SEW EURODRIVE

Operating Instructions

Decentralized Drive Systems

Explosion-Protected MOVI-SWITCH® Drives

With 3D Category EDRN.. AC Motor

Edition 04/2020

25988670/EN

Contents

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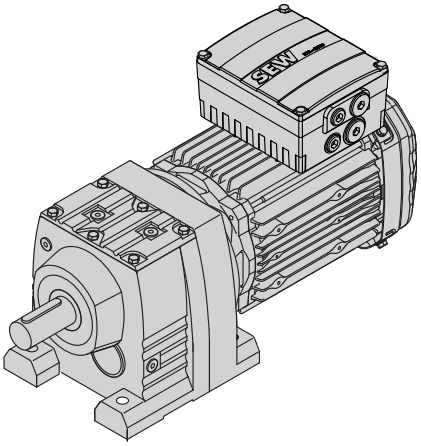
1 Applicable components

1.1 MOVI-SWITCH® in category 3D

These operating instructions apply to the following MOVI-SWITCH® drives:



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Category: 3D, 400 V, temperature class: T3, max. surface temperature: 120 °C or 140 °C

Motor type	P_N	M_N	n_N	I_N	cosφ	IE	$\eta_{50\%}$ $\eta_{75\%}$ $\eta_{100\%}$	I_A/I_N	M_A/M_N M_H/M_N	Brake	Z_0	M_B	m m_B	J_{mot} J_{Mot_B}
	kW	Nm	min^{-1}	A			%				1/h	Nm	kg	10^{-4} kgm^2
EDRN100L4/../MSW/3D	3	19.7	1456	6.5	0.76	IE3	87.3 88.3 87.8	8.2	3.4 2.3	BE5	740	40	34 40	117 123

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2 General information

2.1 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.

2.2 Structure of the safety notes

2.2.1 Meaning of signal words

The following table shows the graduation 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 ON EXPLOSION PROTECTION	Important information about explosion protection	
INFORMATION	Useful information or tip: Simplifies handling of the product.	

2.2.2 Structure of section-related safety notes

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

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

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of automatic restart
	Note on explosion protection

2.2.3 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

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

2.3 Decimal separator in numerical values

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

Example: 30.5 kg

2.4 Rights to claim under limited warranty

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

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2.5 Other applicable documentation

Also observe the following publication:

- Operating instructions "Explosion-Protected EDR..71 – 315 AC Motors, EDRN63 – 315"

Refer to the corresponding documentation for all further components.

2.6 Product names and trademarks

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

2.7 Copyright notice

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3 Safety notes

3.1 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.

3.2 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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3.3 Target group

Specialist for mechanical work

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

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

Specialist for electrotechnical work

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

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

Additional qualifications

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

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

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the training is to give persons the ability to perform the required tasks and work steps in a safe and correct manner.

3.4 Designated use

The product is intended for use in industrial and commercial systems.

In the case of installation in electrical systems or machines, it is prohibited to start the proper operation of the product until it is determined that the machine meets the requirements stipulated in the local laws and directives.

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

INFORMATION

- The motor may only be operated with an inverter when the requirements of the prototype test certificates, the documentation in hand, and the information on the nameplate of the motor are adhered to.
- The motor must not be operated in areas/applications that produce strong charges on the motor housing.
  - Example: As a fan motor inside a tube. Dust in the tube can produce a buildup of static electricity. The dust can ignite as a result of electrostatic discharge.

3.4.1 Lifting applications

The product may not be used for lifting applications or on slopes.

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3.4.2 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.

3.5 Transportation/storage

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.

The lifting eyebolts are designed to carry only the weight of the motor without gear unit. Tighten installed lifting eyebolts. Mounted gear units have separate suspension attachments, which must be used according to the gear unit operating instructions when lifting the gearmotor. Do not mount any additional loads.

The installed lifting eyebolts are in accordance with DIN 580. Observe the loads and regulations specified there. The tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the following notes when transporting the device:

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

If the product is not immediately installed, it must be stored in a dry and dust-free location. The product can be stored for up to 9 months without requiring any special measures before startup. Do not store the product outdoors.

Do not transport or store the product on the fan guard.

3.6 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).

3.6.1 Required preventive measure

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

3.6.2 Stationary application

Necessary preventive measure for the product is:

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

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3.7 Protective separation

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

3.8 Startup/operation

Observe the safety notes in chapters Startup and "Operation" (→ 🗎 37) in this documentation.

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

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

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

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

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

1 minute.

Observe the corresponding information signs on the product.

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

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

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

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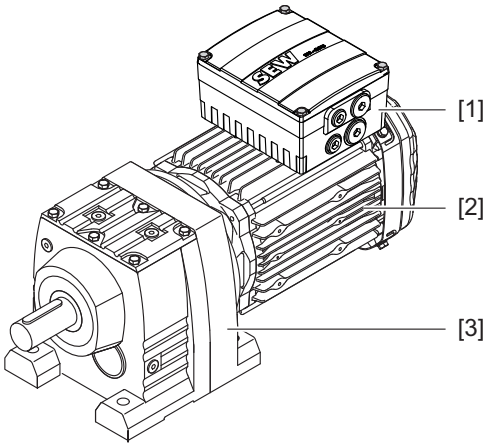
4 Unit structure

4.1 MOVI-SWITCH® 1E drive

The following figure shows a MOVI-SWITCH® 1E drive with helical gear unit:



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[1] Connection box with MOVI-SWITCH® motor starter

[2] Motor

[3] Helical gear units

MOVI-SWITCH® 1E is a gearmotor with decentralized motor starter.

It is not permitted to install the MOVI-SWITCH® 1E motor starter close to the motor!

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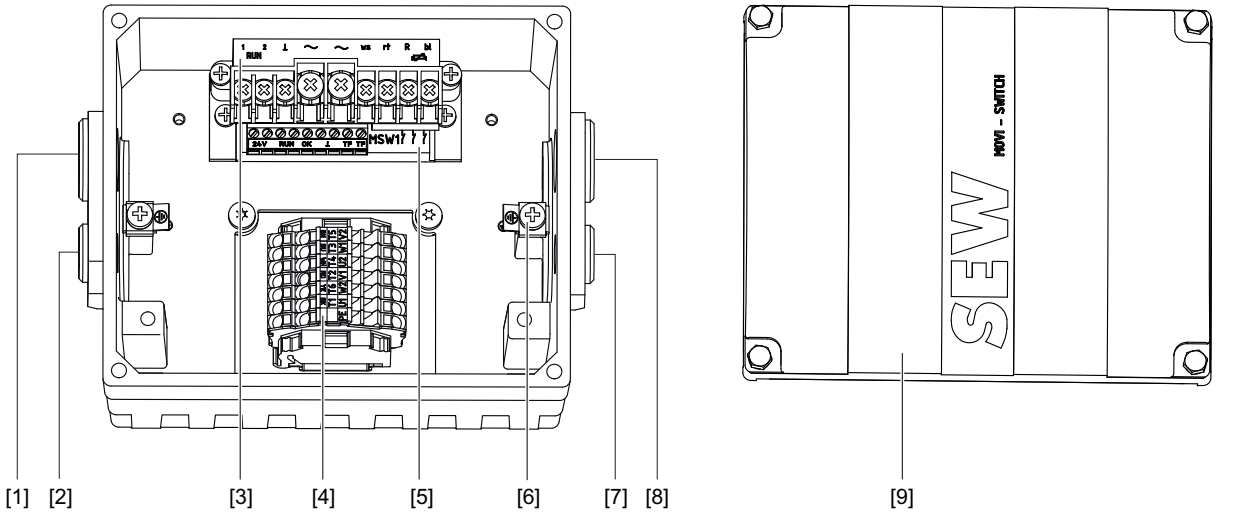
4.2 MOVISWITCH® 1E

The following figure shows the connection box of the MOVI-SWITCH® 1E motor starter:



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[1] 2 x M25 x 1.5 cable glands
[2] 2 x M16 x 1.5 cable glands
[3] BGW brake control (only with brake motors)
[4] Power supply (L1, L2, L3)
[5] MOVI-SWITCH® motor starter
[6] Screw for PE connection ⏚
[7] 2 x M16 x 1.5 cable glands
[8] 2 x M25 x 1.5 cable glands
[9] Terminal box cover

4.2.1 Features of MOVI-SWITCH® 1E

- MOVI-SWITCH® 1E is an AC motor with integrated electronic on/off switch for one direction of rotation and integrated full motor protection.
- Switching the star point with power semiconductors connects or disconnects the current flow to the motor.
- The BGW brake control integrated as standard ensures short response times (brake voltage = motor voltage/$\sqrt{3}$, alternatively motor voltage).

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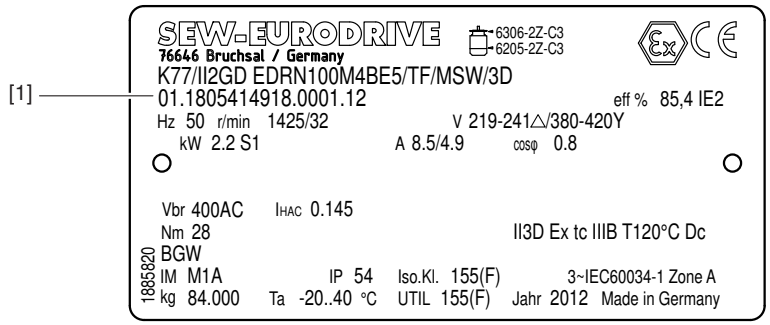
4.3 Type designation of MOVI-SWITCH® 1E drive

4.3.1 Nameplate

The following figure shows a sample nameplate of a MOVI-SWITCH® 1E drive:



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[1] Serial number

4.3.2 Type designation

The following table shows the type designation of the MOVI-SWITCH® drive:

K	**Gear unit series**
77	**Gear unit size**
II2GD	**Explosion-protected gear unit to directive 94/9/EG**
EDRN	**Motor series**
100M4	**Motor size and number of poles**
BE5	**Motor option: brake**
TF	**Thermistor** (standard)
MSW	**MOVI-SWITCH®**
3D	**Category 3D** (explosion protection)

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4.4 Accessory equipment

4.4.1 Mounting variants

The following table shows possible output designs:

Designation	Category	Option
/FI	/3D	IEC foot-mounted motor with specification of shaft height
/FG		7-series integral motor, as stand-alone motor
/FF		IEC flange-mounted motor with bore
/FT		IEC flange-mounted motor with threads
/FL		General flange-mounted motor (other than IEC)
/FM		7-series integral gearmotor with IEC feet, with specification of shaft height if required
/FE		IEC flange-mounted motor with bore holes and IEC feet, with specification of shaft height
/FY		IEC flange-mounted motor with thread and IEC feet, with specification of shaft height if required
/FK		General flange-mounted motor (other than IEC) with feet, with specification of shaft height if required

4.4.2 Mechanical attachments

The following table shows possible mechanical attachments:

Designation	Category	Option
BE	/3D	Spring-loaded brake with specification of size
/RS		Backstop (line-powered only)

4.4.3 Ventilation

The following table shows possible ventilation variants:

Designation	Category	Option
/AL	/3D	Metal fan (standard)
/C		Canopy for fan guard (standard in mounting position V1)

4.4.4 Other additional features

The following table shows an additional feature:

Designation	Category	Option
/2W	/3D	Second shaft end on the motor/brakemotor

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4.5 Identification of explosion-protected drives

4.5.1 Designation according to EU directive

At least the following information must be attached visibly and permanently to each unit and protection system.

- Name, registered trade name, or registered trade brand, and manufacturer address.
- CE marking (see annex II to regulation (EG) no. 765/2008).
- Designation of the series and type.
- If applicable, batch number and serial number.
- Year of manufacture, hexagonal explosion protection mark, and the mark for equipment group and equipment category.
- For equipment group II, the letter G (for areas with potentially explosive gas, vapor or mist/air mixtures).
- The letter D (for areas in which dust could produce potentially explosive atmospheres).

In addition, all safety-relevant information must be attached to the equipment before operation.

4.5.2 Marking in accordance with directives and standards

The protection types are linked to equipment groups, categories, potentially explosive atmospheres, minimum degrees of protection and temperature classes, and are indicated on the nameplate according to EU Directive 2014/34/EU.

The identification according to the standard includes the following symbols:

- The Ex icon indicates that the electrical equipment meets the requirements of one or more protection types.
- Symbol for the relevant protection type.
- Symbol for the group plus information on gas or dust.

Information

The IECEx identification consists of the normative part.

Examples

Example 1: Operating resources in protection type e for increased safety: 0102 II 2G Ex eb IIC T3 Gb

Example 2: Operating resources in protection type t for dust explosion protection provided by the enclosure: II 3D Ex tc IIIC T120 °C Dc

Example 1	Example 2		Meaning
CE		Designation according to EU Directive	CE marking
0102			Identification number of the notified body (here: PTB), only for category 2
Ex			Explosion protection mark
II			Equipment group
2	3		Equipment category
G	D		• G for areas containing potentially explosive mixtures of gas, steam, fog, and air. • D for areas where dust may create potentially explosive atmospheres.
Ex		Designation according to standard	Symbol indicating that the equipment complies with one or more protection types.
eb	tc		Information on protection type/protection level • eb: Increased safety • tc: Protection by enclosure
IIC	IIIC		Information on: • IIC: Gas group • IIIC: Dust group
T3	T120 °C		T3: Temperature class T120 °C: Maximum surface temperature in degrees Celsius
Gb	Dc		Equipment protection level (EPL)

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4.5.3 Identification for potentially explosive dust atmospheres

Example

Ex tc	Symbol for explosion protection with protection type/protection level
IIIC	Classification of the dust group
T120°C	Maximum surface temperature in °C
Dc	Equipment protection level

Classification of the dust group

In addition, equipment group III has been split up into three subgroups A, B and C depending on the type of dust. This also includes a minimum requirement on the degree of protection according to IEC/EN 60529:

Equipment group	Approved for atmospheres with	Minimum degree of protection IP
IIIA	Inflammable fluffing	5x
IIIB	Non-conducting dust	5x
IIIC	Conductive dust	6x

x Placeholder

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5 Mechanical installation

5.1 Installation notes

INFORMATION

Observe the general safety notes.

⚠ WARNING

Improper installation/disassembly of MOVI-SWITCH® drives and mount-on components.

Risk of injury.

- Adhere to the notes about installation and disassembly.
- Before releasing shaft connections, make sure that there are no active torsional moments present (tensions within the system).

- Comply with all instructions referring to the technical data and the permissible conditions where the unit is operated.
- Only use the provided attachment options when mounting the MOVI-SWITCH® drive.
- Only use mounting and locking elements that fit into the existing bores, threads and countersinks.

5.2 Tools required

- Set of wrenches
- Socket wrench, SW8
- Torque wrench
- Screwdriver set
- Compensation elements (washers and spacing rings), if necessary

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5.3 Installation requirements

Make sure that the following requirements are met before you start installing the unit:

- The data on the nameplate of the drive matches the voltage supply system.
- The drive is undamaged (no damage caused by transportation or storage).
- The ambient temperature corresponds to the specifications in chapter "Technical data". Note that the temperature range of the gear unit may also be restricted (see gear unit operating instructions).
- The MOVI-SWITCH® drive must **not** be installed under the following harmful ambient conditions:
  - Oils
  - Acids
  - Gases
  - Vapors
  - Radiation
  - etc.
- When the drive is installed in abrasive ambient conditions, protect the output end oil seals against wear.

5.3.1 Installation tolerances

The following table shows the permitted tolerances of the shaft ends and flanges of the MOVI-SWITCH® drive.

Shaft end	Flanges
Diameter tolerance according to EN 50347 • ISO j6 at Ø ≤ 26 mm • ISO k6 with Ø ≤ 38 mm up to ≤ 48 mm • ISO m6 at Ø > 55 mm • Center hole according to DIN 332, shape DR..	Centering shoulder tolerance in accordance with EN 50347 • ISO j6 at Ø ≤ 250 mm • ISO h6 at Ø > 300 mm

5.4 Motor installation notes

In this chapter, observe the information in the operating instructions "Explosion-Protected AC Motors EDR..71 – 315, EDRN63 – 315".

5.5 Assembling the input elements

In this chapter, observe the information in the operating instructions "Explosion-Protected AC Motors EDR..71 – 315, EDRN63 – 315".

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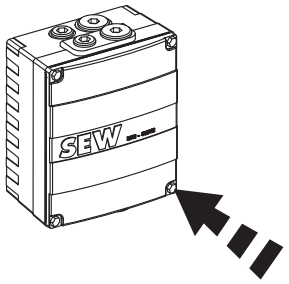
5.6 Tightening torques

5.6.1 Terminal box cover

Tighten the screws on the terminal box cover using 3.0 Nm working diagonally across.



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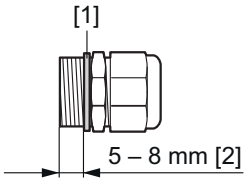
5.6.2 Cable glands

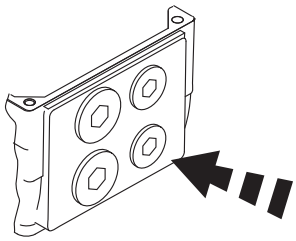
Observe the manufacturer's specifications and the following information for cable glands.

- Pay attention to the O-ring on the thread [1].
- The thread must be 5 – 8 mm long [2].



5.6.3 Screw plugs

Tighten screw plugs with 2.5 Nm.



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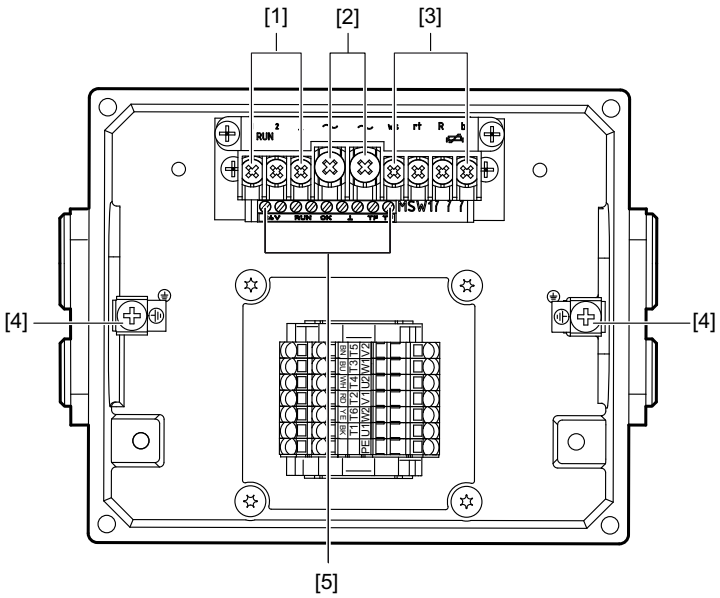
5.6.4 Tightening torques for terminals

Use the following tightening torques for terminals during installation:



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[1] 0.5 – 0.7 Nm

[2] 1.2 – 1.6 Nm

[3] 0.5 – 0.7 Nm

[4] 2.0 – 2.4 Nm

[5] 0.3 – 0.5 Nm

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6 Electrical installation

6.1 Installation notes

Observe the following information on electrical installation:

- Observe the general safety notes.
- Comply with all instructions referring to the technical data and the permissible conditions where the unit is operated.
- Use suitable screw fittings for the cables (use reducing adapters if necessary). With connector plug variants, you must use a suitable mating connector.
- Seal open cable entries with screw plugs.
- Use protective caps to seal plug connectors not in use.

6.2 Installation instructions

6.2.1 Cable glands

INFORMATION

The terminal boxes have metric threaded holes according to EN 60079-0 and EN 60079-31. All bores are equipped with explosion-protected screw plugs upon delivery.

- In order to provide for a correct cable entry, you have to replace the screw plugs with cable glands with strain relief, that are certified for the use in the respective explosion-protected zone.
- Select the cable glands according to the diameter of the respective cable. For further information, refer to the documentation from the cable gland manufacturer.
- The cable glands must comply with the requirements according to EN 60079-0 and EN 60079-31. The degree of protection must be ensured in accordance with the data on nameplate.
- For ambient temperatures > 40 °C, you have to use cable glands and cables that are suited for a temperature > 90 °C.
- Close all cable entries you do not require with suitable closing plugs.

6.2.2 Connecting supply system cables

- The rated voltage and frequency of MOVI-SWITCH® must correspond to the data for the power supply system (mains).
- Install line fuses at the beginning of the power supply cable behind the supply bus junction, see F11/F12/F13 in chapter "Connection of MOVI-SWITCH®".

  Use only D, D0 or NH fuses, or circuit breakers for F11/F12/F13. Select the fuse size according to the cable cross section.

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6.2.3 Permitted cable cross-section

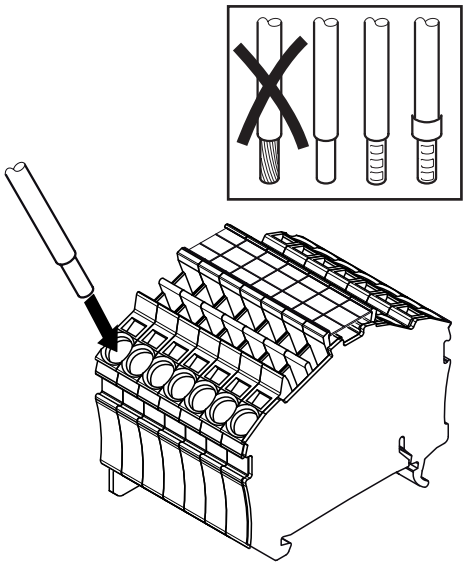
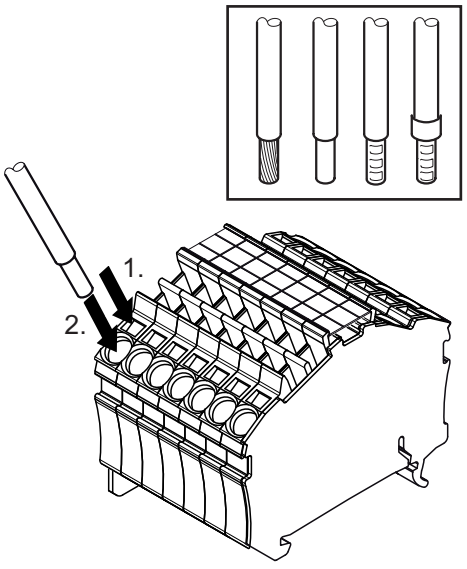
Observe the permitted cable cross sections for installation:

Power terminals		
Cores Rigid	**Cores Flexible**	**Cores Flexible with conductor end sleeve**
0.75 mm^2 – 4.0 mm^2	0.75 mm^2 – 4.0 mm^2	0.75 mm^2 – 2.5 mm^2
AWG20 – AWG12	AWG20 – AWG12	AWG20 – AWG14

MOVI-SWITCH® module (for internal wiring)	**BGW brake control (only with brake motor, for internal wiring)**	
Control terminals	**Power terminals**	**Control terminals**
0.25 mm^2 – 1.0 mm^2	1.0 mm^2 – 4.0 mm^2 (2 x 4.0 mm^2)	0.25 mm^2 – 1.0 mm^2 (2 x 0.75 mm^2)
AWG22 – AWG17	AWG17 – AWG10 (2 x AWG10)	AWG22 – AWG17 (2 x AWG18)

6.2.4 Actuating the power terminals

Note the following information for actuating the power terminals:

Connect the conductor Without pressing the actuation button	**Connect the conductor After pressing the activation button**
	
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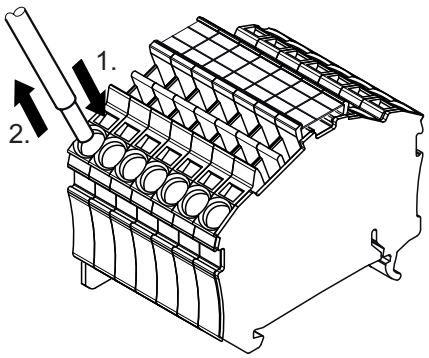
Connect the conductor Without pressing the actuation button	Connect the conductor After pressing the activation button
The following conductors can be installed directly (without tool) up to two cross-section sizes below the nominal cross section: • Single-wire conductors • Flexible conductors with end sleeves	When connecting the following conductors, you must press the actuation button on top to open the clamping spring: • Untreated, flexible conductors • Conductors with small cross sections that cannot be plugged in directly

Removing the conductor After pressing the activation button
 *5486549259*

Before removing the conductor, first press the actuation button on top.

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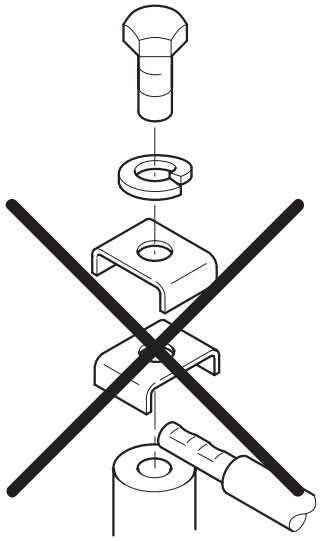
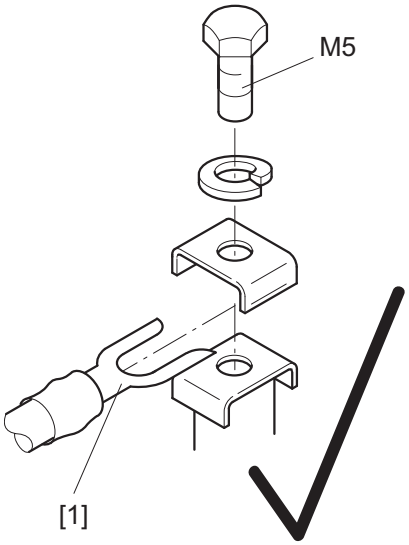
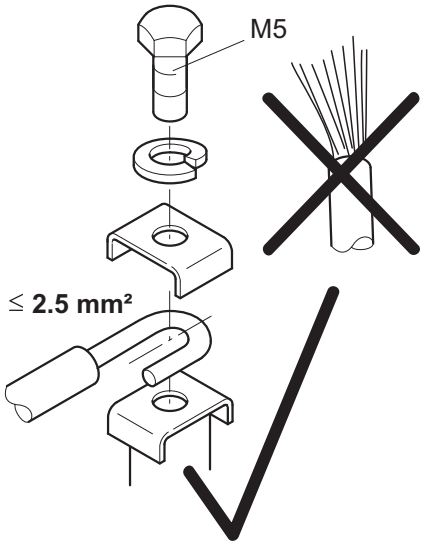
6.2.5 Notes on PE connection

⚠ WARNING

Improperly connecting the PE can cause an electric shock.

Severe, fatal injuries

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

Impermissible assembly	Recommendation: Assembly with forked cable lug Permitted for all cross sections	Assembly with solid connecting wire Permitted for cross section up to max. 2.5 mm²
	 *9007199577775243*	 *9007199577779339*

[1] Forked cable lug suitable for M5 PE screws

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6.2.6 Improving the grounding (EMC), HF grounding

For improved, low-impedance grounding at high frequencies, we recommend using the following connections with corrosion protected connection elements:

HF grounding is not installed as standard.

The HF grounding option can be combined with LF grounding at the terminal box.

If you require LF grounding in addition to HF grounding, you can connect the conductor to the same point.

The HF grounding option can be ordered as follows:

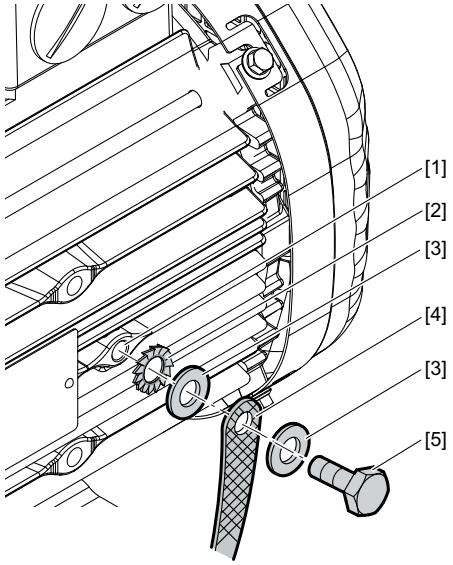
- Completely pre-assembled at the factory
- As "grounding terminal" kit for customer installation; part numbers listed in the following table.

Motor	Part number of "Grounding terminal" kit
EDRE 100L – 132, EDRN100L – 132S	13633945

INFORMATION

If 2 or more ground straps are used, you have to attach them with a longer screw. The specified tightening torques refer to a strap thickness of t ≤ 3 mm.

EDRE100L – 132, EDRN100L – 132S motors with HF (+LF) grounding



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[1] Use of tapped hole for lifting eyes
[2] Serrated lock washer DIN 6798
[3] Washer ISO 7089/ISO 7090
[4] Ground strap (not included in the delivery)
[5] Hex head screw ISO 4017 M8 × 18, tightening torque 10 Nm

6.2.7 Equipotential bonding

In accordance with EN 60079-14, connection may have to be made to an equipotential bonding system.

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6.2.8 EMC-compliant installation

INFORMATION

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

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

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

6.2.9 Installation altitude

The maximum installation altitude of 1000 m above sea level must not be exceeded.

6.2.10 Connecting the 24 V supply

- Connect the MOVI-SWITCH® motor starter with an external DC 24 V supply.

6.2.11 Binary control

- Connect the required control leads.
- Use shielded cables as control cables and route them separately from the supply system cables.

6.2.12 Protection devices

- MOVI-SWITCH® drives are equipped with integrated protection devices against overload. External overload devices are not necessary.

6.2.13 Ambient conditions during operation

Ambient temperature

If the MOVI-SWITCH® drives are used at an ambient temperature ≥ +40 °C (max. +50 °C), the cables and cable glands must be dimensioned for temperatures ≥ 90 °C.

Hazardous gases, vapors and dusts

If used according to their designated use, explosion-protected motors are incapable of igniting explosive gases, vapors or dusts. However, explosion-protected motors may not be subjected to gases, vapors or dusts that endanger operational safety, for example through

- Corrosion
- Damage to the protective coating
- Damage to the sealing material, etc.

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Gasket selection

If the motor is operated in environments with high environmental impact, such as increased ozone values, the motors can be optionally equipped with gaskets of a higher quality. If you have doubts regarding the stability of the gaskets when subjected to the respective environmental impacts, contact SEW-EURODRIVE.

6.2.14 Protection concept

- MOVI-SWITCH® drives in category 3D are equipped with temperature sensors (TF) at the factory. When the motor winding reaches the permitted maximum temperatures, the MOVI-SWITCH® motor starter sets the "OK" output signal to "0".
- The "OK" output signal must be monitored by an independent evaluation unit.
- When the MOVI-SWITCH® motor starter sets the "OK" output signal to "0", the drive must be disconnected from the supply system.
- The TF automatically switches itself back on when the temperature drops below the maximum value. A restart lockout must prevent the drive from starting again.
- Please note: Do not switch the drive back on until the cause of the problem has been checked. This check must be performed by a trained specialist.

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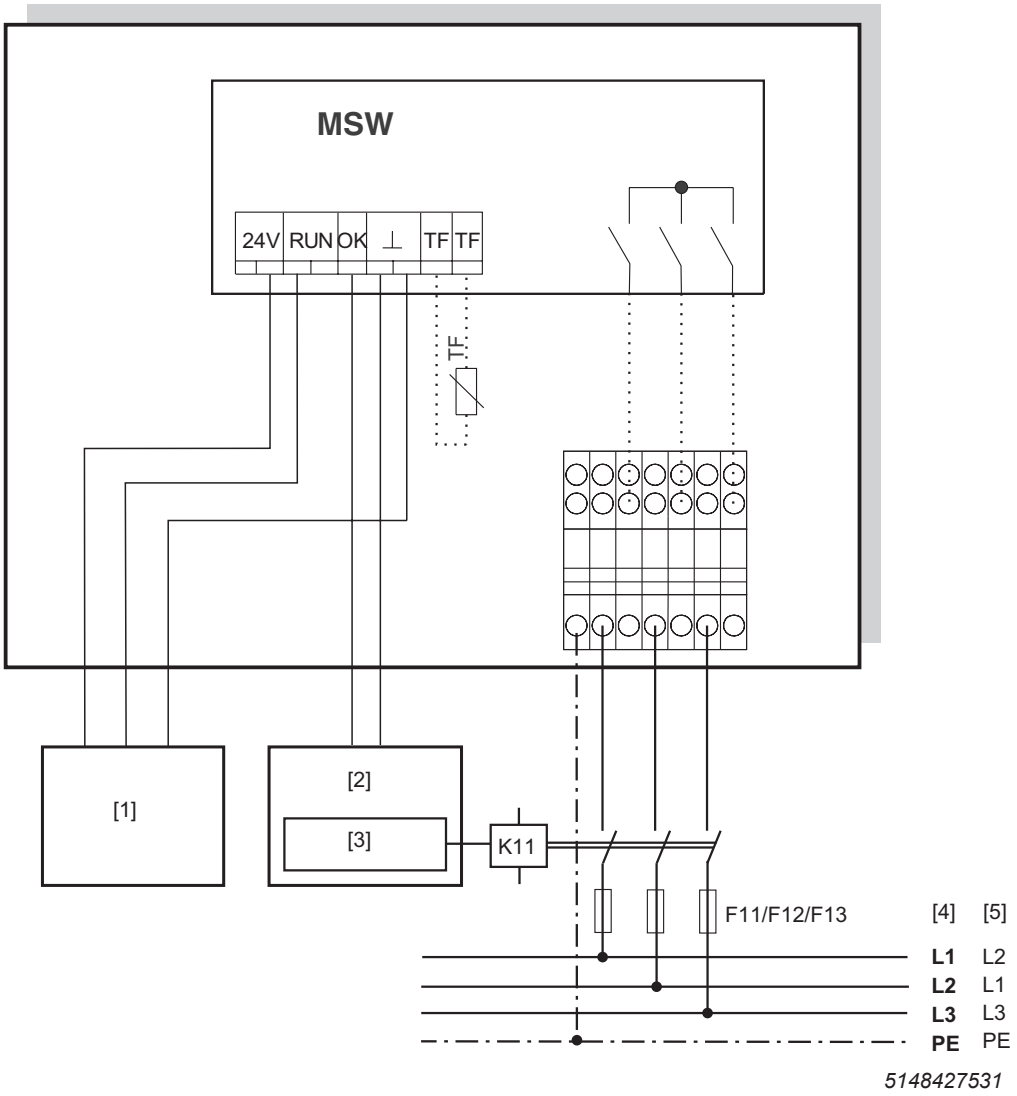
6.3 Connecting the MOVI-SWITCH® drive

The following figure shows the electrical connection of MOVI-SWITCH®:



..... Wired at the factory

[1] Higher-level controller

[2] Independent evaluation unit

[3] Restart lock

[4] Clockwise rotation

[5] Counterclockwise rotation

Description of the control signals	
Terminal	**Function**
24 V	DC 24 V supply voltage
RUN	Control signal DC 24 V 0: Stop drive 1: Start drive
⊥	Reference potential 0V24

Description of the control signals	
Terminal	**Function**
OK	Ready signal, DC 24 V 0: Overtemperature or no DC 24 V supply 1: DC 24 V supply is connected and no overtemperature is present

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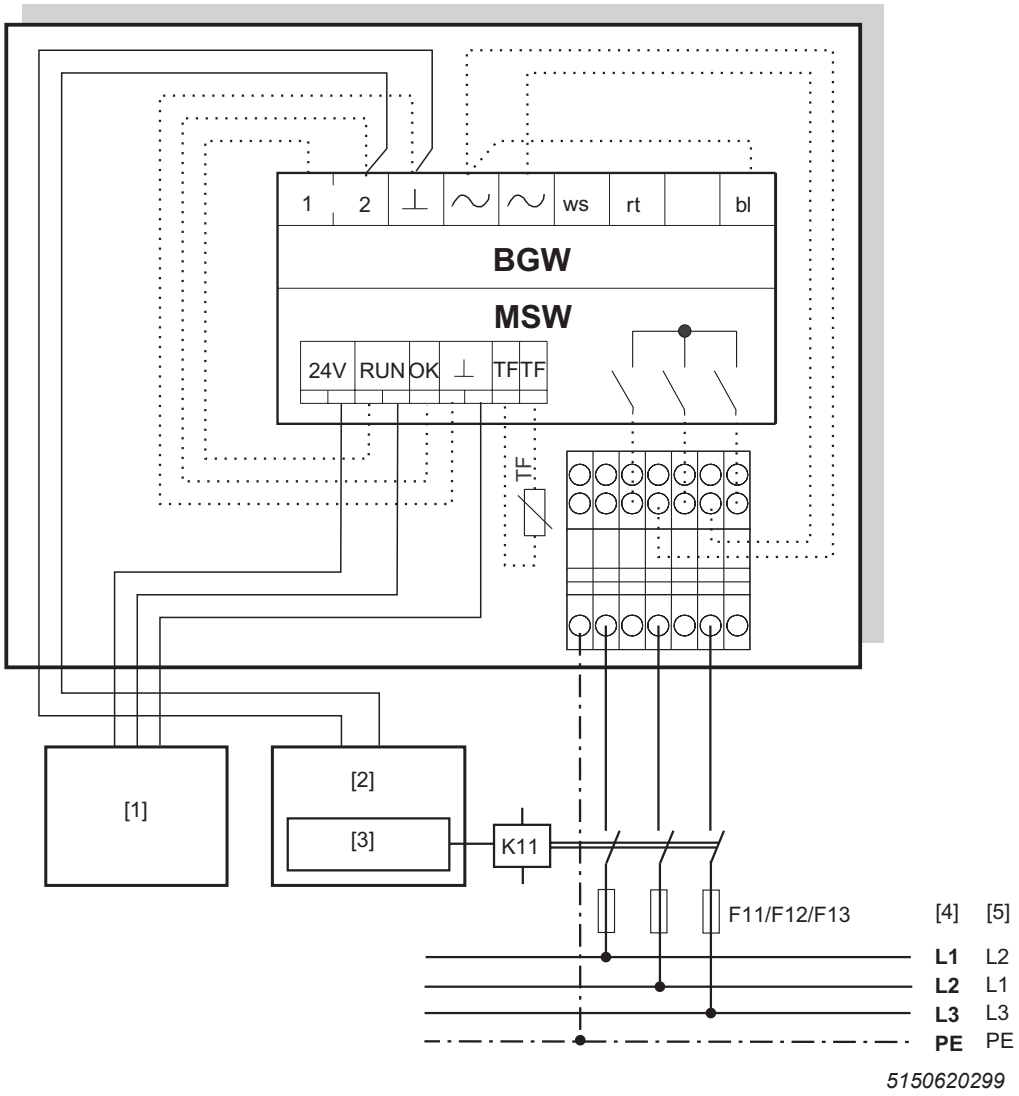
6.4 Connecting MOVI-SWITCH® drives with brake

The following figure shows the electrical connection of MOVI-SWITCH® with brake:



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..... Wired at the factory

[1] Higher-level controller

[2] Independent evaluation unit

[3] Restart lock

[4] Clockwise rotation

[5] Counterclockwise rotation

Description of the control signals	
Terminal	**Function**
24 V	DC 24 V supply voltage
RUN	Control signal DC 24 V 0: Stop drive 1: Start drive
⊥	Reference potential 0V24

Description of the control signals	
Terminal	**Function**
OK	Ready signal, DC 24 V 0: Overtemperature or no DC 24 V supply 1: DC 24 V supply is connected and no overtemperature is present

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7 Startup

7.1 General information

⚠ WARNING

Electric shock due to incorrect installation.

Severe or fatal injuries.

- Use switch contacts in utilization category AC-3 according to EN 60947-4-1 for switching the motor.

⚠ CAUTION

The surfaces on the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down sufficiently before you start working on it.

7.2 Requirements

The following requirements apply to startup:

- The drive is undamaged and not blocked.
- The drive must be installed correctly both mechanically and electrically.
- The direction of rotation of the motor/gearmotor is correct.
- Appropriate safety measures prevent the drives from starting up unintentionally.
- All protection covers are installed correctly.
- Appropriate safety measures are taken to prevent risk of injury or damage to the machine.

During startup, make sure that

- The motor is running properly (no speed fluctuations, no loud noises, etc.).

On brake motors with a self-reengaging manual brake release, the hand lever must be removed after startup! A bracket is provided for storing the lever on the outside of the motor.

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7.3 Startup of MOVI-SWITCH® 1E

7.3.1 Starting the drive

1. Check the connection of the MOVI-SWITCH® drive.
   See chapter "Electrical installation".
2. Switch on the line voltage.
3. Switch on the MOVI-SWITCH® drive with the control signal "RUN" = "1".

7.3.2 Description of the control signals

The following table shows the digital input and output signals for controlling the MOVI-SWITCH® drive:

Description of the control signals	
Terminal	**Function**
24 V	DC 24 V supply voltage
RUN	Control signal DC 24 V 0: Stop drive 1: Start drive
⊥	Reference potential 0V24
OK	Ready signal, DC 24 V 0: Overtemperature or no DC 24 V supply 1: DC 24 V supply is connected and no overtemperature is present

7.3.3 Function check of the brake

In this chapter, observe the information in the operating instructions "Explosion-Protected AC Motors EDR..71 – 315, EDRN63 – 315".

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8 Operation

8.1 Operating notes

⚠ WARNING

Electric shock can be 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 if the device is blocked and the motor is at a standstill.

Severe or fatal injuries.

- Do not switch under load.
- Before performing any work on the device, disconnect it from the voltage supply. Note that dangerous voltages can be present at the terminals and connections for up to 1 minute after the controller is switched off.
- Block the output stage of the inverter before switching at the output of the device.

⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Observe the startup instructions.
- Deactivate all control signals.

⚠ WARNING

Danger of burns due to hot surfaces of the device (e.g. the heat sink).

Serious injuries.

- Do not touch the device until it has cooled down sufficiently.

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8.2 Permitted duty types

8.2.1 Permitted duty types and protection concept for category 3 motors

Design	Duty types on nameplate	Additional nameplate	Permitted duty types	Protection against excessive heating	Identification on the nameplate
3G 3D 3GD	S1	–	Line operation: S1	Motor circuit breaker[1)]	–
	S1		Line operation: Switching operation, soft starter, heavy starting	PTC thermistor /TF[2)]	Option designation /TF[2)]
	S1	VFC	Line operation: S1	Motor circuit breaker[1)]	–
	S1	VFC	Line operation: S1	Optional PTC thermistor /TF [2)]	Option designation /TF[2)]
	S1	VFC	Line operation: Switching operation, soft starter, heavy starting	PTC thermistor /TF[2)]	Option designation /TF[2)]
	S1	VFC	Inverter operation, group drive (only for 3D)	PTC thermistor /TF[2)]	Additional nameplate: Permitted continuous currents listed depending on the frequency

1) Monitoring device for protecting explosion-protected drives (e.g. Directive 2014/34/EU).

2) The catalog designation for PTC thermistors is /TF. Monitoring of the PTC thermistor by a thermistor "monitoring device for protecting explosion-protected drives" (e.g. Directive 2014/34/EU).

INFORMATION

All motors must be protected from impermissible heating according to ATEX Directive 2014/34/EU. Safety equipment required for safe operation is affected by this Directive and must be certified for this reason.

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8.3 Line operation

8.3.1 Motors in category 3

Continuous duty

The motors are designed for continuous duty at a constant power rating (S1) and are marked accordingly. This includes low load startup at a small number of starts per hour that cause hardly any additional heating.

Overload protection must be ensured using a time delayed, current-controlled overload protection device.

Switching operation

In case of switching frequencies that are assigned to duty types S3, S4, and S6, the load changes must be considered in addition to start-up. This is ensured by calculating the permitted switching frequency.

To calculate the permitted cycles per hour, use the formula for calculating the switching frequency.

The evaluation of PTC thermistors (/TF) is the only measure to prevent overheating.

Important notes on the brake

In line operation, the brake is applied at rated speed of the motor when the drive is switched off or in case of an emergency stop. The braking work may not exceed the permitted maximum braking work per braking operation. Observe the information in the manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake".

The evaluation of a PTC thermistor (/TF) is the only measure to prevent overheating. The brakemotors from SEW-EURODRIVE are equipped with PTC thermistors (/TF).

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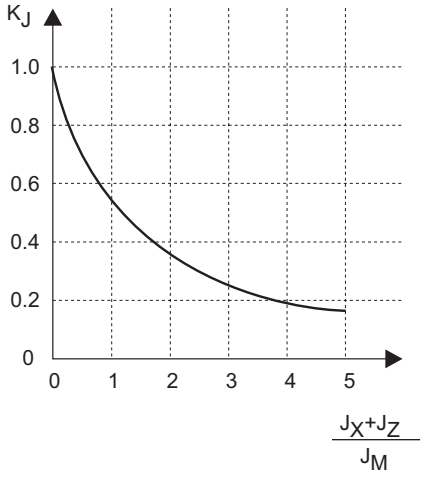
8.3.2 Calculating the starting frequency

You can determine the permitted switching frequency Z of the motor in cycles/hour using the following formula:

$$Z = Z_0 \times K_J \times K_M \times K_P$$

You can determine the factors $_J$, K_M, and K_P using the following diagrams:

Depending on the additional moment of inertia



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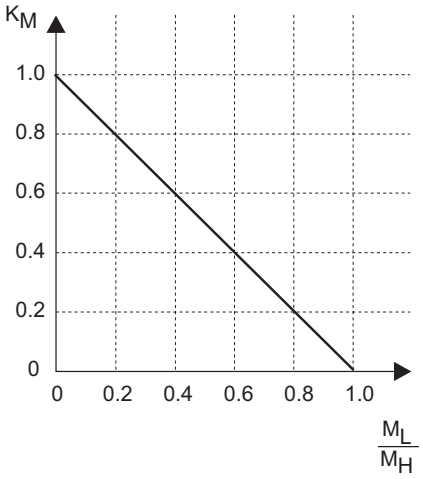
Depending on the counter-torque at startup



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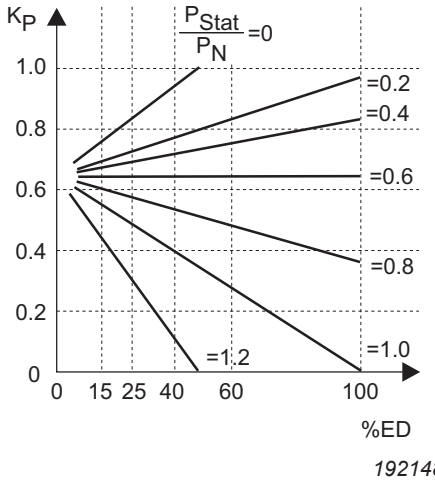
Depending on the static power and the relative cyclic duration factor cdf



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J_X	Total of all external mass moments of inertia in relation to the motor axis	M_H	Acceleration torque of the motor
J_Z	Mass moment of inertia flywheel fan	P_{Stat}	Power demand after run-up (static power)
J_M	Motor's mass moment of inertia	P_N	Rated motor power
M_L	Counter-torque during startup	% cdf	Relative cyclic duration factor

Z_0 is the no-load starting frequency defined by the manufacturer.

The permitted starting frequency Z of a motor is calculated using the formula for calculating the starting frequency. Z_0 indicates the number of times per hour that the motor can accelerate the mass moment of inertia of its rotor up to nominal speed without counter-torque.

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9 Service

9.1 MOVI-SWITCH® 1E fault list

The following table helps you with troubleshooting:

Fault	Cause	Measure
Drive turns in the wrong direction	Incorrect phase sequence	• Swap 2 phases of the power terminals U1, V1 and W1
Motor does not run, no current consumption	No line voltage	• Check incoming cable, correct • Check line protection fuse, replace
	No DC 24 V supply	• Check DC 24 V supply, connect
	Missing "RUN" signal	• Set "RUN" signal ("RUN" terminal) = 24 V)
	Overtemperature fault	• Check DC 24 V supply, connect • Check "OK" output short-circuit to ground, correct • Motor or power semiconductor too hot, let it cool down, reduce load • TF not connected, check connections, correct
Motor buzzes, high current consumption	Mechanical components blocking Defective winding	• Correct mechanical fault • Replace the drive
	2-phase operation	• Check fuses and line cable connections • Provide 3 phases
	Brake does not release	• Carry out brake maintenance, see chapter "Inspection and Maintenance"
	Brake rectifier is defect	• Replace brake rectifier

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9.2 Motor malfunctions

Fault	Possible cause	Measure
Motor does not start up	Supply cable interrupted	Check the connections and (intermediate) terminal points, correct if necessary
	Brake does not release	See "Brake malfunctions"
	Supply cable fuse has blown	Replace fuse
	Motor protection (switch) has triggered	Check that the motor protection (switch) is set correctly; current specification is on the nameplate
	Motor protection does not trip	Check motor protection control
	Malfunction in control or in the control process	Observe the switching sequence; correct if necessary
Motor only starts with difficulty or does not start at all	Motor power designed for delta connection but connected in star	Correct the connection from star to delta; follow the wiring diagram
	Motor power designed for star-star connection but only connected in star	Correct the connection from star to star-star; follow the wiring diagram
	Voltage or frequency differs considerably from the setpoint, at least when switching on the motor	Provide better power supply system; reduce the power supply load; Check cross section of supply cable, replace with cable of larger cross section if necessary
Motor does not start in star connection, only in delta connection	Star connection does not provide sufficient torque	If the delta inrush current is not too high (observe the regulations of the power supplier), start up directly in delta; Check the project planning and use a larger motor or special design if necessary. Contact SEW-EURODRIVE.
	Contact fault on star/delta switch	Check the switch, replace if necessary; Check the connections
Incorrect direction of rotation	Motor connected incorrectly	Swap two phases of the motor supply cable
Motor hums and has high current consumption	Brake does not release	See "Brake malfunctions"
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	Send motor to specialist workshop for repair
Fuses blow or motor protection trips immediately	Short circuit in the motor supply cable	Eliminate short circuit
	Supply cables connected incorrectly	Correct the wiring, observe the wiring diagram
	Short circuit in the motor	Send motor to specialist workshop for repair
	Ground fault on motor	Send motor to specialist workshop for repair

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Fault	Possible cause	Measure
Severe speed loss under load	Motor overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Voltage drops	Check cross section of supply cable, replace with cable of larger cross section if necessary
Motor heats up excessively (measure temperature)	Overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Insufficient cooling	Provide for cooling air supply or clear cooling air passages, retrofit forced cooling fan if necessary. Check the air filter, clean or replace if necessary
	Ambient temperature too high	Observe the permitted temperature range, reduce the load if necessary
	Motor in delta connection instead of star connection as intended	Correct the wiring, observe the wiring diagram
	Loose contact in supply cable (one phase missing)	Tighten loose contact, check connections, observe wiring diagram
	Fuse blown	Look for and rectify cause; replace fuse
	Line voltage deviates from the rated motor voltage by more than 5% (range A) / 10% (range B).	Adjust motor to line voltage
	Nominal duty cycle (S1 to S10, DIN 57530) exceeded, e.g. caused by excessive starting frequency	Adjust the nominal duty cycle of the motor to the required operating conditions; consult a professional to determine the proper drive, if necessary
Excessively loud	Ball bearing compressed, dirty or damaged	Re-align motor and the driven machine, inspect rolling bearing and replace if necessary.
	Vibration of rotating parts	Look for the case, possibly an imbalance; correct the cause, observe method for balancing
	Foreign bodies in cooling air ducts	Clean cooling air ducts

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9.3 SEW Service

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

9.4 Inspection and maintenance

9.4.1 MOVI-SWITCH®

MOVI-SWITCH® is maintenance-free. SEW-EURODRIVE does not prescribe any inspection or maintenance work for the MOVI-SWITCH®.

9.4.2 Motor

The motor requires regular inspection and maintenance work.

Observe the notes and instructions in chapter "Inspection/Maintenance" of the motor operating instructions.

9.4.3 Gear unit (only for gearmotors)

The gear unit requires regular inspection and maintenance work.

Observe the notes and instructions in chapter "Inspection/Maintenance" of the gear unit operating instructions.

9.5 Shutdown

To shut down the MOVI-SWITCH® drive, de-energize the drive using appropriate measures.

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9.6 Waste disposal

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

- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- 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 Technical data of MOVI-SWITCH® 1E

MOVISWITCH® 1E		
Supply voltages (motor-dependent)	U_{line}	AC 3 x 380 – 420 V / 415 V / 440 V / 460 V / 480 V / 500 V ± 5 % (specify when placing order)
Line frequency (motor-dependent)	f_{line}	50 Hz or 60 Hz (specify when placing order)
Rated operating current (for 400 V) (dependent on motor)		I_{max} = AC 7.0 A I_{min} = AC 0.5 A
Motor protection		Thermistor
Module protection		Temperature shutdown from 89 °C to 100 °C Temperature hysteresis typically 5 K
Maximum starting frequency		1800 cycles/h
Pulse frequencies		Typically 10 ms
Interference immunity		Meets requirements of EN 61800-3
Interference emission		Complies with EN 61800-3 and limit class A according to EN 55011 and EN 55014
Ambient temperature	ϑ_{Amb}	**-20 °C – +40 °C** (P_N derating: 3% I_N per K up to max. 50 °C), no moisture condensation
Storage temperature	ϑ_L	-25 °C – +85 °C (EN 60721-3-3, class 3K3)
Climate class		3 K3
Degree of pollution		2 according to IEC 60664 (VDE0110-1)
Degree of protection (depending on the motor)		IP54, IP55, IP65 (optional, specify when ordering)
Operating mode		S1 (EN 60034-1)
Type of cooling (DIN 41 751)		Natural cooling
Installation altitude		h ≤ 1000 m
Electronics power supply		U = +24 V ± 25 %, EN 61131-2, residual ripple max. 13 % I_{input} ≤ 50 mA (without I_{OK})
Digital input "RUN"		Isolated via optocoupler; PLC compatible (EN 61131-2) R_i ≈ 3.0 kΩ, I_E ≈ 10 mA, sampling cycle ≤ 5 ms
Signal level		+13 V – +30 V = "1" = contact closed -3 V – +5 V = "0" = contact open
Control functions		Run/stop
Binary output "OK"		Response time ≤ 10 ms

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MOVISWITCH® 1E		
Signal level		U_{OK} > $U_{24\ V}$ -3 V, when drive is ready for operation
	I_{OK}	Current for checkback max. 0.65 A, short-circuit proof
Signaling function		Output for ready signal Checkback signal "Ready for operation" = "1": U_{OK} > $U_{24\ V}$ -3 V • With voltage present (24 V) • If no error was detected • At the end of self-testing phase (after power on)
Mass		Refer to the catalog "Explosion-protected AC Motors EDRN80 – EDRN315"
Dimensions, dimension drawings		
Output torque		
Required preventive measures		Grounding the device

In this chapter, observe the information in the operating instructions "Explosion-Protected AC Motors EDR..71 – 315, EDRN63 – 315".

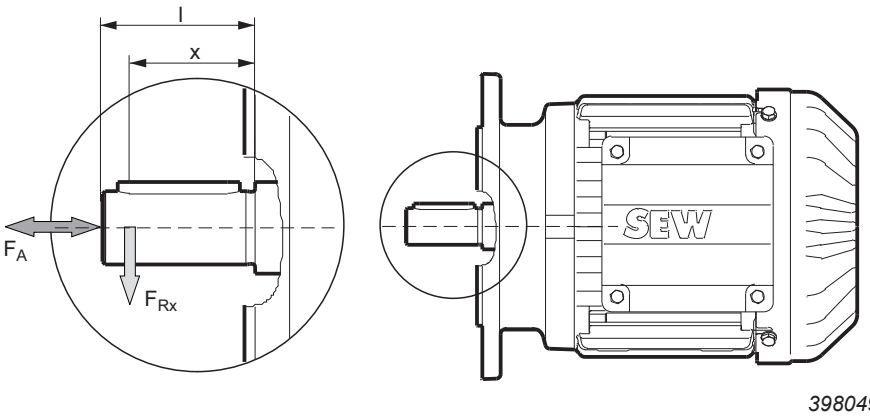
10.2 Overhung and axial loads for motor shaft ends

10.2.1 Permitted overhung load

You can read the maximum permitted overhung load F_{Rx} of the respective motor depending on the point of force application relative to the shaft shoulder from the following diagrams.

All overhung load diagrams depict the values for a statistical bearing service life of 40000 hours at the input side shaft end. A detailed bearing service life calculation is available on request.

The following figure shows the point of force application of the overhung load F_{Rx} at point X.



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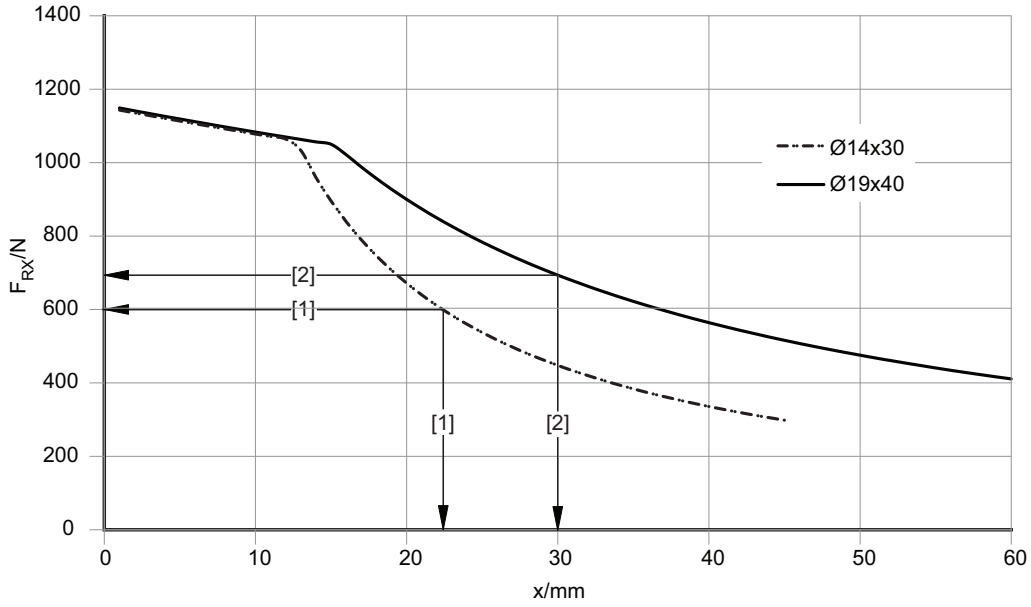
l Length of the shaft end
x Distance between overhung load application point and shaft shoulder
F_{RX} Maximum permitted overhung load at point of force application
F_A Maximum permitted axial load

The customer's overhung load F_R always has to be less than or equal to the maximum permitted overhung load F_{RX} from the diagrams:

$F_R \leq F_{RX}$

The following diagram shows an example of how you can read the maximum overhung load from the diagram:



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[1] Motor with shaft diameter 14 mm, force application x at 22 mm, maximum permitted overhung load F_{Rx} = 600 N
[2] Motor with shaft diameter 19 mm, force application x at 30 mm, maximum permitted overhung load F_{Rx} = 700 N

When determining the overhung load, a transmission element factor f_Z must be considered under certain conditions. This factor depends on the used transmission elements, such as gear wheels, chains, V-belts, flat belts or toothed belts.

When belt pulleys are used, the initial belt tension must be considered as well. In total, the overhung loads F_R calculated with the transmission element factor must not exceed the maximum permitted overhung load of the motor F_{RX}.

Transmission element	Transmission element factor f_Z	Comments
Direct drive	1.0	–
Gear wheels	1.0	≥ 17 teeth
Gear wheels	1.15	< 17 teeth
Sprockets	1.0	≥ 20 teeth
Sprockets	1.25	< 20 teeth
Narrow V-belt	1.75	Influence of pretensioning
Flat belt	2.50	Influence of pretensioning
Toothed belt	1.50	Influence of pretensioning
Gear rack	1.15	< 17 teeth (pinion)

The resulting customer overhung load is calculated using the following equation:

$F_R \times f_z \leq F_{Rx}$

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The diagrams are summarized according to the motor size. The shaft ends available for the respective size are represented in one diagram.

The information considers the rated speed n_N and the higher-level rated torque M_N for continuous duty (S1) of the motor.

For duty types other than S1 (e.g. S2, S3, etc.), the permitted values for F_{Rx} and F_A have to be multiplied with the factor 0.8.

$F_{Rx,switching\ operation} = F_{Rx} \times 0.8$

$F_{A,switching\ operation} = F_A \times 0.8$

If further application conditions occur that are not considered in the descriptions or diagrams in this chapter, consult SEW-EURODRIVE.

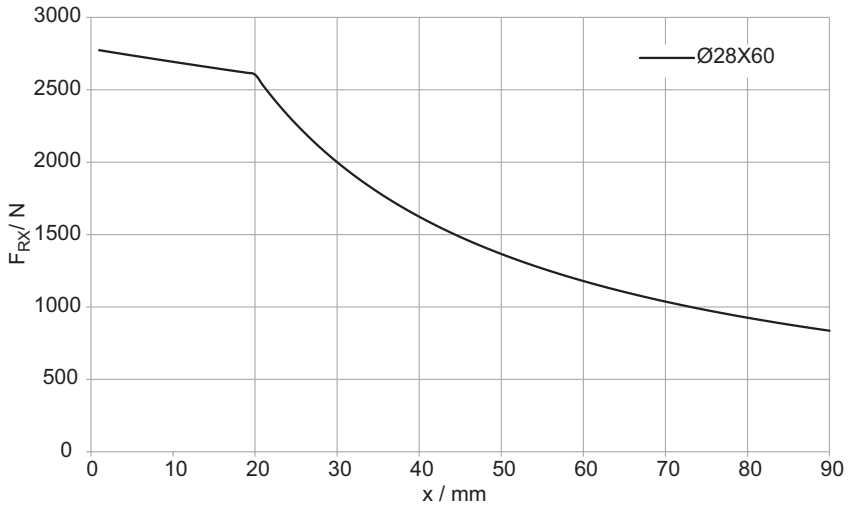
10.2.2 Overhung load diagrams

Key

2, 4, 6	Number of poles
Ø19×40	Shaft end

For overhung load diagrams of the second shaft end, refer to chapter Output.

Overhung load diagram EDRN100



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10.3 Permitted rolling bearing types

Motor type	A-side bearing		B-side bearing	
	IEC motor	Gearmotor	AC motor	Brakemotor
EDRN71	6204-2Z-J-C3	6303-2Z-J-C3	6203-2Z-J-C3	6203-2RS-J-C3
EDRN80	6205-2Z-J-C3	6304-2Z-J-C3	6304-2Z-J-C3	6304-2RS-J-C3
EDRN90 EDRN100	6306-2Z-J-C3		6205-2Z-J-C3	6205-2RS-J-C3

10.4 Braking torque assignment

Motor type	Brake type	Braking torque steps Nm									
EDRN71S	BE05	1.8	2.5	3.5							
EDRN71M	BE1				5.0	7.0					
EDRN80MK	BE1				5.0	7.0					
EDRN80M	BE2					7.0	10	14			
EDRN90	BE2					7.0	10	14			
EDRN100	BE5								20	28	40

10.5 Braking work, working air gap, and brake lining carrier thickness

If the brake is used in combination with a safety encoder, or if the brake is designed as safety brake, the maximum values for the working air gap and for the braking work until maintenance are reduced. For the new values, refer to the addendum to the operating instructions for safety brakes and safety encoders.

Brake	Braking work until maintenance[1)]	Working air gap		Brake lining carrier
		min.[2)]	Maximum	Minimum
	10^6 J	mm	mm	mm
BE05	120	0.25	0.6	11.0
BE1	120	0.25	0.6	11.0
BE2	180	0.25	0.6	11.0
BE5	390	0.25	0.9	11.0

1) The specified values are nominal values that were determined during rating operation. The actual braking work that can be reached before maintenance may vary depending on the actual load during operation.

2) When checking the working air gap, note: After a test run, parallelism tolerances on the brake lining carrier may give rise to deviations of ±0.15 mm.

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11 Declaration of Conformity

11.1 Type examination certificate

INFORMATION

The EU prototype test certificate is provided with the drive. The notified body as well as the technical details are listed in the provided EU prototype test certificate.

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EU Declaration of Conformity

SEW EURODRIVE

Translation of the original text **901440312/EN**

SEW-EURODRIVE GmbH & Co. KG
Ernst-Blickle-Straße 42, D-76646 Bruchsal
declares under sole responsibility that the following products

Electronic motor starter of the product series	**MOVI-SWITCH® EDR.../../MSW/3D**	
Category	**3D**	
Designation	**II 3D Ex tc IIIB T120°C Dc** **II 3D Ex tc IIIB T140°C Dc** **II 3D Ex tc IIIC T120°C Dc** **II 3D Ex tc IIIC T140°C Dc**	
in accordance with		
ATEX Directive	**2014/34/EU** **(L 96, 29.03.2014, 309-356)**	
EMC Directive	**2014/30/EU** **(L 96, March 29, 2014, 79-106)**	**4)**
RoHS Directive	**2011/65/EU** **(L 174, July 1, 2011, 88-110)**	
Applied harmonized standards:	**EN 60079-0:2012/A11:2013** **EN 60079-31:2014** **EN 61800-3:2004/A1:2012** **EN 50581:2012**	

4) According to the EMC Directive, the listed products are not independently operable products. EMC assessment is only possible after these products have been integrated in an overall system. For the assessment, the product was installed in a typical plant configuration.

Bruchsal	**05.07.2017**	Johann Soder Managing Director Technology	a) b)
Place	Date		

a) Authorized representative for issuing this declaration on behalf of the manufacturer
b) Authorized representative for compiling the technical documents

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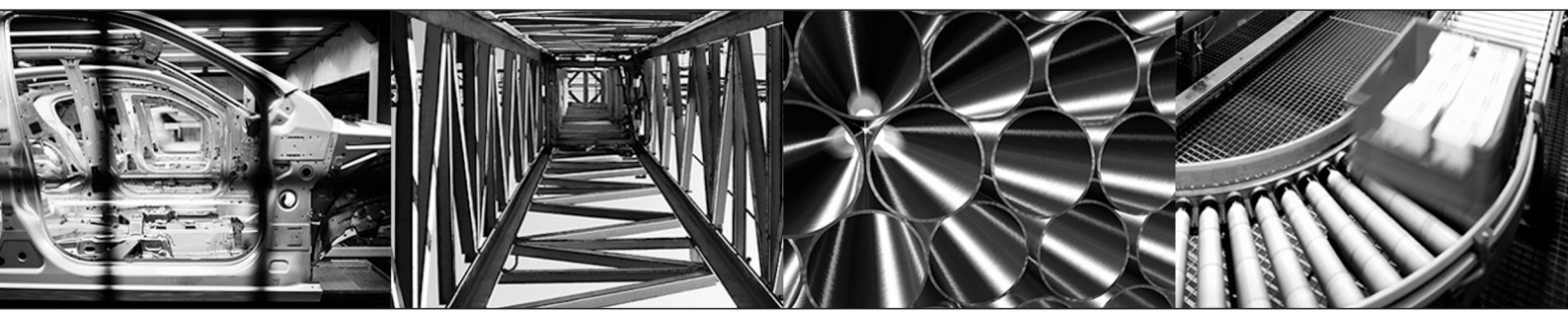

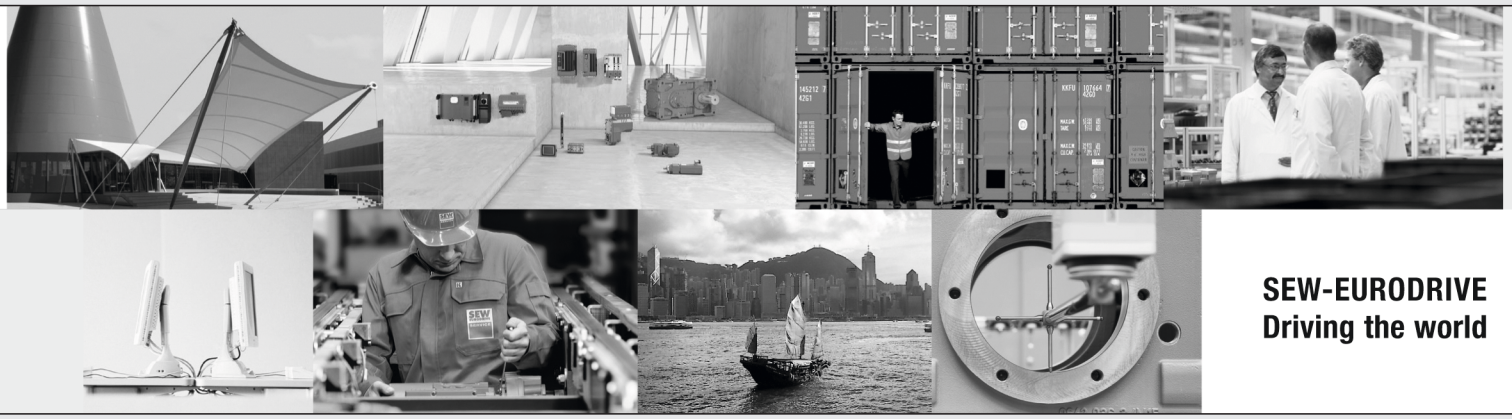

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