SEW EURODRIVE

Operating Instructions

Frequency Inverters

MOVITRAC® LTE-B+

Edition 03/2024

31965865/EN

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1 General information

1.1 Structure of the safety notes

1.1.1 Meaning of signal words

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

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.1.2 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

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2 Safety notes

2.1 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, and 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, and who possess the following qualifications:

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

Additional qualifications

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

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

Instructed persons

All work in the areas of transport, storage, installation, operation and waste disposal may only be carried out by persons who are trained and instructed appropriately. These instructions must enable the persons to carry out the required activities and work steps safely and in accordance with regulations.

2.2 Designated use

The product is intended for control cabinet installation in electrical systems or machines.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply. Observe EN 60204-1 (Safety of machinery - electrical equipment of machines). The product meets the requirements stipulated in the Low Voltage Directive 2014/35/EU.

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

The systems can be mobile or stationary.

Only connect ohmic/inductive loads.

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

- AC asynchronous motors
- AC synchronous motors

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

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

2.2.1 Lifting applications

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

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

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

2.2.3 Restrictions of use

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

- Use in potentially explosive areas.
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation.
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1.
- Use at an elevation of more than 3800 m above sea level.

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

- The reduction of the nominal output current and/or line voltage is taken into account as per chapter "Technical data" in the associated product manual.
- Above 2000 m above sea level, the air and creepage distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level, limiting measures must therefore be taken that 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.

Observe the restrictions of use in chapter "General technical data".

2.3 Transport

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product or the packaging is damaged, do not assemble, install, connect, or start up the product. If the packaging is damaged, the product itself may also be damaged.

Observe the following notes when transporting the device:

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

If necessary, use suitable, adequately dimensioned transport aids.

Observe the notes on the climatic conditions in accordance with chapter "Technical data" in the corresponding product manual.

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2.4 Installation/assembly

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

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

Observe the notes in chapter "Mechanical installation" in the documentation.

2.5 Electrical installation

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

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

2.5.1 Required preventive measure

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

2.5.2 Stationary application

The necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	Ground connection

2.5.3 Regenerative operation

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

2.6 Protective separation

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

In order to avoid exceeding the permitted contact voltages in SELV or PELV power circuits in the event of a fault, continuous equipotential bonding is required in the vicinity of these power circuits. If this is not possible, other preventive measures must be taken. These preventive measures are described in IEC 61800-5-1.

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2.7 Startup/operation

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.

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.

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

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

When the system is switched on, dangerous voltages are present on all voltage-controlled product parts as well as any cables and terminals that are connected. This also applies even when the product is inhibited and the motor is in an idle state. Do not touch the components during operation.

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

10 minutes.

Observe the corresponding information signs on the product.

The fact that the operation or 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. Removing the cause of this problem or performing a reset can result in the machine or the system re-starting on its own. First, disconnect the product from the supply system before you 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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3 Device structure

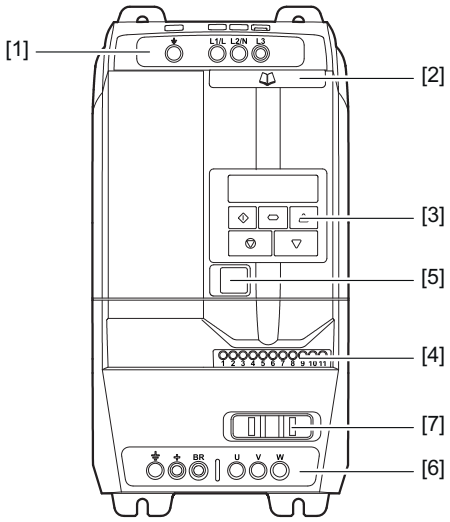
3.1 Inverter

The frequency inverters of the MOVITRAC® LTE-B+ product series are available in degree of protection IP20 for installation in a control cabinet and in degree of protection IP66 for installation in the field.

3.1.1 Inverters with degree of protection IP20/NEMA 1

The following inverters have the housing shown below:

Nominal line voltage	Inverter power
110 – 115 V	0.37 – 1.1 kW
200 – 240 V	0.37 – 5.5 kW
380 – 480 V	0.75 – 11 kW



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[1] Connecting terminal strip PE, L1/L, L2/N, L3
[2] Help card with terminal assignment and basic parameters
[3] Keypad with 6-digit 7-segment display
[4] Control terminal strip
[5] RJ45 communication socket
[6] Connecting terminal strip PE, +, BR, U, V, W (+ and BR not for size 1)
[7] Tab for fastening the control cables

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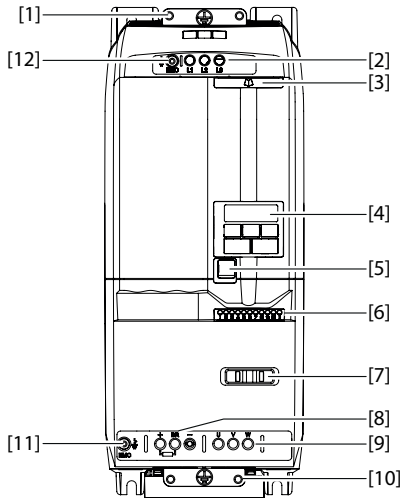
The following inverters have the housing shown below:

Nominal line voltage	Inverter power
200 – 240 V	7.5 – 11 kW
380 – 480 V	15 – 22 kW



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[1] PE connection (2 connection options)
[2] Connecting terminal strip L1, L2, L3
[3] Help card with terminal assignment and basic parameters
[4] Keypad with 6-digit 7-segment display
[5] RJ45 communication socket
[6] Control terminal strip
[7] Tab for fastening the control cables
[8] Connecting terminal strip +, BR, - (braking resistor and DC link)
[9] Connecting terminal strip U, V, W
[10] PE connection (2 connection options)
[11] EMC screw
[12] EMC screw

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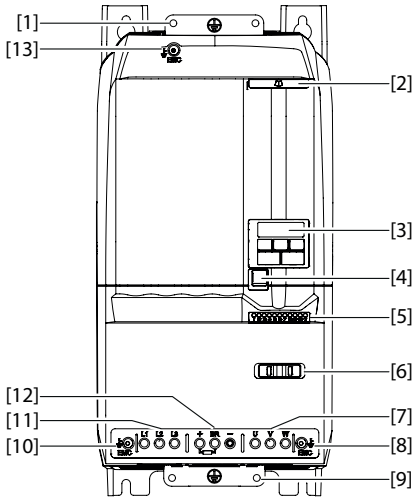
The following inverters have the housing shown below:

Nominal line voltage	Inverter power
200 – 240 V	15 – 18.5 kW
380 – 480 V	30 – 37 kW



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[1] PE connection (2 connection options)
[2] Help card with terminal assignment and basic parameters
[3] Keypad with 6-digit 7-segment display
[4] RJ45 communication socket
[5] Control terminal strip
[6] Tab for fastening the control cables
[7] Connecting terminal strip U, V, W
[8] EMC screw
[9] PE connection (2 connection options)
[10] EMC screw
[11] Connecting terminal strip L1, L2, L3
[12] Connecting terminal strip +, BR, - (braking resistor and DC link)
[13] EMC screw

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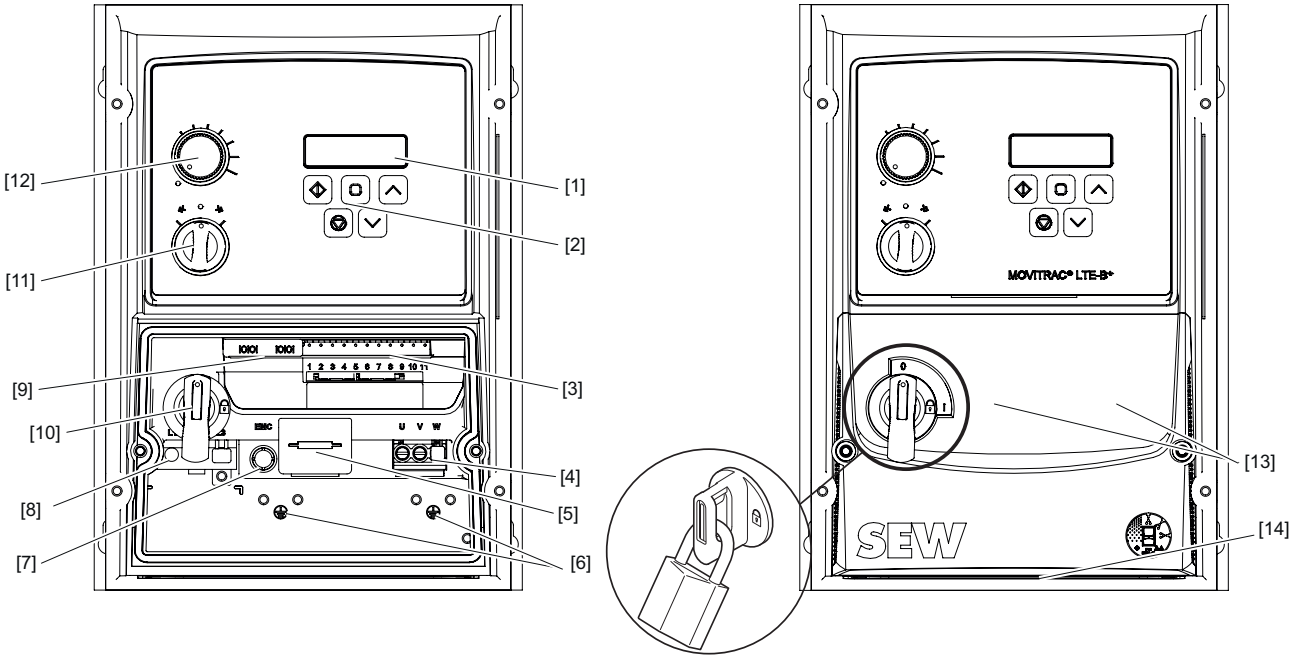
3.1.2 Inverters with degree of protection IP66/NEMA 4X



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[1] 6-digit 7-segment display
[2] Keypad
[3] Control terminal strip
[4] Connecting terminal strip U, V, W
[5] Connecting terminal strip for braking resistor and DC link +, BR, - (not for size 1)
[6] PE connection (2x for size 1 to size 3 and 4x for size 4)
[7] EMC screw
[8] Connecting terminal strip L1/L, L/N, L3
[9] RJ45 communication socket (dual implementation)

The following points are available only in the device design with switch option:

[10] Main switch for supply system separation (main switch is lockable)
[11] Rotary switch for direction of rotation CW/0/CCW
[12] Rotary potentiometer for speed

Optional, customer-specific extension of the front cover:

The front cover of the terminal space [13] can be extended with two additional buttons or switches. For this purpose, it is necessary to drill holes in the cover. The position of these bore holes is marked with punching on the rear side.

The front cover of the terminal space can be extended at the bottom with three additional screw fittings. For this purpose, it is necessary to drill holes in the cover. The position of these bore holes [14] is marked with punching on the underside.

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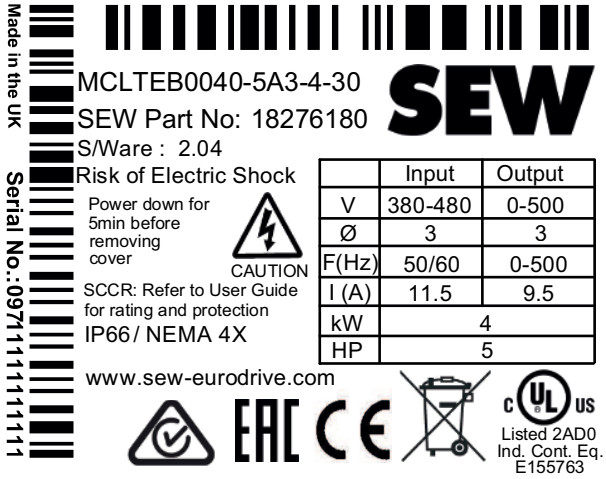
3.2 Nameplate

The following figure shows an example of a nameplate:



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3.3 Type designation

Example: MCLTEB0015-2B1-1-00	
MC	**Product family** MOVITRAC®
LTE	**Device type** LTE
B	**Version** B = version status of the device series
0015	**Recommended motor power** 0015 = 1.5 kW
2	**Connection voltage** • 1 = 110 – 115 V • 2 = 200 – 240 V • 5 = 380 – 480 V
B	**Interference suppression at the input** • 0 = Device without filter (no interference suppression) • A = C2 • B = C1
1	**Connection type** • 1 = 1-phase • 3 = 3-phase
1	**Quadrants** • 1 = 1-quadrant operation without brake chopper • 4 = 4-quadrant operation with brake chopper

Example: MCLTEB0015-2B1-1-00	
00	**Design** • 00 = Standard IP20 housing • 30 = IP66/NEMA 4X housing without switch • 40 = IP66/NEMA 4X housing with switch
(60 Hz)	**Country-specific variant** 60 Hz = 60 Hz design

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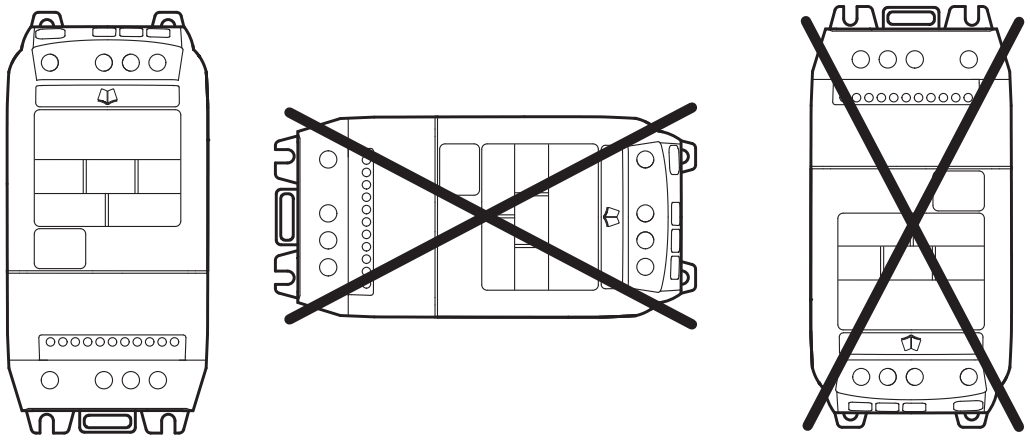
4 Mechanical installation

4.1 Installation notes

- Carefully check the inverter for damage prior to installation.
- Store the inverter in its original packaging until it is used. The storage location must be clean and dry with an ambient temperature between -40 °C and +60 °C.
- Install the inverter in a suitable housing on a level, vertical, non-flammable, and vibration-free surface. If a certain degree of protection is required, observe EN 60529.
- Keep flammable substances away from the inverter.
- Prevent the ingress of conductive or flammable foreign objects.
- The relative humidity must be kept below 95% (condensation not permitted).
- Protect the IP66 inverter from direct sunlight. Use a cover outdoors.
- Inverters can be installed next to each other. Ensure sufficient ventilation space between the individual devices. If the inverter is installed above another inverter or another heat-emitting device, the minimum vertical clearance is 150 mm. To enable self-cooling, the control cabinet must either be cooled through forced ventilation, or dimensioned accordingly. See chapter "IP20 housing: Installation and installation space" (→ 🗎 18).
- The permitted ambient temperatures are defined in chapter "Environmental conditions".
- The mounting rail can only be installed for the following inverters with IP20 degree of protection:
  - 100 – 115 V: 0.37 – 1.1 kW
  - 200 – 240 V: 0.37 – 2.2 kW
  - 380 – 480 V: 0.75 – 4 kW

  The mounting rail must have the dimensions 35 × 15 mm or 35 × 7.5 mm and be designed in accordance with EN 50022.
- The inverter may only be installed as shown in the following figure:



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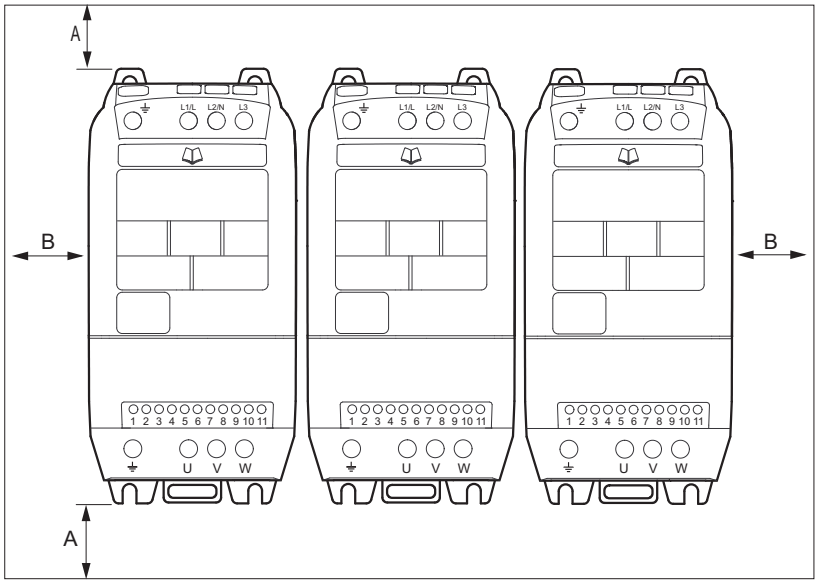
4.2 Installing the inverter

4.2.1 IP20 housing: Installation and installation space

Inverters with degree of protection IP20 must be installed in a control cabinet. Observe the following requirements:

- The control cabinet must be made of heat-conducting material, unless it has forced air cooling.
- If you use a control cabinet with ventilation openings, the openings must be provided below and above the inverter. This way, you ensure good air circulation. The air must be supplied underneath the inverter and extracted above it.
- If the outer surroundings contain particles such as dust, install a suitable particle filter on the ventilation openings and use forced air cooling. Clean and maintain the filter.
- In environments with high humidity, salt or chemicals concentrations, use a closed control cabinet (without ventilation openings).
- You can install the inverters in IP20 directly next to each other without spacing.



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Size	A in mm	B in mm	Air flow rate per inverter
1	50	50	> 18 m³/h
2	75	50	> 37 m³/h
3	100	50	> 100 m³/h
4	100	50	> 200 m³/h
5	200	25	> 350 m³/h

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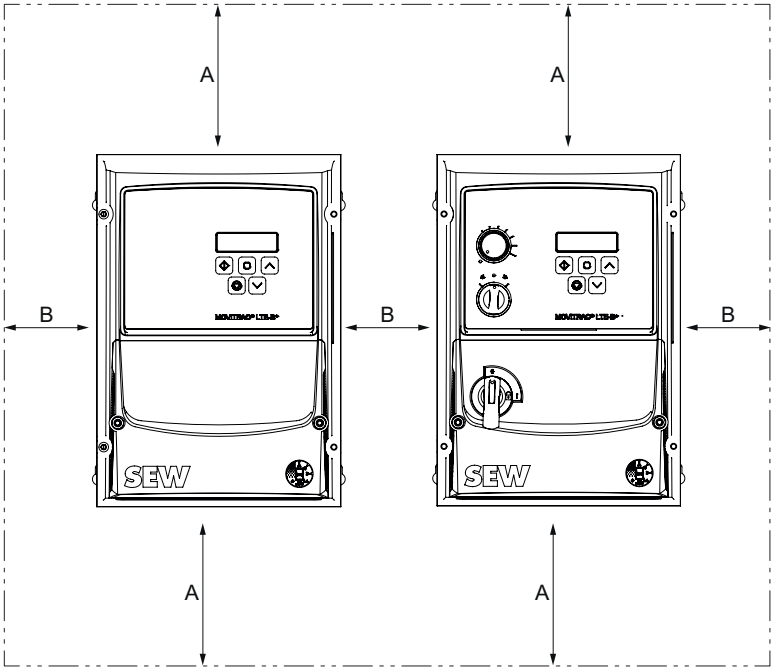
4.2.2 IP66 housing: Installation and control cabinet dimensions

Inverters with degree of protection IP66 can be used indoors.

In control cabinets or in the field, the minimum clearances must not be less than shown below:



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Size	A in mm	B in mm	Cooling
1	200	10	Convection
2	200	10	Convection
3	200	10	Convection[1)]
4	200	10	Fan

1) The MCLTEB0055-2A3-4-xx and MCLTEB0110-5A3-4-xx devices have a fan for cooling.

INFORMATION

If the IP66 inverter is installed in a control cabinet, sufficient control cabinet ventilation must be ensured.

The dimensioning of the control cabinet ventilation is carried out by the control cabinet manufacturer, taking all sources of heat into account.

4.3 Tightening torques

Tighten the clamping screw with the following tightening torques:

Power of inverter	Tightening torque in Nm	
	Control terminals	Power terminals
Nominal line voltage 110 – 115 V		
0.37 – 1.1 kW	0.5	1
Nominal line voltage 200 – 240 V		
0.37 – 5.5 kW	0.5	0.8
7.5 – 11 kW		2
15 – 18.5 kW		4
Nominal line voltage 380 – 480 V		
0.75 – 11 kW	0.5	0.8
15 – 22 kW		2
30 – 37 kW		4

4.4 Installing braking resistors

The surfaces of the braking resistors will reach temperatures of up to 250 °C when the braking resistors are loaded with the nominal power. The installation location of the braking resistor must be designed according to the high temperatures. For this reason, the braking resistors are usually mounted outside the control cabinet. Non-permissible installation might lead to heat build-up in the braking resistor due to reduced convection. A tripping temperature contact or an overheated braking resistor can lead to a system standstill.

The following minimum clearances must be observed for convection cooling depending on the continuous braking power and the mounting position:

Continuous braking power at 100% cdf	Mounting position	Lateral distance in mm	Distance below in mm	Distance above in mm
up to 1 kW	horizontal[1)]	200	0	350
	vertical[2)]	150	250	300
up to 10 kW	horizontal[1)]	300	0	650
	vertical[2)]	250	350	600
up to 22 kW	horizontal[1)]	400	0	750
	vertical[2)]	350	400	700
up to 44 kW	horizontal[3)]	500	0	850
	vertical[2)]	Not permitted	Not permitted	Not permitted

1) Corresponds to mounting position 1, 2, 5, 6.
2) Corresponds to mounting position 3, 4.
3) Corresponds to mounting position 1, 2, 5 and 6.

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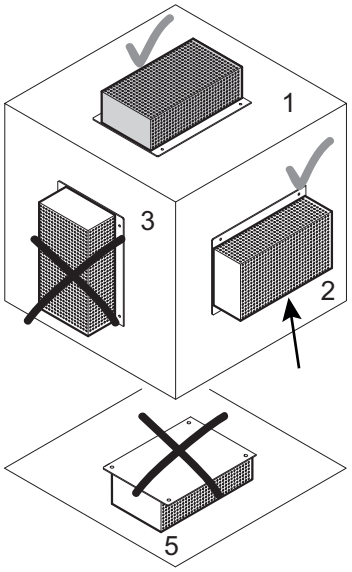
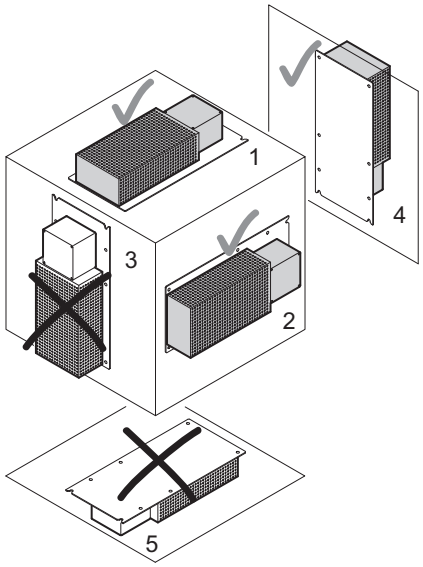
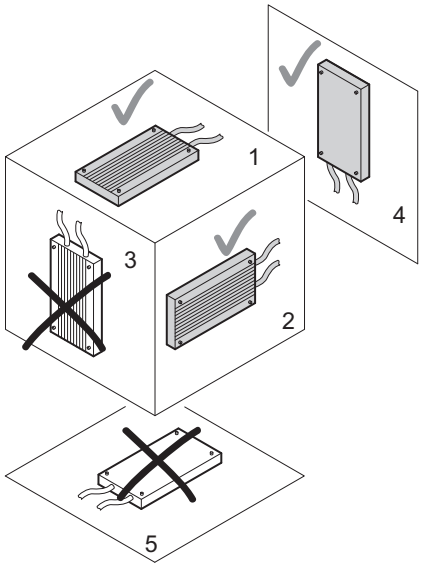
Permitted mounting positions		
Grid resistor, frame resistor	**Wire resistor**	**Flat type resistor**
		

The BW003-420-T and BW1.0-170 braking resistors may only be used in position 1.

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5 Electrical installation

⚠ WARNING

Electric shock from charged capacitors. Dangerous voltage levels may still be present inside the device and at the terminals up to 10 minutes after disconnection from the grid.

Severe or fatal injuries.

- Wait 10 minutes after you have de-energized the inverter and disconnected the line voltage and the DC-24 V voltage.
- Make sure that the device is de-energized.
- Only then must you commence any work on the device.

- Only trained electricians may install the inverter in observation of the applicable rules and regulations.
- The grounding cable must be dimensioned for the maximum line fault current that is normally limited by fuses or motor circuit breakers.

5.1 EMC-compliant installation according to EN 61800-3

Inverters with EMC filters are designed for use in machines and drive systems. They meet the EMC product standard EN 61800-3 for drives with variable speed. Observe the specifications of Directive 2014/30/EU for EMC-compliant installation of the drive system.

5.1.1 Interference immunity

With regard to interference immunity, the inverter with EMC filter complies with the limit values of standard EN 61800-3 and can therefore be used both in industrial and household applications (light industry).

5.1.2 Interference emission

With regard to interference emission, the inverter with EMC filter meets the limit values of the standard EN 61800-3:2004. The inverters are suitable for industrial as well as household applications (light industry).

To ensure the best possible electromagnetic compatibility, the inverters must be installed according to the specifications in chapter "Electrical installation". Make sure that the inverters have good ground connections. Use shielded motor cables to comply with the specifications on interference emission.

The conditions for use in drive applications are defined in the following tables.

Inverter type	Cat. C1 (class B)	Cat. C2 (class A)	Cat. C3
	according to EN 61800-3		
230 V, 1-phase LTEBxxxx-2B1-x-xx	No additional filtering is required. Use a shielded motor cable.		

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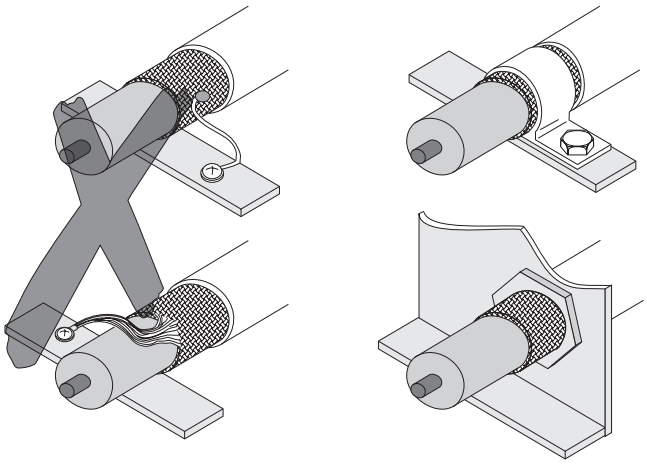
Inverter type	Cat. C1 (class B)	Cat. C2 (class A)	Cat. C3
	according to EN 61800-3		
230 V/400 V, 3-phase LTEBxxxx-2A3-x-xx LTEBxxxx-5A3-x-xx	Use an external filter of the type NF LT xxx xxx.	No additional filtering is required.	
	Use a shielded motor cable.		

Use an external filter and a shielded motor cable to comply with the specifications on frequency inverters without internal filter.

5.1.3 General information about connecting the motor shield

For all applications in which increased EMC exposure is to be expected, the use of shielded cables is recommended. The shield must be connected as follows:

Connect the shield by the shortest possible route and make sure it is grounded over a wide area at both ends. This also applies to cables with several shielded core strands.



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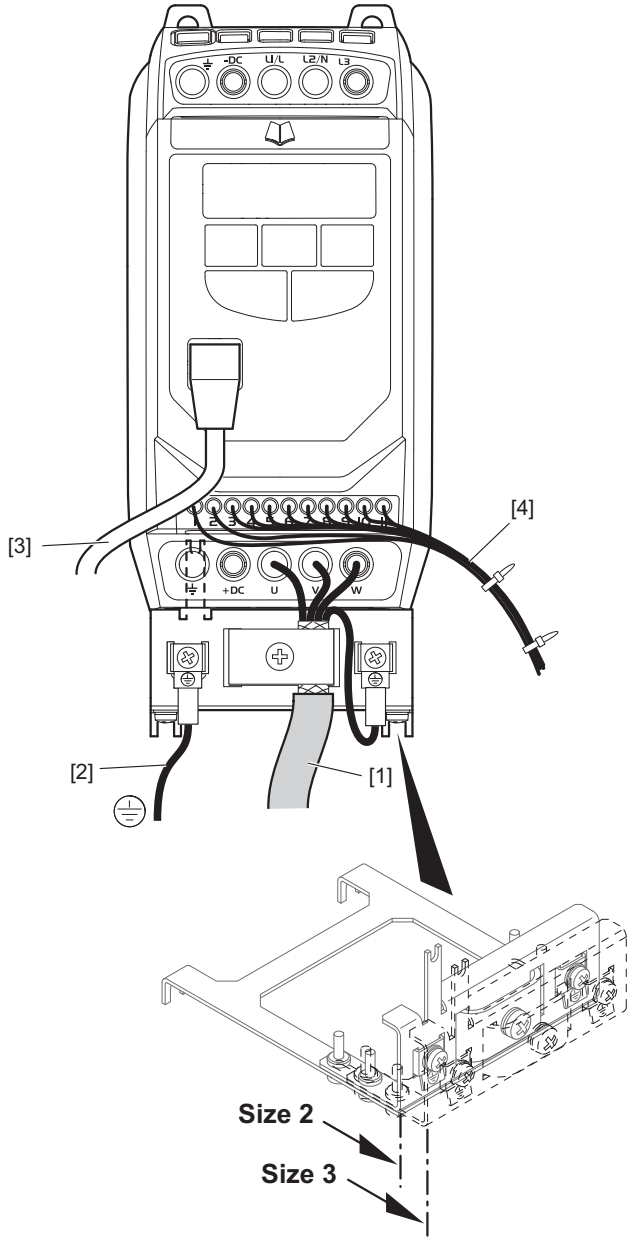
Recommendation for applying the motor shield to inverters with IP20

Size 2 and 3



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[1]	Motor cable	[3]	RJ45 communication cable
[2]	Additional PE connection	[4]	Control cables

The shield plate can be used optionally for size 2 and 3 of the IP20 design. Proceed as follows to adjust:

1. Loosen the 4 screws on the slotted holes
2. Move the sheet metal up to the stop according to the required size.
3. Tighten the screws again.

Make sure that the sheet metal is correctly attached to the PE connection.

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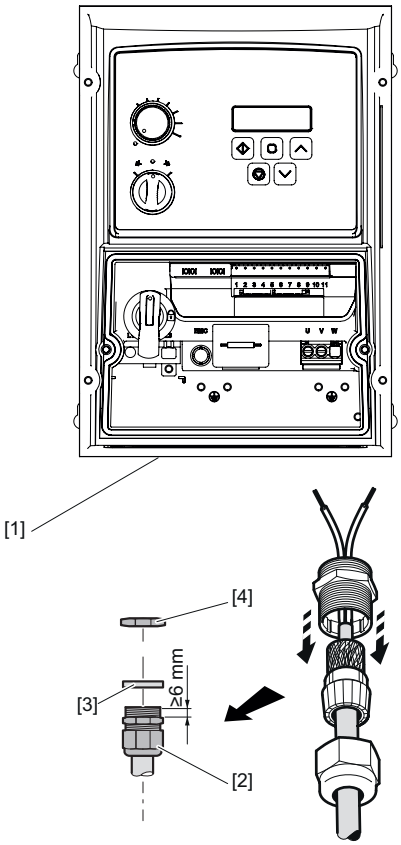
Recommendation for applying the motor shield to inverters with IP66

The cable bushing on the device is made of metal. It is therefore possible to fasten a corresponding metal screw fitting directly.



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[1] Cable bushing
[2] EMC screw fitting
[3] Seals for cable gland (enclosed with the device)
[4] EMC lock nut

It is recommended to use metal screw fittings to connect the motor shield to the device. The length of the thread must be at least 8 mm.

5.2 Installation instructions

5.2.1 Before installation

- Make sure that the supply voltage, frequency and the number of phases (one or three-phase) correspond to the nominal values of the inverter on delivery.
- A circuit breaker or similar disconnector must be installed between the voltage supply and the inverter.
- Never connect the power supply to the output terminals U, V or W of the inverter.
- Do not install any contactors between the inverter and the motor. Where control cables and high-voltage power lines are installed close to each other, keep a minimum distance of 100 mm and an angle of 90° for crossing cables.
- The cables are only protected by slow-blow high-power fuses or a motor circuit breaker. For further information, refer to section "Permitted voltage supply systems" (→ 🗎 27).
- Use a 4-core PVC-insulated and shielded cable as the motor cable. Route this cable according to the applicable national regulations of the industry sector and in accordance with the rule set. Use conductor end sleeves to connect the motor cable to the inverter.
- Make sure that shieldings and sheaths of the motor cable are designed according to the wiring diagram in section "General information about connecting the motor shield".
- Make sure that the grounding terminal of each inverter is connected individually and **directly** to the ground busbar (ground) of the installation site, via a filter if available.
- Do not loop the ground connections of the inverter from one inverter to the other. Do not route the ground connections to the inverters from other inverters either.
- The impedance of the ground circuit must comply with the local safety regulations of the industry sector.
- Make sure that all of the terminals are tightened to the corresponding tightening torque, see chapter "Tightening torques" (→ 🗎 20).
- To comply with UL regulations, all ground connections must be designed with UL-listed crimp ring cable lugs.

Unlike direct operation in the supply system, the inverters on the motor generate suitable fast-switching output voltages (PWM). In the case of motors wound for operation with adjustable-speed drives, no further preventive actions are necessary. If, however, the insulation quality is unknown, contact the manufacturer of the motor because preventive actions may be necessary.

INFORMATION

Make sure that the ground connections are properly connected. The inverter can generate leakage currents of > 3.5 mA. The grounding cable must be sufficiently dimensioned to carry the maximum fault current of the voltage source, which is usually limited by fuses or miniature circuit breakers.

Sufficiently rated fuses or miniature circuit breakers must be integrated into the inverter's power supply in accordance with local laws and/or regulations.

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5.2.2 Permitted voltage supply systems

- **Voltage supply systems with grounded star point**

  Inverters with all degrees of protection are intended for operation on TN and TT systems with directly grounded star point.

- **Voltage supply systems with non-grounded star point**

  All inverters can be used on supply systems with non-grounded star point (e.g. IT systems) after appropriate modification. Refer to chapter "Operation on IT system" (→ 🗎 27).

- **Voltage supply systems with grounded outer conductor**

  Inverters with all degrees of protection may only be operated on supply systems with a maximum phase-to-ground AC voltage of 300 V.

5.2.3 Operation on IT system

⚠ WARNING

Danger of electric shock. Dangerous voltage levels may still be present inside the device and at the terminals up to 10 minutes after disconnection from the supply system.

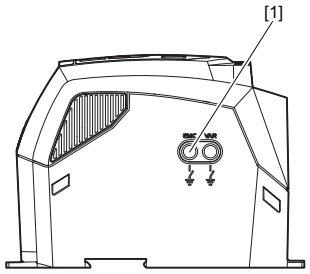
Severe or fatal injuries.

- De-energize the inverter at least 10 minutes before unscrewing the EMC screw.

To operate a MOVITRAC® LTE-B+ device on the IT system, the integrated EMC filter must be deactivated.

IP20 devices:

- On sizes 1 – 3, unscrew the EMC screw on the side of the device.



[1] EMC screw

- On sizes 4 – 5, unscrew the EMC screws at the marked points.

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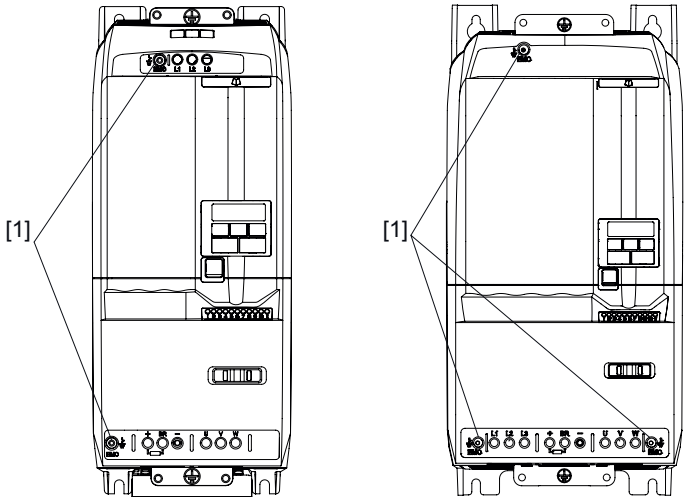
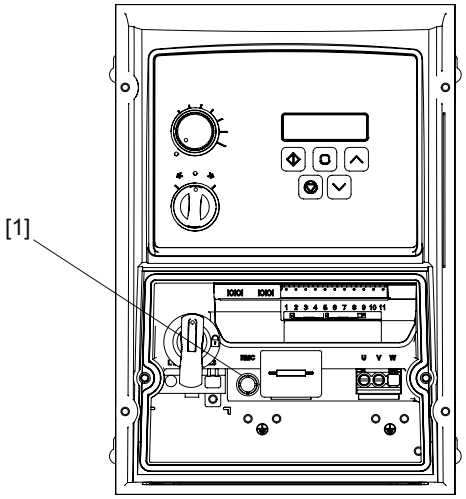


[1] EMC screw

IP66 devices:

- On sizes 1 – 4, unscrew the EMC screw in the terminal connection under the cover.



[1] EMC screw

SEW-EURODRIVE recommends using insulation monitors with pulse-code measurement in voltage supply systems with a non-grounded star point (IT systems). Using such devices prevents false tripping of the insulation monitor due to the earth capacitance of the inverter.

5.2.4 Selecting the residual current device

The inverter can cause a direct current in the PE conductor.

Proceed as follows to select the residual current device:

1. If using a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.
2. ⚠ **WARNING!** No protection against electric shock if an incorrect type of residual current device is used. Severe or fatal injuries.
   If a residual current device (residual current device RCD or residual current monitor RCM) is provided, use an all-current-sensitive RCD or RCM of type B.

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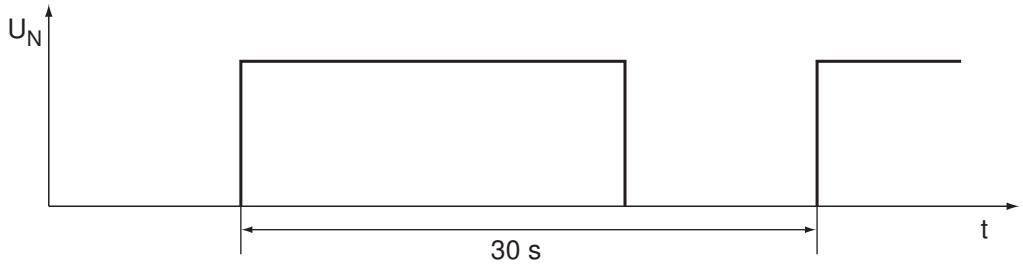
3. If a residual current device is required, select the residual current device according to the requirements for protecting persons, fire protection or system protection. Observe the tripping characteristic, the deceleration and the rated tripping current of the residual current device during selection.
4. During project planning, note that leakage currents which are as low as possible occur in the system for operational reasons.
5. If the operational leakage currents are too high, you can distribute the current supply among several RCDs.

5.2.5 Using the line contactor

Use only input contactors of the AC-3 utilization category (EN 60947-4-1).

Wait for at least 30 seconds between two switching cycles.



5.2.6 Line fuses

Fuse types:

- Line protection types in operation classes gL, gG:
  - Nominal fusing voltage ≥ nominal line voltage
  - The nominal fusing current must be designed for at least 100% of the inverter nominal input current depending on the inverter utilization.
- Power circuit breaker with characteristics B, C:
  - Nominal circuit breaker voltage ≥ nominal line voltage
  - The nominal currents of the power circuit breakers must be 10% higher than the nominal inverter current.

5.2.7 Motor cable

Cable length

For the maximum length of the motor cable, refer to the respective device listed in chapter "Technical data".

Cable cross section

Select the cable cross section of the motor cable in a way that a maximum of 5% voltage drop occurs at nominal motor current. Read the information in the relevant motor catalogs. An excessively high voltage drop means that the full motor torque is not achieved.

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5.2.8 Multi-motor drive/group drive

- The sum of the motor currents must not exceed the nominal inverter current. The maximum permitted cable length for the group is limited to the values of the single connection. See chapter "Technical data".
- The motor group is limited to 5 motors and must not differ by more than 3 sizes.
- Multi-motor operation is only possible with AC asynchronous motors, not with synchronous motors.
- SEW-EURODRIVE recommends using a "HD LT xxx" output choke, additionally unshielded cables, and a maximum permitted output frequency of 4 kHz for groups of more than 3 motors.

Maximum motor cable length

The permitted total length of all motor cables connected in parallel (I_{tot}) must not exceed the maximum permitted motor cable length of the individual inverter (I_{max}).

$$I_{tot} \leq \frac{I_{max}}{n}$$

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I_{tot} = Maximum permitted total length of the motor cables connected in parallel:
I_{tot} = I1 + I2 + ... +In (I1, I2, ... In = cable from inverter to motor 1, 2, ...)

I_{max} = Maximum motor cable length (see chapter "Technical data")

n = Number of motors connected in parallel.

Fusing

No additional fusing is required if the cross section of the motor cable corresponds to that of the supply system cable. If the cross section of the motor cable is smaller than the cross section of the supply system cable, you must secure the motor cable against short circuit for the corresponding cross section. Motor circuit breakers are suitable for this purpose.

Comply with the regulations issued by specific countries and for specific machines regarding fusing and the selection of supply system and motor cables.

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5.2.9 UL-compliant installation

INFORMATION

Due to UL requirements, the following chapter is always printed in English and in some cases in French, regardless of the language of this documentation.

Field wiring power terminals

- Use 75 °C copper wire only.
- Tighten terminals to Nm as described in chapter "Tightening torques" (→ 🗎 20).

Ambient temperature

The units in IP20 are suitable for an ambient temperature of 40 °C, max. 50 °C[1)].

The units in IP66 are suitable for an ambient temperature of 40 °C, max 45 °C.

1) 200 – 240 V, 2.2 kW, max. 45 °C

Thermal motor protection

Thermal motor overload protection shall be provided by one of the following means:

- NEC compliant installation of a motor temperature sensor, see also section "Motor temperature protection (TF/TH)" in chapter "Electrical Installation" of the operating instructions.
- Using internal thermal motor overload protection according to NEC (National Electrical Code, US). Thermal motor overload protection can be activated via parameter *P-41*.
- Implementing external measures to ensure thermal motor overload protection according to NEC (National Electrical Code).
- The motor overload protection (current limit P-54) must be limit to maximum 150 %.

Parameter

The following parameter must be set to enable the internal thermal motor protection according to NEC:

- *P-41* Thermal motor protection according to NEC
  - 0: disabled
  - 1: enabled

Functional principle

The motor current is accumulated in an internal memory over the course of time. The inverter goes to fault state as soon as the thermal limit is exceeded (I.t-trP).

Once the output current of the inverter is less than the set rated motor current, the internal memory is decremented depending on the output current.

- When *P-41* is disabled, thermal memory retention is reset upon shutdown or power loss.
- When *P-41* is enabled, thermal memory retention is maintained upon shutdown or power loss.

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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 (US) or Canadian Electrical Code, Part 1 (CA).

WARNING - The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

ATTENTION - LE DÉCLENCHEMENT DU DISPOSITIF DE PROTECTION DU CIRCUIT DE DÉRIVATION PEUT ÊTRE DÛ À UNE COUPURE QUI RÉSULTE D'UN COURANT DE DÉFAUT. POUR LIMITER LE RISQUE D'INCENDIE OU DE CHOC ÉLECTRIQUE, EXAMINER LES PIÈCES PORTEUSES DE COURANT ET LES AUTRES ÉLÉMENTS DU CONTRÔLEUR ET LES REMPLACER S'ILS SONT ENDOMMAGÉS. EN CAS DE GRILLAGE DE L'ÉLÉMENT TRAVERSÉ PAR LE COURANT DANS UN RELAIS DE SURCHARGE, LE RELAIS TOUT ENTIER DOIT ÊTRE REMPLACÉ.

Suitable for use on a circuit capable of delivering not more than 100,000 rms symetric amperes, @B volts maximum and when protected with class J fuse with the following ratings:

1 × 110 – 115 V devices			
Devices	**Non semiconductor fuses (currents are maximum values**	**Max. supply short circuit current**	**Max. line voltage**
0004	10 A	100 kA rms (AC)	115 V
0008	20 A		
0011	30 A		

1 × 200 – 240 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0004	6 A	100 kA rms (AC)	240 V
0008	10 A		
0015	17.5 A		
0022	25 A		
0040	40 A		

3 × 200 – 240 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0015	15 A	100 kA rms (AC)	240 V
0022	17.5 A		
0040	30 A		
0055	35 A		
0075	45 A		
0110	70 A		
0150	70 A		
0185	80 A		

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3 × 380 – 480 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0008	6 A	100 kA rms (AC)	480 V
0015	10 A		
0022	10 A		
0040	15 A		
0055	25 A		
0075	30 A		
0110	35 A		
0150	45 A		
0185	60 A		
0220	70 A		
0300	70 A		
0370	90 A		

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5.3 Terminal assignment

5.3.1 Opening the front cover

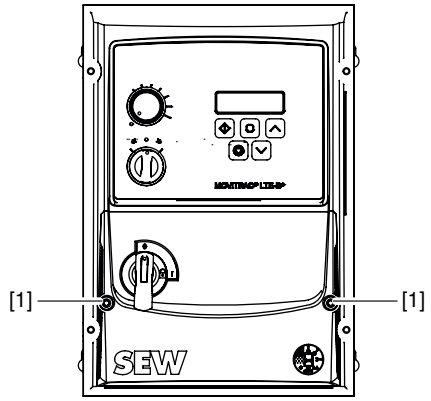
If you loosen the marked screws on the front of the product, you will gain access to the terminals. Proceed in reverse order to attach the front cover again.

INFORMATION

The front cover must be closed during operation for thermal reasons.

Inverters with degree of protection IP66/NEMA 4X (all sizes)

Remove the screws on the front of the inverter to open the front cover.



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[1] Screws of the front cover

5.3.2 Help card

The help card contains an overview of the terminal assignment and additionally an overview of the basic parameters of parameter group 1.

In the IP66 housing, the help card is attached behind the removable front cover. In the IP20 housing, the help card is located in a slot above the display.

5.3.3 Connection of thermal motor protection TF, TH

Motors with an internal temperature sensor (TF, TH, or equivalent) can be connected directly to the inverter.

If the thermal protection is triggered, the inverter displays the fault "F-PTC".

The following options can be selected for motor protection monitoring:

PTC-th for TF thermal sensor or TH bimetallic switch with trigger threshold 2.5 kΩ

Use a shielded cable for the motor sensor lead.

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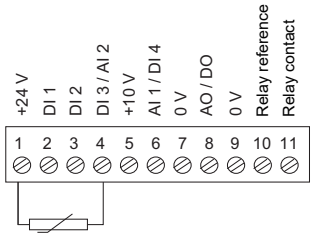
Connection example for the temperature sensors:

TF thermal sensor TH bimetallic switch
 *45925782795*
P-15 = 3, 6, 7 (see chapter "P-15 Digital input function selection")
P-47 = PTC-th (see chapter "P-47 Analog input 2 format")

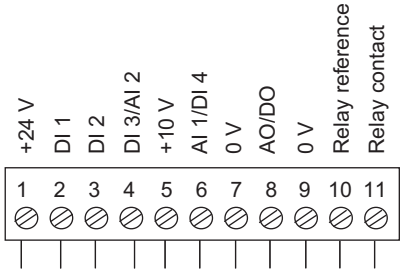
5.3.4 Signal terminal overview

NOTICE

Application of impermissible voltages.

Possible damage to property.

- Do not connect any voltages to the output terminal.
- The voltage applied to the signal terminals must not exceed 30 V.



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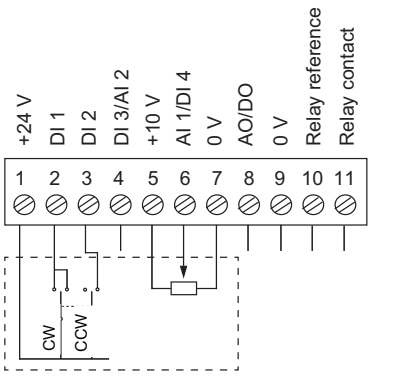
IP20 and IP66



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IP66 with switch option

INFORMATION

In the IP66 device variant with switches and potentiometers, the assignment to the corresponding terminal functions is connected internally. In the case of the external use of terminals 2, 3, and 6, the internally fitted switches and potentiometers can be deactivated. For the relevant procedure, refer to chapter "Configuration parameters".

Signal connections of the signal terminal block

INFORMATION

If the inputs of the inverter are supplied by an external 24 V voltage supply or PLC, the GND reference potential must be connected to the terminals 7 and 9. The control electronics of the inverter work in isolated fashion.

- Do not connect any inductive loads to the relay contact.

Terminal no.	Signal	Connection	Description[1)]
1	+24 V	Output +24 V: Reference voltage	Reference voltage for control of the digital inputs (100 mA max.)
2	DI 1	Digital input 1	Compatible with PLC request if 0 V is connected to terminal 7 or 9.
3	DI 2	Digital input 2	
4	DI 3/AI 2	Digital input 3 Analog input 2 (12 bits)	Digital: 0/24 V Analog: 0 – 10 V, 0 – 20 mA, 4 – 20 mA, 20 – 4 mA, PTC-th
5	+10 V	Output +10 V: Reference voltage	10 V reference voltage for analog input (potential supply +, max. 10 mA, 1 – 10 kΩ)
6	AI 1/DI 4	Analog input 1 (12 bits) Digital input 4	Analog: 0 – 10 V, 0 – 20 mA, 4 – 20 mA, 20 – 4 mA Digital: 0/24 V
7	0 V	0 V: Reference potential	
8	AO/DO	Analog output (10 bits) Digital output	Analog: 0 – 10 V, max. 20 mA Digital: 0/24 V, max. 20 mA
9	0 V	0 V: Reference potential	
10	Relay reference	Relay switching voltage input	NO contact (AC 250 V / DC 30 V, max. 5 A) Brake control must be carried out via a contactor or brake rectifier.
11	Relay contact	Relay contact	

1) Function assignment takes place via P-15.

The following switching thresholds apply to all digital inputs and multi-functional inputs with binary control:

- Logical "1" input voltage range 8 to 30 V
- Logical "0" input voltage range 0 to 2 V
- Response time of the digital inputs: < 8 ms
- Resolution and response time of the analog inputs: 12 bit, < 16 ms
- Resolution of the update time of the analog outputs: 10 bit, 64 ms

	Input impedance
Digital inputs	100 kΩ
Analog inputs in voltage mode	100 kΩ
Analog inputs in current mode	500 Ω

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5.3.5 RJ45 communication socket

NOTICE

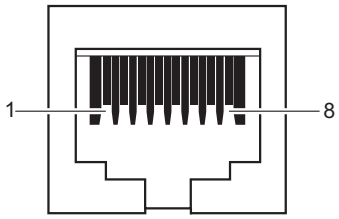
Voltage at socket contact not suitable for PCs.

Damage to PC when connected directly to RJ45 communication socket.

- Use the engineering adapters as described in chapter "Startup with LT Shell engineering software" (→ 🗎 42).

- Inverters with degree of protection IP20 have one RJ45 socket contact for engineering and communication.
- Inverters with degree of protection IP66 have two RJ45 socket contacts for engineering and communication.

Socket contact on the device



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[1] SBus-/CAN bus-
[2] SBus+/CAN bus+
[3] 0 V
[4] RS485- (engineering)
[5] RS485+ (engineering)
[6] +24 V (output voltage)
[7] RS485- (Modbus RTU)
[8] RS485+ (Modbus RTU)

5.4 Wiring diagram

⚠ WARNING

Danger of electric shock. Incorrect wiring can lead to dangerously high voltages.

Severe or fatal injuries.

- Adhere to the following points.

In the following applications, always deactivate the brake on the AC- and DC-side:

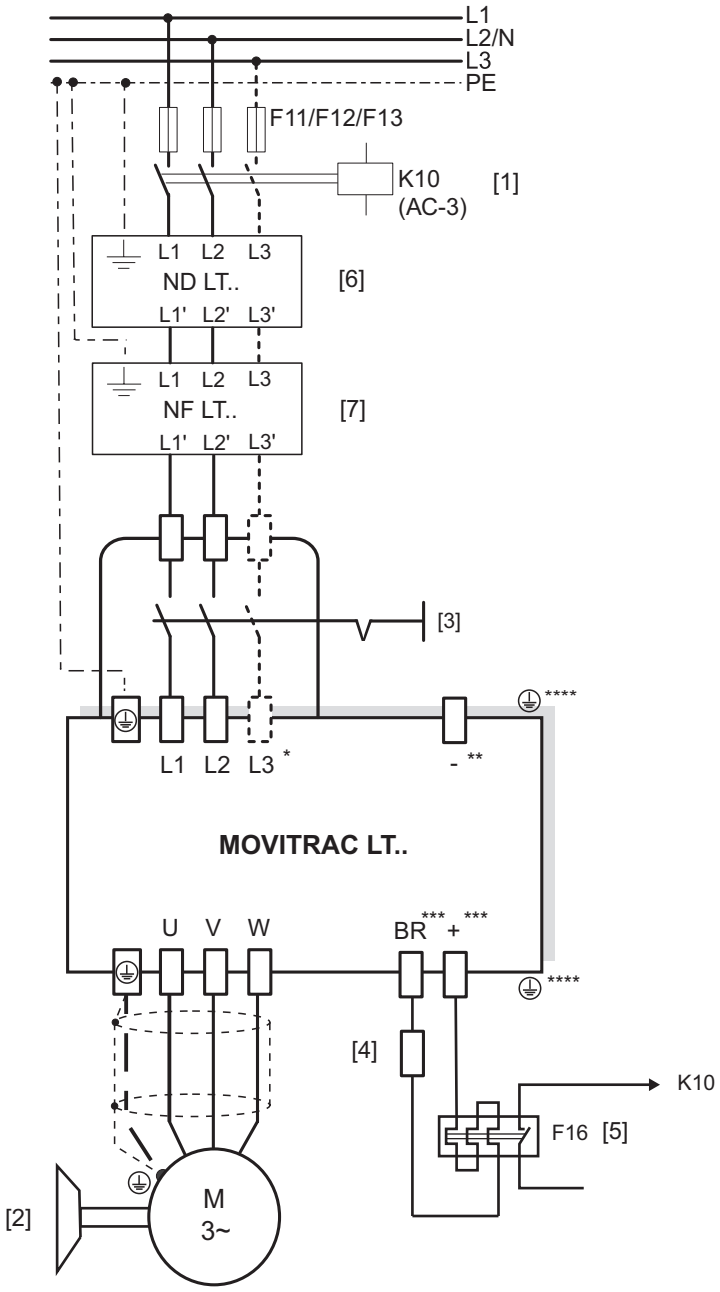
- Applications that require a quick brake reaction time.

Observe the following information:

- Connect the brake rectifier via a separate supply system cable.
- Supply via the motor voltage is not permitted!

INFORMATION

In the case of a new device, the terminal slots + (DC+) and BR have covers installed that must be broken out, if required.



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[1] Line contactor between supply system and inverter.
[2] Brake
[3] Main switch (only for device design IP66/NEMA 4X housing with switch (MC LTE-B..-40))
[4] Connection of BW../BW..T braking resistor
[5] Bimetallic relay for protection of the braking resistor
[6] Line choke (optional)
[7] Line filter (optional)
* not with 1-phase 230 V
** no $-U_z$ connection for IP20 size 1 – 3 and IP66 size 1
*** no BR and $+U_z$ connection for size 1
**** only with IP66

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5.4.1 Connecting AC brakemotors

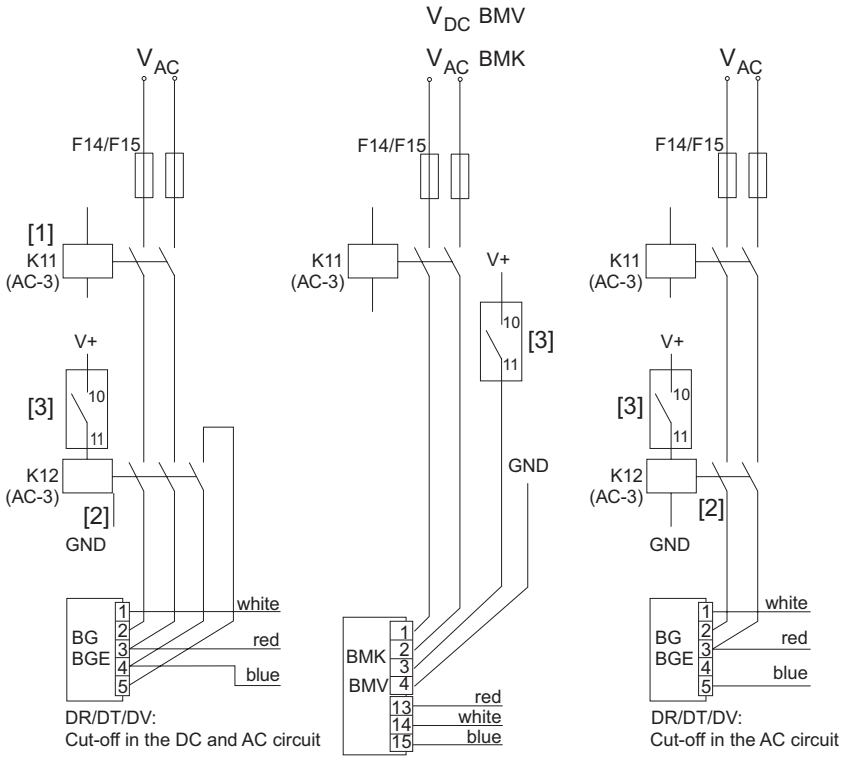
For detailed information about the SEW-EURODRIVE brake system, refer to the "AC Motors" catalog, which you can order from SEW-EURODRIVE.

SEW-EURODRIVE brake systems are disk brakes with a DC coil that release electrically and brake using spring force. A brake rectifier supplies the brake with DC voltage.

INFORMATION

The brake rectifier must have a separate supply system cable for inverter operation. Supply via the motor voltage is not permitted.

5.4.2 Brake control connection



[1] Power supply of the brake rectifier, switched simultaneously via K10.
[2] Control contactor/control relay, is powered by the internal relay contact [3] of the inverter and supplies the brake rectifier.
[3] Isolated relay contact of the inverter.
V+ External voltage supply AC 250 V / DC 30 V at max. 5 A.
V_{DC} (BMV) DC voltage supply BMV.
V_{AC} (BMK) AC voltage supply BMK.

5.4.3 Connection of the DC link connection

The DC link is only led out to terminals on the following devices:

- IP20/NEMA-1 housing: Size 4 and 5
- IP66/NEMA-4X housing: Sizes 2 – 4

It is therefore possible to couple these devices via a DC link connection. It is also possible to supply all devices with DC voltage. Contact SEW-EURODRIVE in both cases.

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5.4.4 Braking resistor connection

⚠ WARNING

Danger of electric shock. The supply cables to the braking resistors carry a high DC voltage (approx. DC 900 V) during nominal operation.

Severe or fatal injuries.

- Before removing the supply cable, disconnect the inverter from the power supply and wait at least 10 minutes.

⚠ CAUTION

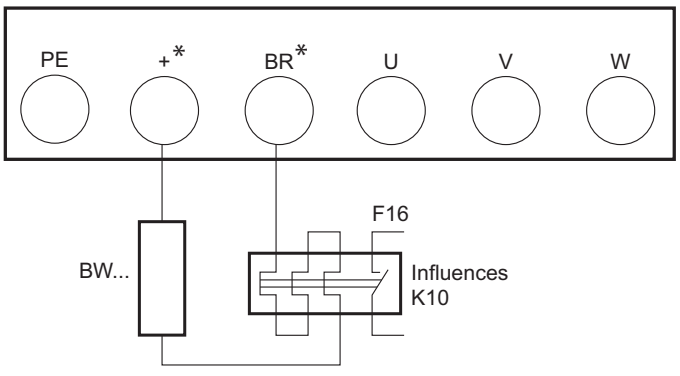
Risk of burns. The surfaces of the braking resistors reach high temperatures under a load of P_N.

Minor injuries.

- Choose a suitable installation location.
- Do not touch the braking resistors.
- Install a suitable touch guard.

The braking resistor is connected between the inverter terminals "BR" and "+". In case of a new device, these terminals have covers installed that can be broken out. Brake out the covers for first use.

- Cut the cables to the appropriate length.
- Use 2 tightly twisted leads or a 2-core shielded power cable. Dimension the cable cross section according to the tripping current I_F of F16 and the nominal voltage in accordance with DIN VDE 0298.
- Protect the braking resistor with a bimetallic relay and set the tripping current I_F of the respective braking resistor.
- The flatpack resistors have internal thermal overload protection (fuse cannot be replaced). Install the flatpack resistors using appropriate touch guards.
- For braking resistors of the BW...-...-T series, you can connect the integrated temperature sensor using a 2-core, shielded cable as an alternative to a bimetallic relay.



* No + and BR connection in size 1

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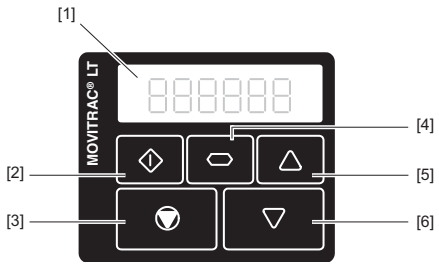
6 Startup

6.1 Keypads

The inverters are equipped with a standard keypad.

6.1.1 Standard keypad



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[1] 6-digit 7-segment display
[2] Start key
[3] Stop/Reset key
[4] Navigate key
[5] Up key
[6] Down key

6.1.2 Operation

Both keypads have 5 keys with the following functions:

Start	key [2]	• Enable drive • Change direction of rotation
Stop	key [3]	• Stop drive • Acknowledge fault
Navigate	key [4]	• Switch the menu • Save parameter values • Display real-time information
Up	key [5]	• Increase speed • Increase parameter values
Down	key [6]	• Decrease speed • Decrease parameter values

The parameter edit menu can only be accessed via the <Navigate> key [4].

- To switch between the parameter edit menu and real-time display (operating speed/operating current): Press and hold the key for more than 1 second.
- To switch between the operating speed and operating current of the running inverter: Press the key briefly (less than 1 second).

The operating speed is only displayed if a nominal motor speed has been entered in *P-10*. Otherwise, the electrical rotating field speed is displayed.

6.2 Resetting parameters to default settings

To reset the parameters to the factory setting, proceed as follows:

1. The inverter must not be enabled and the display must show "Stop".

2. Press the 3 keys  , and simultaneously for at least 2 s.
   "P-deF" appears on the display.
3. Press the  key to acknowledge the "P-deF" message.

6.3 PC connection

6.3.1 Startup using LT Shell engineering software

The LT Shell software enables quick and easy startup of the inverters. You can download it from the SEW-EURODRIVE website. After installation of the software, perform software updates at regular intervals.

The inverter can be connected to the software together with the engineering package (cable set C) and the USB11A or USM21A interface adapter.

A maximum of 63 inverters can be connected to LT Shell in a network.

The software can be used to carry out the following tasks:

- Monitor, upload and download parameters
- Parameter printout
- Firmware update (manual and automatic)
- Export inverter parameters to Microsoft Word
- Monitor the state of inputs/outputs and of the motor
- Control inverter/manual mode
- Scope

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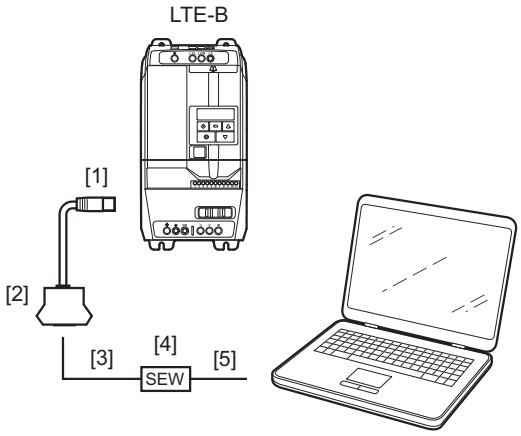
Connection to LT Shell engineering software

The connection can be performed via an RS485 interface (USB11A or USM21A + PC engineering package) or via Bluetooth (parameter module).

Connection to LT Shell via RS485



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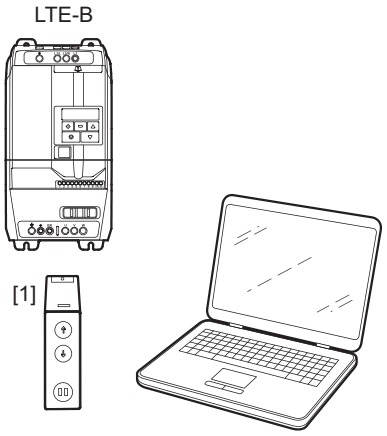
[1]	RJ45 to RJ45 cable	[4]	USB11A or USM21A
[2]	RJ adapter (2 × RJ45, 1 × RJ10)	[5]	USB A – B cable
[3]	RJ10 to RJ10 cable		

Connection to LT Shell via Bluetooth parameter module



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[1] Parameter module

6.3.2 Startup with MOVITOOLS® MotionStudio engineering software

The software can be connected to the inverter as follows:

- Via a system bus connection between PC and inverter. The PC can be connected to the inverter via USM21A, for example.
- Via a connection of the PC with a gateway or a MOVI-PLC®. The PC gateway/ MOVI-PLC® connection can be made via USB11A, USM21A, USB or Ethernet, for example.

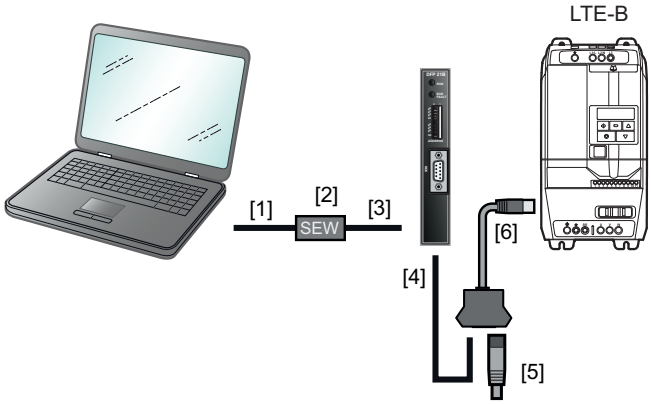
The following functions are available in MOVITOOLS® MotionStudio:

- Monitor, upload and download parameters
- Parameter printout
- Monitor the state of inputs/outputs and of the motor.

Connection to the MOVITOOLS® MotionStudio engineering software

The connection can be established indirectly via a gateway from SEW-EURODRIVE or a controller from SEW-EURODRIVE.

Connection to MOVITOOLS® MotionStudio via gateway



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[1]	USB A-B cable	[4]	RJ45 cable with open end
[2]	USB11A or USM21A	[5]	Terminating connector (120 Ω)
[3]	RJ10 to RJ10 cable	[6]	Cable splitter

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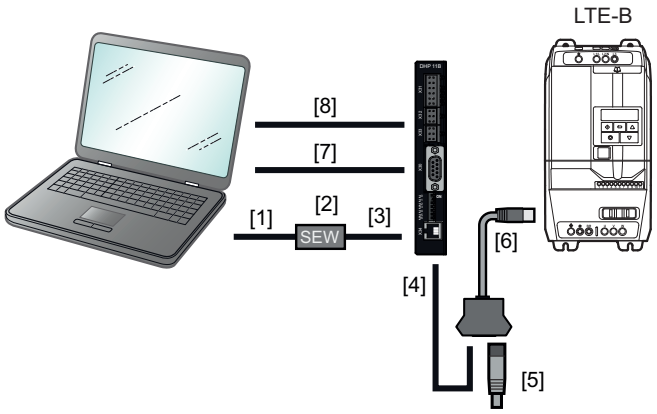
Connection to MOVITOOLS® MotionStudio via controller



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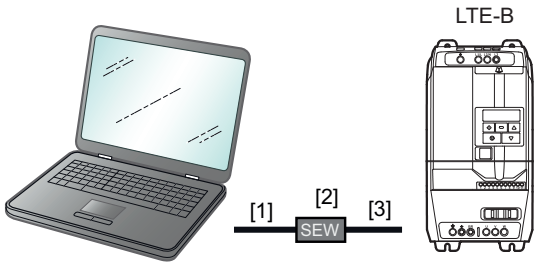
[1]	USB A-B cable	[5]	Terminating connector (120 Ω)
[2]	USB11A or USM21A	[6]	Cable splitter
[3]	RJ10 to RJ10 cable	[7]	USB A-B cable
[4]	RJ45 cable with open end	[8]	RJ45 Ethernet cable

Connection to MOVITOOLS® MotionStudio via SBus with USM21A



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[1] USB A-B cable
[2] USM21A
[3] RJ10 to RJ45 cable

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6.4 "Auto tune" automatic measuring procedure

You can also start the "Auto tune" automatic measuring procedure manually with the parameter *P-52* after entering the motor data. This procedure can take up to 2 minutes, depending on the control mode.

Do not interrupt the measuring procedure.

Do not start the measuring procedure until all the motor data was entered correctly.

The inverter must not be enabled for the measuring procedure. "Stop" has to be displayed.

6.5 Startup with motors

⚠ WARNING

If parameter *P-52* is set to "1" (auto tune), the motor may start up automatically.

Severe or fatal injuries.

- Make sure that no persons are within the reach of moving parts of the system.

INFORMATION

The ramp times in parameters *P-03* and *P-04* refer to 50 Hz.

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6.5.1 Startup with asynchronous motors with V/f control

1. Connect the motor to the inverter. During the connection, adhere to the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
   - *P-07* = Nominal voltage of the motor
   - *P-08* = Rated current of the motor
   - *P-09* = Rated frequency of the motor
   - *P-10* = Rated speed of the motor
     - Value = 0: Slip compensation deactivated
     - Value ≠ 0: Slip compensation activated
   - *P-14* = 101 (extended parameter access)
   - *P-51* = 1 (V/f open-loop speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.

6.5.2 Startup with asynchronous motors with LVFC speed control

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
   - *P-07* = Nominal voltage of the motor
   - *P-08* = Rated current of the motor
   - *P-09* = Rated frequency of the motor
   - *P-10* = Rated speed of the motor
   - *P-14* = 101 (extended parameter access)
   - *P-51* = 0 (LVFC speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto-tune automatic measuring procedure" (→ 🗎 46).
6. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

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6.5.3 Startup with LSPM motors from SEW-EURODRIVE

DR..J type motors are motors with LSPM technology (Line Start Permanent Magnet motors).

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
   - *P-07* = Internal voltage/no-load voltage [V/min^{-1}] at nominal motor speed
   - *P-08* = Rated current of the motor
   - *P-09* = Rated frequency of the motor
   - *P-10* = Rated speed of the motor
   - *P-14* = 101 (extended parameter access)
   - *P-51* = 5 (LSPM speed control).
3. Set the maximum speed *P-01* and minimum speed *P-02* to 300 min^{-1}.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto-tune automatic measuring procedure" (→ 🗎 46).
6. Adjust the boost with *P-11*.
7. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

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6.5.4 Startup of synchronous motors without encoder feedback (PMVC speed control)

INFORMATION

Check the operation of encoder-free synchronous motors through a test application. Stable operation in this operating mode cannot be ensured for all application cases.

1. Connect the motor to the inverter. Pay attention to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
   - *P-07* = Internal voltage/no-load voltage [V/min^{-1}] at nominal motor speed
   - *P-08* = Rated motor current
   - *P-09* = Rated motor frequency
   - *P-10* = Rated speed of the motor
   - *P-14* = 101 (extended parameter access)
   - *P-17* = PWM frequency (at least 8 – 16 kHz)
   - *P-51* = 2 (PMVC speed control)
3. Set the maximum speed to the maximum rated motor speed using *P-01* and the minimum speed to a minimum of 10% of the rated motor speed using *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto tune" (→ 🗎 46).
6. Check the magnetizing current (P00-31) value 1 at half nominal speed without load.
   - If the value is greater than +0.3 A, the nominal motor voltage P-07 must be reduced.
   - If the value is less than -0.3 A, the nominal motor voltage P-07 must be increased.
7. Adjust the boost with *P-11*.
8. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

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6.5.5 Startup with brushless DC motors (BLDC speed control)

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
   - *P-07* = Internal voltage/no-load voltage [V/min-1] at nominal motor speed
   - *P-08* = Rated current of the motor
   - *P-09* = Rated frequency of the motor
   - *P-10* = Rated speed of the motor
   - *P-14* = 101 (extended parameter access)
   - *P-51* = 3 (BLDC speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto tune" (→ 🗎 46).
6. Adjust the boost with *P-11*.
7. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

6.5.6 Startup with synchronous reluctance motors (SYN-R speed control)

1. Connect the motor to the inverter. During the connection, adhere to the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
   - *P-07* = Rated voltage of the motor
   - *P-08* = Rated current of the motor
   - *P-09* = Rated frequency of the motor
   - *P-10* = Rated speed of the motor
   - *P-14* = 101 (extended parameter access)
   - *P-51* = 4 (SYN-R speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto tune" automatic motor measurement procedure as described in chapter "Auto tune" (→ 🗎 46).
6. Adjust the boost with *P-11*.
7. If the control performance is not adequate, you can optimize the control behavior using the parameters *P-53 Level 1 + 2* (P-share, I-share).

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6.6 Startup of the control signal source

⚠ WARNING

Installing sensors or switches at the terminals may cause an enable signal. The motor may start up automatically.

Severe or fatal injuries.

- Make sure that no persons are within the reach of moving parts of the system.
- Install the switches in open state.
- If you install a potentiometer, set it to 0 first.

6.6.1 Terminal mode (factory setting) *P-12* = 0

For operation in terminal mode (factory setting):

- *P-12* must be set to "0" (factory setting).
- Change the input terminal configuration according to your requirements in *P-15*. For the possible settings, refer to chapter "P-15 Digital input function selection".
- Connect a switch between terminals 1 and 2 on the user terminal block.
- Connect a potentiometer (1 k – 10 k) between terminals 5, 6 and 7. The center tap is connected to terminal 6.
- Enable the inverter by establishing a connection between terminals 1 and 2.
- Set the speed using the potentiometer.

6.6.2 Keypad mode (*P-12* = 1 or 2)

For operation in keypad mode:

- Set *P-12* to "1" (unidirectional) or "2" (bidirectional).
- Connect a wire jumper or switch between terminals 1 and 2 on the terminal block to enable the inverter.
- Now press the <Start> key. The inverter is enabled with 0.0 Hz.
- To increase the speed, press the <Up> key. To decrease the speed, press the <Down> key.
- Press the <Stop/Reset> key to stop the inverter.
- After the <Start> key is pressed, the inverter starts according to the setting in *P-31*. If bidirectional mode is enabled (*P-12* = 2), the direction of rotation is reversed by pressing the <Start> key again.

INFORMATION

You can preset the desired setpoint speed by pressing the <Stop/Reset> key in an idle state. Pressing the <Start> key then moves the drive along the preset ramp until it has reached the required speed.

6.6.3 PI controller mode (P-12 = 9 or 10)

The implemented PI controller can be used for temperature, pressure control or other applications.

General information on use

Connect the sensor for the controlled variable to analog input 1 depending on *P-45 Level 2*. You can scale the sensor value using parameter *P-40 Level 2* in such a way that the value is indicated correctly on the inverter display, e.g. 0 – 10 bar.

Set the setpoint frequency for the PI controller with *P-45 Level 1*.

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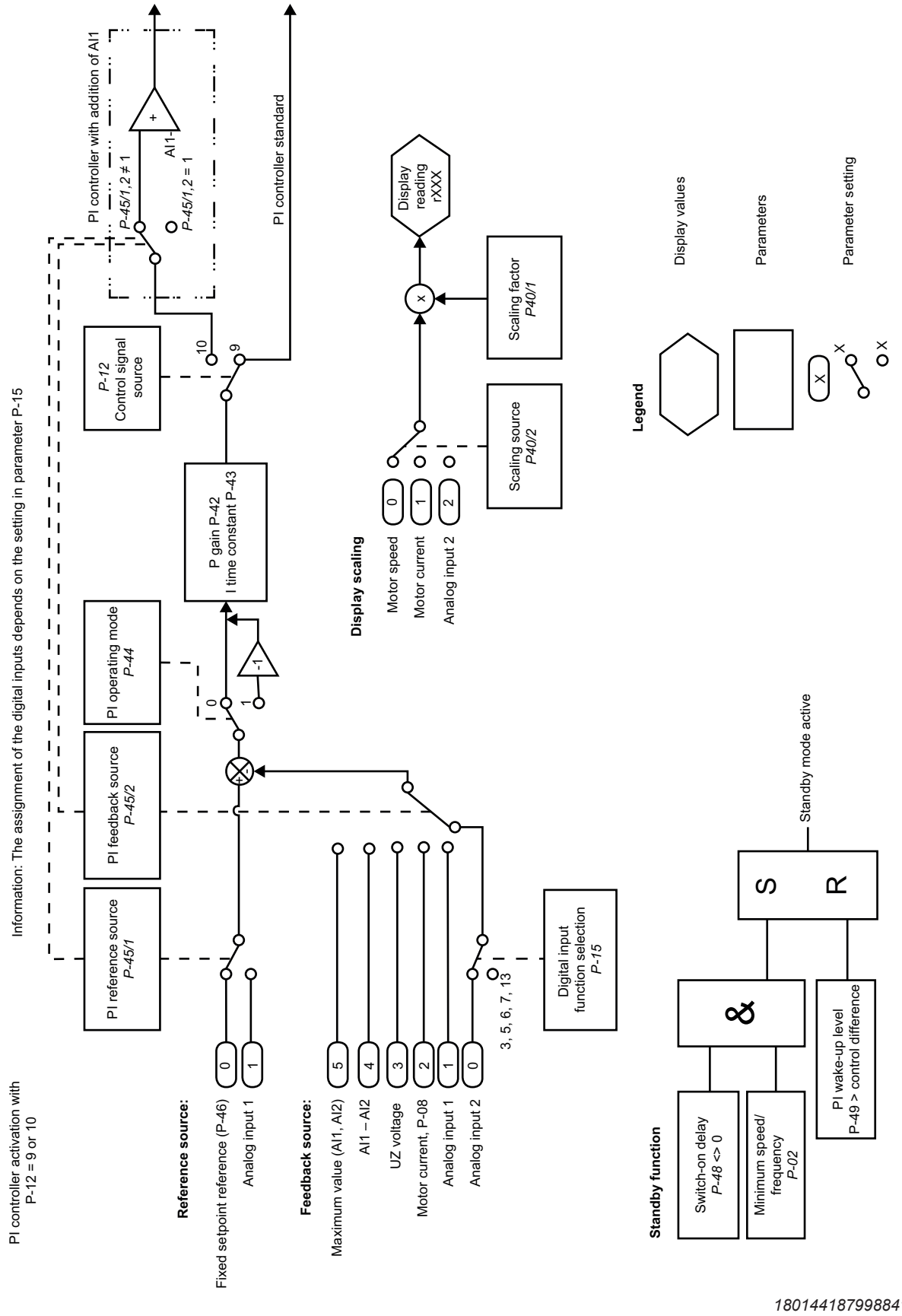
The following figure shows the configuration options for the PI controller:



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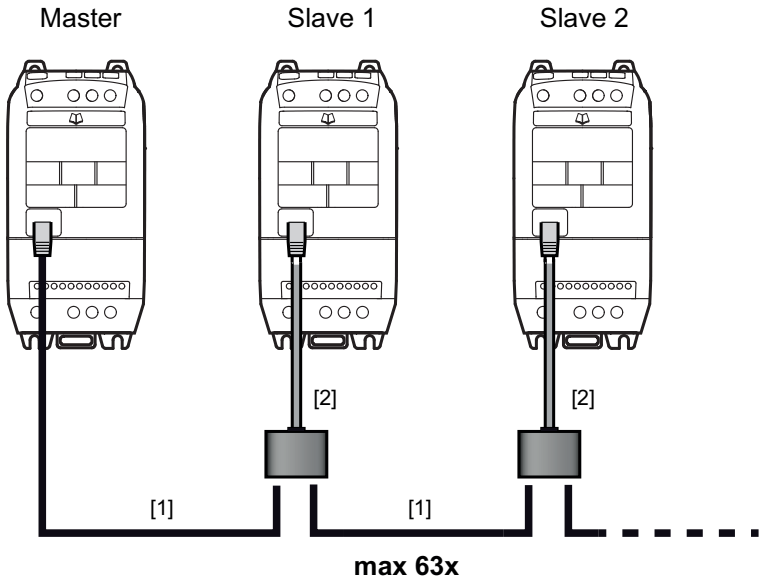
6.6.4 Master-slave mode (*P-12* = 11)



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[1] RJ45 to RJ45 cable
[2] Cable splitter

The inverter has an integrated master-slave function.

The master-slave communication is obtained via a special protocol. In this case, the inverter communicates via the RS485 engineering interface. Up to 63 inverters can be connected to each other in a communication network via RJ45 connectors.

One inverter is configured as the master, the remaining inverters as slaves. There may only be one master inverter per network. This master inverter sends its operating state (e.g. activated, deactivated) and its setpoint frequency every 30 ms. The slave inverters then follow the state of the master inverter.

Configuration of the inverters for speed synchronism

Parameter description	Master settings	Slave settings
P-03 (acceleration ramp)	User-defined	≤ master ramps
P-04 (deceleration ramp)		
P-12 (control signal source)	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	11
P-14 (extended parameter menu)	101	101
P-31 Level 1 (inverter address)	1	2 – 63
P-35 (slave scaling)	–	User-defined

INFORMATION

To set up the master-slave network, use cable set B. You do not need a terminating resistor. For information on the cable sets, refer to the catalog.

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6.6.5 Fieldbus mode (P-12 = 3, 4, 5, 6, 7 or 8)

See chapter "Fieldbus operation".

6.7 Startup of the brake control

The brake control is installed via the relay.

For horizontal applications, set the function of the relay (*P-18*) to 0.

6.8 Fire mode/emergency mode

Set the fire mode/emergency mode as described below:

- Perform a motor startup.
- Set parameter *P-14* to "101" to access further parameters.
- Set parameter *P-15* to "13" to be able to use the fire mode/emergency mode via digital inputs.
- Connect the signal for activating the fire mode/emergency mode to DI 3.
- Set parameter *P-60* to the speed that is used in fire mode/emergency mode. You can specify a positive or a negative speed setpoint.

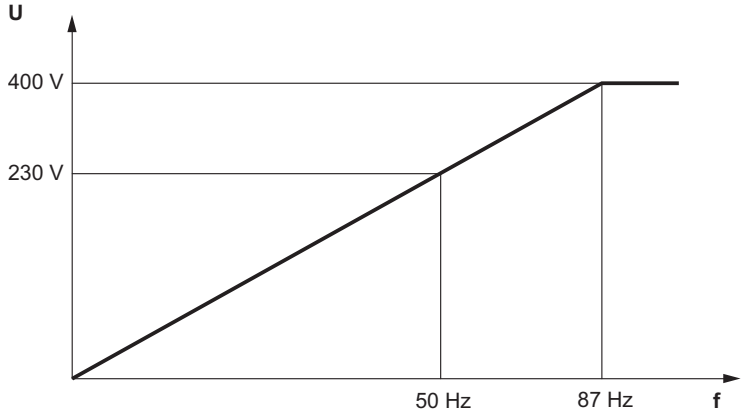
You can read out *P00-47* to analyze the fire mode/emergency mode.

INFORMATION

When the "fire mode/emergency mode" is activated, the inverter drives the motor with the preset values. In this mode, the inverter ignores all errors, shutdowns, and set-points and operates the motor until it is destroyed or until the loss of voltage supply. It is also not possible in this mode to perform a reset to the factory setting. Removing the "hardware enable" stops the operation.

6.9 Operation at 87 Hz characteristic (50 Hz motors)

The V/f ratio remains the same at 87 Hz operation. However, higher power and speeds are generated which causes a higher current flow.



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Set the "87 Hz characteristic" operation as follows:

- Set the parameter *P-07* to star voltage (data on the motor nameplate).
- Set the parameter *P-08* to delta current (data on the motor nameplate).
- Set the parameter *P-09* to "87 Hz".
- Set the parameter *P-10* to "(Synchronous speed at nominal frequency) × (87 Hz/ 50 Hz) - (slip speed at nominal frequency)".

Example for calculating P-10:

DRN80M4: 0.75 kW, 50 Hz

Nominal speed 1440 min^{-1}

P-10 = 1500 min^{-1} × (87 Hz/50 Hz) - (1500 min^{-1} - 1440 min^{-1}) = 2550 min^{-1}

INFORMATION

Set *P-01 maximum speed* according to your requirements. In 87 Hz operation, the inverter has to provide a current that is √3-times higher. For this purpose, select an inverter with a √3-times higher power rating.

6.10 Fans and pumps

6.10.1 Startup of pumps and fans

1. Start up and parameterize the connected motor type using the control mode intended for it, see chapter "Startup with motors". For asynchronous motors, use V/f control.
   ⇨ The slip compensation must remain deactivated (P-10 = 0).
2. Set the ramps P-03 and P-04 to the most sensible values possible.
   ⇨ The difference between acceleration and deceleration must be as small as possible.
3. In the case of freely rotating fans or pumps, always activate the flying start function P-33 = 1 or 2 if they are operated with asynchronous motors.
4. If the process does not require an overload, limit P-54 to 110%. An individual adjustment to max. 150% may be necessary.

6.10.2 Other functions for applications with pumps or fans

The following functions are additionally available for applications with pumps or fans:

- Voltage increase/boost *(P-11*)
- Adjustment of the V/f characteristic curve (*P-28*, *P-29*)
- Energy-saving function (*P-06*)
- Flying start function (*P-33*)
- DC current holding function (*P-32*)
- Standby mode (*P-48*)
- PI controller
- Fire mode/emergency mode, see chapter "Fire mode/emergency mode" (→ 🗎 55)
- Deactivating slip compensation via rated motor speed (*P-10*)
- Skip function (*P-26/P-27*)

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6.11 Motor potentiometer

The motor potentiometer function lets the inverter respond to key commands.

This function is available only in the keypad mode *P-12* = 1 or 2.

If the digital inputs are activated that increase or decrease the speed, the speed changes along the preset ramp *P-03* and *P-04*.

To be able to use the motor potentiometer function, select a function in parameter P-15 that uses the digital inputs for increasing or reducing the speed. See chapter "P-15 Digital input function selection".

When using this function, the arrow-up and arrow-down keys can also be used directly on the inverter.

6.12 3-wire control

The function is activated via the digital input function selection *P-15* = 11.

The 3-wire control principle determines the control.

The enabling and direction of rotation signals of the inverter then respond in an edge-controlled way.

- Connect the start key <CW> with NO contact to digital input DI1.
- Connect the start key <CCW> with NO contact to digital input DI3.
- Connect the stop key as NC contact to digital input DI2.

If you connect <CW> and <CCW> at the same time, the drive decelerates along the rapid stop ramp *P-24*.

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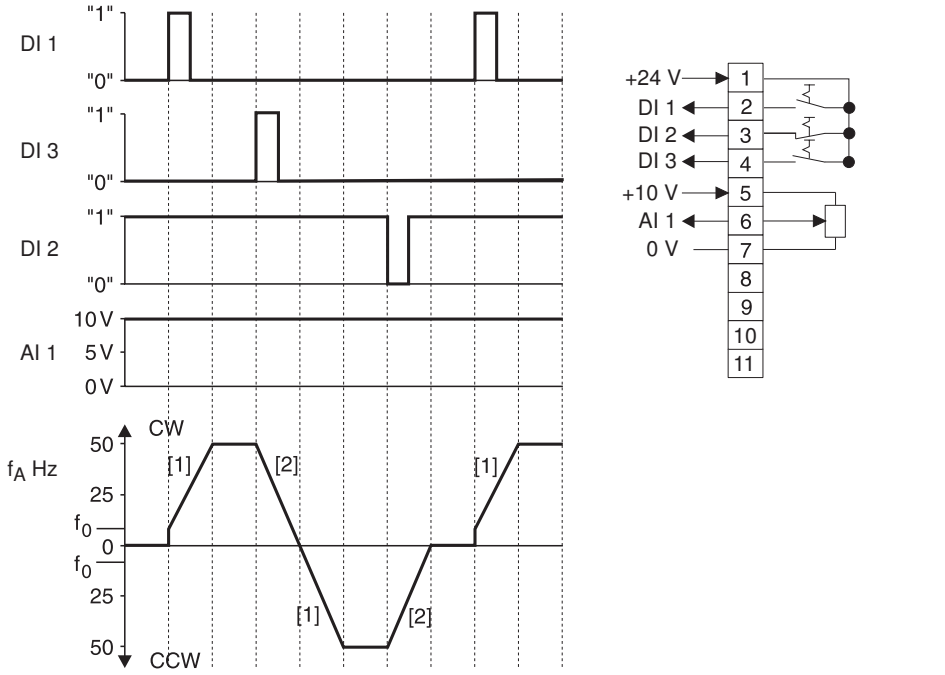
6.12.1 Control signal source 3-wire control



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DI 1	CW/stop	CW	CW rotation
DI 3	CCW/stop	CCW	CCW rotation
DI 2	Enable/stop	[1]	Ramp up (*P-03*)
AI 1	Setpoint input AI	[2]	Ramp down (*P-04*)
f_A	Output frequency		
f_0	Start/stop frequency		

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7 Operation

7.1 Status of the inverter

7.1.1 Static inverter status

The following table shows the status messages when the inverter is not enabled.

Message	Description
StoP	Power section of inverter disabled. This message is displayed when the motor is at standstill and no error is present. The inverter is ready for normal operation.
P-deF	Parameter factory settings have been loaded. This message appears when the user issues the command for loading the parameter factory settings. To put the inverter into operation again, press the <Reset> key.
Standby	Inverter is in standby mode. This message is displayed when the inverter ran previously at minimum speed (P-02) for the period of time defined in the parameter Standby mode (P-48) and the speed setpoint is lower than/equal to the minimum speed.

7.1.2 Operating state of the inverter

The following table shows the status messages for an enabled inverter.

You can toggle between displaying the output frequency, output current, output power, and speed by briefly pressing the <Navigate> key on the keypad.

Message	Description
H xxx	Output frequency of the frequency inverter (in Hz) This display appears when the frequency inverter is enabled.
A xxx	Output current of the frequency inverter (in amperes) This display appears when the frequency inverter is enabled.
P xxx	Output power of the motor (in kW) This display appears when the frequency inverter is enabled.
L xxx	The parameter is locked for changes. Make sure that: • the parameter lock in *P-38* is not activated. • the inverter is not enabled. • the inverter is supplied with line voltage.
xxxx	Output speed of the frequency inverter (in min-1) This display appears when the frequency inverter is enabled and a value > 0 has been entered in parameter *P-10*.
C xxx	The scaled speed (*P-40*).
Auto-t	An automatic measurement of the motor parameters is being performed. This process can take up to 2 minutes.
. . . . . . (flashing dots)	The output current of the frequency inverter exceeds the current value entered in *P-08*. The frequency inverter monitors the level and duration of the overload. The frequency inverter triggers fault message "I.t-trP" depending on the overload.
. . (alternately flashing dots)	Phase failure or supply voltage outside specification
. (flashing dot)	Fire mode/emergency mode activated
dELAy.t	Time-delayed reset; see also error description O-I " "

7.2 IT security

7.2.1 Hardening measures

Perform the following hardening measures:

- Regularly check if updates are available for your products.
- Report incidents concerning IT security by e-mail to cert@sew-eurodrive.com.

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- Regularly check which Security Advisories are available in the Online Support of SEW-EURODRIVE.
- Evaluate the fault memories and diagnostics information of your products regularly and check whether there are entries that affect IT security.

7.2.2 Guidelines for secure operation

The engineering protocol from SEW-EURODRIVE allows authorized personnel to activate various service accesses on the device. Authentication is implemented by using static access data. This data is not used to defend against attacks on IT security but to protect against unintentional modification. This is the reason why it cannot be changed.

To prevent misuse of these service accesses, network access must be restricted according to the state of the art. For more information, refer to section "It security of the environment".

7.2.3 Guidelines for user account management

The product uses an administrative service account. It is not relevant for operation and is only used for service purposes. The account is protected by static, device-specific access data.

7.3 Troubleshooting

Symptom	Cause and solution
Overload or overcurrent error of the unloaded motor during acceleration	Check the star/delta terminal connection in the motor. The nominal operating voltage of motor and inverter must match. The delta connection always yields the lower voltage of a multi-voltage motor.
Overload or overcurrent – motor does not turn	Check whether the rotor is blocked. Make sure that the mechanical brake is released (if installed).
No enable for the inverter – display remains as "StoP"	• Check whether the hardware enable signal is present at digital input 1. • Ensure proper +10 V user output voltage (between terminals 5 and 7). • If faulty, check the wiring of the user terminal strip. • Check *P-12* for terminal mode/keypad mode. • If keypad mode is selected, press the "Start" key. • The line voltage must correspond with the specified values.
The inverter does not start at extremely cold ambient conditions	The inverter might not start at ambient temperatures below -20 °C. Under such conditions, provide a heat source that keeps the ambient temperature of the drive above -20 °C.
No access to advanced menus	*P-14* must be set to the advanced access code. The value is "101" unless the user has changed the code in *P-37*.

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7.4 Fault history

The parameter *P00-28* archives the last four errors. Each error is displayed in abbreviated form. The most recent error is shown first (when calling *P00-28*). The oldest error will be deleted from the error history.

- **NOTE**

  If the latest error in the error history is an undervoltage error, no further undervoltage errors will be entered in the error history. The reason is to prevent the error history from being filled with undervoltage errors, which occur every time the inverter is switched off.

7.5 Fault reset

You can reset a fault in the event of a fault response, see chapter "Fault list" (→ 🗎 61), by pressing the <Stop> key or with a rising edge at digital input 1.

7.6 Fault list

Code (inverter display)	Code (MOVITOOLS® MotionStudio in P00-28)	Fault code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
4-20 F	18	0x71	0x1012	Signal loss 4 – 20 mA	• Check whether the input current falls within the range defined in *P-16* and *P-48*. • Check the connection cable.
AtF-01	40	0x51	0x1028	Measured stator resistance fluctuates between the phases.	The measured stator resistance of the motor is asymmetrical. Check whether: • the motor is connected correctly and free of faults. • the windings have the correct resistance and symmetry.
AtF-02	41	0x51	0x1029	Measured stator resistance is too high.	The measured stator resistance of the motor is too high. Check whether: • the motor is connected correctly and free of faults. • the power rating of the motor corresponds to the power rating of the connected inverter.
AtF-03	42	0x51	0x102A	Measured motor inductance is too low.	The measured motor inductance is too low. Check whether the motor is connected correctly and free of faults.
AtF-04	43	0x51	0x102B	Measured motor inductance is too high.	The measured motor inductance is too high. Check whether: • the motor is connected correctly and free of faults. • the power rating of the motor corresponds to the power rating of the connected inverter.
AtF-05	44	0x51	0x102C	Timeout of inductance measurement	The measured motor parameters are not convergent. Check whether: • the motor is connected correctly and free of faults. • the power rating of the motor corresponds to the power rating of the connected inverter.
dAtA-E	19	0x62	0x1013	Internal memory error (DSP)	Contact SEW-EURODRIVE.
dAtA-F	17	0x62	0x1011	Internal memory error (IO)	Contact SEW-EURODRIVE.
DC-trP	–	0x2E	0x100C	Communication failure error	Check the communication connection Make sure that each inverter in the network is assigned a unique address.
E-triP	11	0x1A	0x100B	External error at digital input 3.	NC contact was opened. • Check the motor thermistor (if connected).

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Code (inverter display)	Code (MOVITOOLS® MotionStudio in P00-28)	Fault code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
Err-SC				The keypad has lost the communication connection to the inverter.	Press the STOP key to reset. Check the address of the frequency inverter.
F-PTC	21	0x1F	0x1015	Motor protection triggered	The motor protection sensor (TF, TH) is connected to analog input 2 (terminal 4).
FAN-F	22	0x32	0x1016	Internal fan fault.	Contact SEW-EURODRIVE.
FAULtY				Communication between the controller and power section is interrupted	Contact SEW-EURODRIVE.
FLt-dc	13	0x07	0x320D	DC link ripple too high.	Check the current supply
I.t-trp	04	0x08	0x1004	Overload of inverter/motor (I2t fault)	Make sure that: • the motor nameplate parameters are correctly inserted in *P-07*, *P-08* and *P-09*. • Auto-tuning has been performed correctly. Check whether: • The decimals flash (inverter overloaded) and increase the acceleration ramp (*P-03*) or decrease the motor load. • The cable length meets the requirements. • The load can move freely and there are no blockages or other mechanical faults (mechanically check the load). • The thermal motor protection to UL508C is activated in *P-41*. See also **Fault reset delay** in the case of an O-I and hO-I fault.
no-Flt	0	0x0	0x0	No fault	• The empty fault memory has these entries. • If this message is displayed, EMC interference is the cause. Check your application for EMC-compliant installation.

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Code (inverter display)	Code (MOVITOOLS® MotionStudio in P00-28)	Fault code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
O-I	03	0x01	0x2303	Short-term overcurrent at the inverter output. High motor overload.	**Fault during stop procedure:** Check for premature brake application. **Fault during inverter enable:** Check whether: • the motor nameplate parameters are correctly inserted in *P-07*, *P-08* and *P-09*. • Auto-tuning has been performed correctly. • the load can move freely and there are no blockages or other mechanical faults (mechanically check the load). • a short circuit between the phases or a ground fault of a phase has occurred at the motor and motor connection cable. • the brake is connected correctly, controlled correctly, and correctly released when the motor has a holding brake. **Fault during operation:** Check: • for a sudden overload or malfunction. • the cable connection between the inverter and motor. The acceleration/deceleration time is too short and requires too much power. If you cannot increase *P-03* or *P-04*, use a larger inverter. **Measures:** Reduce the setting of the voltage enhancement in *P-11*. Set a longer run-up time in *P-03*. Disconnect the motor from the inverter. Enable the inverter again. If this fault occurs again, check the entire system and completely replace the inverter. **Fault reset delay (dELAy.t)** If the fault occurs again immediately after the O-I or hO-I fault messages are reset, the following delay times apply for resetting: • First reset after 4 seconds • Second reset after 8 seconds • Third reset after 16 seconds • Fourth reset after 32 seconds • Further resets after 64 seconds The delay is reset to 4 seconds if no further fault occurs within the delay time.
hO-I	15	0x01	0x230F	Hardware overcurrent fault at the inverter output (IGBT self-protection in case of overload).	
O-hEAt	23	0x7C	0x4117	Ambient temperature too high.	Check if the ambient conditions are within the range specified for the inverter.
O-t	8	0x0B	0x4208	Heat sink overtemperature	The heat sink temperature can be displayed in *P00-09*. A historical protocol is saved in parameter *P00-16* at 30 s intervals prior to a switch off with fault. This fault message is displayed at a heat sink temperature of ≥90 °C. Check: • the ambient temperature of the inverter. • the inverter cooling and housing dimensions. • the function of the internal cooling fan of the inverter. Reduce the setting of the effective clock frequency in parameter *P-17*, or the load at the motor/inverter.
O-Volt	06	0x07	0x07	Overvoltage in the DC link	The fault occurs if a high flywheel load or overhauling load is connected, and the excess regenerative energy is transferred back to the inverter. If the fault occurs while stopping or during deceleration, increase the deceleration ramp time *P-04* or connect a suitable braking resistor to the inverter. Reduce the proportional gain in *P-53/1* in vector mode. Additionally check if the supply voltage is within the specified range. Information: The value of the DC link voltage (U_z) can be displayed in *P00-08*. A historical log is saved in parameter *P00-15* at 256 ms intervals prior to a switch off with fault.

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Code (inverter display)	Code (MOVITOOLS® MotionStudio in P00-28)	Fault code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
OI-b	01	0x04	0x2301	Braking channel overcurrent, braking resistor overload	Make sure that the connected braking resistor does not fall below the minimum value approved for the inverter (see technical data). Check the braking resistor and the cabling for possible short circuits. See also **Fault reset delay** in the case of an O-I and hO-I fault.
OL-br	02	0x04	0x1002	Braking resistor overloaded	The software has detected an overload of the braking resistor and switches off to protect the resistor. Make sure that the braking resistor is operated within the planned parameters before performing any changes to the parameters or the system. To reduce the load on the resistor, increase the deceleration time, reduce the load's mass moment of inertia, or connect additional braking resistors in parallel. Note the minimum resistor values for the inverter in use.
Out-F	26	0x52	0x101A	Inverter output stage fault	Check the EMC-compliant wiring of any external control cables. Use shielded cables. As a test, use the internal 24 V supply directly at the digital inputs to rule out faults in the signal cable. As a test, disconnect the temperature sensor to rule out faults in the sensor cable. As a test, disconnect the motor cable from the inverter to rule out faults originating in the inverter. Contact SEW-EURODRIVE.
P-LOSS	14	0x06	0x310E	Input phase failure	An input phase was disconnected or interrupted. Check the supply voltage.
P-dEF	10	0x09	0x100A	Factory settings have been restored.	
PS-trP	05	0xC8	0x1005	Output stage fault (IGBT self-protection in case of overload)	See **O-I** fault.
SC-F01	50	0x2B	0x1032	Modbus communication error	Check the communication settings.
SC-F02	51	0x2F	0x1033	SBus/CANopen communication error	Check: • the communication connection between inverter and external devices. • the assigned, unique address per inverter in the network.
SC-FLt	–	–	–	Internal fault of the inverter	Contact SEW-EURODRIVE.
SC-trP	–	0x2E	0x100C	Communication failure error	Check the communication connection. Make sure that each inverter in the network is assigned a unique address.
SC-OBS	12	0x2E	0x100C	Loss of communication between the devices.	Check the address of the inverter. Check the communication connection of the inverters.
StoP				The inverter is not enabled.	Activate the enable.
th-Flt	16	0x1F	0x1010	Faulty thermistor on the heat sink.	Contact SEW-EURODRIVE.
type-f				Parameter module and inverter are not compatible.	The parameter module used is not of type LT BP C
U-t	09	0x75	0x4209	Undertemperature	Occurs at an ambient temperature below -20 °C. Increase the temperature to above -20 °C to start the inverter.
U-Volt	07	0xC6	0x3207	DC link undervoltage	Occurs routinely when switching off the inverter. Check the line voltage if this occurs while the inverter is running.

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8 Service

To ensure fault-free operation, SEW-EURODRIVE recommends checking the ventilation openings in the housing of the inverters regularly and cleaning them if necessary.

8.1 SEW-EURODRIVE Service

If you are unable to rectify a fault, contact SEW-EURODRIVE Service. For 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 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
- Type of fault
- Accompanying circumstances
- Unusual events preceding the problems

8.2 Extended storage

If the unit is stored for a long time, connect it to the supply system voltage for at least 5 minutes every 2 years. Otherwise, the unit's service life may be reduced.

Procedure when maintenance has been neglected:

Electrolytic capacitors are used in the inverters. They are subject to aging effects when de-energized. This effect can damage the capacitors if the unit is connected using the nominal voltage after a longer period of storage.

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

The following stages are recommended:

AC 115 V devices:

- Stage 1: AC 80 V for 15 minutes
- Stage 2: AC 115 V for 1 hour

AC 230 V devices:

- Stage 1: AC 170 V for 15 minutes
- Stage 2: AC 200 V for 15 minutes
- Stage 3: AC 240 V for 1 hour

AC 400 V devices:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 480 V for 1 hour

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After you have completed the regeneration process, the device can be used immediately or stored again for an extended period with maintenance.

8.3 Shutdown

⚠ WARNING

Risk of burns due to hot surfaces.

Severe injuries.

- Let the devices cool down before touching them.

⚠ WARNING

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

Severe or fatal injuries.

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

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

8.4 IT security guidelines for secure disposal

8.4.1 Removing the product from its intended environment

If the data stored on the product is considered relevant for IT security, remove it as described in the section "Secure removal of data stored in the product." (→ 🗎 66)

8.4.2 Removing reference and configuration data in the environment

Reference files, configuration files, log files, and other data belonging to the product can be stored in the environment on other devices, such as a higher-level controller or a local OPC-UA client. If the stored data is considered relevant for IT security, remove it from the corresponding devices.

8.4.3 Secure removal of data stored in the product

You can reset the data saved in the product to the factory settings using the MOVISUITE® engineering software.

This encompasses the following data, if present on the device variant:

- Configuration of the device

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- Scope recording of the device
- Fault memory
  - Fault number
  - Timestamp
  - Fault code, subfault code, descriptive text
  - Process data
  - States of the digital inputs/outputs
  - Control word and status word
- Device name
- IP address
- Safety-relevant data

The following data is not reset with this procedure and can be changed individually, if present on the device variant:

- Enabled functions
- AS-Interface address
- Data set of the safety option
- EtherCAT® device designation
- PROFINET name
- Last detected options

8.4.4 Removing a customer data backup

The product does not create local customer data backups.

8.5 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.

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- 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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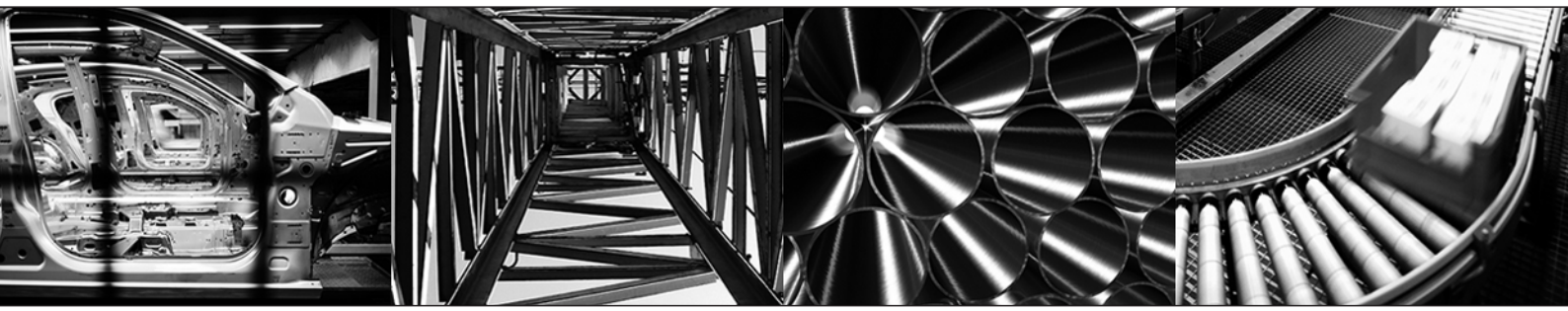

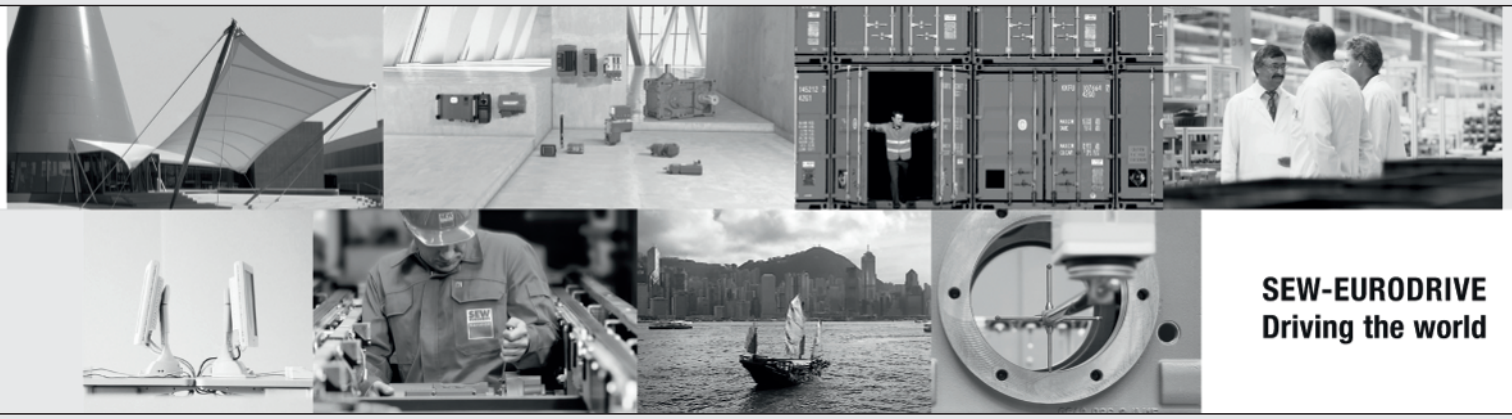

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Driving the world

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