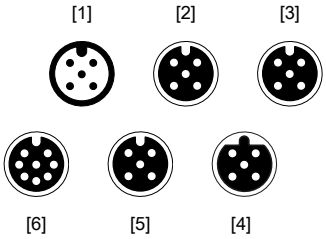
Communication package 2

Connection			Function	Type designation
	[1]	X4441	M12 parameter memory	PHE.**2**B-...-...-..
	[2]	X5002_2	Digital input – communication and control unit	
	[3]	X5002_1	Digital inputs/outputs – communication and control unit	
	[4]	X4011	RS485 interface – external (with DC 24 V)	
	[5]	X5002_3	Digital input – communication and control unit	
	[6]	X5002_4	Digital input – communication and control unit	

Communication package 3 (STO)

Connection			Function	Type designation
	[1]	X4441	M12 parameter memory	PHE.**3**B-...-...-..
	[2]	X5002_2	Digital input – communication and control unit	
	[3]	X5002_1	Digital inputs/outputs – communication and control unit	
	[4]	X4011	RS485 interface – external (with DC 24 V)	
	[5]	X5502	Safe disconnection – input	
	[6]	X5003	Digital input – communication and control unit	

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6.11 Electrical connections

6.11.1 Representation of connections

The wiring diagrams show the contact end of the connections.

6.11.2 Connection cables

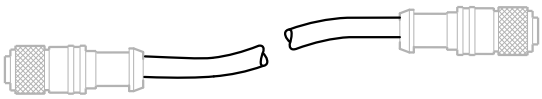
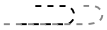
Connection cables are not included in the delivery.

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 device design 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:

Depiction	Meaning
	Set length
	Variable length
	Suitable for cable carriers
	Not suitable for cable carriers

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6.11.3 Cable structure

Diagram

The following table shows the cable structure based on an example:

Depiction	Meaning
(	Cable shield
4	Number of core pairs (in twisted cables only)
X	
2	Number of cores
X	G - with green-yellow PE conductor X - without PE
0.25	Core cross section in mm^2
)	Cable shield
+	A plus sign is added to cores with other features.
…	

Examples

The following examples illustrate the cable structure:

- **3G1.5:**

  Cable with 3 cores of 1.5 mm^2 each, one of them is a green-yellow PE conductor.
- **((2X2X0.25)+4G2.5):**

  Shielded hybrid cable with
  - 4 twisted-pair cables of 0.25 mm^2 each, shielded, and
  - 4 power cores of 2.5 mm^2 each, one of them is a green-yellow PE conductor.

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6.11.4 X1261: AC 400 V contact conductor connection

⚠ WARNING

Electric shock from blank live connections.

Severe or fatal injuries.

- Use safe, insulated female push-on connectors for installation.
- To avoid coming into contact with unused male push-on connectors, you have to install the touch guard on unused male push-on connectors.

⚠ WARNING

Electric shock from live connections.

Severe or fatal injuries.

- Note the following points for selecting suitable female push-on connectors:
- Use safe, insulated female push-on connectors for installation.
- The installed female push-on connectors must comply with the standard DIN 46 245 part 3, DIN 46 247 part 3 or DIN 46 346 part 3.
- Use the female push-on connector only with the insulating housing specified by the manufacturer.
- Make sure that each female push-on connector is plugged in correctly and latched.
- The latching function of the female push-on connector cannot be guaranteed for multiple use. Therefore, use a new female push-on connector after single use.

NOTICE

Damage caused by corrosion.

Damage of connection X1261.

- The push-on contacts of connection X1261 are accessible from the outside. Ensure that the push-on contacts do not come into contact with water or other corrosive substances.

Function
AC 400 V connection for units with half-wave control supplied by the conductor rail

Connection type
Male push-on connectors 6.3 mm

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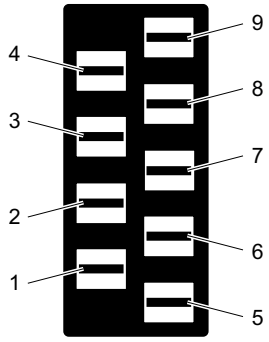
Connection diagram


No.	Name	Function
1	+R	Brake resistor (+)
2	-R	Brake resistor (-)
3	PE	PE connection
4	M	Signal output M
5	$L_{X/M}$	Line connection phase X/jumper to signal contact control This phase is used for the signal output M.
6	L_Y	Line connection phase Y
7	L_Z	Line connection phase Z
8	C2/n.c.	Control input C2(with PHE..B-..-1X0.2.. device variant)/ Not assigned
9	C1	Control input C1

Connection recommendation

INFORMATION

Phase L1, phase L2 or phase L3 can be connected to the control input C1 independent of phase $L_{X/M}$. For further information, refer to chapter "Technical data" (→ 🗎 96).

INFORMATION

Connect all 3 phases (L1, L2, L3). Deactivated phase failure detection may result in unwanted operating behavior. For further information, refer to the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

The phase that is connected to $L_{X/M}$ is output at the signal output M. Select the connection assignment from the following recommendations depending on the desired signal phase:

$L_{X/M}$	L_Y	L_Z
L1	L2	L3
L2	L3	L1
L3	L1	L2

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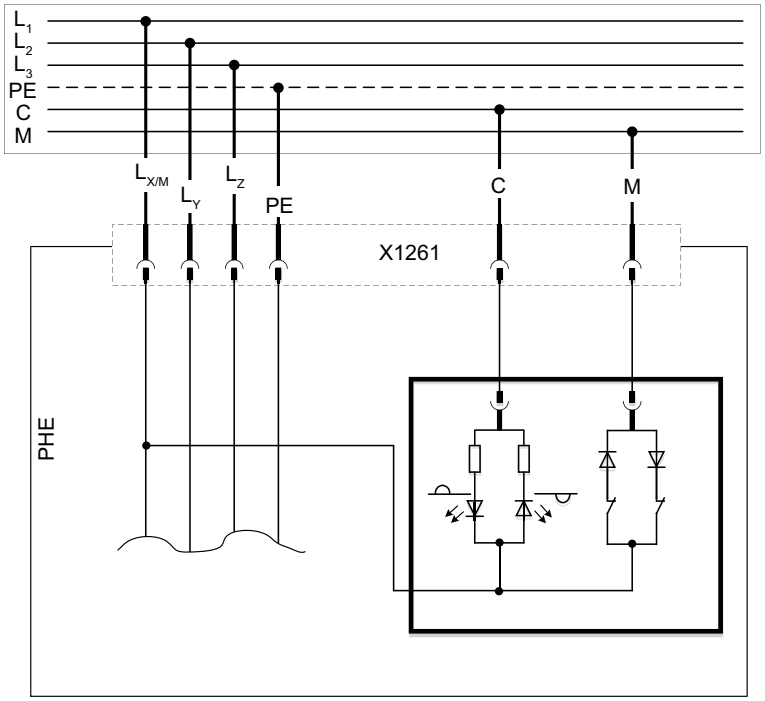
Example: Reference of the control input to $L_{X/M}$



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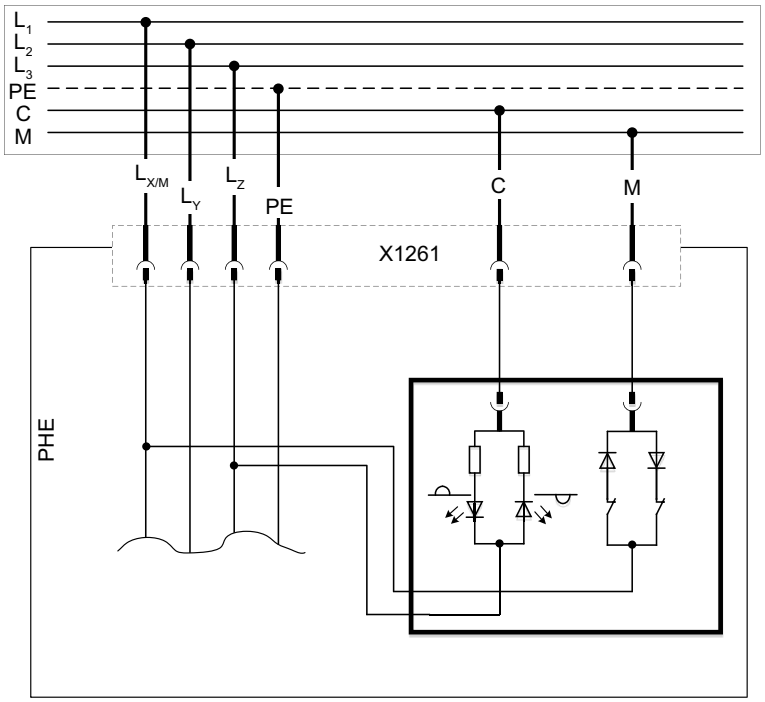
Example: Reference of the control input against L_Z



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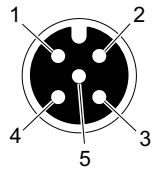
6.11.5 X1551: DC 24 V connection for external operating switches

Function
DC 24 V connection for external operating switches

Connection type
M12, 5-pin, female, A-coded

Connection image


No.	Name	Function
1	+24V	DC 24 V output
2	0V24_SW	0V24 reference potential – switched
3	0V24	0V24 reference potential
4	+24V_SW	DC 24 V input – switched
5	res.	Reserved

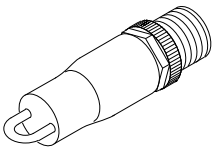
Connection component

Jumper plug

Part number: 11747099

Structure: bridged 1+4/2+3

Connection: M12



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6.11.6 X2011: Motor with brake control

NOTICE

Damage or malfunction due to motors with built-in brake rectifiers.

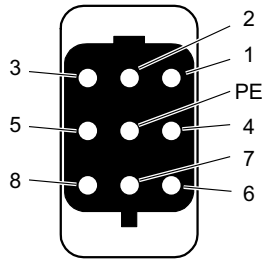
Damage to the drive system or its environment.

- Do not use motors with built-in brake rectifiers in conjunction with this device.

Function
Power connection for motor with brake up to 4 kW

Connection type
Han® Q 8/0, female

Connection diagram



No.	Name	Function
1	U	Motor phase U output
2	14	Brake terminal 14 (white)
3	W	Motor phase W output
4	15	Brake terminal 15 (blue)
5	TH	Motor temperature sensor (+)
6	13	Brake terminal 13 (red)
7	V	Motor phase V output
8	TH	Motor temperature sensor (-)
PE	PE	PE connection

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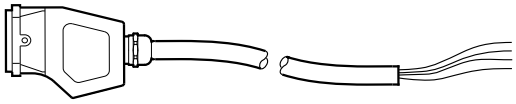
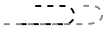
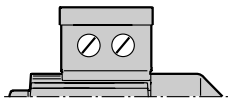
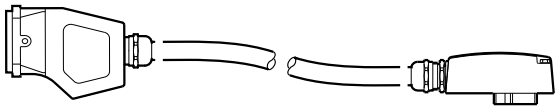
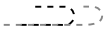
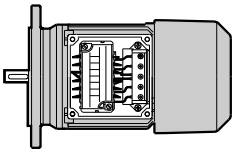
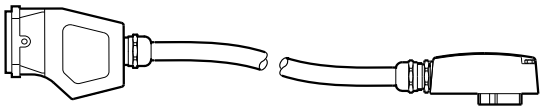
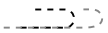
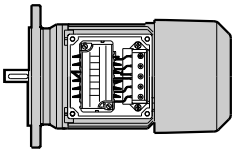
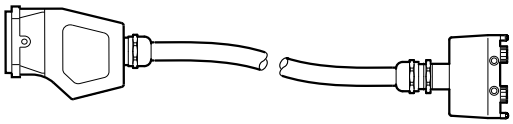
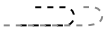
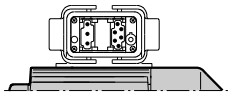
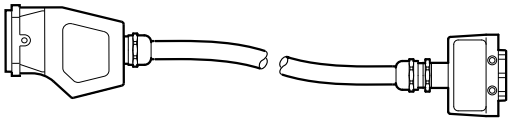
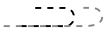
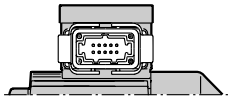
Connection cables

Up to maximum 2.2 kW device power IEC

Cable	Length/installation type	Type	Component
Part number: 18125794 Cable design: 4G1.5  Han®Q 8/0 ↔ open (terminal box connection M4)	Variable length 	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 
Part number: 18127681 △ Cable design: 4G1.5  Han® Q 8/0 ↔ IS △	Variable length 	D/1.5	DRS71△ DRE80 – 90△ DRN80 – 90△ 
Part number: 18127703 人  Han® Q 8/0 ↔ IS 人	Variable length 	D/1.5	DRS71人 DRE80 – 90人 DRN80 – 90人 
Part number: 18127711 Cable design: 4G1.5  Han® Q 8/0 ↔ ABB8	Variable length 	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 
Part number: 18127738 Cable design: 4G1.5  Han® Q 8/0 ↔ ASB8	Variable length 	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 

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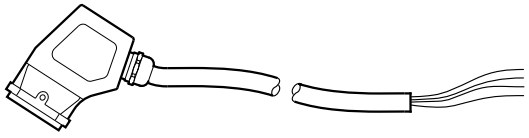
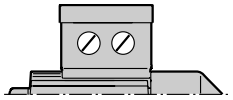
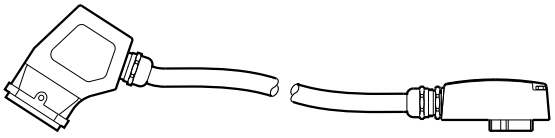
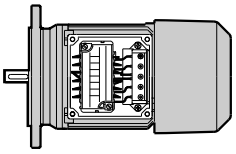
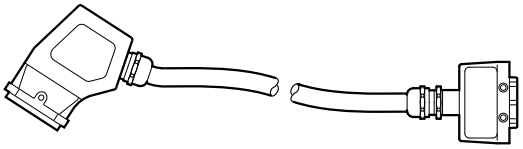
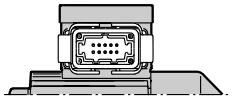
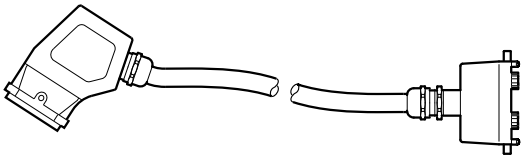
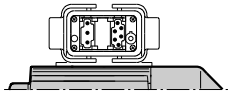
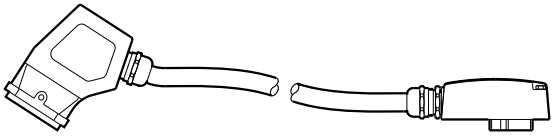
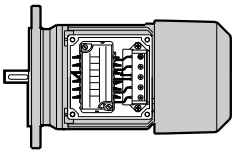
Cable	Length/installation type	Type	Component
Part number: 18164234  Han®Q 8/0 ↔ open (terminal box connection M4)	Variable length	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 
Part number: 18164250 ⅄  Han® Q 8/0 ↔ IS ⅄	Variable length	D/1.5	DRS71⅄ DRE80 – DRE90⅄ DRN80 – DRN90⅄ 
Part number: 18164269  Han® Q 8/0 ↔ ASB8	Variable length	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 
Part number: 18164285  Han® Q 8/0 ↔ ABB8	Variable length	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 
Part number: 18164374 △  Han® Q 8/0 ↔ IS △	Variable length	D/1.5	DRS71△ DRE80 – DRE90△ DRN80 – DRN90△ 

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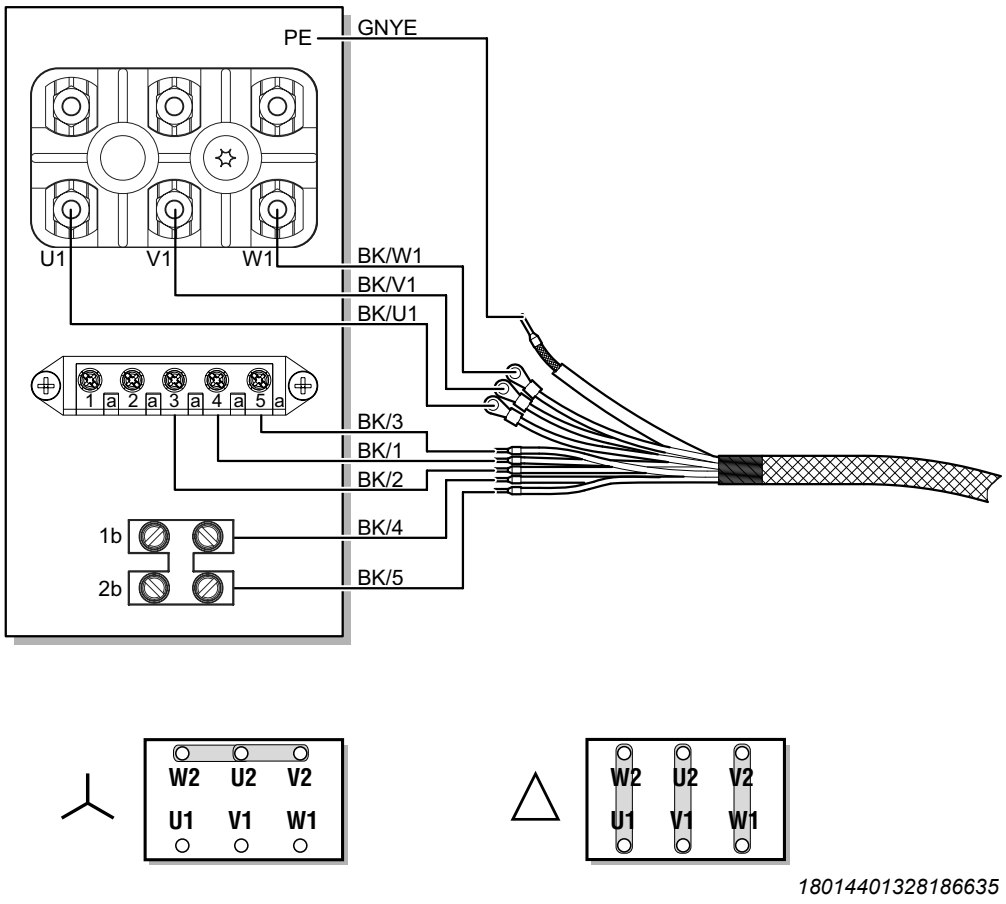
Conductor assignment

Part number	Signal name	Core color
18125794 (straight connector) 18164234 (angled connector)	U1	Black/U1
	V1	Black/V1
	W1	Black/W1
	4a	Black/1
	3a	Black/2
	5a	Black/3
	1b	Black/4
	2b	Black/5
	PE connection	Green-yellow + shield end (Inner shield)

Connecting the hybrid cable

The following figure shows the connection of the hybrid cable to the terminal box of the motor. Also observe the wiring diagram of the respective motor.



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6.11.7 X2013: Motor with brake control

NOTICE

Damage or malfunction due to motors with built-in brake rectifiers.

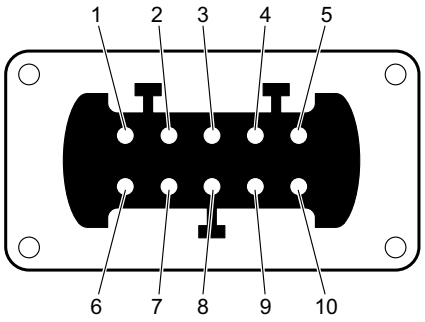
Damage to the drive system or its environment.

- Do not use motors with built-in brake rectifiers in conjunction with this device.

Function
Power connection for motor with brake up to 4 kW

Connection type
Han® 10 E

Connection diagram



No.	Name	Function
1	U	Motor phase U output
2	V	Motor phase V output
3	W	Motor phase W output
4	13	Brake terminal 13 (red)
5	15	Brake terminal 15 (blue)
6	14	Brake terminal 14 (white)
7	res.	Reserved
8	res.	Reserved
9	TH	Motor temperature sensor (+)
10	TH	Motor temperature sensor (-)
PE	PE	PE connection

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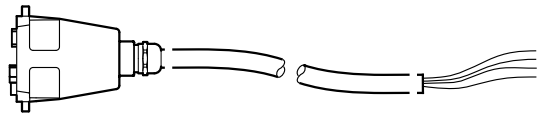
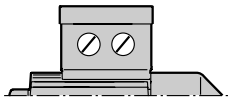
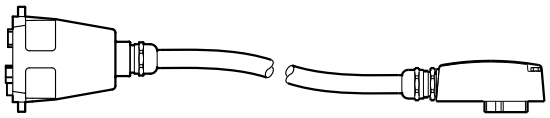
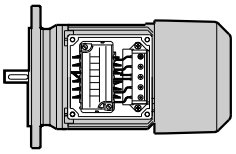
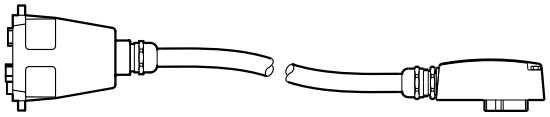
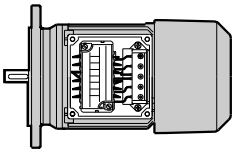
Connection cables

Cable	Length/installation type	Type	Component
Part number: 18164242  Han® 10 E ↔ open (terminal box connection M4)	Variable length	D/1.5	DRS71 DRE80 – DRE90 DRN80 – DRN90 
Part number: 18164277 ⅄  Han® 10 E ↔ IS ⅄	Variable length	D/1.5	DRS71⅄ DRE80 – DRE90⅄ DRN80 – DRN90⅄ 
Part number: 18164323 △  Han® 10 E ↔ IS △	Variable length	D/1.5	DRS71△ DRE80 – DRE90△ DRN80 – DRN90△ 

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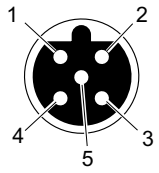
6.11.8 X4011: RS485 interface – external

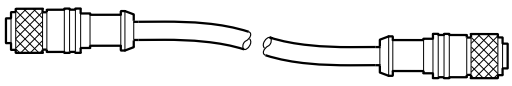
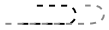
Function
RS485 interface for external components

Connection type
M12, 5-pin, female, B-coded

Connection diagram


Assignment		
No.	**Name**	**Function**
1	+24V	DC 24 V output
2	RS-	RS485 data line (-)
3	GND	Reference potential
4	RS+	RS485 data line (+)
5	res.	Reserved

Connection cables

Cable	Length/installation type	Component
Part number: 18161871 Cable design: 5X0.34  M12, 5-pin, female, A-coded ↔ M12, 5-pin, male, A-coded	Variable length 	–

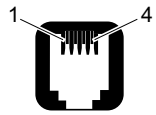
Conductor assignment

Part number	Pin assignment female	Pin assignment male
18161871	1	1
	2	4
	3	3
	4	2
	5	5

6.11.9 X4022: RS485 interface – service

Function
RS485 service interface

Connection type
RJ10

Wiring diagram


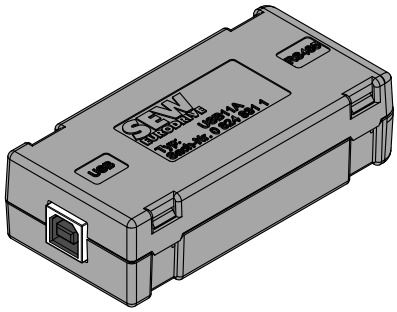
No.	Name	Function
1	GND	Reference potential
2	RS-	RS485 data line (-)
3	RS+	RS485 data line (+)
4	+5V	DC 5 V output

Connection component

USB11A interface adapter

Part number: 08248311

Connection: RJ10



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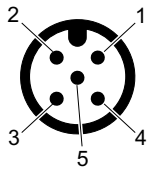
6.11.10 X4441: M12 parameter memory

Function
Interface for connecting the M12 parameter memory

Connection type
M12, 5-pin, male, A-coded

Connection image


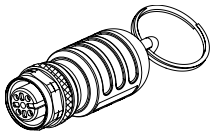
No.	Name	Function
1	GND	Reference potential
2	+5V	DC 5 V output
3	D-	Data line (-)
4	D+	Data line (+)
5	res.	Reserved

Connection component

M12 parameter memory

Part number: 17976340

Connection: M12



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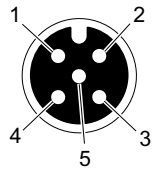
6.11.11 X5002_1: Digital inputs/outputs – communication and control unit

Function
Digital inputs/outputs of the communication and control unit

Connection type
M12, 5-pin, female, A-coded

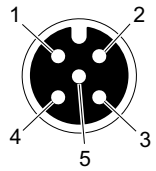
Connection image


No.	Name	Function
1	+24V	DC 24 V output
2	DIO01	Digital input/digital output 01
3	0V24	0V24 reference potential
4	DIO00	Digital input/digital output 00
5	FE	Equipotential bonding / functional earth

6.11.12 X5002_2: Digital input – communication and control unit

Function
Digital input of communication and control unit

Connection type
M12, 5-pin, female, A-coded

Connection image


No.	Name	Function
1	+24V	DC 24 V output
2	DI03	Digital input 03
3	0V24	0V24 reference potential
4	DI02	Digital input 02
5	FE	Equipotential bonding / functional earth

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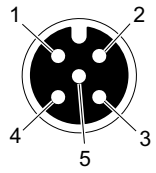
6.11.13 X5002_3: Digital input – communication and control unit

Function
Digital input of communication and control unit

Connection type
M12, 5-pin, female, A-coded

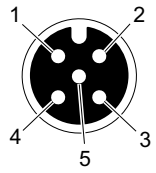
Connection image


No.	Name	Function
1	+24V	DC 24 V output
2	DI05	Digital input 05
3	0V24	0V24 reference potential
4	DI04	Digital input 04
5	FE	Equipotential bonding / functional earth

6.11.14 X5002_4: Digital input – communication and control unit

Function
Digital input of communication and control unit

Connection type
M12, 5-pin, female, A-coded

Connection image


No.	Name	Function
1	+24V	DC 24 V output
2	DI07	Digital input 07
3	0V24	0V24 reference potential
4	DI06	Digital input 06
5	FE	Equipotential bonding / functional earth

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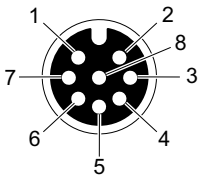
6.11.15 X5003: Digital input – communication and control unit

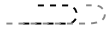
Function
Digital input of communication and control unit

Connection type
M12, 8-pin, female, A-coded

Connection image


No.	Name	Function
1	DI04	Digital input 04
2	DI05	Digital input 05
3	DI06	Digital input 06
4	DI07	Digital input 07
5	+24V	DC 24 V output
6	res.	Reserved
7	GND	Reference potential
8	res.	Reserved

Connection cables

Cable	Length/installation type	Component
Length 0.6 m: Part number 19185421 **Length 1.5 m:** Part number 19115881 **Length 3 m:** Part number 18161103  M12, male, straight ↔ M12, female, straight	Fixed length 	Sensor/actuator box

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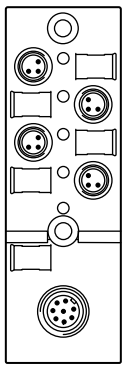
Connection component

Sensor/actuator box

Part number: 19111142

Connection: M8



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6.11.16 X5502: Safe disconnection – input

⚠ WARNING

Risk of injury due to non safety-related disconnection of the device if the connection is jumpered.

Severe or fatal injuries.

- Jumper this connection only if the device will not perform any safety functions according to EN ISO 13849-1.

INFORMATION

Use only shielded cables for this connection.

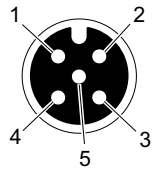
The operating switch is disabled when the connection cable is connected. The functions DC 24 V output (+24V) and 0 V 24 reference potential (0V24) may be used only when the STO function is jumpered and not used. The functions must not be used to supply a safety relay.

This connection is marked with a yellow ring.

Function
Input for safe disconnection

Connection type
M12, 5-pin, female, A-coded

Wiring diagram



No.	Name	Function
1	+24V	DC 24 V output
2	STO-	0V24 reference potential for safe disconnection
3	0V24	0V24 reference potential
4	STO+	DC 24 V input for safe disconnection
5	res.	Reserved

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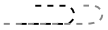
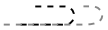
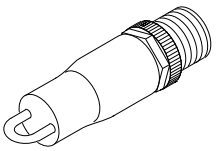
Connection cable

Cable	Length/installation type	Component
Part number: 28129261 Cable design: ((2xAWG24)+(2xAWG22)  M12, 5-pin, male, A-coded ↔ M12, 5-pin, male, A-coded	Variable length 	Terminal box of the safety relay/safety controller
Part number: 28129253 Cable design: (2x0.75)  M12, 5-pin, male, A-coded ↔ M12, 5-pin, male, A-coded	Variable length 	Terminal box of the safety relay/safety controller

Connection component

STO jumper plug

Part number: 11747099
Structure: bridged 1+4/2+3
Connection: M12



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7 Startup

7.1 For your safety

⚠ WARNING

Risk of injury due to uncontrolled device behavior caused by ineffective emergency switching off circuit.

Severe or fatal injuries.

- Have the installation carried out only by qualified personnel.

⚠ WARNING

Risk of injury due to device malfunction caused by incorrect device setting.

Severe or fatal injuries.

- Make sure that the installation was carried out by trained specialists.
- Check the parameters and data sets.
- Only use settings that are correct for the function.

⚠ WARNING

Risk of injury and possible damage to property if the motor starts up unintentionally.

Fatal or severe injuries and damage to property.

- Set the device to a safe state.
- Switch off the output stage.
- De-couple the drive.
- Deactivate auto-reset for drives that start up automatically.

⚠ WARNING

Electric shock due to missing or defective protection covers.

Severe or fatal injuries.

- Make sure all protection covers are installed properly.
- Never start the device if the protection covers are not installed.

⚠ WARNING

Danger of electric shock due to open connections.

Severe or fatal injuries.

- Never start the device if the touch guard is not installed.

INFORMATION

Observe the safety notes in chapter "Safety notes" > "Startup/Operation".

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INFORMATION

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

7.2 Requirements

The following conditions apply to startup:

- The device must be installed correctly both mechanically and electrically.
- The system and connected drives must be configured correctly.
- Safety measures prevent accidental drive startup.
- Safety measures prevent danger to persons or machines.

7.2.1 Required hardware

INFORMATION

The following prerequisites must be fulfilled to ensure fault-free operation:

- The M12 parameter memory must be plugged in.
- Connect the jumper plug or a suitable external operating switch for devices with communication package 1. See chapter "X1551: DC 24 V connection for external operating switches" (→ 🗎 60) for additional information.
- Connect the jumper plug or a suitable safety relay for devices with communication package 3 (STO). Observe the information in chapter X5502: Safe disconnection – input.

- PC or laptop with USB interface
- USB11A interface adapter

7.2.2 Required software

To parameterize the device, connect the device or the M12 parameter memory to the PC and open the MOVIVISION® EMS basic plant software. Follow the instructions in the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

7.3 Startup note

The device is configured during startup. Use the RS485 interface – service interface (X4022) to establish the connection to the processing unit of the device.

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7.4 Device configuration

7.4.1 Software

Use the latest version of the following software to make all the required settings: "MOVIVISION® EMS basic parameterizable plant software".

7.4.2 Additional information

For further information, refer to the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

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8 Operation

8.1 For your safety

⚠ WARNING

Electric shock caused by dangerous voltages at the connections, cables and motor terminals.

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

Severe or fatal injuries.

- Do not switch under load.
- Before performing any work on the device, disconnect it from the voltage supply. Dangerous voltages may still be present for up to 10 minutes after the controller is switched off.
- Inhibit the output stage of the frequency inverter before changing the switch at the device output.

⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Observe the startup instructions.
- Ensure that persons are not present in the danger zone of system parts.
- Deactivate automatic restarting.
- Switch off the operating switch.
- Decouple the drive.
- Disconnect the vehicle from the supply system.

⚠ WARNING

Electric shock due to charged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time after disconnecting the supply voltage: **10 minutes.**

⚠ CAUTION

Risk of burns due to hot surfaces of the device or connected options, e.g. braking resistors.

Injury.

- Provide for covers to secure hot surfaces.
- Install the protection devices according to the regulations.
- Check the protection devices on a regular basis.
- Let the device and the connected options cool down before you start working on them.

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INFORMATION

Connect all 3 phases (L1, L2, L3). Deactivated phase failure detection may result in unwanted operating behavior. For further information, refer to the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

INFORMATION

To ensure fault-free operation, the M12 parameter memory must be plugged in.

INFORMATION

- After disconnecting the device from the current supply, adhere to a minimum switch-off time of 5 seconds before re-establishing the current supply.
- The avoid bouncing, do not switch the device on and off again in quick succession.

8.2 Relative cyclic duration factor (cdf)

The cyclic duration factor (cdf) is the ratio between the period of loading and the cycle duration. The cycle duration is the sum of times of operation and times at rest and de-energized. The typical value for the cycle duration is 10 min.

$$cdf = \frac{\textit{total time of operation} \quad (t1 + t2 + t3)}{\textit{cycle duration}\,(T)} \cdot 100\,\%$$

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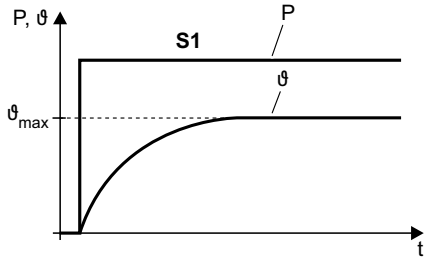
8.3 Duty cycles

8.3.1 Duty type S1

Continuous duty: Operation with a constant loading condition, the motor achieves a thermal steady state.



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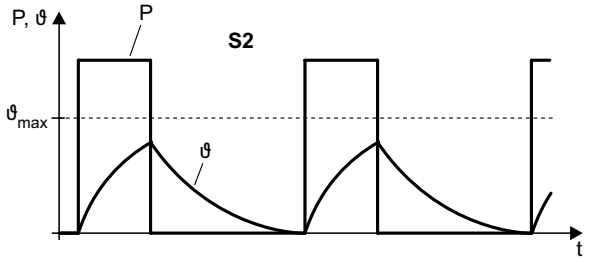
8.3.2 Duty type S2

Short-time duty: Operation at constant loading condition for a limited, given time followed by a time at rest. The motor returns to ambient temperature during the rest period.



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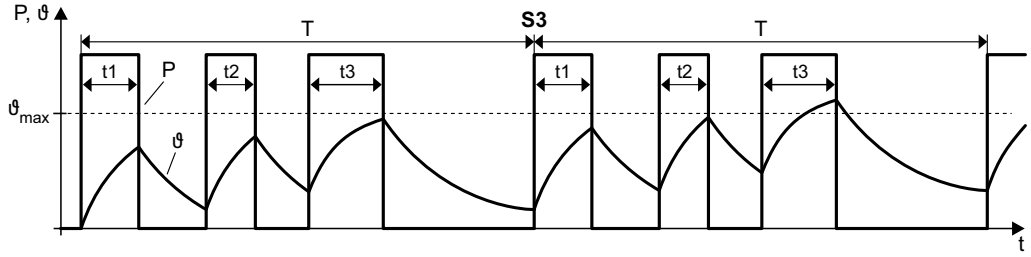
8.3.3 Duty type S3

Intermittent periodic duty: The switch-on sequence does not affect the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the relative cyclic duration factor (cdf) in %.



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8.3.4 Duty types S4 to S10

Intermittent periodic duty: The startup current affects the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the relative cyclic duration factor (cdf) in % and the number of cycles per hour.

8.4 Status and fault messages

The status display of the device displays the following information depending on parameterization and operating state:

- In automatic operation:
  - Active travel command or active travel command and speed limitation
- in manual mode:
  - Active command
- In fault status:
  - ErA or ErP
  - Fault code
- When establishing a connection with the IR remote control:
  - Vehicle ID
- In all other operating states:
  - Operating state

8.4.1 Status display of the device

The status display shows the current states of the vehicle. The status display is priority controlled, meaning an error has highest priority, the current travel command has lowest priority.

State	Representation	Meaning
Travel command	C0X	Current half wave command Values for X: • 0: passive • 1: positive half wave • 2: negative half wave • 3: Full wave The travel commands C00 – C03 are equal.
Z-stop	CS-	A full wave is present at control input C2. The vehicle stops with the speed limitation L00.
Speed limitation	L0X	Limiting of the speed Values for X: • 0: Stop • 1 – 8: Travel with limited speed
Distance sensor	d0X	Distance sensor Values for X: • 0: Stop • 1 – 2: Travel with limited speed
Pending error	ErP XXX	Pending error. Display switches. The displayed value range is 0 – 999. The faults are described in chapter List of faults.

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State	Representation	Meaning
Error "Waiting for acknowledgment"	ErA XXX	Acknowledgeable error. Display switches. The displayed value range is 0 – 999. The faults are described in chapter List of faults. To reset errors, switch the operating switch off.
Initialization	rbt	Device restarts.
	InI	The device is in the initialization phase.
	boo	Device is starting.
Initialization error	IbX	Error initializing the device Values for X: • 1: Reserved • 2: Device parameter invalid • 3: Parameter "Version" invalid
Internal initialization error	InE	Internal error during initialization of the device
Manual mode	CON	Establishing a connection with infrared remote control. This display alternates with the device ID (also see chapter Establishing a connection with the device).
	dId	The device is waiting for a new device ID to be entered via the infrared remote control (also see chapter Writing the device ID).
	JSt	No command
	JFF	Traveling fast forward.
	JFS	Traveling slowly forward.
	JrF	Traveling fast backward.
	JrS	Traveling slowly backward.
	JC0 – JC3	Traveling with commands C0 – C3 (semi-automatic operation).
M12 parameter memory	PS-	The M12 parameter memory connects to the device.
	PSc	The M12 parameter memory is connected to the device.
	PSL	The device is reading parameters from the M12 parameter memory.
	PSS	The device is writing parameters to the M12 parameter memory.
	PSE XXX	M12 parameter memory error. Display switches. Contact SEW-EURODRIVE.
Downloading parameters	PdL	Parameters are being downloaded from MOVIVISION® to the device.

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State	Representation	Meaning
Transfer drive parameters	UPd 614	A motor of a different series was parameterized. The new motor parameters are transferred. The process takes approx. 10 seconds. Then, the device starts automatic operation.

8.4.2 List of faults

In case of a malfunction, the status display of the device displays the following fault codes.

Code	Meaning	Possible cause	Measure
302	Overcurrent	• Short circuit at frequency inverter output	• Check the connection between the frequency inverter output and the motor as well as the motor winding for short circuits. • Reset the fault by switching off the 24 V supply voltage or via fault reset.
303	Thermal overload of the output stage or internal device fault	• Heat sink dirty	• Clean the heat sink. • Reset the fault by switching off the 24 V supply voltage or via fault reset.
		• Ambient temperature too high	• Lower the ambient temperature. • Reset the fault by switching off the 24 V supply voltage or via fault reset.
		• Heat build-up in frequency inverter	• Prevent heat from building up. • Reset the fault by switching off the operating switch.
		• Drive load too high	• Reduce the load on the drive. • Reset the fault by switching off the operating switch.
304	Frequency inverter offline	• Frequency inverter switched off	• Switch on the frequency inverter.
		• Fault on internal bus	• Reset the fault by switching off the operating switch.
307	Undervoltage in the supply system	• Undervoltage at supply system input	• Inspect energy distribution.
308	Internal error	• Error message of the frequency inverter	• Contact SEW-EURODRIVE.
309	Initialization error frequency inverter	• Frequency inverter switched off	• Switch on operating switch.
		• Error on internal bus	• Reset the error by switching off the operating switch.
		• Incorrect frequency inverter parameters	• Correct parameters. • Contact SEW-EURODRIVE.

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Code	Meaning	Possible cause	Measure
312	Brake chopper	• Overcurrent in brake output • Braking resistor defective • Braking resistance value too low	• Check braking resistor connection. • Replace braking resistor.
313	DC link voltage too high	• Faulty connection between brake coil/braking resistor	• Check the braking resistor/brake coil connection. Correct, if necessary. • Reset error by switching the device off or via error reset function.
		• Incorrect internal resistance of brake coil/braking resistor	• Check the internal resistance of the brake coil/braking resistor. • Reset error by switching the device off or via error reset function.
		• Thermal overload of braking resistor • Wrong size of braking resistor selected	• Dimension the braking resistor correctly. • Reset error by switching the device off or via error reset function.
		• Invalid voltage range of supply input voltage	• Check supply input voltage for permitted voltage range. • Reset error by switching the device off or via error reset function.
314	Speed monitoring	• Speed deviation due to operation at the current limit	• Reduce the load on the drive. • Reset the fault by switching off the DC 24 V supply voltage or resetting the error.
317	Open output	• 2 or all output phases interrupted • Rated motor power too small in relation to nominal frequency inverter power	• Check connection between frequency inverter and motor.

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Code	Meaning	Possible cause	Measure
318	Thermal overload of motor	• Ambient temperature too high	• Lower ambient temperature. • Reset the error by switching off the operating switch.
		• Heat build-up at the motor	• Prevent heat build-up. • Reset error by switching the device off or via error reset function.
		• Motor load too high	• Reduce the load on the motor. • Reset error by switching the device off or via error reset function.
		• Speed too low	• Increase speed. • Reset the error by switching off the operating switch.
		• The error is displayed shortly after the motor has been started.	• Check drive parameters. • Reset the error by switching off the operating switch.
		• The temperature monitoring of the motor (TH winding thermostat) has triggered.	• Reduce the load on the motor. • Reset the error by switching off the operating switch.
		• The connection to the TH winding thermostat of the motor is interrupted. • The motor connector is not plugged in.	• Check connection.
320	Phase failure	• Phase failure	• Check supply cables including conductor rail, current collectors and device connection for phase failure. • Reset the error by switching off the operating switch.
321	Thermal overload of the output stage or internal device error	• Heat sink is dirty	• Clean the heat sink. • Reset the fault by switching off the DC 24 V supply voltage or resetting the error.
		• Ambient temperature too high	• Lower ambient temperature. • Reset the fault by switching off the DC 24 V supply voltage or resetting the error.
		• Heat build-up in frequency inverter	• Prevent heat build-up. • Reset error by switching the device off or via error reset function.
		• Drive load too high	• Reduce the load on the drive. • Reset error by switching the device off or via error reset function.

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Code	Meaning	Possible cause	Measure
322	Overcurrent	• Short circuit at frequency inverter output	• Check the connection between the frequency inverter output and the motor as well as the motor winding for short circuits. • Reset the error by switching off the 24 V supply voltage or via error reset.
323	Thermal brake overload	• Line voltage too high	• Select suitable line voltage.
		• Grid very asymmetrical	• Check symmetry of the grid. Eliminate unbalanced load.
		• Braking power too high • Wrong brake type selected	• Reduce braking power. Increase ramp time.
399	Other fault	–	• Contact SEW-EURODRIVE.
601	Distance sensor offline	• Distance sensor defective	• Replace distance sensor.
		• Distance sensor not connected	• Check wiring.
602	Overcurrent	• See fault 302	• See fault 302
603	Thermal overload of the output stage or internal device fault	• See fault 303	• See fault 303
604	Frequency inverter offline	• See fault 304	• See fault 304
607	Phase failure	• Error in the current supply	• Check supply cables including conductor rail, current collectors and device connection for phase failure. • Reset error by switching the device off or via error reset function.
608	Infrared connection canceled	• Infrared connection to keypad physically interrupted for more than 15 s	• Establish infrared connection via keypad.
OFF	Operating switch switched off	• Operating switch switched off	• Switch on operating switch.
609		• Interruption of external operating switch connection	• Check wiring of external operating switch.
610	M12 parameter memory connection	M12 parameter memory connected or disconnected during operation	• Ensure that the M12 parameter memory is always correctly connected during operation. • Check that the union nut on the M12 parameter memory unit is positioned securely. • Only remove the M12 parameter memory when the device is disconnected from the voltage. Insert the M12 parameter memory again before starting up the device. • Reset the error by switching off the operating switch.

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Code	Meaning	Possible cause	Measure
611	Error while reading M12 parameter memory	• M12 parameter memory not plugged in or not plugged in correctly	• Plug in the M12 parameter memory correctly.
		• Data on M12 parameter memory faulty	• Write new M12 parameter memory.
		• Incompatible M12 parameter memory connected	• Connect compatible M12 parameter memory.
		• M12 parameter memory defective	• Replace M12 parameter memory.
612	Error while writing M12 parameter memory	• M12 parameter memory not plugged in or not plugged in correctly	• Plug in the M12 parameter memory correctly.
		• Incompatible M12 parameter memory connected	• Connect compatible M12 parameter memory.
		• M12 parameter memory defective	• Replace M12 parameter memory.
613	Plausibility monitoring	• Interruptions or crossfaults in wiring to signal source	• Check signal source.
UPd 614	Transfer drive parameters	• Motor data was parameterized or changed	• No measures required. Code does not indicate an error. The new motor parameters are transferred. The process takes approx. 10 seconds. Then, the device starts automatic operation.
654	Other fault	• Other undefined error occurred (e.g. due to phase failure with deactivated phase failure detection)	• Contact SEW-EURODRIVE.
698	M12 parameter memory replaced	• M12 parameter memory replaced	• No measures required. Code does not indicate an error. The code serves to distinguish between old and new errors in the error history and is not displayed on the device.
699	Other fault	–	• Contact SEW-EURODRIVE.
LEx	Unwanted or too long applied signal combinations for speed limitation.	• Signal source	• Check signal source. x = the row in the list "Speed limitation" that caused the error. The row count starts at 0.
PSE XXX	Memory error	• Internal error	• Contact SEW-EURODRIVE.

Error groups

Depending on the parameterization, the errors in the table above are displayed as an error number (detailed error display) or an error group (compressed error display).

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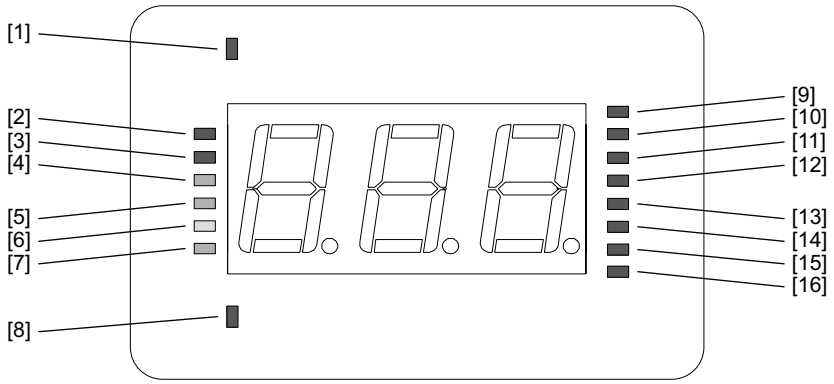
The error groups have the following meaning:

Error group	Meaning	Code
651	Motor connection error	317, 322
652	Overload	303, 313, 314, 318, 323
653	Frequency inverter defective	302, 312
654	Other error	304, 308, 309, 320, 321

For further information on parameterization, refer to the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

8.4.3 Status LEDs

The device features additional LEDs for servicing. The status LEDS display additional status information. The following table is used exclusively for diagnostics by the SEW-EURODRIVE Service.



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	LED	LED status	Description
[1]	Positive half wave command	Lights up red	The device receives positive half waves from the command rail.
[2]	Phase failure	Lights up red	There is a phase failure.
[3]	Software status	Flashes red	The device software on the control is operating.
[4]	24 V supply	Lights up green	There is an internal 24 V supply.
[5]	Supply service interface	Lights up green	The service interface is supplied.
[6]	Frequency inverter bus supply	Lights up yellow	The frequency inverter bus is supplied. This LED only lights up when the operating switch is switched on.
[7]	CPU supply	Lights up green	The CPU is supplied.
[8]	Negative half wave command	Lights up red	The device receives negative half waves from the command rail.
[9]	DIO00	Lights up red	The digital input 0 or the digital output 0 is set.
[10]	DIO01	Lights up red	The digital input 1 or the digital output 1 is set.

	LED	LED status	Description
[11]	DI02	Lights up red	The digital input is set.
[12]	DI03		
[13]	DI04		
[14]	DI05		
[15]	DI06		
[16]	DI07		

8.5 Fault information

⚠ WARNING

Risk of injury and possible damage to property due to automatic restart of the drive after fault elimination or after a reset.

Fatal or severe injuries and damage to property.

- Disconnect the device from the power supply before rectifying a fault if automatic restart of the driven machine is not permitted for safety reasons.
- After a reset, make sure that the drive can start up automatically depending on the setting.

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8.5.1 Fault memory

The error memory stores the 10 most recent error messages.

The following information is stored when a failure occurs:

- Timestamp
- Current command (positive/negative half-wave or full wave)
- Device status
- Error that has occurred (error code)
- Error counter (1 - 10)

For further information, refer to the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

8.5.2 Acknowledging error messages

⚠ WARNING

Risk of injury and possible damage to property if the motor starts up unintentionally.

Fatal or severe injuries and damage to property.

- Set the device to a safe state.
- Switch off the output stage.
- De-couple the drive.
- Deactivate auto-reset for drives that start up automatically.

An error message can be acknowledged by:

- Switching the voltage supply off and on again:
  Always maintain a minimum switch-off time of 1 minute.
- Switching the operating switch off and on again:
  Always maintain a minimum switch-off time of 1 minute.

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9 Service

9.1 Inspection/maintenance

INFORMATION

Never open the device. Only SEW-EURODRIVE may perform repairs.

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

- Connection cables:

  If cables are damaged or fatigued, replace these immediately.
- Cooling fins (if available):

  In order to ensure sufficient cooling, remove any deposits which occur.
- Fan assembly (if available):

  Check whether the axial fans of the fan assembly function properly.

9.2 Device replacement

9.2.1 Notes on replacing devices

The M12 parameter memory contains the application parameters and the vehicle ID. If you connect the M12 parameter memory to a replacement device, the data is transferred automatically to the replacement device. The replacement device is therefore immediately ready for operation.

Observe the following:

- Connect or disconnect the M12 parameter memory only when the application control is switched off.
- Device replacement is indicated in the fault history by code 698.
- For further information, refer to the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual.

9.2.2 Replacing the device

Proceed as follows:

1. De-energize the conductor rail, disconnect the device from the power supply, and remove it from the plant.
2. Loosen the screw fitting of the M12 parameter memory and remove it from the device.
3. Plug the M12 parameter memory into the X4441 plug connector of the replacement unit and tighten the screw fitting.
4. Install the replacement unit in the plant.
5. Switch the power supply back on.

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9.3 Cleaning

Before cleaning the device, disconnect it from the grid. Disconnect the conductor rail from the power if required.

Clean the device only with solvent-free cleaning agent.

9.4 Status display

The status display shows status and error messages and thus enables you to record the current state of the device.

For further information refer to chapter "Status and fault messages" (→ 🗎 82) and the following documentation: "MOVIVISION® EMS basic parameterizable plant software" manual. In case of questions, contact SEW-EURODRIVE.

9.5 Fault information

INFORMATION

For more information on the fault memory and on acknowledging fault messages, refer to chapter "Fault information" (→ 🗎 90).

9.6 Electronics Service by SEW-EURODRIVE

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

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

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

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9.7 Shutdown

⚠ WARNING

Electric shock due to charged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time after disconnecting the supply voltage: **10 minutes.**

To shut down the device, disconnect it from the power supply using appropriate measures.

9.8 Storage

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

- Cover the connections with the supplied protection caps.
- Place the device on a side without connectors.
- Ensure that the device is not subject to mechanical impact.

Observe the notes on storage temperature in chapter "Technical data" (→ 🗎 96).

9.9 Extended storage

Electrolytic capacitors are used in the frequency inverters. They are subject to aging effects when de-energized. If the device is connected to the voltage supply directly after a long storage period, the capacitors can be damaged.

In case of extended storage, connect the device to the supply voltage for at least 5 minutes every 2 years. Otherwise, the service life of the device may be reduced.

If you have not performed maintenance regularly every 2 years, SEW-EURODRIVE recommends that you increase the supply 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:

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

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9.10 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.

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10 Technical data

10.1 General

Basic unit	
Electromagnetic compatibility according to EN 61800-3	Interference emission: C3 Interference immunity: 2. Environment (industry)
Ambient temperature without derating	+5 – +40 °C (not condensed) The device provides intrinsic thermal safety. Once the heat sink temperature exceeds a certain level, a disconnection is triggered and an "Overtemperature" error message is generated.
Ambient temperature with derating	+40 – +60 °C h < 1000 m above sea level: I_N reduction by 3% per K h > 1000 m above sea level: I_N reduction by 4% per K See also chapter "Current reduction (derating)" (→ 🗎 97).
Installation altitude with derating	h > 1000 m above sea level: I_N reduction by 1% per 100 m h > 2000 m above sea level: V_{line} reduction by 6 V per 100 m Observe chapters "Current reduction (derating)" (→ 🗎 97) and "Restrictions of use" (→ 🗎 14).
Climate class according to EN 60721-3-3	Class 3K3, no condensation
Storage temperature according to EN 60721-3-3	-25 – +70 °C
Degree of protection	IP65 (excluding X1261 connection, see chapter "X1261: AC 400 V contact conductor connection" (→ 🗎 57))
Vibration resistance	2M2 (IEC 60721-3-2:1997) 3M4 (IEC 60721-3-3:1994) 5M2 (IEC 60721-3-5:1997)
Mass	4.5 kg
Dimensions W x H x D	350 × 203 × 98 mm

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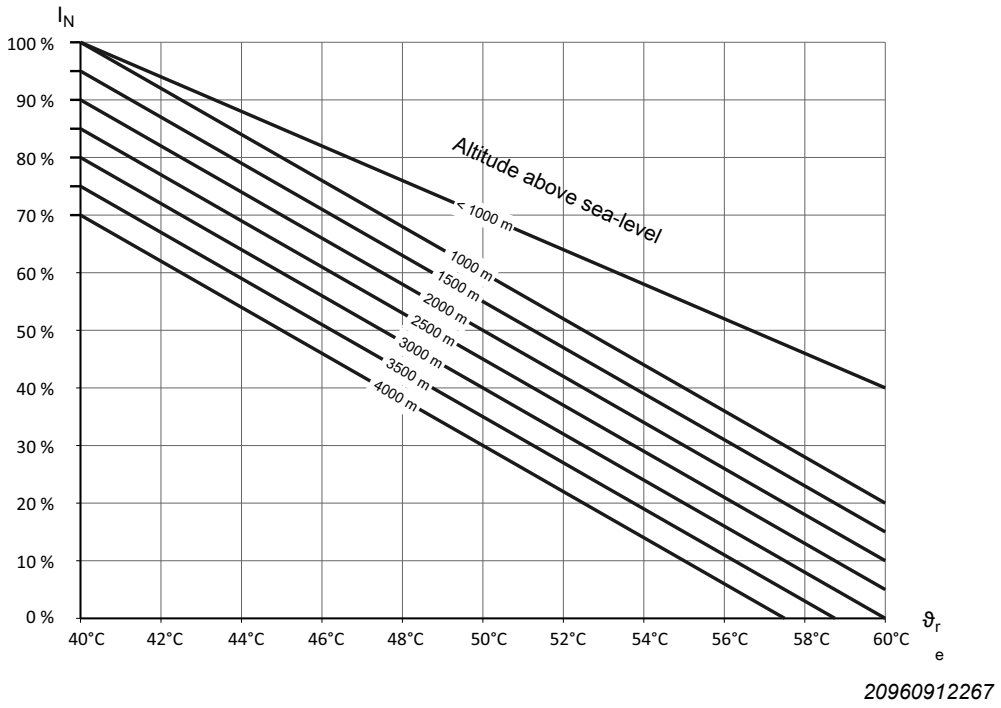
10.2 Current reduction (derating)

The following diagram shows how to reduce the output current in dependence of installation altitude and ambient temperature for a PWM of 4 kHz. Refer to chapter "Technical data" (→ 🗎 96) for a detailed description of the parameters.

Also observe the "Restrictions of use" (→ 🗎 14) and the V_{line} reduction by 6 V per 100 m.



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10.3 Input data

The following table shows the technical data of the inputs.

Current supply	
Supply type	3-phase AC connection; TT or TN system with directly grounded star point
Input voltage range	3 × AC 380 – 500 V
Rated input voltage	3 × AC 400 V
Nominal input current	AC 3.5 A
Nominal input frequency	50 – 60 Hz

Control input	
Input voltage range	Active: AC 350 – 500 V Inactive: AC 0 – 235 V Full wave, measured against reference phase. The reference phase depends on the device configuration L_X or L_Z. Refer to the nameplate for the data.
Current consumption in the active status (full wave)	3 – 6 mA ± 10 %
Input frequency	50 – 60 Hz

Binary inputs	
Design	Compatible with IEC 61131-2 type 3
Current consumption	5 mA
High level	DC +11 – +30 V
Low level	DC -3 – +5 V

Technical data of safety-related 24 V supply voltage	Min.	Typical	Max.	Unit
Input voltage range	18	24	30	V (DC)
Power consumption	–	3.7	4	W
Input capacitance	–	100	120	µF
Switch-on/switch-off threshold	–	7.5	–	V
Input voltage for OFF status (STO)	–	–	5	V
Permitted leakage current of the external safety controller	–	0	10	mA
Time from disconnecting the 24 V supply until the deactivation of the rotating field	–	25	50	ms

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10.4 Output data

The device outputs have the following technical data:

General	
Operating mode	S1 (IEC 60034-1)
Nominal output current I_N	AC 4 A
Minimum permitted braking resistance (4Q operation)	150 Ω

Axis data	
Nominal output power (at f_{PWM} = 8 kHz)	1.5 kW
Nominal output power (at f_{PWM} = 16 kHz)	0.9 kW
Current limiting	AC 6 A, motor mode Duration depending on the utilization
Output voltage	3 × AC 0 – 500 V
PWM frequency	Selectable: 16/8/4 kHz or 8/4 kHz or 4 kHz
Motor protection	TH
Maximum motor cable length	3 m
Possible brake voltage with 3-wire brake	120 V, **230 V** (recommended), 400 V
Maximum brake holding current (of 2-wire brake variant)	DC 0.41 A
Output voltage of brake control (of 2-wire brake variant)	DC value ≙ 0.45 × (V_{Ly} - V_{Lz})

INFORMATION

The device features load- and speed-dependent overload protection with thermal memory.

Overload protection	
Trip level	140% of the motor current
Trip time	60 –134 s [1]

1) Depending on speed and start temperature

INFORMATION

The total current of all external 24 V consumers must not exceed 500 mA.

24 V voltage supply of RS485 interface	
Nominal voltage	DC 24 V +20%/-15%
Nominal current	Maximum DC 500 mA

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X5502	
Nominal voltage	DC 24 V +20%/-15%
Nominal current	Maximum DC 500 mA
The DC 24 V input voltage must comply with DIN EN 61131-2. The DC 24 V output voltage complies with DIN EN 61131-2.	

INFORMATION

The signal output is fed via $L_{X/M}$. For further information, refer to chapter "X1261: AC 400 V contact conductor connection" (→ 🗎 57).

Undefined levels may occur at the signal output M in the event of a phase failure.

Signal output M	
Switching voltage (full wave)	max. AC 450 V or AC 500 V see chapter "Device structure" > "Information on switching voltage" (→ 🗎 28)
Output current (full wave)	I_{eff} < 40 mA
Output current (half wave)	I_{eff} < 28 mA
Integrated short-circuit protection	• PTC • I^2t (full wave): 4.4 A^2s at AC 400 V • Maximum short-circuit current (full wave) at AC 400 V: 18 A for 20 ms

Binary outputs	
Design	Short-circuit proof
Nominal output current	Max. DC 500 mA per digital output
Inductive loads	Dissipation of inductive switch-off energy up to 0.7 J per output, freewheeling diodes are not integrated
Low level	DC 0 V, I_{LEAK} = 10 µA
High level	DC 24 V + 20%/− 15%, R_{ON} = 320 mΩ

10.5 Safety-related characteristic value STO

Characteristic safety values	
Approved safety classes	Performance Level d to EN ISO 13849-1 SIL 2 to EN 61800-5-2
Probability of dangerous failure per hour (= PFHd value)	0 (fault exclusion)
Service life or proof test interval in accordance with EN 61508	20 years, after which the component must be replaced with a new one
Safe state	Safe Torque Off (STO)

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10.6 Dimension drawings

10.6.1 Device with motor connection HAN® Q8/0

INFORMATION

For the connections, connection cables and connected components, observe a clearance of 120 mm to the side.

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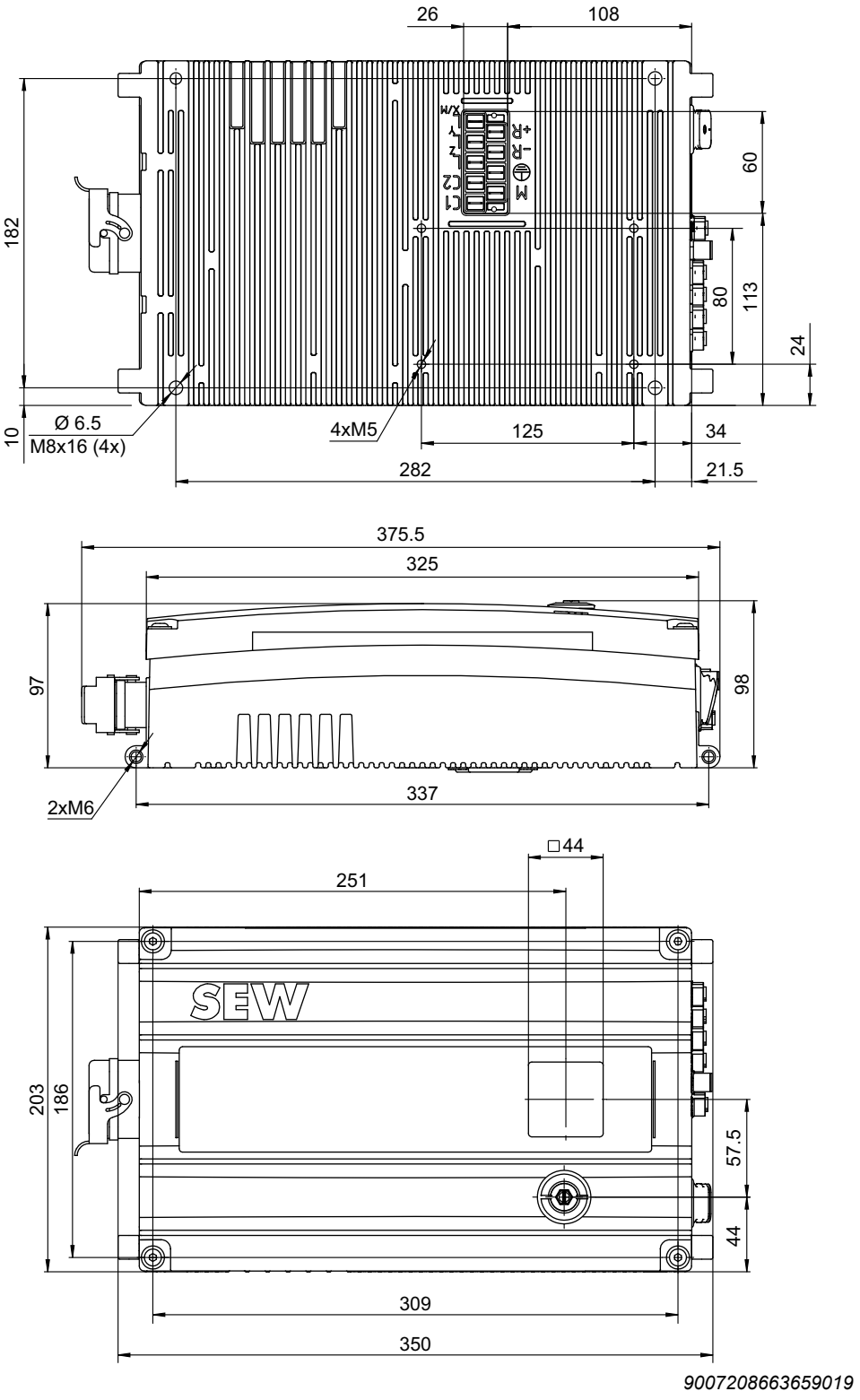
The dimension drawing shows the mechanical dimensions of the device in mm:



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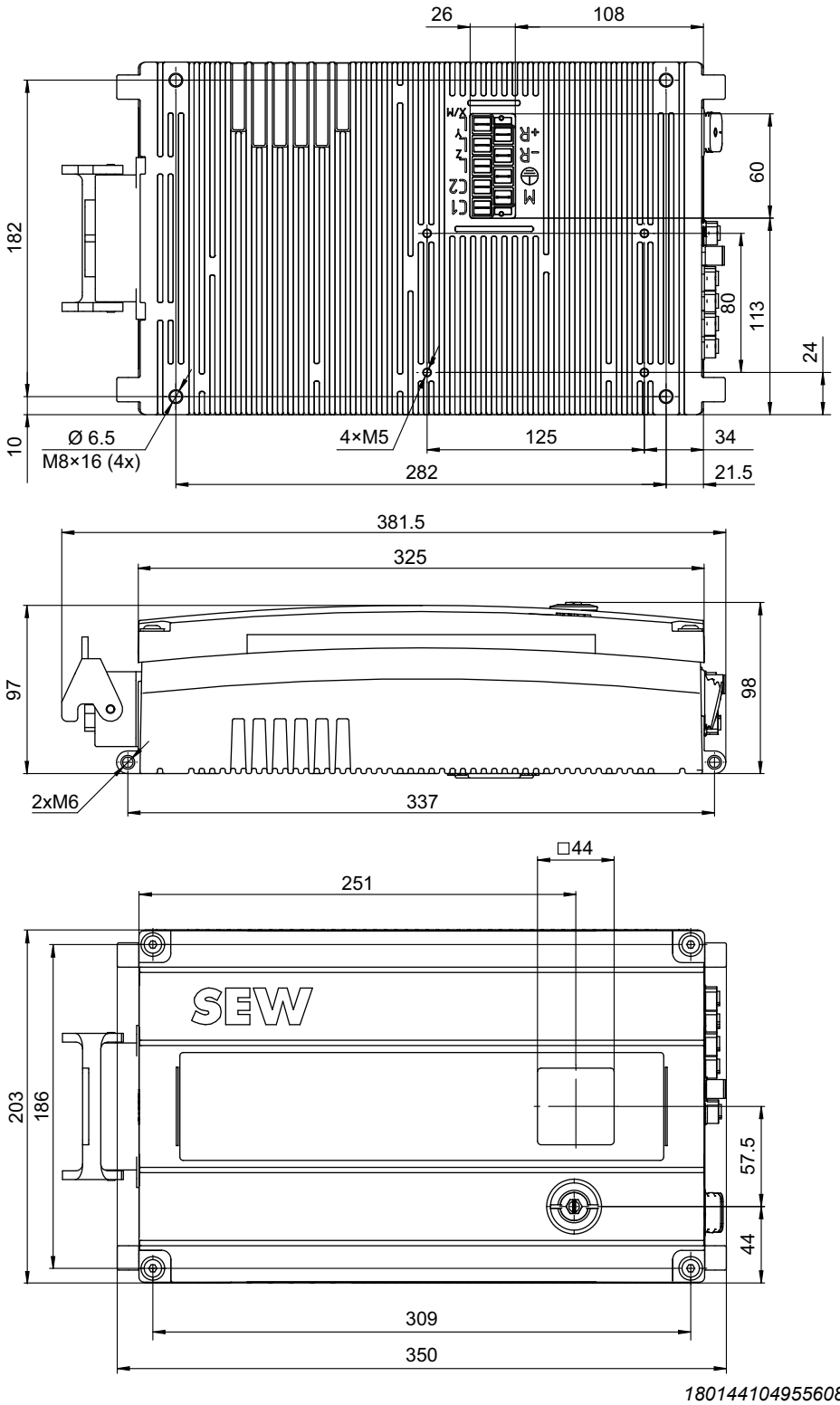
10.6.2 Device with motor connection HAN® 10E

INFORMATION

For the connections, connection cables and connected components, observe a clearance of 120 mm to the side.

The dimension drawing shows the mechanical dimensions of the device in mm:



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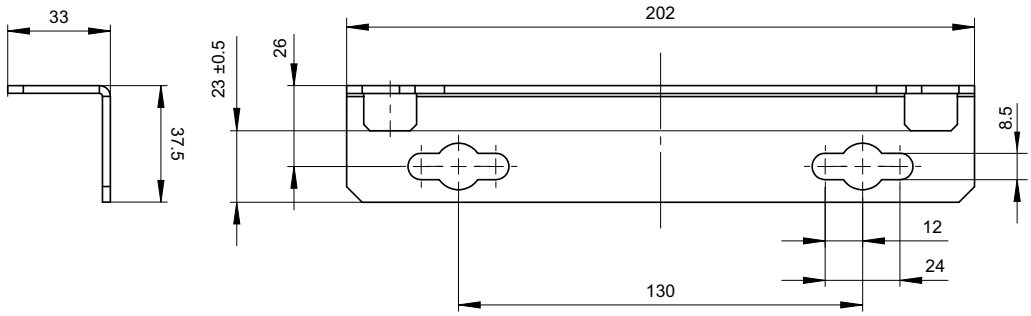
10.6.3 Mounting bracket



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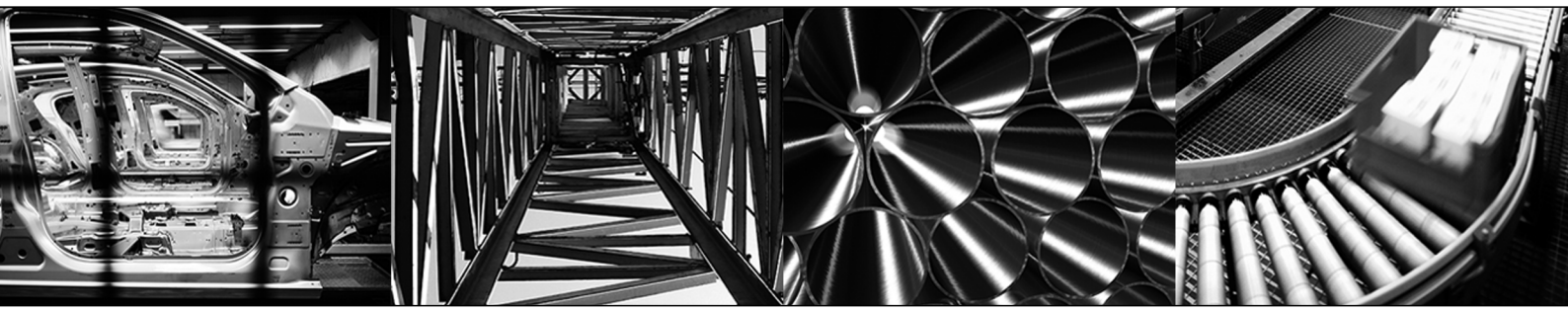

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