



SEW
EURODRIVE

Operating Instructions



MOVITRAC® B



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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 graduation and meaning of the signal words in the safety notes.

Signal word	Meaning	Consequences if not observed
▲ DANGER	Imminent danger	Death or severe injuries
▲ WARNING	Possibly dangerous situation	Death or severe injuries
▲ CAUTION	Possibly 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 Structure of section-related safety notes

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

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



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

1.1.3 Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing

Hazard symbol	Meaning
	Warning about suspended load

1.1.4 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

▲ SIGNAL WORD! Type and source of danger. Possible consequence(s) if disregarded. Measure(s) to prevent danger.

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.

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

2.2.1 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.

2.2.2 Lifting applications

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

- Use mechanical protection devices.
- Perform a hoist startup.

Application in ELSM® control mode

When the inverter is operated in ELSM® control mode, using it in lifting applications and inclining tracks is not permitted.

2.3 Functional safety technology

The product includes the STO safety sub-function. As an option, additional safety sub-functions can be included for the product.

The safety sub-functions are deactivated in the delivery state. The product may not perform any safety function without higher-level safety systems.

To use the STO safety sub-function or other safety sub-functions, please follow the product manual and the manual for the optional safety function of this device.

2.4 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.

2.5 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.

2.6 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).

2.6.1 Required preventive measure

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

2.6.2 Stationary application

The necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	Ground connection

2.6.3 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.

2.7 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.

2.8 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.

2.8.1 Energy storage unit

Products with a connected energy storage unit are not necessarily de-energized when they have been disconnected from the supply system. Usually, the energy storage unit stores sufficient energy to continue operation of the connected motors for a limited period of time. It is not sufficient to observe a minimum switch-off time.

Perform a shutdown as described in the documentation in the chapter "Service" > "Shutdown".

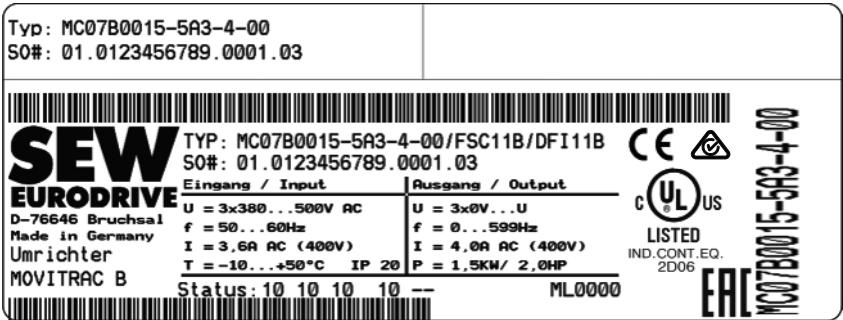
3 Device structure

3.1 Type designation

Example: MC07B0022-2B1-4-00/T	
MC	Product family MOVITRAC®
07	Series Series 07
B	Version B = version status of the device series
0022	Performance class 0022 = 2.2 kW
2	Connection voltage 2 = AC 200 to 240 V 5 = AC 380 to 500 V
B	Radio interference suppression 0 = no radio interference suppression A = radio interference suppression level C2 B = radio interference suppression level C1
1	Connection type 1 = 1-phase connection type 3 = 3-phase connection type
4	Quadrants 4 = 4-quadrant operation
00	Application level 00 = Standard - S0 = Safe Torque Off
/T	Options /T = technology device /L = Partially coated PCBs

3.2 Nameplate

The following figure shows an example of a nameplate:



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Input	V	Nominal line voltage	T	Ambient temperature
	I	Nominal line current 100% operation	P _{motor}	Recommended motor power 100% operation
	f	Nominal line frequency		
Output	V	Output voltage 100% operation		
	I	Nominal output current 100% operation		
	f	Output frequency		

The device status is shown above the lower barcode. It documents the hardware and software status of the device.

3.3 Scope of delivery

The following parts are combined in one accessory bag for each size.

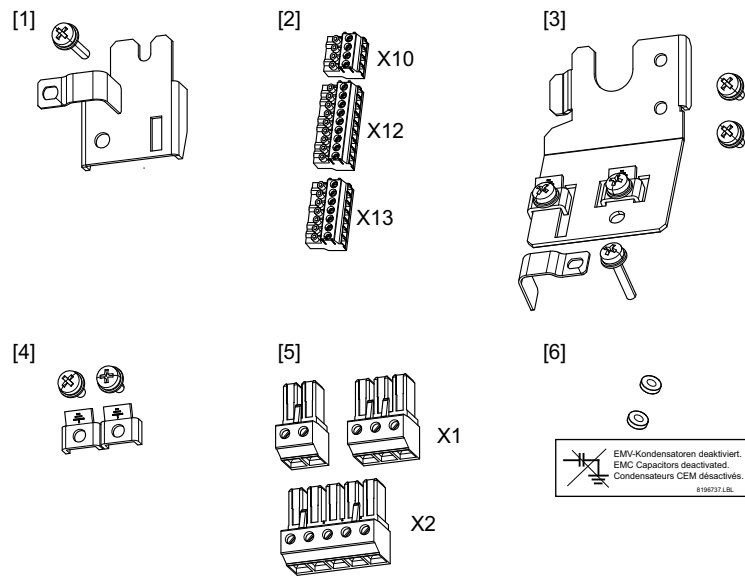
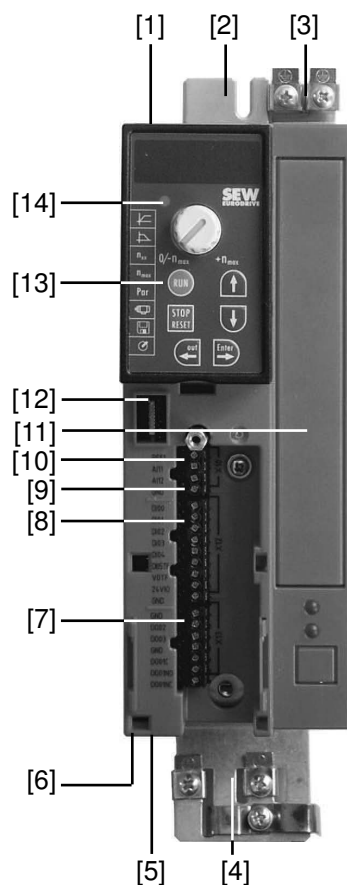


Figure number	Size					
	0XS, 0S, 0L	1	2S	2	3	4, 5
Shield plate for control electronics with terminal and screw						
[1]	1x	1x	1x	1x	1x	1x
[3]	1x					
Shield plate for power section without screws						
		1x				
Shield plate for power section with screws						
			1x	1x		
Electronics terminals connector						
[2]	3x	3x	3x	3x	3x	3x
Grounding terminals with screws						
[4]	1x	1x	1x	1x		
Connectors for supply system (2 or 3-pin) and motor						
[5]	1x					
Plastic insulation with label						
[6]	1x					
Touch guard						
						1x
Fastening tabs						
		1x	1x			

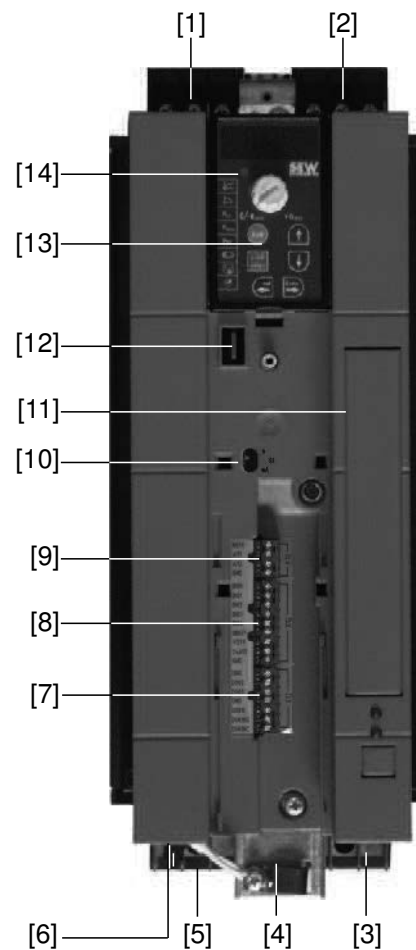
3.4 Sizes 0XS / 0S / 0L



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- [1] X1: Line connection:
 - 3-phase: L1/L2/L3
 - 1-phase: L/N
- [2] Fastening tab
- [3] PE connection
- [4] Shield plate for motor cable, including fastening tab
- [5] X2: Motor connection U/V/W / Brake connection +R/-R
- [6] X17: Safety contact for Safe Torque Off
(only MC07B ...-S0: Size 0S/0L, 400/500 V)
- [7] X13: Digital outputs
- [8] X12: Digital inputs
- [9] X10: Analog input
- [10] Switch S11 for V-mA changeover of analog input (for sizes 0XS and 0S behind the removable connector)
- [11] Space for option card (cannot be retrofitted/not for BG0XS)
- [12] Connection for optional communication/analog module
- [13] Optional operator panel, plugged on
- [14] Status LED (also visible without optional operator panel)

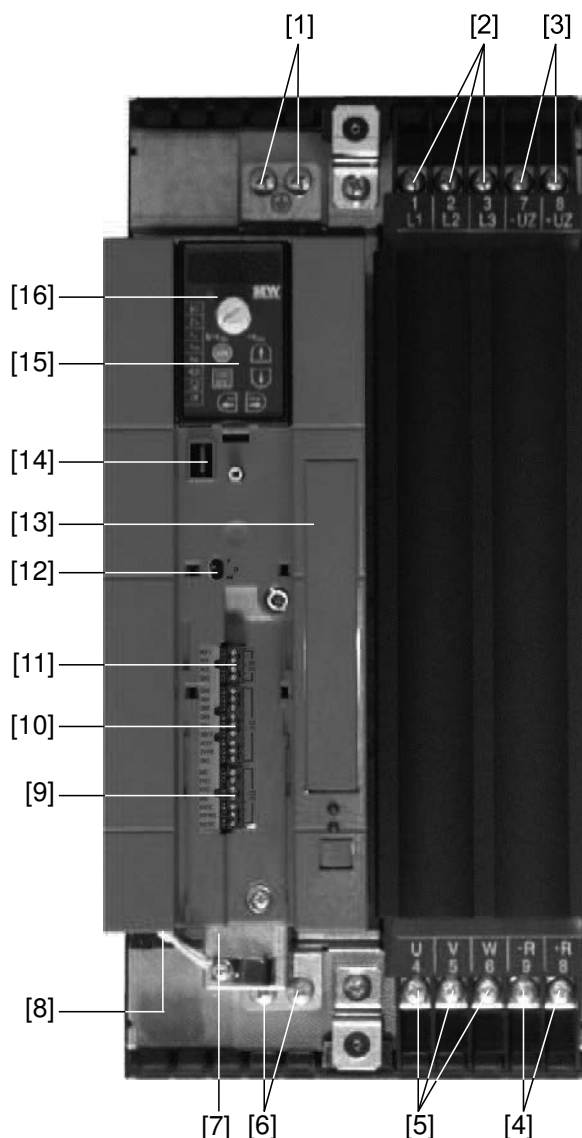
3.5 Sizes 1 / 2S / 2



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- [1] X1: Line connection, 3-phase: L1 / L2 / L3 / PE screw
- [2] X4: DC link connection -V_{DCL} / +V_{DCL}
- [3] X3: Connection of braking resistor R+ / R- / PE
- [4] Electronics shield clamp
- [5] X2: Motor connection U / V / W / PE screw
- [6] X17: Safety contact for Safe Torque Off (only 400/500 V)
- [7] X13: Digital outputs
- [8] X12: Digital inputs
- [9] X10: Analog input
- [10] Switch S11 for V-mA changeover of analog input
- [11] Space for option card (cannot be retrofitted)
- [12] Connection for optional communication / analog module
- [13] Optional operator panel, plugged on
- [14] Status LED (also visible without optional operator panel)

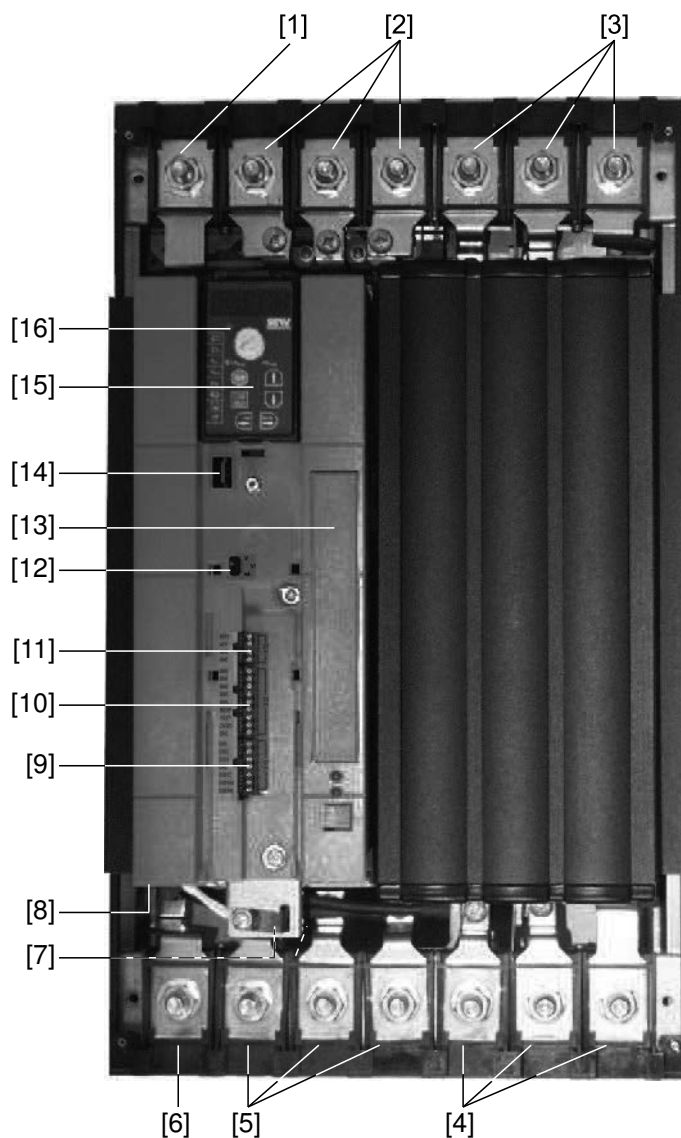
3.6 Size 3



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- [1] X2: PE connection
- [2] X1: Line connection, 3-phase: 1/L1 / 2/L2 / 3/L3
- [3] X4: DC link connection $-V_{DCL}$ / $+V_{DCL}$
- [4] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [5] X2: Motor connection U (4) / V (5) / W (6)
- [6] X2: PE connection
- [7] Electronics shield clamp
- [8] X17: Safety contact for Safe Torque Off (only 400/500 V)
- [9] X13: Digital outputs
- [10] X12: Digital inputs
- [11] X10: Analog input
- [12] Switch S11 for V-mA changeover of analog input
- [13] Space for option card (cannot be retrofitted)
- [14] Connection for optional communication / analog module
- [15] Optional operator panel, plugged on
- [16] Status LED (also visible without optional operator panel)

3.7 Sizes 4 / 5



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- [1] X2: PE connection
- [2] X1: Line connection, 3-phase: 1/L1 / 2/L2 / 3/L3
- [3] X4: DC link connection $-V_{DCL}$ / $+V_{DCL}$ and PE connection
- [4] X3: Braking resistor connection R+ (8) / R- (9) and PE connection
- [5] X2: Motor connection U (4) / V (5) / W (6)
- [6] X2: PE connection
- [7] Electronics shield clamp
- [8] X17: Safety contact for Safe Torque Off (only 400/500 V)
- [9] X13: Digital outputs
- [10] X12: Digital inputs
- [11] X10: Analog input
- [12] Switch S11 for V-mA changeover of analog input
- [13] Space for option card (cannot be retrofitted)
- [14] Connection for optional communication / analog module
- [15] Optional operator panel, plugged on
- [16] Status LED (also visible without optional operator panel)

4 Mechanical installation



⚠ DANGER

The surfaces of the heat sinks can exceed 70 °C.

Risk of burns.

- Do not touch the heat sink.



⚠ DANGER

Dangerous voltages on cables and terminals.

Death or severe injuries due to electric shock.

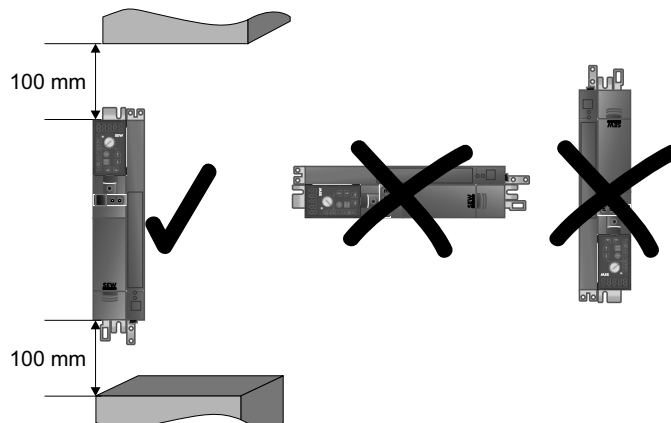
- Disconnect the inverter from the supply system and wait 10 minutes before starting work.
- Use suitable measuring devices to verify that there is no voltage on cables and terminals.

4.1 Installation notes for basic device

4.1.1 Minimum clearance and mounting position

Observe the following information:

- Leave 100 mm free space at the top and bottom of the housing for proper cooling. Lateral clearance is not required, you can line up the devices.
- Make sure that cables and other installation material do not interfere with the air circulation. Prevent the device from being blown by the warm exhaust air from other devices.
- Only install the devices vertically. Do not install them horizontally, tilted or upside down.
- Good heat dissipation from the rear of the heat sink improves the thermal capacity utilization of the device.

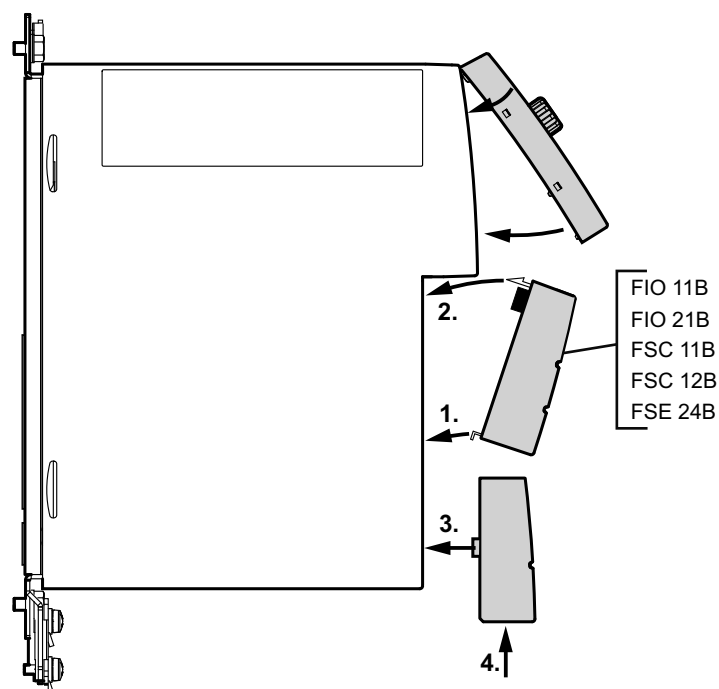


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4.2 Installation of accessories and options

4.2.1 Attaching the front modules

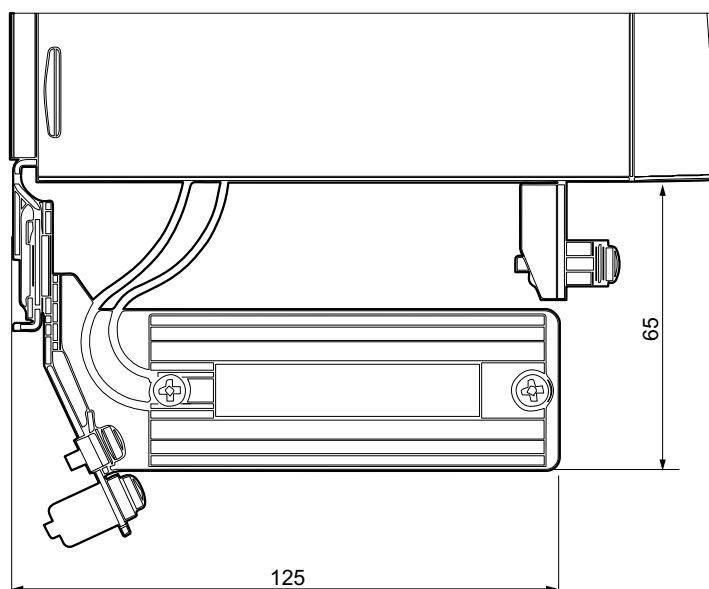
Set up the front modules as follows:



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4.2.2 PTC braking resistors BW1 / BW3 with FKB10B

The PTC braking resistors BW1 and BW3 [1] can be mounted on the shield plate below the inverter using an optional angle bracket FKB10B [2], part number 18216218.

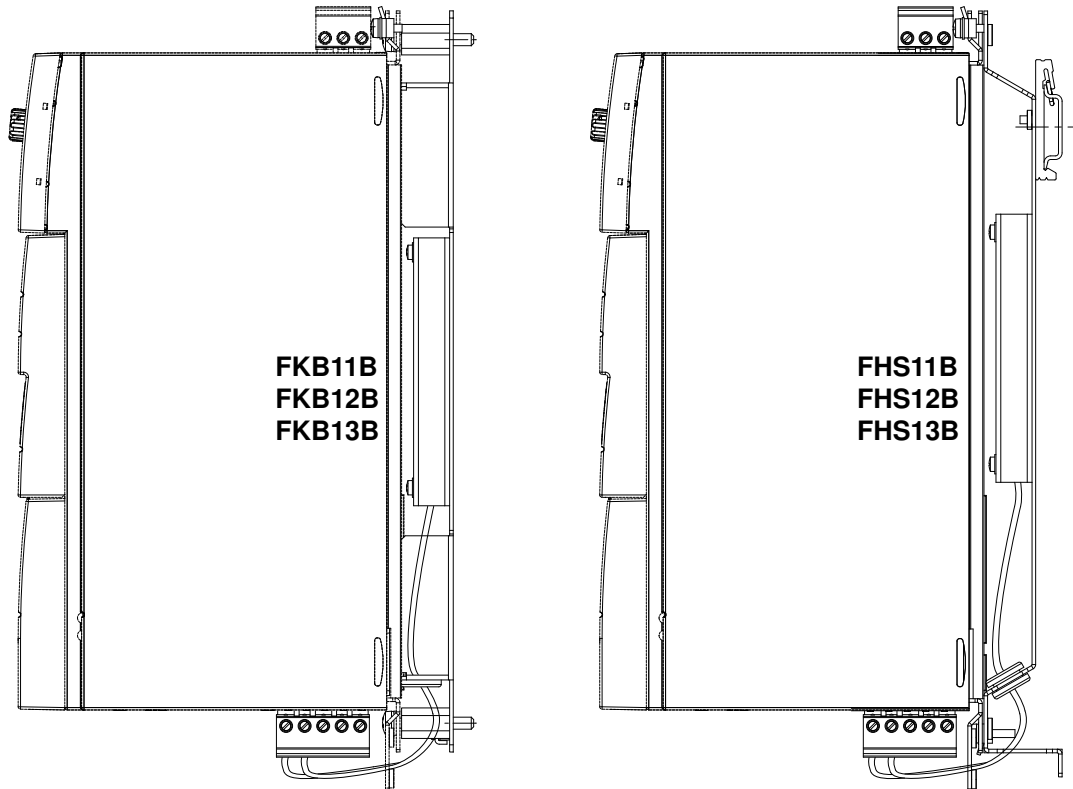


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4.2.3 Flat-design resistors with FKB11B / FKB12B / FKB13B and FHS11B / FHS12B / FHS13B

Install flatpack resistors as follows:

- FKB11B / FKB12B / FKB13B: Mounting on the rear panel of the control cabinet
- FHS11B / FHS12B / FHS13B: Mounting with mounting rail



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INFORMATION

Guide the cable of the FKB1xB through the center of the recess through the tabs (burr-free). Ensure that the conductors are not crushed during the subsequent installation of the inverter. For FKB12B, FKB13B, and FHS1xB, the cables must be routed through the grommet.

5 Electrical installation

5.1 Installation notes for basic device

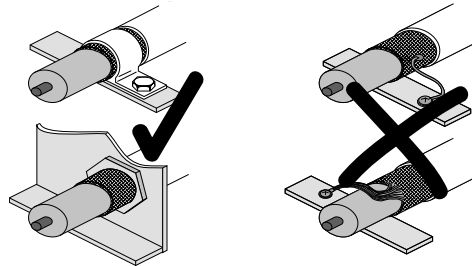
5.1.1 Recommended tools

Use a screwdriver with a blade width of 2.5 mm to connect the electronics terminal strip X10/X12/X13.

5.1.2 EMC-compliant installation

Observe the following information:

- Shield all cables except the supply system cable. For the motor cable, you can use the HD.. option (output choke) as an alternative to the shield to achieve the interference emission limit values.
- When using shielded motor cables, e.g. assembled motor cables from SEW-EURODRIVE, you must keep unshielded conductors between the shield overlay and the terminal of the inverter as short as possible.
- Connect the shield by the shortest possible route and make sure it is grounded over a wide area at both ends. If using double-shielded cables, ground the outer shield on the inverter side and the inner shield on the other end.



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- You can also use grounded sheet-metal ducts or metal pipes to shield the cables. Lay the power and control cables separately from each other.
- Ground the inverter and all additional devices in a high-frequency-compliant manner by making flat, metallic contact between the device housing and ground, e.g. unpainted control cabinet mounting panel.

INFORMATION



- MOVITRAC® B is a product that can cause EMC interference in accordance with EN 61800-3. In this case, it is recommended that the user take the appropriate measures.
- Detailed information on EMC-compliant installation can be found in the documentation "Drive Engineering – Practical Implementation: EMC in Drive Engineering" from SEW-EURODRIVE.

5.1.3 Shield terminals

Installation of shield plate for control electronics (all sizes)



[1]

MOVITRAC® B is supplied as standard with a shield plate for control electronics with a retaining screw. Install the shield plate for control electronics as follows:

1. First loosen the screw [1]
2. Slide the shield terminal into the slot in the plastic housing
3. Screw the shield terminal tight

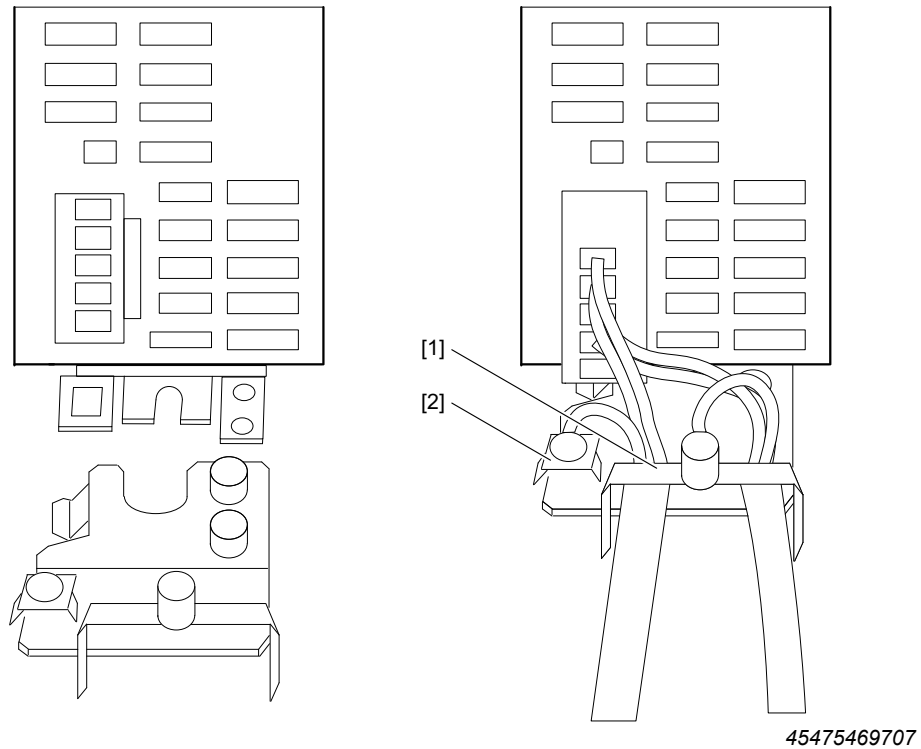
Installation of shield plate for the power section

The shield plate for the power section allows you to conveniently install the shielding for the motor and braking resistor cable. Connect the shield and PE conductor as shown in the following pictures.

Size 0

MOVITRAC® B size 0 is supplied as standard with a shield plate for the power section with 2 retaining screws.

Mount the shield plate for the power section using the two retaining screws.

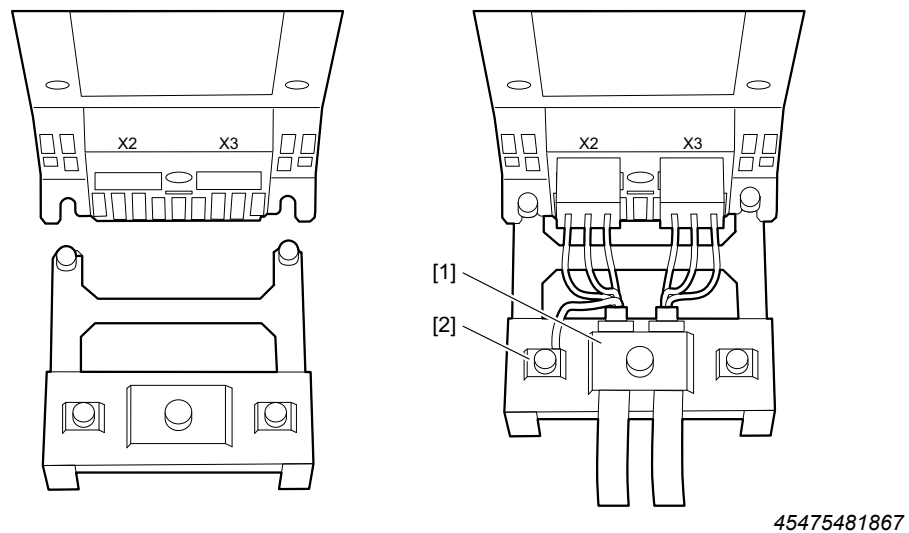


- [1] Shield plate
- [2] PE connection

Size 1

MOVITRAC® B size 1 is supplied as standard with a shield plate for the power section with 2 retaining screws.

Mount the shield plate for the power section using the two retaining screws.

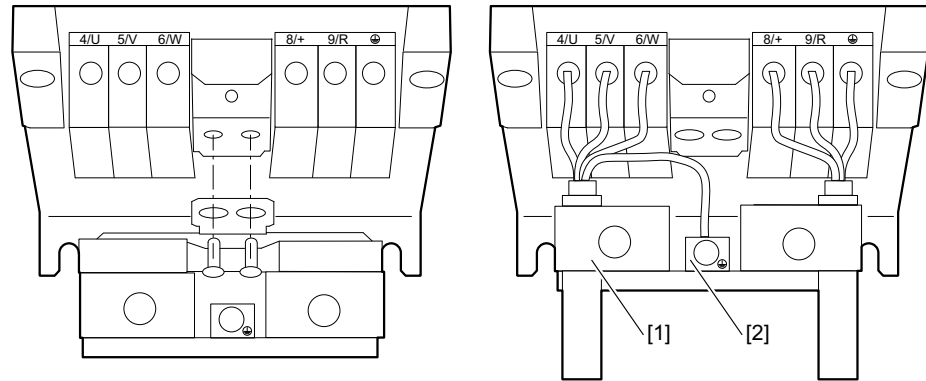


- [1] Shield plate
- [2] PE connection

Size 2S/2

For MOVITRAC® B size 2S / 2, a shield plate for the power section with 2 retaining screws is supplied as standard.

Mount the shield plate for the power section using the two retaining screws. The following figure shows size 2.



- [1] Shield plate
[2] PE connection

Sizes 3 – 5

MOVITRAC® B sizes 3 – 5 are not supplied with shield plates for the power section. Use commercially available shield terminals for the installation of the shielding of the motor and braking resistor cables. Apply the shielding as closely as possible to the inverter.

Touch guard installation

**⚠ DANGER**

Uncovered power connections.

Severe or fatal injuries due to electric shock.

- Install the touch guard in accordance with the regulations.
- Never start up the device if the touch guard has not been installed.

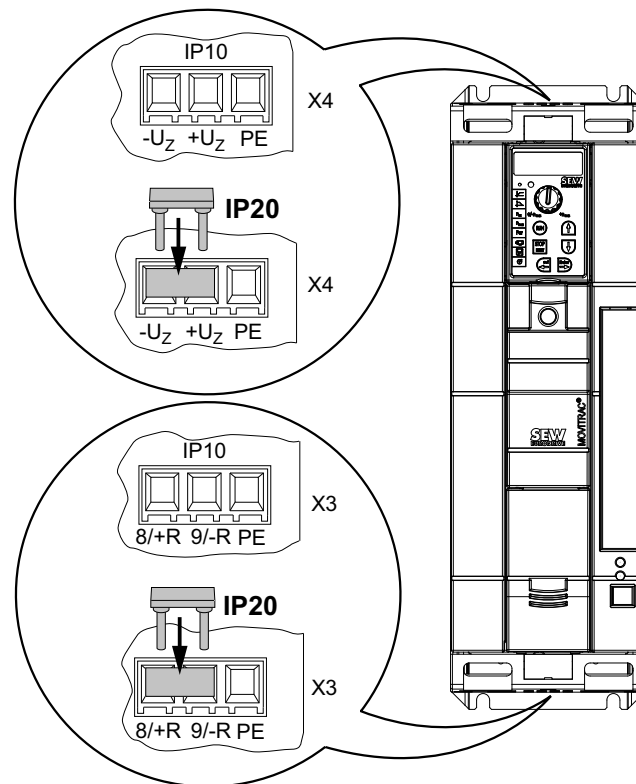
Size 2S

MOVITRAC® B size 2S are supplied with 2 pieces of touch guard for the DC link and braking resistor terminals as standard. With the touch guard, MOVITRAC® B size 2S has degree of protection IP20.

INFORMATION

Without touch guard fitted, MOVITRAC® B size 2S has degree of protection IP10.

Install the touch guard according to the following diagram.

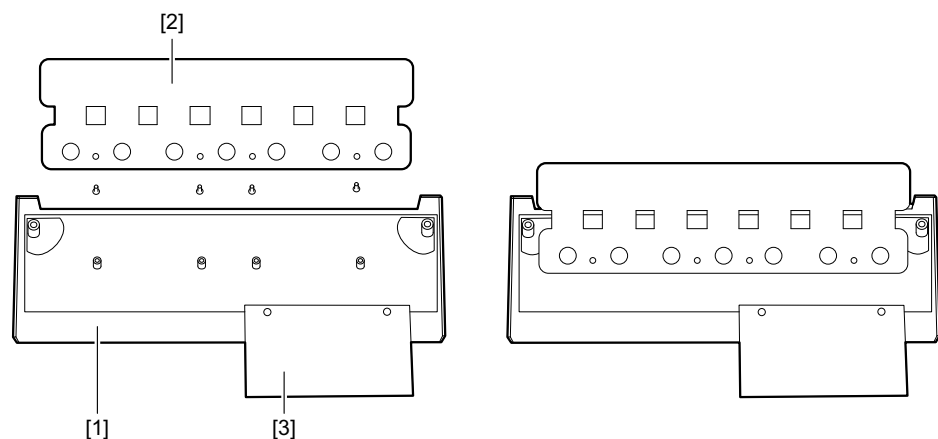


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Sizes 4 / 5

MOVITRAC® B size 4/5 are supplied with 2 pieces of touch guard with 8 fixing washers as standard.

Fit the touch guard to the two safety covers for the power section terminals.



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- [1] Cover plate
- [2] Connection cover
- [3] Panel (size 4 only)

MOVITRAC® B size 4 and 5 only achieve degree of protection IP10 under the following conditions:

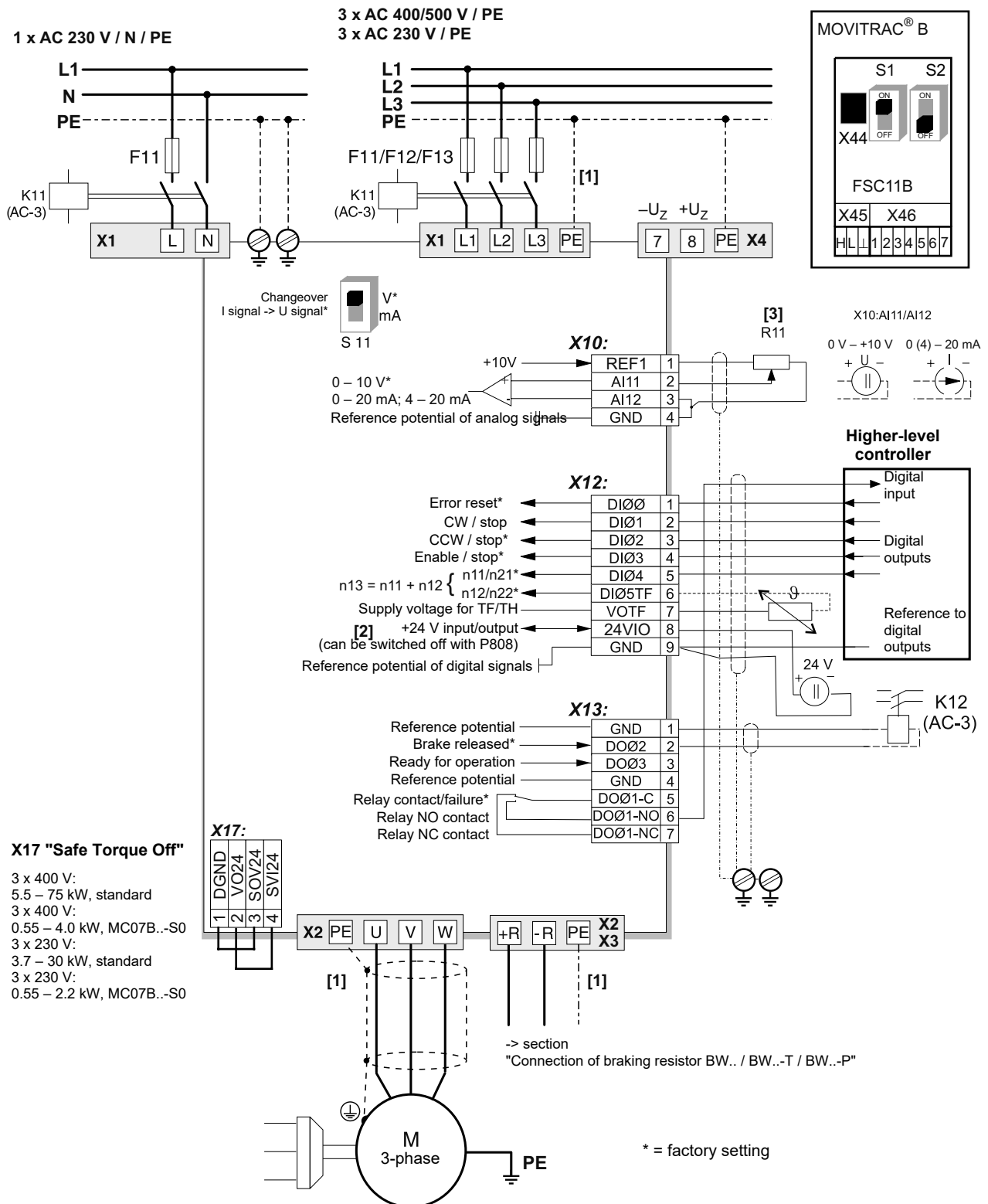
- The touch guard is fully fitted
- The heat shrink tubing is attached to all power section terminals (X1, X2, X3, X4)

INFORMATION



If the above conditions are not met, the MOVITRAC® B inverters of size 4 and 5 only achieve degree of protection IP00.

5.1.4 Wiring diagram



[1] Sizes 1, 2S, and 2 do not have a PE connection in addition to the line connection and motor connection terminals [X1]/[X2]. Then use the PE terminal next to the DC link connection [X4] (only available for sizes 1 – 5). For size 0, the sheet metal is the PE connection.

[2] The MC07B...S0 device type must always be supplied with external voltage.

[3] R11: The resistance value of the external setpoint potentiometer must be $\geq 3 \text{ k}\Omega$.

X4 is only available for sizes 1 – 5. From size 3, there are 2 additional PE terminals.

5.1.5 Requirements for cold plate installation – size 0 only

The dissipation of the frequency inverter's power loss can take place via coolers that work with different cooling media (air, water, oil, etc.). This can be useful in cramped installation conditions, for example. If the usual installation notes are observed (40 °C / 100 mm space above and below), cold plate technology is not necessary.

A good thermal connection to the cooler is important for the safe operation of the frequency inverter:

- The contact surface between the cooler and the frequency inverter must be as large as the cooling plate of the frequency inverter.
- Flat contact surfaces are required, deviation max. 0.05 mm.
- Connect the cooler and cooling plate with all the prescribed screw connections.
- The mounting plate must not get warmer than 70 °C during operation. This must be ensured by the cooling medium.
- Cold plate installation is not possible with FHS or FKB.

5.1.6 Deactivating the EMC capacitors – size 0 only



⚠ DANGER

Death or severe injuries due to electric shock.

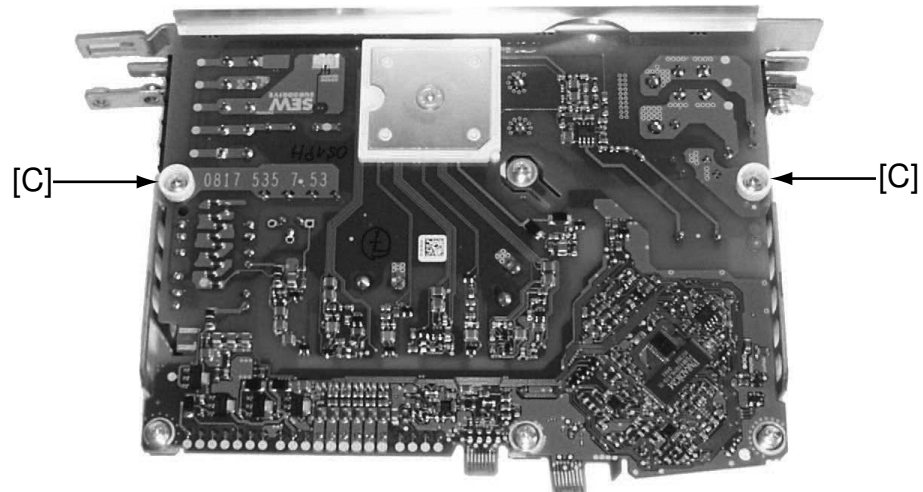
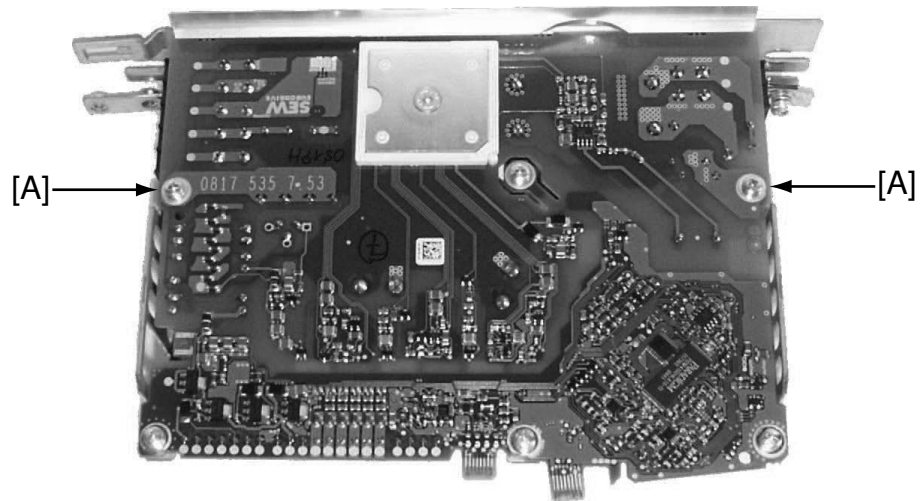
- Disconnect the inverter from the power. Disconnect the DC 24 V and the line voltage.
- Wait 10 minutes.
- Check that power disconnection has been carried out.
- Discharge yourself using suitable measures (discharge strap, conductive shoes, etc.) before removing the hood.
- Only touch the device by the frame and heat sink. Do not touch any electronic components.

The conversion is only allowed to be carried out by a skilled person (electrically). After the conversion, the device must be marked with the label enclosed in the accessory bag.

If you want to deactivate the EMC capacitors on the MOVITRAC® B frequency inverter, proceed as follows:

1. Open the device:
 - Remove **all** connectors
 - Remove the electronics shield clamp
 - Remove the housing retaining screw in the center of the front of the housing
 - Remove the housing
2. Remove the two screws [A] for fastening the circuit board.
3. Insert the screws into the plastic insulators [B] supplied.
4. Screw the screws back onto the device [C].
5. Close the unit.

6. Label the device with the enclosed label.



25372555

By deactivating the EMC capacitors, leakage currents no longer flow via the EMC capacitors.

- Note that the leakage currents are essentially determined by the level of the DC link voltage, the PWM frequency, the motor cable used, its length, and the motor used.

The EMC filter is no longer active when the interference suppression capacitors are deactivated.

5.1.7 Separate cable ducts

Route power cables and electronics cables in separate cable ducts.

5.1.8 Operation on IT systems

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.

5.1.9 Utilization category of contactors

Use only contactors in utilization category AC-3 (EN 60947-4-1).

5.1.10 Required cross sections

Supply system cable: Cross section according to nominal input current I_{Line} at nominal load

Motor cable: Cross section according to nominal output current I_N

Electronic cables: maximum 1.5 mm² without conductor end sleeves¹⁾

Maximum 1.0 mm² with conductor end sleeves

1) You must not install fine-stranded conductors without conductor end sleeves.

5.1.11 Cable lengths for individual drives

The cable lengths depend on the PWM frequency. The approved motor cable lengths are listed in the chapter "Project planning".

5.1.12 Device output

Only connect ohmic/inductive loads (motors).

5.1.13 Switched inductances



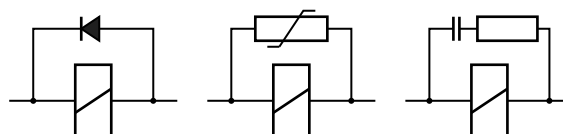
⚠ CAUTION

Switched inductances.

Malfunctions / material damage.

- The distance from switched inductances to the inverter must be at least 150 mm.

- Use suppressors for interference suppression of:
 - Contactors
 - Relay
 - Solenoid valves
- Suppressors are, for example, diodes, varistors or RC elements:



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You must not connect any suppression devices directly to the MOVITRAC® B. Connect the interference suppression devices as close as possible to the inductance.

5.1.14 PE supply system connection according to EN 61800-5-1

During normal operation, leakage currents ≥ 3.5 mA might occur. Note the following for a safe PE connection:

- Supply system cable < 10 mm²:

- Second PE conductor with the cross section of the supply system cable parallel to the protective earth via separate terminals or
- Copper PE conductor with a cross section of 10 mm²
- Supply system cable 10 to 16 mm²:
 - Copper protective earth with the cross section of the supply system cable.
- Supply system cable 16 to 35 mm²:
 - Copper PE conductor with a cross section of 16 mm².
- Supply system cable > 35 mm²:
 - Copper protective earth with half the cross section of the supply system cable.

5.1.15 Interference emission

- For EMC-compliant installation, use shielded motor cables or output chokes HD.

5.1.16 Digital outputs

The digital outputs are short-circuit proof and external-voltage-proof up to 30 V. Higher external voltage can destroy the digital outputs.

5.2 Installation of accessories and options

5.2.1 Braking resistor connection

- Shorten the conductor to the required length.
- Use 2 tightly twisted conductors or a shielded power cable. Cable cross-section according to the tripping current I_F of F16. The nominal voltage of the cable must amount to at least $V_0/V = 300 \text{ V}/500 \text{ V}$ (according to DIN VDE 0298).
- Protect the braking resistor (except BW90-P52B) with a bimetallic relay. Set the tripping current as per the technical data of the braking resistor. SEW-EURODRIVE recommends using overcurrent relays of tripping class 10 or 10A in accordance with EN 60947-4-1.
- For braking resistors in the BW..-T/BW..-P series, the integrated temperature switch/overcurrent relay can be connected with a shielded cable as an alternative to a bimetallic relay.
- The flatpack resistors have internal thermal overload protection (fuse cannot be replaced). Install the flatpack resistors using appropriate touch guards.

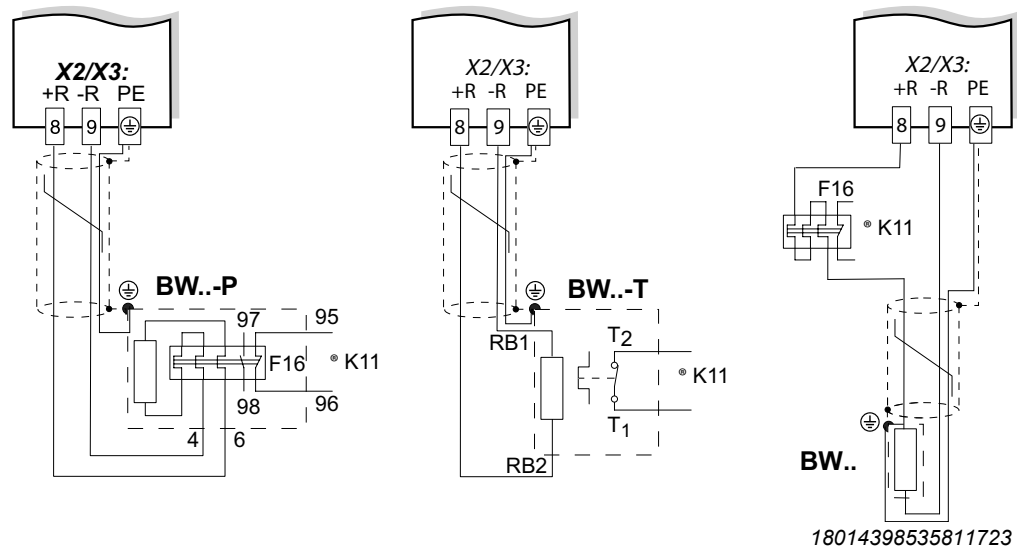
5.2.2 Connecting BW..-P / BW..-T / BW.. to X3 / X2 braking resistor



⚠ WARNING

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

- Select a suitable installation location. Braking resistors are usually mounted on the control cabinet.
- Do not touch the braking resistor.



Program a terminal to "/Controller inhibit". K11 must be opened and the "/Controller inhibit" must receive a "0" signal if:

- BW..-P: the auxiliary contact trips.
- BW..-T: the internal temperature switch trips.
- BW..: the external bimetallic relay F16 trips.

The resistance circuit must not be interrupted.

Overload protection for braking resistors BW:

Braking resistor type	Overload protection		
	Specified by design	Internal temperature switch (..T / ..P)	External bimetallic relay (F16)
BW..	—	—	Required
BW..-T ¹⁾ / BW..-P	—	One of the two options must be selected (internal temperature switch / external bimetallic relay).	
BW..-003 / BW..-005	Sufficient	—	Permitted
BW1 – BW4	Sufficient	—	—

1) Permitted installation: On horizontal surfaces or on vertical surfaces with terminals at the bottom and perforated sheets at the top and bottom. Impermissible mounting: On vertical surfaces with terminals at the top, CW or CCW.

5.2.3 Installing the braking resistor

Observe the following information:

- The supply cables to the braking resistors carry a high DC voltage (approx. DC 900 V) during nominal operation.
- The surfaces of the braking resistors reach high temperatures under a load of P_N . Choose a suitable installation location. Braking resistors are usually mounted on the control cabinet roof.

5.2.4 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.

Minimum clearances for convection cooling

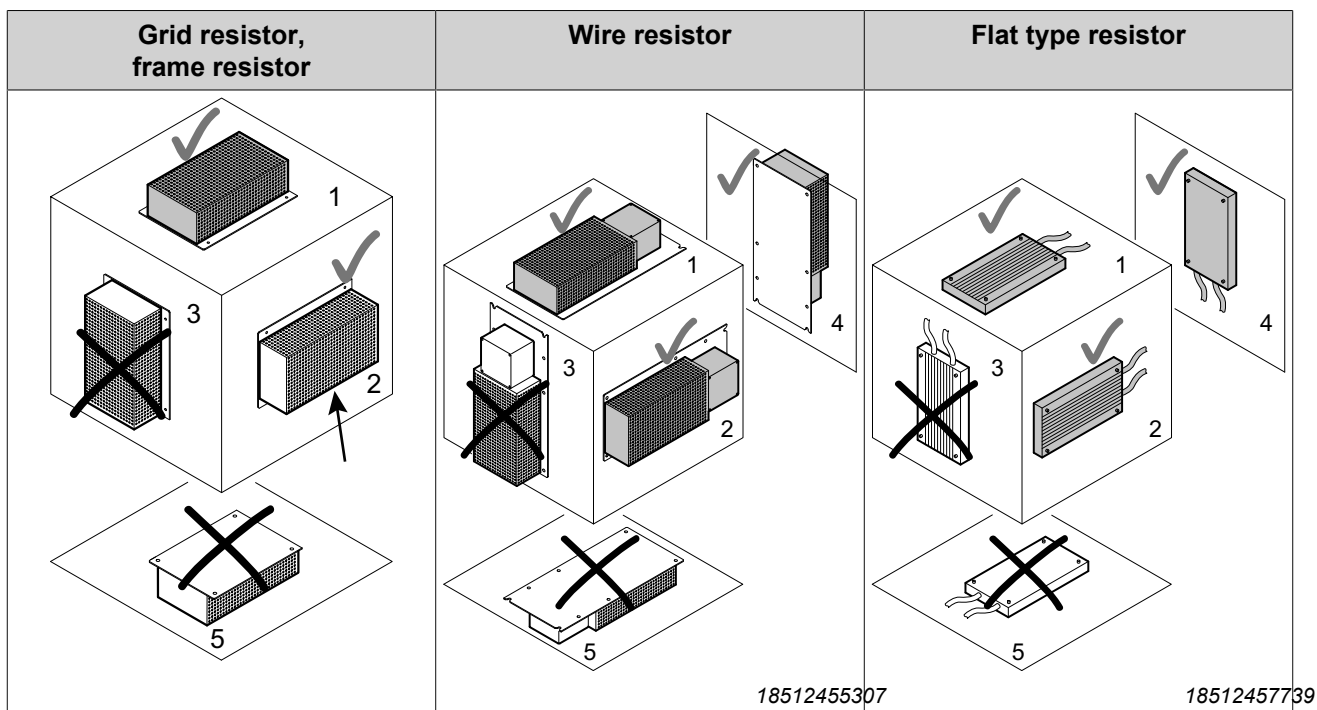
The following minimum clearances must be observed for convection cooling depending on the continuous braking power and the mounting position.

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

1) Corresponds to mounting position 1, 2, 5, 6.

2) Corresponds to mounting position 3, 4.

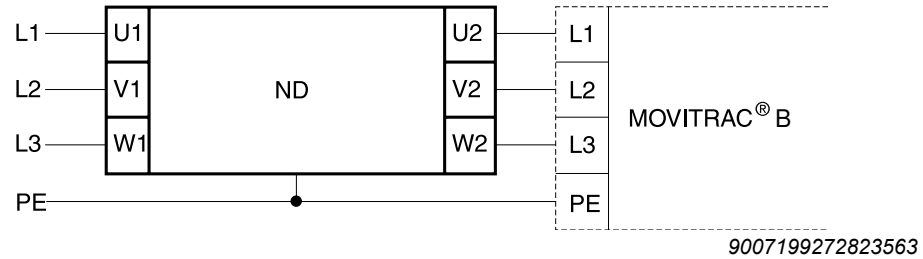
Permitted mounting positions



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

5.2.5 Line choke ND..

Connection of line choke type series ND..



Installing optional power components

Line contactor for multiple devices

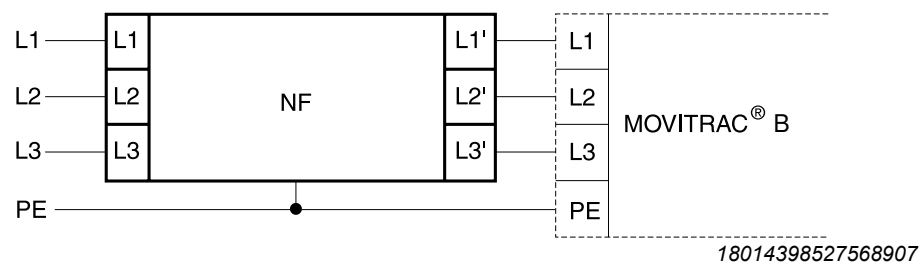
Connect a line choke for limiting the inrush current:

- With 5 or more 3-phase devices
- With 2 or more 1-phase devices

5.2.6 NF.. line filter

- With the NF.. line filter, you can comply with limit value class C1/B for MOVITRAC® B size 0 – 5.
- **⚠ CAUTION!**
Possible damage to property:
Destruction of the input stage.
– Do not switch between the line filter and MOVITRAC® B.
- Install the line filter close to the inverter but outside the minimum clearance for cooling.
- Limit the cable between the line filter and the inverter to the absolutely necessary length, max. 400 mm. Unshielded, twisted cables are sufficient.
- Also use unshielded cables for the supply system cable.

Connection of line filter NF..



Line filters

MOVITRAC® B frequency inverters have a line filter installed as standard up to 11 kW. They comply with the following limit value class according to EN 61800-3 on the supply system side without further measures:

- 1-phase connection: C1 wired
- 3-phase connection: C2

The EMC limit values for interference emission are not specified for voltage supply systems without grounded star point (IT systems). The efficiency of line filters is severely limited.

5.2.7 ULF11A folding ferrites

Insert the supply cable (L and N) into the folding ferrite and press the folding ferrite together until it snaps into place.

Compliance with the EMC limit value class C1 has been proven on the specified test setup. Compliance with class C1 for interference emission is achieved by the professional installation of the folding ferrite ULF11A.

5.2.8 HF.. output filter

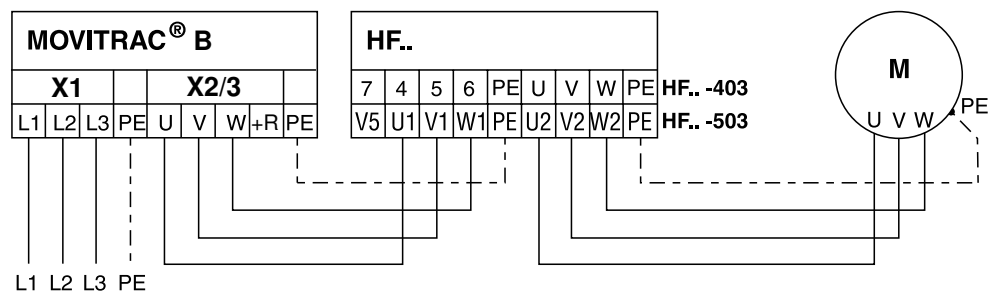


INFORMATION

Install the output filter next to the corresponding inverter. Maintain a ventilation clearance of at least 100 mm above and below the output filter; a lateral clearance is not necessary.

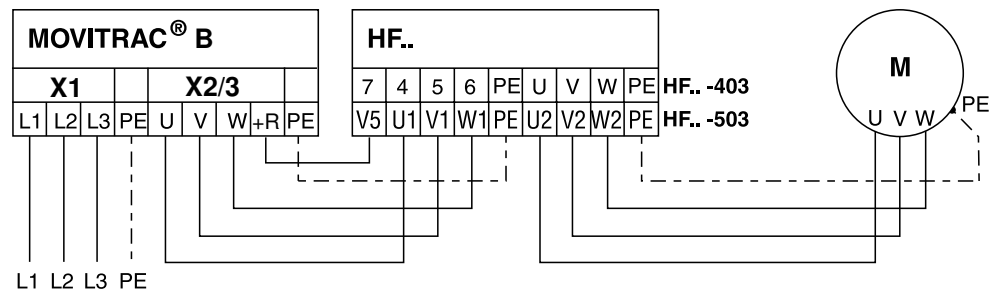
- Limit the cable between the inverter and the output filter to the absolutely necessary length. Maximum 1 m for unshielded cable and 10 m for shielded cable.
- You can connect several motors together to an output filter during operation of a motor group on an inverter. The sum of the rated motor currents must not exceed the nominal throughput current of the output filter.
- The parallel connection of 2 identical output filters to an inverter output to double the nominal throughput current is permitted. Switch all connections of the same name in parallel on the output filters to do so.
- If you operate the inverter with $f_{PWM} = 4$ or 8 kHz, you must not connect the output filter V5 (for HF..-503) or 7 (for HF..-403).
- You must not make a VDCL connection for devices of size 0XS.

Connection of output filter HF.. without V_{DCL} connection (PWM frequency only 4 or 8 kHz)



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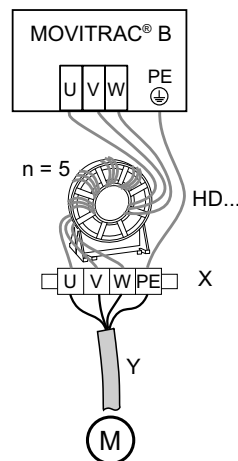
Connection of output filter HF.. with V_{DCL} connection (PWM frequency only 12 or 16 kHz)



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5.2.9 HD.. output choke

- Install the output choke near the MOVITRAC® B outside the minimum free space.
 - Always route all 3 phases (not PE) together through the output choke.
 - With a shielded cable, you must not feed the shield through the output choke.
- With the HD.. output choke, you must feed the cable through the choke 5 times.



If the cable diameter is large, you can use fewer than 5 windings and connect 2 or 3 output chokes in series. SEW-EURODRIVE recommends connecting 2 output chokes in series for 4 windings and 3 output chokes in series for 3 windings.

- Installation of output choke HD012:

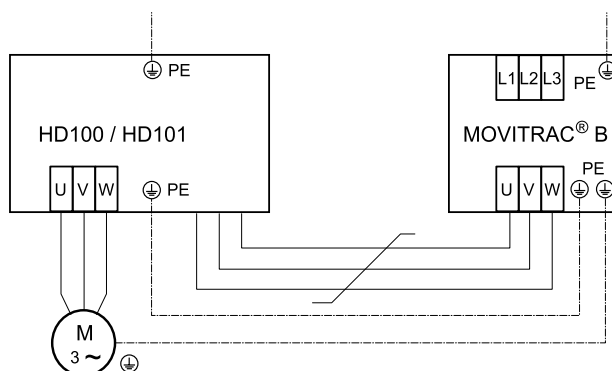
Install the output choke under the corresponding inverter. Maintain a ventilation clearance of at least 100 mm above and below the output choke. Allow a clearance of 10 mm at each side.

There are 3 marked alternative connection options for connecting the protective earth. You can connect the PE line of the motor cable directly to the frequency inverter.

Installation of output choke HD100 / HD101

Mount the HD100/HD101 output choke together with the MOVITRAC® B frequency inverter on the conductive installation surface in the control cabinet using the supplied screws.

The U / V / W connections are labeled U / V / W and must be connected accordingly.



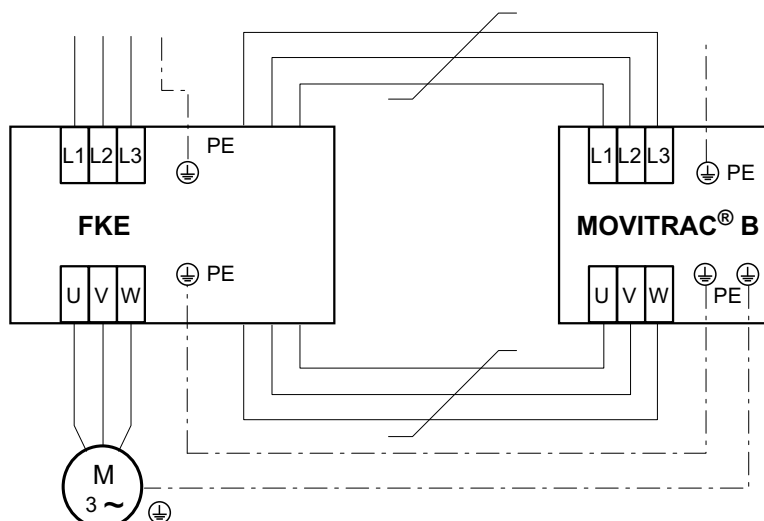
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5.2.10 EMC module FKE12B / FKE13B

Mount the EMC module together with the MOVITRAC® B frequency inverter on the conductive installation surface in the control cabinet using the screws supplied.

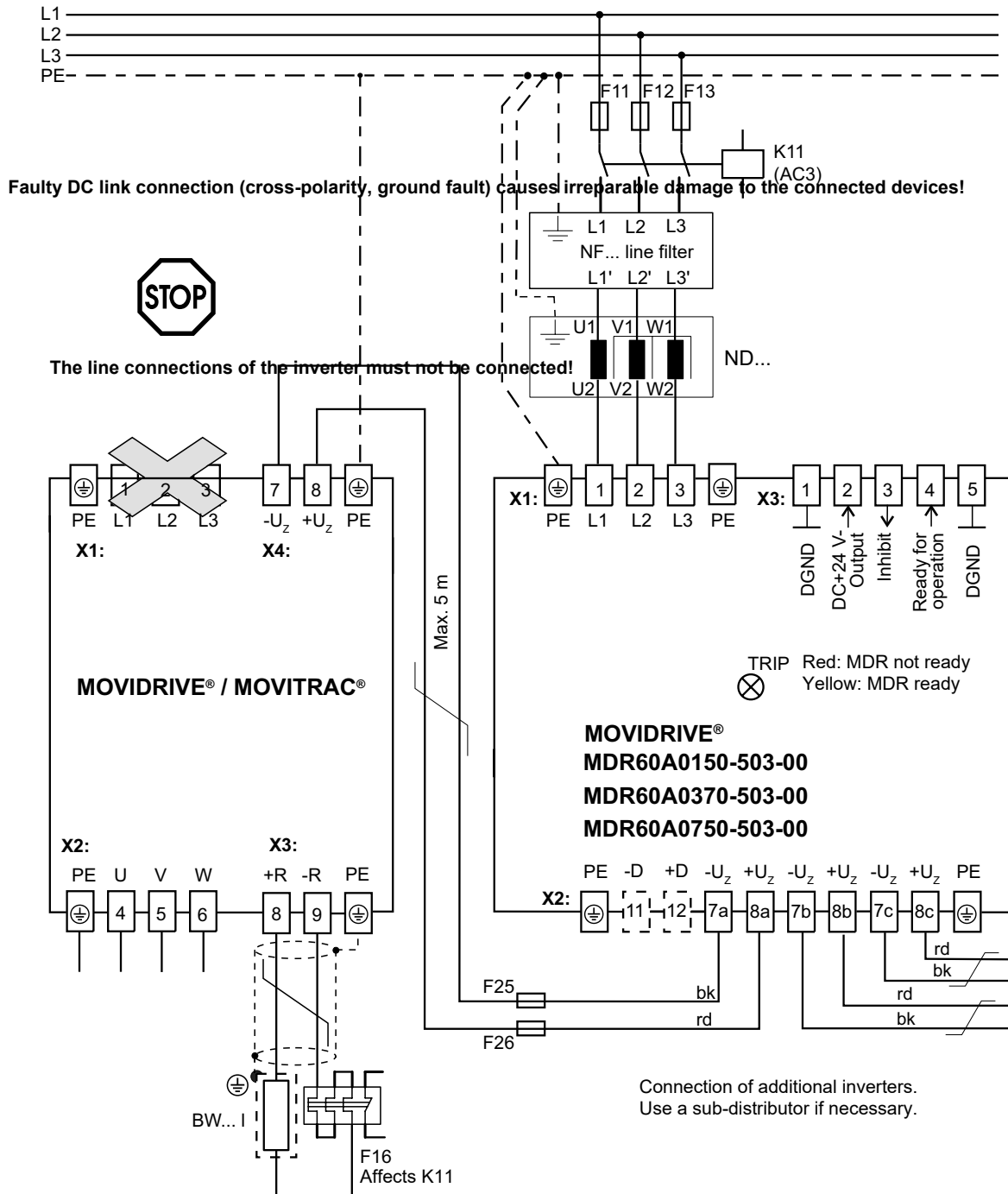
The U / V / W connections are labeled U / V / W and must be connected accordingly.

The connections L1 / L2 / L3 (brown/orange/white) can be connected in any order.



5.2.11 Connection of the regenerative power supply unit

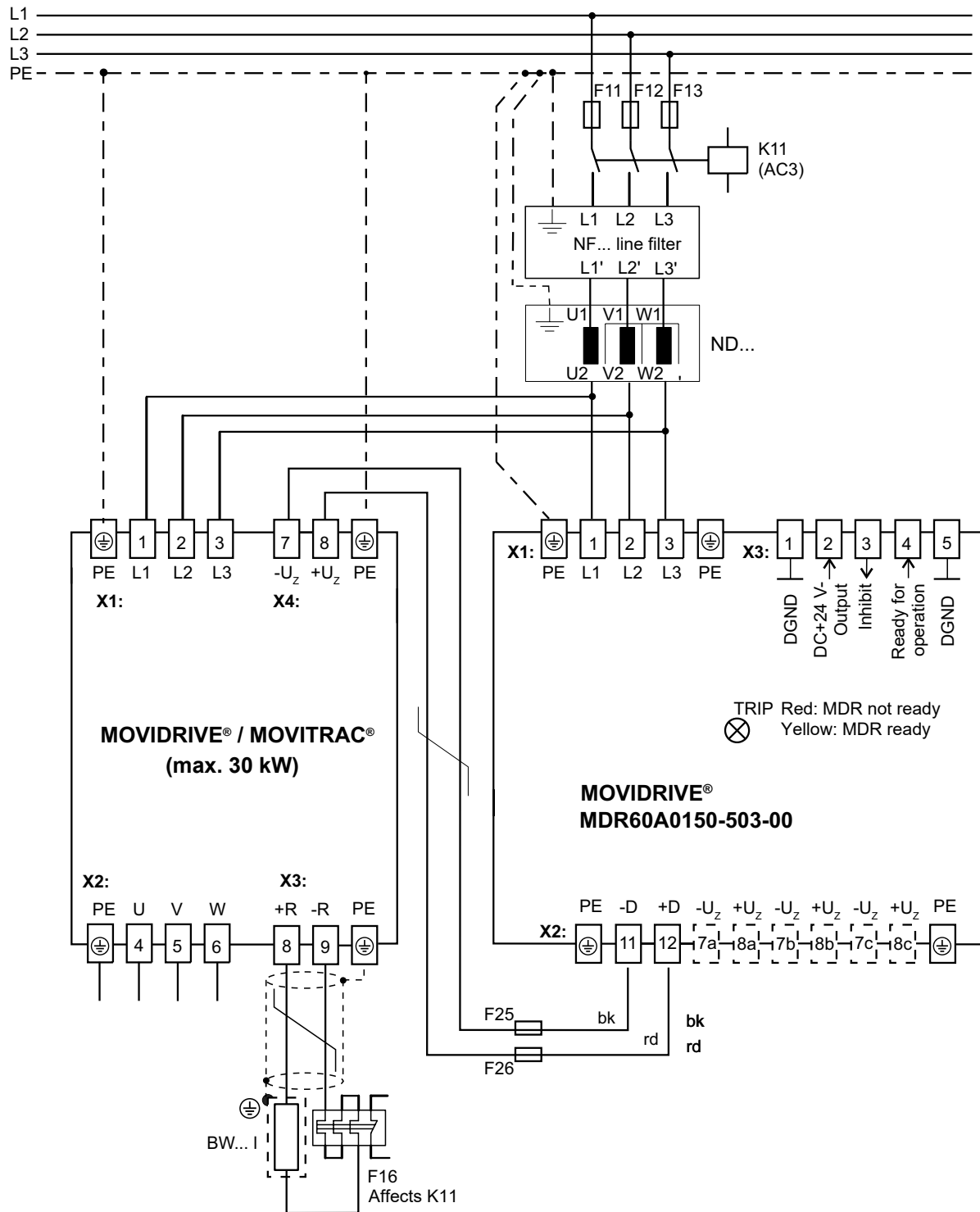
DC link connection with MDR60A0150/0370/0750 regenerative power supply unit



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DC link connection with MDR60A0150 regenerative power supply unit with brake module function



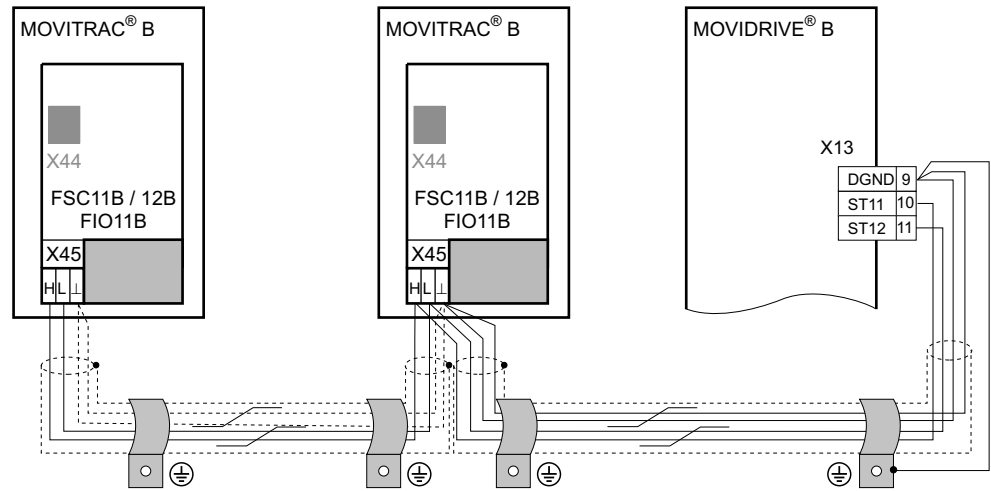
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5.2.12 Connection of RS485 interface

Installation of RS485 interface on FSC11B/12B

You can use the RS485 interface to connect a maximum of 32 devices from MOVITRAC® B with each other.

RS485 connection of MOVITRAC® B



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INFORMATION



Terminating resistor: Dynamic terminating resistors are permanently installed. **Do not connect any external terminating resistors.**

Cable length

- The total permissible cable length is 200 m.
- You must use shielded cable.

5.2.13 System bus connection (SBus 1)

Installing system bus (SBus) to FSC11B/12B/FIO21B

Max. 64 CAN bus stations can be addressed via the system bus (SBus). The SBus supports transmission technology in accordance with ISO 11898.

A terminating resistor of 120 Ω can be added via DIP switch S1 or S1:8 (bus termination).

With the FSC11B, the continuing CAN is also disconnected via X46:4::5.

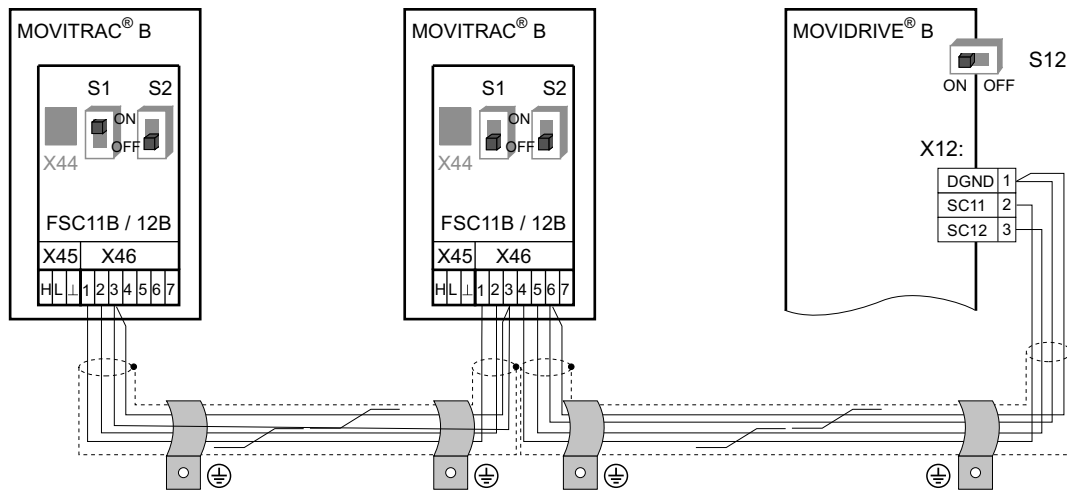
The FIO21B does not have an integrated switchable terminating resistor of 120 Ω; the enclosed resistor must be connected between X46:1 and X46:2 for bus termination.

FSC11	FSC12	FSC11/12	FSC11	FSC12
S1	S1:8	X46:1::2	X46:4::5	X46:4::5
Off		CAN 1	CAN 1	CAN 1
On		CAN 1 disconnected	—	CAN 1 disconnected

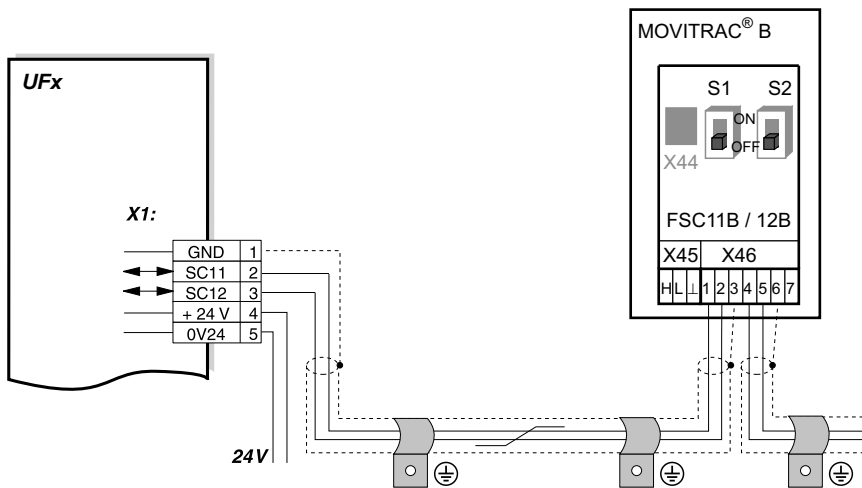
S2 is reserved on the FSC11B and must always be set to "Off".

A connection cable for the system bus connection is supplied with MOVITRAC® B with built-in option card (not with FIO21B).

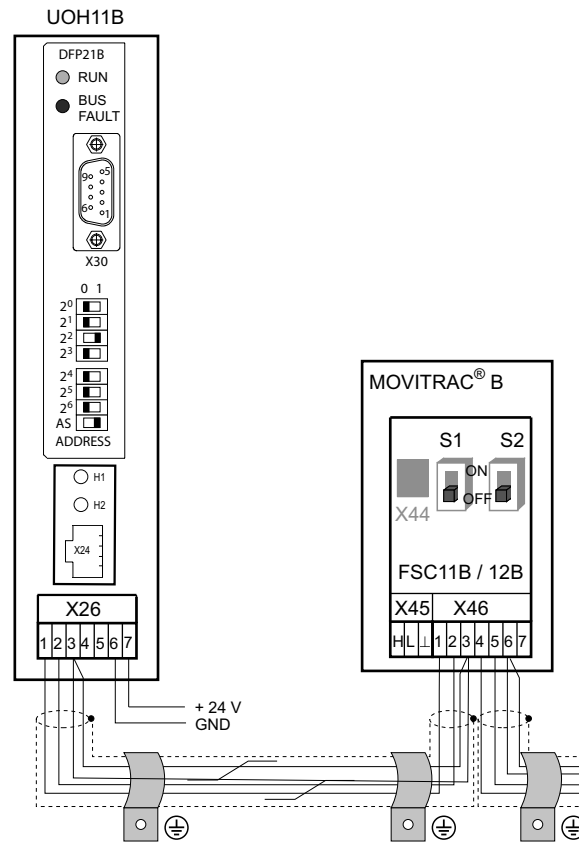
System bus connection of MOVITRAC® B



System bus connection of MOVITRAC® B with UFx



System bus connection of MOVITRAC® B with DFx/UOH11B gateways or DFx installed in MOVITRAC® B



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- The total permissible cable length depends on the set SBus baud rate (*P884*):
 - 125 kB: 500 m
 - 250 kB: 250 m
 - **500 kB: 100 m**
 - 1000 kB: 25 m
- You must use shielded conductors.

INFORMATION



- Terminating resistor: Connect the system bus terminating resistor at the beginning and end of the system bus connection (S1 = ON). For the devices in between, switch off the terminating resistor (S1 = OFF).
- Certain devices have a permanently integrated terminating resistor that cannot be switched off. This is the case with the UFx and DFx/UOH gateways; these gateways form one end of the physical phase. **Do not connect any external terminating resistors.**

Cable specification

Use a 4-core, twisted and shielded copper cable (data transmission cable with braided copper shield). The cable must meet the following specifications:

- Core cross section 0.25 – 0.75 mm²

- Line resistance 120 Ω at 1 MHz
 - Capacitance per unit length ≤ 40 pF/m at 1 kHz
- CAN bus or DeviceNet cables, for example, are suitable.

Applying the shield

- Fasten the shield to the electronics shield clamp on the inverter and the master controller and make sure it is connected over a wide area at both ends.
- When making a connection between MOVIDRIVE® B and MOVITRAC® B, always ensure that the electrical isolation between the reference potential DGND and ground at MOVIDRIVE® B is removed.

Connecting the system bus (SBus) to DFP21B

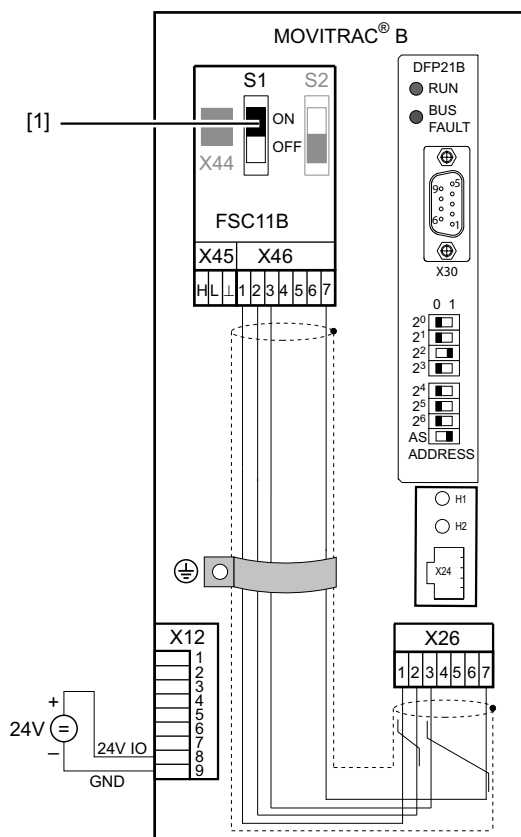
Installing the DFP21B option card in MOVITRAC® B

INFORMATION



- The MOVITRAC® B does not require a special firmware status.
- Only SEW-EURODRIVE is allowed to install or remove the option cards for MOVITRAC® B.

SBus connection



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[1] Terminating resistor activated, S1 = ON

INFORMATION



The DFP21B has an integrated SBus terminating resistor and must therefore always be installed at the beginning of the system bus connection.

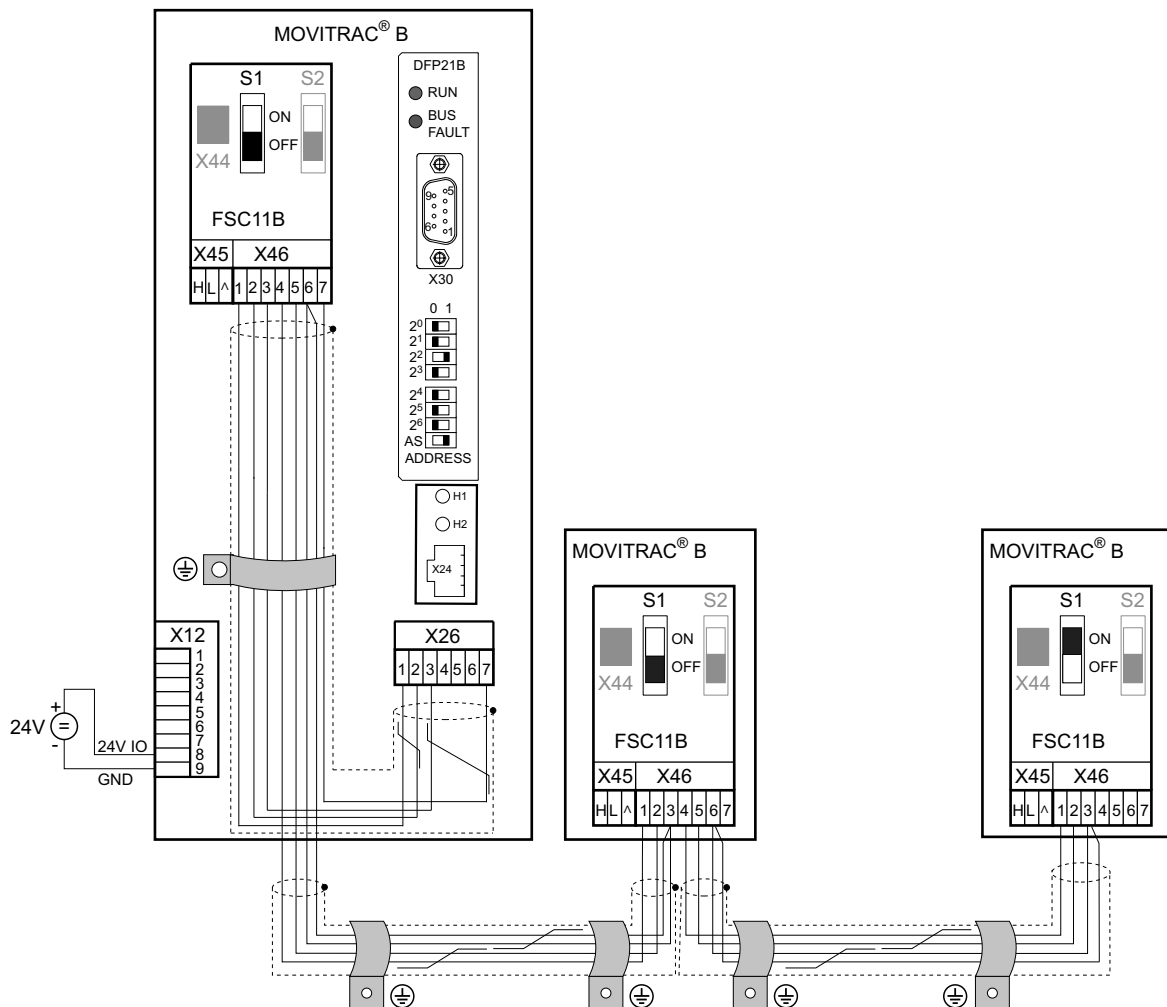
The DFP21B always has the address 0.

X46	X26	
X46:1	X26:1	SC11 SBus +, CAN high
X46:2	X26:2	SC12 SBus -, CAN low
X46:3	X26:3	GND, CAN GND
X46:7	X26:7	DC 24 V
X12		
X12:8		+24 V input
X12:9		GND reference potential of digital inputs

For easy cabling, the DFP21B can be supplied with 24 V DC voltage from X46.7 of the MOVITRAC® to X26.7.

If the DFP21B is supplied by MOVITRAC®, the MOVITRAC® itself must be supplied with 24 V DC voltage at terminals X12.8 and X12.9.

System bus connection



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DFP

GND = system bus reference
SC11 = system bus high
SC12 = system bus low

MOVITRAC® B

GND = system bus reference
SC22 = system bus outgoing low
SC21 = system bus outgoing high
SC12 = system bus incoming low
SC11 = system bus incoming high
S12 = system bus terminating resistor

Note:

- Use a 4-core, twisted and shielded copper cable (data transmission cable with braided copper shield). Connect the shield flatly on both sides of the electronics shield clamp of the MOVITRAC® and also connect the ends of the shield to GND. The cable must meet the following specifications:
 - Core cross section 0.25 – 0.75 mm²
 - Line resistance 120 Ω at 1 MHz
 - Capacitance per unit length ≤ 40 pF/m at 1 kHz
- The permitted total cable length depends on the set SBus baud rate:
 - 250 kB: 160 m
 - 500 kB: 80 m
 - 1000 kB: 40 m
- Switch on the system bus terminating resistor at the end of the system bus connection (S1 = ON). Switch off the terminating resistor on the other devices (S1 = OFF). The DFP21B gateway must always be at the beginning or end of the system bus connection and has a terminating resistor permanently installed.

INFORMATION

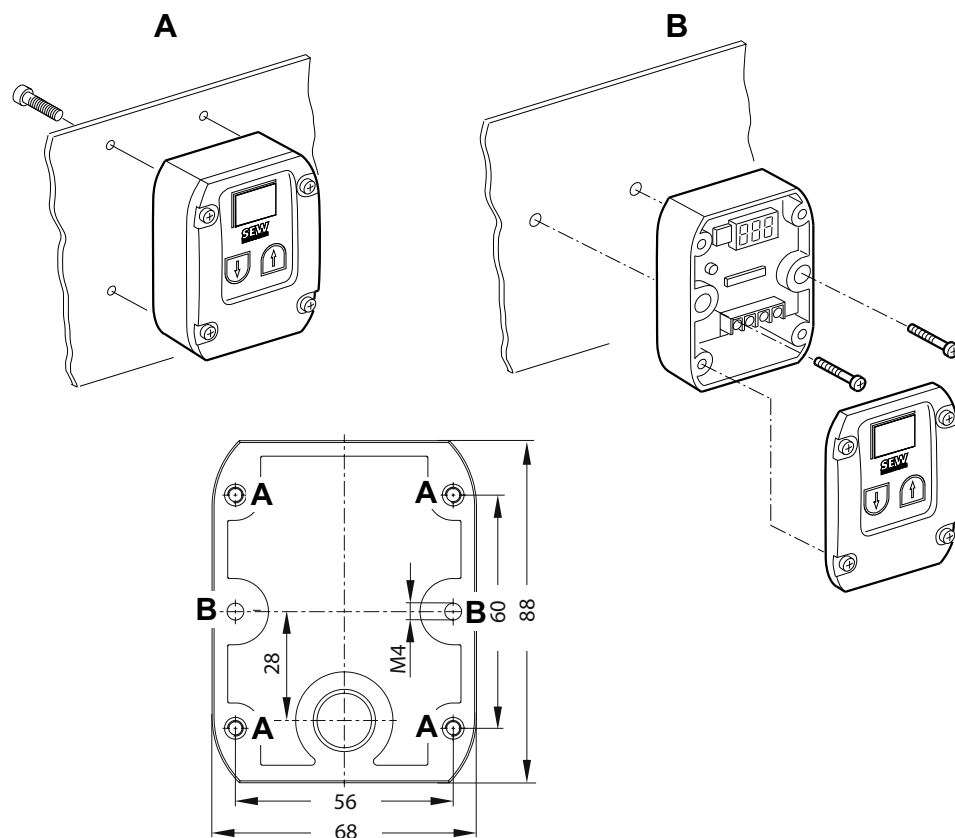


- There must be no potential shift between the devices that are connected with SBus. Take suitable measures to avoid potential shift, e.g. by connecting the device grounds using a separate cable.
- Star-shaped wiring is not permitted.

5.2.14 Setpoint adjuster connection

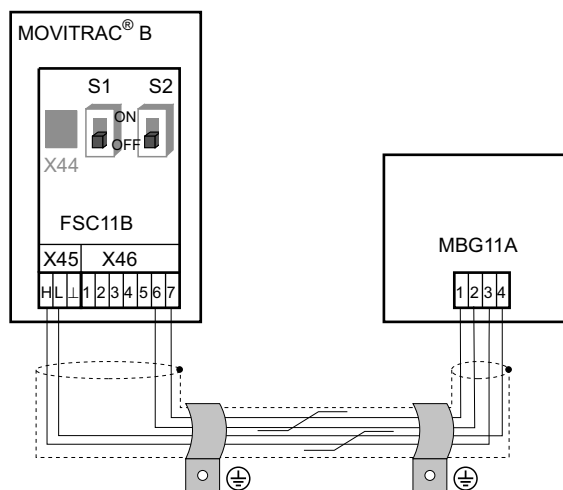
Installing the MBG11A setpoint adjuster

- A: Installation from behind via 4 tapped holes
- B: Installation from the front via 2 mounting holes



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Connection



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5.2.15 Connection of the interface adapter option UWS21B

Part number

UWS21B interface adapter option: 18204562

Scope of delivery

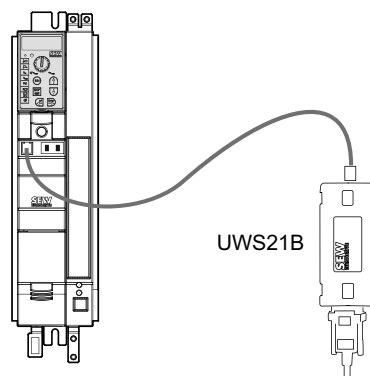
The scope of delivery for the UWS21B option includes:

- UWS21B device
- Serial interface cable with 9-pin D-sub socket and 9-pin D-sub connector for connection of UWS21B – PC
- Serial interface cable with two RJ10 connectors for connection of UWS21B – MOVITRAC®

Connecting inverter and UWS21B

- Use the connection cable supplied to connect the UWS21B to the MOVITRAC®.
- Connect the connection cable to the XT slot of the MOVITRAC®.
- Note that the DBG60B keypad and the UWS21B serial interface cannot be connected to the MOVITRAC® at the same time.
- The following image shows the connection cable for MOVITRAC® – UWS21B.

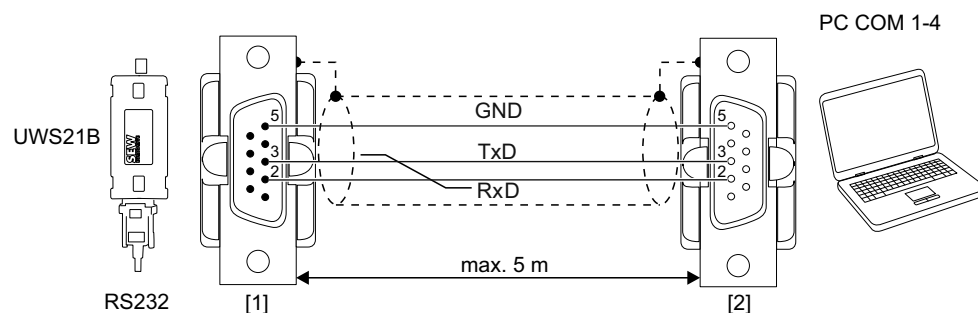
MOVITRAC® MC07B



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Connecting inverter and PC

- Use the connection cable supplied (shielded RS232 standard interface cable) to connect the UWS21B to the PC.
- The following picture shows the connection cable for UWS21B – PC (1:1 connection).

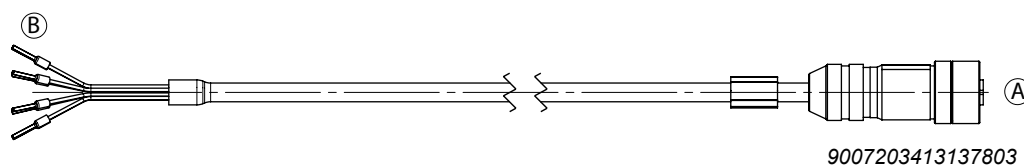


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- [1] 9-pin D-sub connector
[2] 9-pin D-sub socket

5.2.16 Built-in encoder EI7C connection

Encoder cable with an M12



Inverter connection			Motor connection side
Contact	Signal	Cable core color	Contact
X12.5 (DI04)	A	Brown (BN)	3
	A	White (WH)	4
X12.4 (DI03)	B	Yellow (YE)	5
	B	Green (GN)	6
	nc	Red (RD)	7
	nc	Blue (BU)	8
X12.8 (24VIO)	UB	Gray (GY)	1
X12.9 (GND)	GND	Pink (PK)	2

The encoder requires a current of up to 40 mA. An external 24 V supply might be required if the digital inputs are also supplied.

Part number:

Cable type	M12, conductor end sleeves
Fixed installation	1362 3273
Cable carrier installation	1362 3281

Further information can be found in the chapter "Simple positioning application module".

5.2.17 Line protection and earth-leakage circuit breaker

- Install the fuses at the beginning of the supply system cable behind the busbar branch (see wiring diagram for basic device).
- SEW-EURODRIVE recommends that you do not use residual current devices. However, if a residual current device (RCD) is stipulated for direct or indirect protection against contact, observe the following:
- **⚠ DANGER!** Wrong type of residual current device used:

Severe or fatal injuries

- The MOVITRAC® B can cause a direct current in the protective earth conductor. Where a residual current device (RCD) or a residual current monitoring device (RCM) is used for protection in the event of direct or indirect contact, only a type B RCD or RCM is permitted on the power supply side of the MOVITRAC® B.

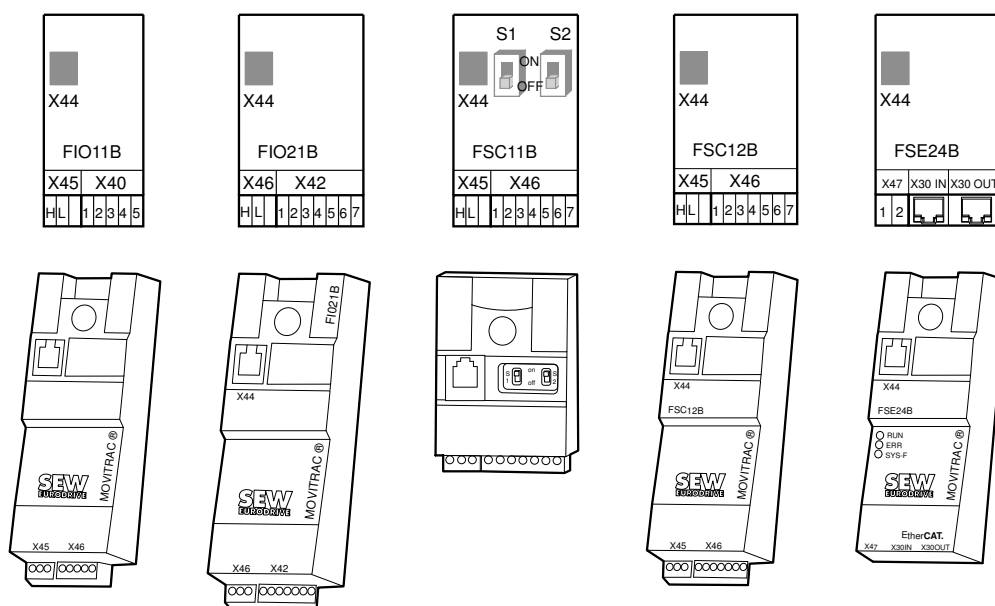
5.2.18 TF thermistor and TH bimetallic switch

The winding temperature is monitored with thermal sensors TF or bimetallic switches TH. Connect TF or TH to the TF output VOTF and TF input DI05TF of the MOVITRAC® B. Set the digital input DI05TF to TF message. Thermal monitoring is then carried out by the MOVITRAC® B; no additional monitoring device is required.

TH bimetallic switches can also be connected to 24 V IO and a digital input. Parameterize the digital input to "/External fault".

5.2.20 Installation of FIO11B/21B, FSC11B/12B, FSE24B

You can expand the basic devices with the FIO11B/21B, FSC11B/12B and FSE24B modules.



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Connection/module type	FIO11B	FIO21B	FSC11B/12B	FSE24B
	Analog module	Digital module	Communication	Communication
Analog input/output X40	Yes	No	No	No
Digital inputs X42	No	Yes	No	No
RS485 for diagnostics (RJ10) X44	Yes	Yes	Yes	Yes
RS485 terminal connection X45	Yes	No	Yes	No
SBus terminal connection X46	No	Yes	Yes	No
EtherCAT® connection (2 × RJ45) X30	No	No	No	Yes

Fastening and installation of front modules

Always screw the option to the device using the screw provided. For size 0, first fit the spacer bolt. From size 1, the bolt is already present. The screw fitting ensures the high-frequency EMC connection between the basic device and the option.

Function	Terminal	Description	Data	FIO11B	FIO21B	FSC11B/12B	FSE24B
Service interface	X44	Via RJ10 plug-in connection	For service purposes only Maximum cable length 3 m	Yes	Yes	Yes	Yes
RS485 interface	X45:H	ST11: RS485+	Connected in parallel with X44	Yes	No	Yes	No
	X45:L	ST12: RS485-					
	X45:'	GND: Reference potential					
System bus	X46:1	SC11: SBus High	CAN bus to CAN specification 2.0, parts A and B Max. 64 stations	No	Yes ¹⁾	Yes ²⁾	No
	X46:2	SC12: SBus Low					
	X46:3	GND: Reference potential					
	X46:4	SC21: SBus High		No	No	Yes ³⁾	No
	X46:5	SC22: SBus Low					
	X46:6	GND: Reference potential					
DC 24 V	X46:7	24VIO: Auxiliary voltage / external voltage supply		No	No	Yes	No

Function	Terminal	Description	Data	FIO11B	FIO21B	FSC11B/ 12B	FSE24B
DC 24 V	X47:1	24VIO: External voltage supply		No	No	No	Input only
	X47:2	GND: Reference potential					
EtherCAT®	X30:In	Via 2 RJ45 plug-in connections	Fast Ethernet	No	No	No	Yes
	X30:Out						
Analog input	X40:1	AI2: Voltage input	-10 to +10 V $R_i > 40 \text{ k}\Omega$ Resolution 10 bits Sampling cycle 5 ms Accuracy $\pm 100 \text{ mV}$	Yes	No	No	No
	X40:2	GND: Reference potential					
Analog output	X40:3	GND: Reference potential	0 to +10 V $I_{\text{max}} = 2 \text{ mA}$ 0 (4) – 20 mA Resolution 10 bits Sampling cycle 5 ms Short-circuit and supply-proof up to 30 V Accuracy $\pm 100 \text{ mV}$	Yes	No	No	No
	X40:4	AOV1: Voltage output					
	X40:5	AOI1: Current output					
Digital inputs	X42:1	DI10	$R_i = 3 \text{ k}\Omega$, $I_E = 10 \text{ mA}$, Sampling cycle 5 ms, PLC-compatible	No	Yes	No	No
	X42:2	DI11					
	X42:3	DI12					
	X42:4	DI13					
	X42:5	DI14					
	X42:6	DI15					
	X42:7	DI16					

- 1) Bus termination possible with enclosed 120Ω resistor between SC11 and SC12.
- 2) Terminating resistor 120Ω switchable via DIP switch, SC21 and SC22 are then deactivated.
- 3) Terminating resistor 120Ω switchable via DIP switch.

The potential DC 24 V of X46:7 and X47:1 is identical to X12:8 of the basic device. All GND terminals of the device are connected to each other and to PE.

Cable specification	• Use a 4-core, twisted and shielded copper cable (data transmission cable with braided copper shield). The cable must meet the following specifications: – Core cross section $0.25 - 0.75 \text{ mm}^2$ – Line resistance 120Ω at 1 MHz – Capacitance per unit length $\leq 40 \text{ pF/m}$ at 1 kHz CAN bus or DeviceNet cables, for example, are suitable.
Apply shield	• Fasten the shield to the electronics shield clamp on the inverter and the master controller and make sure it is connected over a wide area at both ends. • With a shielded cable, you can dispense with a ground connection for a connection between MOVITRAC® B and gateways or MOVITRAC® B and MOVITRAC® B. A 2-core cable is permissible in this case. • When making a connection between MOVIDRIVE® B and MOVITRAC® B, always ensure that the electrical isolation between the reference potential DGND and ground at MOVIDRIVE® B is removed.

- **⚠ CAUTION! Potential shift**

Possible consequences include malfunction or even destruction of the device.

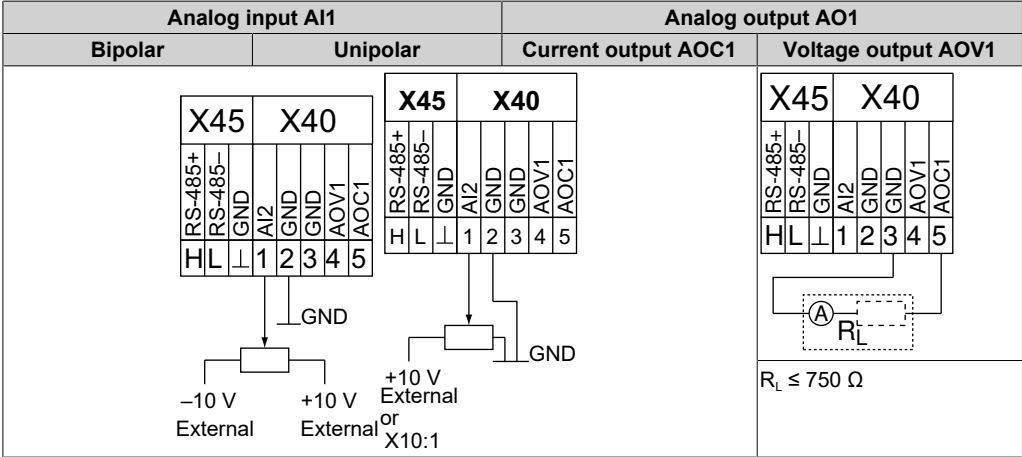
- There must be no potential shift between the connected devices. Take suitable measures to avoid potential shift, e.g. by connecting the device grounds using a separate cable.

INFORMATION

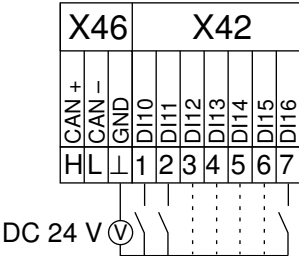


The FIO21B and FSE24B front modules require a 24 V voltage supply. If no external voltage supply is connected, parameter *P808 24VIO auxiliary voltage output* must not be switched off.

Wiring the FIO11B analog module



FIO21B digital module wiring



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6 Startup

6.1 General startup instructions



⚠ DANGER

Uncovered power connections.

Severe or fatal injuries due to electric shock.

- Install the touch guard in accordance with the regulations.
- Never start up the device if the touch guard has not been installed.

6.1.1 Requirements

The prerequisite for successful startup is the correct configuration of the drive.

MOVITRAC® B frequency inverters are factory-commissioned for the power-adapted SEW-EURODRIVE motor (4-pole, 50 Hz) in V/f control mode. This means you can commission and start the adapted motor from SEW-EURODRIVE without configuration.

6.1.2 Hoist applications



⚠ DANGER

Danger of fatal injury due to falling hoist.

Severe or fatal injuries.

- Use monitoring systems or mechanical protection devices as a safety device.

6.2 Preliminary work and resources

- Check the installation.



⚠ DANGER

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Ensure that the motor cannot start unintentionally, by removing the X12 electronics terminal block for example.
- Depending on the application, additional safety precautions must be taken to avoid injury to personnel and damage to machines, e.g. monitoring systems or mechanical protection devices.

6.2.1 Preliminary work and tools for startup with factory setting

- Connect the supply system and motor.
- Connect the signal terminals.
- Switch on the supply system.

6.2.2 Preliminary work and tools for startup with keypad or with PC

- Connect the supply system and motor. **Do not connect any signal terminals so that the inverter cannot receive an enable signal.**
- Switch on the supply system.
- Display *Stop*.
- Program the signal terminals.
- Set the parameters (e.g. ramps).
- Check the set terminal assignment (*P601 – P622*).
- Switch off the supply system.
- Connect the signal terminals.
- Switch on the supply system.

INFORMATION

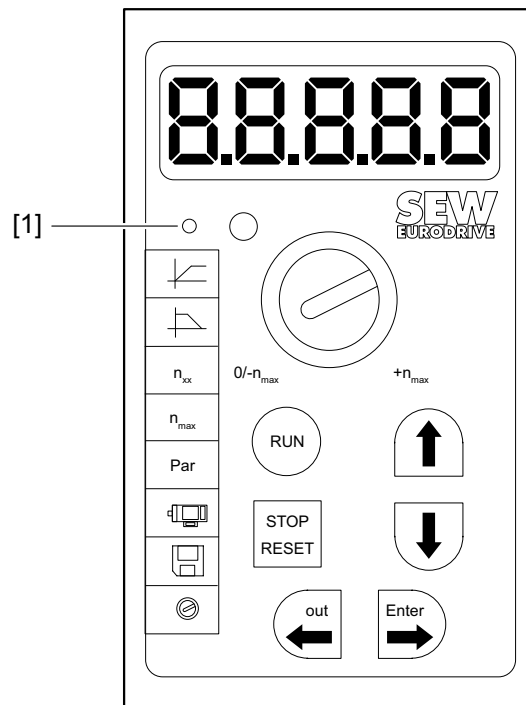


When you perform a startup, the inverter automatically changes parameter values.

6.3 Keypads

6.3.1 FBG11B – Basic keypad

Arrangement of the buttons and pictograms on the operator panel:



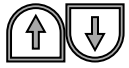
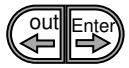
[1] LED display when IPOS^{plus}® program is started

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Keypad functions

The UP/DOWN/OUT/ENTER buttons are used for menu navigation. The RUN and STOP/RESET buttons are used to control the drive. The setpoint adjuster is used for setpoint input.

	UP/DOWN to select the symbols and change values.
	OUT/ENTER to activate and deactivate the symbols or parameter menus
	RUN to start the drive.
	STOP/RESET to reset errors and stop the drive.

The STOP/RESET button has priority over a terminal enable or an enable via interface. If you stop a drive with the STOP/RESET button, you must enable it again with the RUN button.

INFORMATION



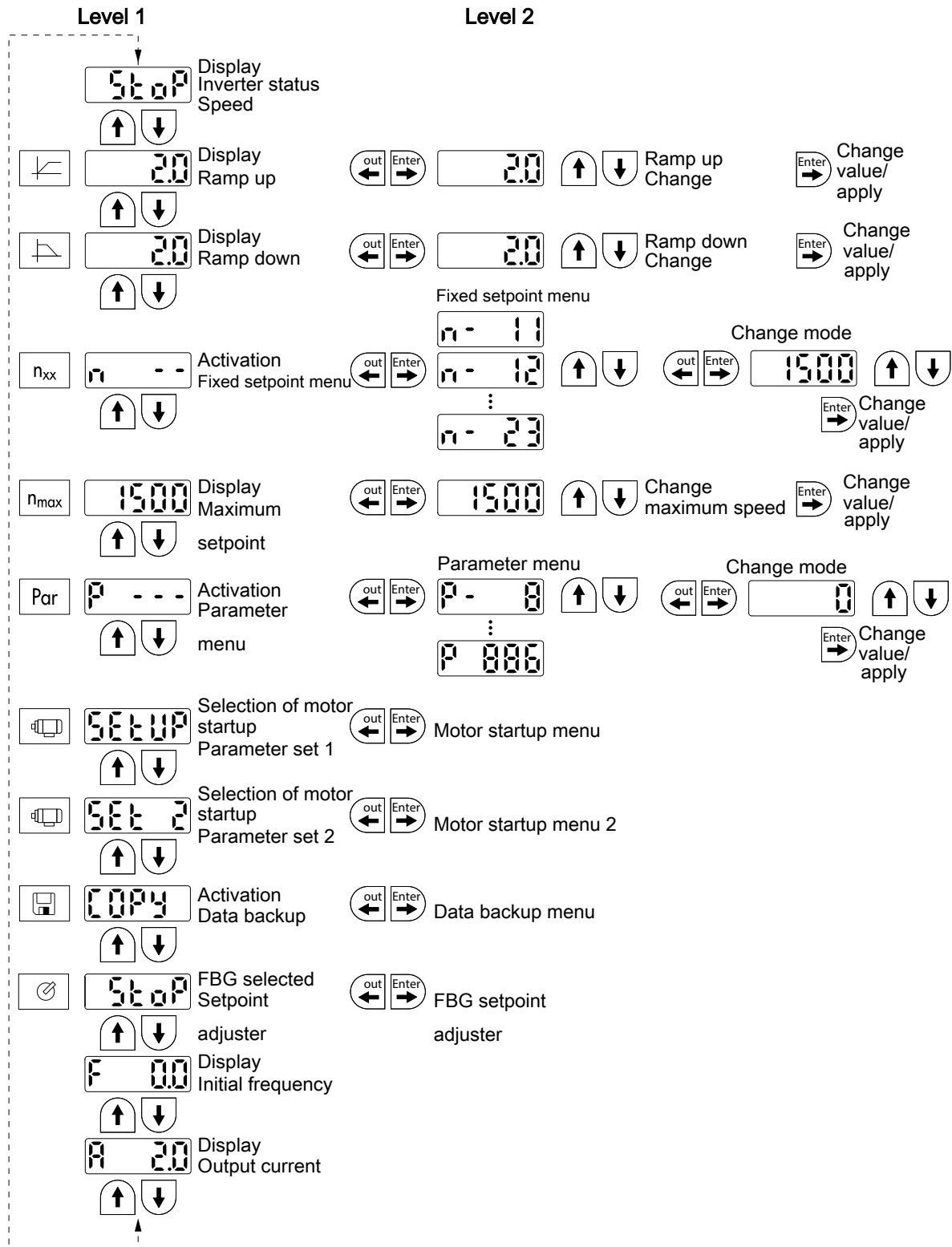
After power off, the interlocking is canceled by the STOP/RESET button.

After an error has occurred and the programmed error response, you can perform a reset using the STOP/RESET button. The drive is then locked and you must enable it with the RUN button. You can use parameter *P760* to deactivate the stop function via FBG11B.

If you stop the drive with the STOP/RESET button, the display flashes *stop*. This indicates that you must enable the drive with the RUN button.

After copying the parameter set to the inverter, the device is also stopped.

Basic operation of the FBG11B keypad



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Menu system

When you select a symbol, the LED integrated in the symbol lights up. With icons that only represent display values, the current display value appears on the display.

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Changing parameters

After selecting a symbol and pressing the ENTER key, you can select the desired parameter.

To change the parameter value, press the ENTER key once again. The flashing of the value and the LED in the corresponding symbol indicates that you can now change the value. Push the ENTER key once more and the value becomes active and stops flashing.

Status display

If the status is "Drive enabled", the display shows the calculated actual speed.

Fault display

If an error occurs, the display changes and flashes with the error code, e.g. F-11, see error list in chapter "Service/error list" (→ 126). However, this is not the case when startup is active.

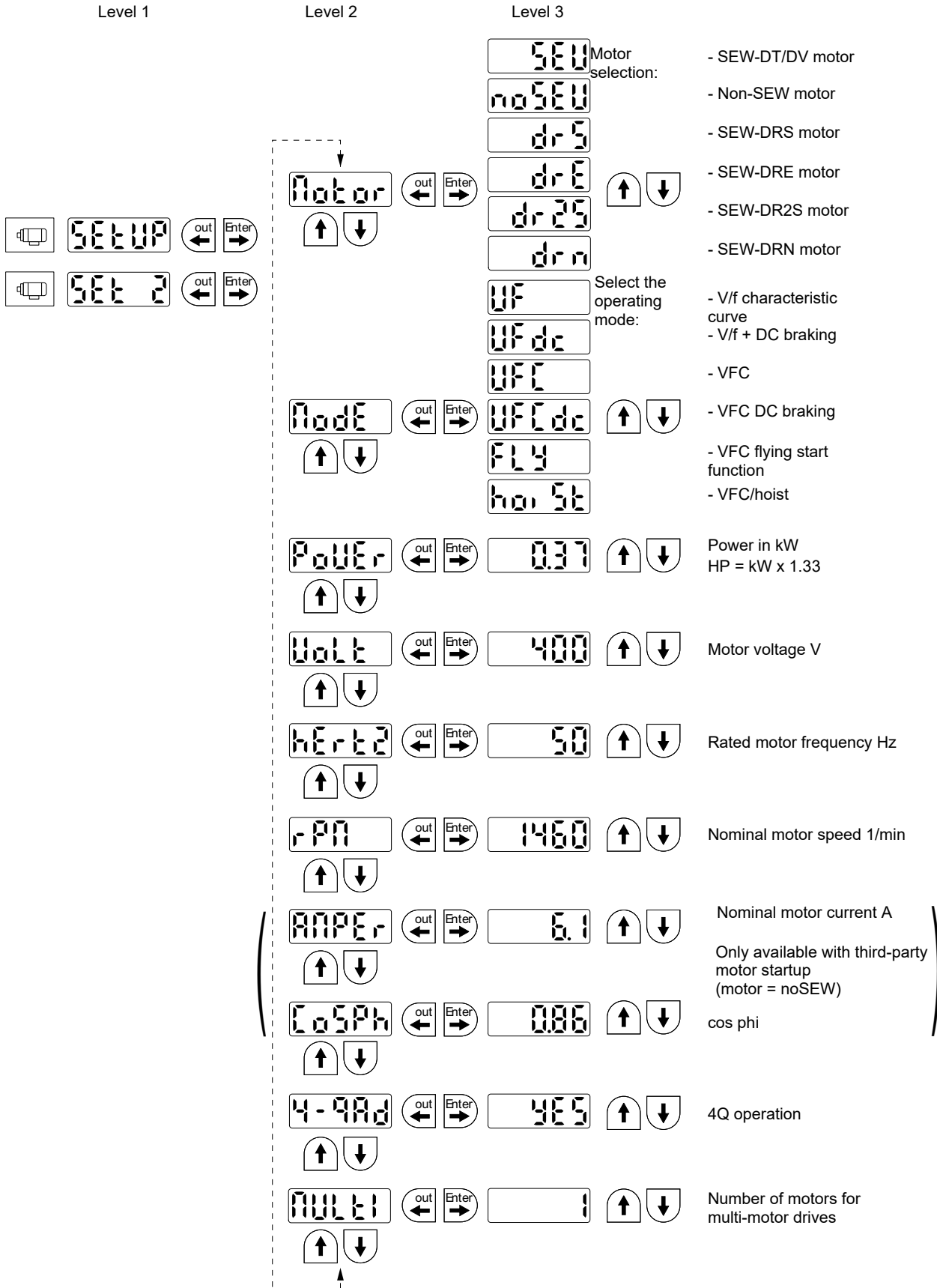
Warnings

Some parameters are not allowed to be changed in all operating states. If you try it anyway, the following is displayed r-19 – r-32. The display shows a code corresponding to the respective action, e.g. r-28 (controller inhibit required). You can find the list of information in the chapter "Operation".

Parameter menu change short ↔ long

You can switch between the quick menu and complete menu via the parameter P800. The parameter description and parameter list indicate which parameters are accessible via the short and long menus.

Startup using the FBG11B keypad



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Required data

The following data is required for successful startup:

- Motor type (SEW motor or third-party motor)
- Motor data
 - Nominal voltage and nominal frequency.
 - Additionally with third-party motor: Nominal current, nominal power, power factor $\cos\phi$ and nominal speed.
- Nominal line voltage

Activating startup

Requirements:

- Drive "No enable": Stop

If you connect a smaller or larger motor (maximum one type step difference), you must select the value that comes closest to the rated motor power.

The complete startup is only completed when you return to the main menu level with the OUT button.

INFORMATION



The SEW-EURODRIVE motor startup is designed for 4-pole motors. It might be advisable to commission 2-pole or 6-pole SEW-EURODRIVE motors as third-party motors.

Multi-motor drive startup

Multi-motor drives are mechanically coupled to each other, e.g. chain drive with several motors.

Group drive startup

Group drives are mechanically decoupled from each other (e.g. different conveyor belts). In this operating mode, the inverter operates without slip compensation and with a constant V/f ratio.

Observe the information in the "MOVIDRIVE® multi-motor drives" manual.

Startup with large load mass moment of inertia, such as with pumps and fans

The slip compensation is designed for a ratio of load moment of inertia to motor moment of inertia of smaller than 10. If the ratio is greater and the drive vibrates, then the slip compensation must be reduced and possibly even set to 0.

Manual operation with FBG11B setpoint adjuster

FBG11B Setpoint adjuster of the operator panel (local manual mode): LED  flashes

The only relevant variables in the "FBG setpoint adjuster" operating mode are:

- *P122 Direction of rotation FBG manual mode*
- RUN key and STOP / RESET key
- Setpoint adjuster (potentiometer)

When the FBG setpoint adjuster is activated, the symbol flashes.

You can limit the minimum speed with *P301 Minimum speed* and the maximum speed with the symbol $n_{\max}$.

After an error, you can perform a reset using the STOP / RESET key via the terminal or the interface. After the reset, the "manual setpoint adjuster" operating mode is active again. The drive remains stopped.

The display *Stop* flashes as an indication that you must re-enable the drive with the RUN key.

The parameter *P760 Interlocking RUN / STOP keys* is ineffective in the "manual setpoint adjuster" operating mode.

Removing FBG11B operator panel triggers a stop response.

6.3.2 Startup with DBG60B keypad

General information

Startup with the DBG60B keypad is only possible in operating modes VFC and V/f. Startup in CFC and SERVO operating modes is only possible using the MOVITOOLS® MotionStudio engineering software.

Required data

The following data is required to ensure startup is successful:

- Motor type (SEW-EURODRIVE or third-party motor)
- Motor data
 - Nominal voltage and nominal frequency.
 - Additionally for third-party motors: Nominal current, nominal power, power factor $\cos \varphi$ and nominal speed.
- Nominal line voltage

The following data is also needed for startup with a speed controller:

- Encoder type and encoder resolution:
- Motor data
 - SEW-EURODRIVE motor: Brake yes or no and flywheel fan (Z fan) yes or no.
 - Third-party motor: Mass moment of inertia of motor, brake and fan
- Stiffness of the closed-loop control system (factory setting = 1; suitable for most applications)

If the drive tends to oscillate → setting < 1

Transient recovery time is too long → setting > 1

Recommended setting range: 0.80 – 1 – 1.10 (factory setting = 1)

- Converted mass moment of inertia of the load (gear unit + driven machine) on the motor shaft.
- Time required for the shortest ramp

INFORMATION



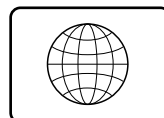
- Activate encoder monitoring (P504 = "ON") after completing the startup. The function and voltage supply of the encoder will then be monitored.
- If a Hiperface® encoder is connected, it is always monitored regardless of the setting of parameter P504. Encoder monitoring is not a safety function!

Choose the required language

The following text appears on the display when the keypad is switched on for the first time or after activating the start mode:

SEW
EURODRIVE

The symbol for language selection then appears on the display.



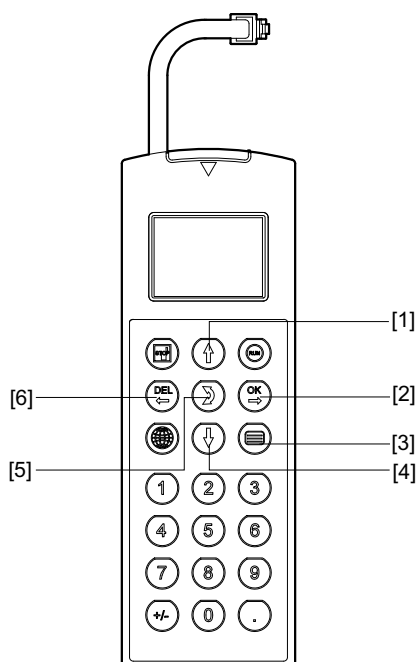
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Proceed as follows to select the language:

- Press the  key. A list of available languages is displayed on the screen.
- Choose the desired language using the  /  keys.
- Confirm your language selection by pressing the  key. The basic display is now shown in your chosen language.

Startup

The figure below shows the keys required for startup.



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- | | | | |
|-----|-----|---|---|
| [1] | Key |  | Move up to the next menu item |
| [2] | Key |  | Confirm entry |
| [3] | Key |  | Activate the context menu |
| [4] | Key |  | Move down to the next menu item |
| [5] | Key |  | Change the menu, display mode ↔ edit mode |
| [6] | Key |  | Cancel or abort startup |

Startup procedure

INFORMATION



This example refers to a 400 V device from (MOVIDRIVE®).

1. Apply "0" signal to terminal X13:1 (DIØØ "/>CONTROLLER INHIBIT"), e.g. by disconnecting electronics terminal block X13.
 - ⇒ 0.00 1/min
 - ⇒ 0.000 amp
 - ⇒ CONTROLLER INHIBIT
2. Activate the context menu by pushing the button.
 - ⇒ BASIC DISPLAY
 - ⇒ PARAMETER MODE
 - ⇒ VARIABLE MODE
3. Scroll down using the button until the menu item "STARTUP" is selected.
 - ⇒ MANUAL MODE
 - ⇒ STARTUP
 - ⇒ COPY TO DBG
 - ⇒ COPY TO MCB
4. Press the button to start the startup. The first parameter appears. The operator panel is in display mode, indicated by the flashing cursor under the parameter number.
 - ⇒ STARTUP IS BEING PREPARED
5. Use the button to switch to edit mode. The flashing cursor disappears.
 - ⇒ C00*STARTUP
6. Use the button or the button to select "PARAMETER SET 1" or "PARAMETER SET 2".
 - ⇒ **PARAMETER SET 1**
 - ⇒ PARAMETER SET 2
7. Confirm your selection with the button.
8. Use the button to switch back to display mode. The flashing cursor appears again.
9. Use the button to select the next parameter.
10. Set whether it is a single motor or group drive. Use the button to select the next parameter.
 - ⇒ C22*MOTORS
 - ⇒ **SINGLE MOTOR**
 - ⇒ IDENT. MOTORS
11. Set the desired operating mode. Use the button to select the next parameter.
 - ⇒ C26 OPERATING MODE1
 - ⇒ STANDARD V/F

- ⇒ **VFC**
12. Set whether an encoder is to be evaluated. Use the  button to select the next parameter.
- ⇒ C29*Encoder
- ⇒ **NO**
- ⇒ YES
13. Set the desired operating mode. Use the context menu button to select the next parameter.
- ⇒ C36*OPER. MODE
- ⇒ **SPEED CONTROL**
- ⇒ HOIST
14. Select the motor type. If the motor is not listed, select the list "THIRD-PARTY MOTOR".
- ⇒ C02*MOTOR TYPE 1
- ⇒ DRN80M42
- ⇒ **DRN90S4**
- ⇒ DRN90L4
15. Use the context menu button to select the next parameter.
- ⇒ C02*MOTOR TYPE 1
- ⇒ **THIRD-PARTY MOTOR**
- ⇒ DT63K4/DR63S4
16. Enter the nominal motor voltage for the selected connection type according to the motor's nameplate.
- ⇒ C03* V
- ⇒ NOMINAL MOTOR VOLT.1
- ⇒ 400 000

Example: Nameplate 230^Δ / 400[☆] 50 Hz

↘ circuit → Enter "400 V".

△ circuit → Enter "230 V".

The full torque up to 87 Hz is available in △ connection, as voltage reserves are present (400 V device). After startup, first set parameter P302 "MAXIMUM SPEED 1" to the value 87 Hz, then start the drive.

Example: Nameplate 400^Δ/690[☆] 50 Hz

△ circuit → Enter "400 V".

↘ connection not useful. The motor would be subject to field weakening as of 28 Hz.

17. Use the  button to select the next parameter.

11. Enter the nominal frequency specified on the motor nameplate.

Example: 230^Δ/400[↘] 50 Hz

Enter "50 Hz" in ↘ and △ circuit.

Use the  button to select the next parameter.

C04* Hz
NOMINAL MOTOR
FREQ.1
50 000

FOR SEW-MOTORS	
12. The motor values for 2 and 4-pole SEW motors are stored and do not need to be entered.	
FOR THIRD-PARTY MOTORS	
12. Enter the following motor nameplate data: - C10* Nominal motor current, observe connection type (⋈ or Δ). - C11* Nominal motor power - C12* Power factor cos φ - C13* Nominal motor speed Use the context menu button to select the next parameter.	C10 – C13 "Value"
13. Choose between 4Q or 2Q operation: select the next parameter using the context menu button.	C47*4Q OPERATION NO YES
14. Enter the nominal voltage of the supply system (C05* for SEW motor, C14* for third-party motor). Use the context menu button to select the next parameter.	C05*/C14* V NOMINAL SUPPLY VOLT. 400 000
15. If no TF/TH is connected to X10:1/2 or X15 → set "NO RESPONSE". If a TF/TH is connected, set the desired error response. To select the sensor, you must set <i>P530 Sensor type 1</i> after startup.	835* RESP.TF-MESS NO RESPONSE DISPLAY ERRORS
16. Start the calculation of the startup data with "YES". The process takes a few seconds.	C06*CALCULATION NO YES
FOR SEW-MOTORS	
17. The calculation is performed. Once the calculation has been completed, the system automatically switches to the next menu item.	C08*SAVE NO YES

FOR THIRD-PARTY MOTORS	
17. For third-party motors, a calibration process is necessary for the calculation: - When prompted, send a "1" signal to terminal X13:1 (DIØØ "/CONTROLLER INHIBIT"). - After the calibration process has been completed, return the "0" signal to terminal X13:1. - Once the calculation has been completed, the system automatically switches to the next menu item.	C46*Calibration procedure?→ Skip? Cxx*Calibrate?→ All DI to 0

18. Set "SAVE" to "YES". The data (motor parameters) are copied to the non-volatile memory of the MOVIDRIVE®.
19. The startup is complete. Use the  key to return to the context menu.
20. Scroll down using the  button until the "EXIT" menu item is selected.
21. Confirm with the  button. The basic display appears.

STARTUP
DATA BEING
COPIED...

MANUAL MODE
STARTUP
COPY TO DBG
COPY TO MDX

SIGNATUR.
EXIT
BASIC DISPLAY

0.00rpm
0.000Amp
CONTROLLER IN-
HIBIT

Starting up the speed controller

Startup is performed without the speed controller first (→ section "Startup procedure, steps 1 through 17").

1. The selected operating mode is displayed. If the setting is correct, go to the next menu item.
2. Select the correct encoder type.
3. Set the correct encoder resolution.

C00*STARTUP
PARAMETER SET
2
VFC n-control

C15*ENCODER
TYPE
INCREM. ENCOD.
TTL
SINE ENCODER
RESERVED

C16*ENC. RES-
OLUT.
512 inc
1024 inc
2048 inc

FOR MOTORS FROM SEW-EURODRIVE

4. Enter whether the motor has a brake.

C17*BRAKE
WITHOUT
WITH

5. Set the stiffness of the closed-loop control system.
If the drive tends to oscillate → setting < 1
Transient recovery time is too long → setting > 1
Recommended setting range: 0.90 – 1 – 1.10

C18*
STIFFNESS
1.000

6. Enter whether the motor has a flywheel fan (Z fan).

C19*Z FAN
WITHOUT
WITH

FOR THIRD-PARTY MOTORS

4. Enter the moment of inertia of the motor.

D00*
J0 OF THE MOTOR
4.600

5. Set the stiffness of the closed-loop control system.
If the drive tends to oscillate → setting < 1
Transient recovery time is too long → setting > 1
Recommended setting range: 0.90 – 1 – 1.10

C18*
STIFFNESS
1.000

6. Enter the moment of inertia of the brake and fan.

D00*
J BRAKE+FAN
1.000

7. Enter the mass moment of inertia of the load (gear unit + driven machine) extrapolated for the motor shaft.

C20* 10e-4kgm²
LOAD MOMENT OF
INERTIA
0.200

8. Enter the time for the shortest ramp you want.

C21* s
SHORTEST RAMP
0.100

9. Start the calculation for the startup data by choosing "YES". The process lasts a few seconds.

C06*CALCULA-
TION
NO
YES

10. The calculation is performed. After calculation, the next menu item appears automatically.

C06*SAVE
NO
YES

11. Set "SAVE" to "YES". The data (motor parameters) are copied to the non-volatile memory of MOVIDRIVE®.

STARTUP
DATA IS
BEING COPIED...

12. The startup procedure is now complete. Use the  key to return to the context menu.

MANUAL MODE
STARTUP
COPY TO DBG
COPY TO MDX

13. Press the  key to scroll down until the menu item "EXIT" is selected.

SIGNATURE
QUIT
BASIC VIEW

14. Confirm your selection using the  key. The basic display appears.

0.00rpm
0.000Amp
CONTROLLER IN-
HIBIT

- Once startup is complete, copy the parameter set from MOVIDRIVE® to the DBG60B keypad. You have the following options:
 - In the context menu, select the menu item "COPY TO DBG". Confirm your selection using the  key. The parameter set is copied from MOVIDRIVE® to the DBG60B.
 - In the context menu, select the menu item "PARAMETER MODE". Select parameter P807 "MDX → DBG". The parameter set is copied from MOVIDRIVE® to the DBG60B.
- The parameter set can now be copied to other MOVIDRIVE® devices using the DBG60B. Plug the DBG60B keypad into the other inverter. You have the following options to copy the parameter set from DBG60B to another inverter:
 - In the context menu of the new inverter, choose the "COPY TO MDX" menu item and confirm your entry using the  key. The parameter set is copied from DBG60B to MOVIDRIVE®.
 - In the context menu, select the menu item "PARAMETER MODE". Select parameter P806 "DBG → MDX". The parameter set is copied from DBG60B to MOVIDRIVE®.

⚠ WARNING

Parameter settings incorrect due to unsuitable data sets.

Severe or fatal injuries.

- In the case of third-party motors, set the correct brake application time (P732 / P735).
- Observe the notes for starting the motor in the section "Starting the Motor" (→ page 102).
- Activate encoder monitoring for TTL and sin/cos encoders (P504 = "ON"). **Encoder monitoring is not a safety function.**



Starting up the speed controller

Startup is performed without the speed controller first (→ section "Startup procedure, steps 1 through 17").

1. The selected operating mode is displayed. If the setting is correct, go to the next menu item.

C00*STARTUP
PARAMETER SET
2
VFC n-control

2. Select the correct encoder type.

C15*ENCODER
TYPE

INCREM. ENCOD.
TTL
SINE ENCODER
RESERVED

3. Set the correct encoder resolution.

C16*ENC. RES-
OLUT.

512 inc
1024 inc
2048 inc

FOR MOTORS FROM SEW-EURODRIVE

4. Enter whether the motor has a brake.

C17*BRAKE

WITHOUT
WITH

5. Set the stiffness of the closed-loop control system.
If the drive tends to oscillate → setting < 1
Transient recovery time is too long → setting > 1
Recommended setting range: 0.90 – **1** – 1.10

C18*
STIFFNESS
1.000

6. Enter whether the motor has a flywheel fan (Z fan).

C19*Z FAN

WITHOUT
WITH

FOR THIRD-PARTY MOTORS

4. Enter the moment of inertia of the motor.

D00*
J0 OF THE MOTOR
4.600

5. Set the stiffness of the closed-loop control system.
If the drive tends to oscillate → setting < 1
Transient recovery time is too long → setting > 1
Recommended setting range: 0.90 – **1** – 1.10

C18*
STIFFNESS
1.000

6. Enter the moment of inertia of the brake and fan.	D00* J BRAKE+FAN 1.000
7. Enter the mass moment of inertia of the load (gear unit + driven machine) extrapolated for the motor shaft.	C20* 10e-4kgm ² LOAD MOMENT OF INERTIA 0.200
8. Enter the time for the shortest ramp you want.	C21* s SHORTEST RAMP 0.100
9. Start the calculation for the startup data by choosing "YES". The process lasts a few seconds.	C06*CALCULATION NO YES
10. The calculation is performed. After calculation, the next menu item appears automatically.	C06*SAVE NO YES
11. Set "SAVE" to "YES". The data (motor parameters) are copied to the non-volatile memory of MOVIDRIVE®.	STARTUP DATA IS BEING COPIED...
12. The startup procedure is now complete. Use the  key to return to the context menu.	MANUAL MODE STARTUP COPY TO DBG COPY TO MDX
13. Press the  key to scroll down until the menu item "EXIT" is selected.	SIGNATURE QUIT BASIC VIEW
14. Confirm your selection using the  key. The basic display appears.	0.00rpm 0.000Amp CONTROLLER INHIBIT
- Once startup is complete, copy the parameter set from MOVIDRIVE® to the DBG60B keypad. You have the following options: - In the context menu, select the menu item "COPY TO DBG". Confirm your selection using the  key. The parameter set is copied from MOVIDRIVE® to the DBG60B.	

- In the context menu, select the menu item "PARAMETER MODE". Select parameter P807 "MDX → DBG". The parameter set is copied from MOVIDRIVE® to the DBG60B.
- The parameter set can now be copied to other MOVIDRIVE® devices using the DBG60B. Plug the DBG60B keypad into the other inverter. You have the following options to copy the parameter set from DBG60B to another inverter:
 - In the context menu of the new inverter, choose the "COPY TO MDX" menu item and confirm your entry using the  key. The parameter set is copied from DBG60B to MOVIDRIVE®.
 - In the context menu, select the menu item "PARAMETER MODE". Select parameter P806 "DBG → MDX". The parameter set is copied from DBG60B to MOVIDRIVE®.

WARNING



Parameter settings incorrect due to unsuitable data sets.

Severe or fatal injuries.

- In the case of third-party motors, set the correct brake application time (P732 / P735).
- Observe the notes for starting the motor in the section "Starting the Motor" (→ page 102).
- Activate encoder monitoring for TTL and sin/cos encoders (P504 = "ON"). **Encoder monitoring is not a safety function.**

Setting parameters

Proceed in this order to set the parameters:

- Use the  key to call up the context menu. In the context menu, select the "PARAMETER MODE" menu item. Press the  key to confirm your selection. The flashing cursor under the parameter number indicates that the keypad is in parameter mode.
- Use the  key to switch to edit mode. The flashing cursor disappears.
- Pressing the  or  key, you can select or set the correct parameter value.
- Press the  key to confirm the selection or setting.
- Press the  key to switch back to parameter mode again. The flashing cursor appears again.
- Press the  key to choose the next parameter.

Manual mode

The manual mode function is used to control the inverter via the DBG60B/ MOVITOOLS® MotionStudio keypad (Context menu → Manual mode). During manual mode, the 7-segment display on the device shows "H".

The digital inputs, with the exception of X13:1 (DIØØ "/Controller inhibit"), are then ineffective for the duration of manual mode. The digital input X13:1 (DIØØ "/Controller inhibit") must receive a "1" signal so that the drive can be started in manual mode. With X13:1 = "0", the drive can also be stopped in manual mode.

The direction of rotation is not determined by the digital inputs "CW/stop" or "CCW/stop", but by selecting the direction of rotation via the DBG60B/MOVITOOLS® MotionStudio keypad. To do this, enter the desired speed and the desired direction of rotation (+ = CW / - = CCW) using the sign button (+/-).

Manual mode remains active even after power off and power on, but the inverter is then disabled. Press the "Run" button to enable and start with n_{min} in the selected direction of rotation. You can increase or decrease the speed using the ↑ and ↓ buttons.



INFORMATION

If manual mode is ended, the signals at the digital inputs are effective immediately; the digital input X13:1 (DIØØ) /Controller inhibit does not have to be switched "1"- "0"- "1". The drive can start according to the signals at the digital inputs and set-point sources.



⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

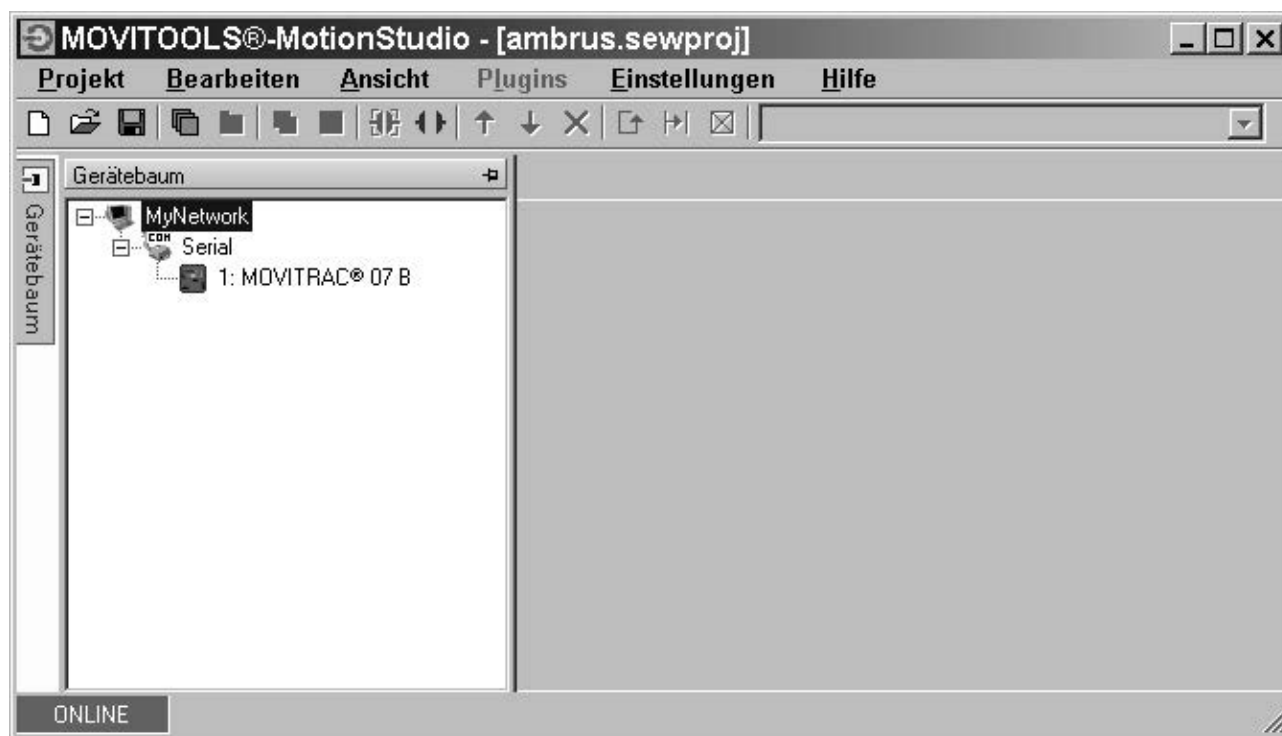
- Ensure that the motor cannot start unintentionally, by removing the X13 signal terminal block for example.
- Depending on the application, additional safety precautions must be taken to avoid injury to personnel and damage to machines.

6.4 MOVITOOLS® MotionStudio engineering software

Start MOVITOOLS® MotionStudio via the Windows start menu:

Programs / SEW / MOVITOOLS MotionStudio / MotionStudio

You can use the [Scan] button to list all connected devices in the device tree with MOVITOOLS® MotionStudio.



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By clicking the right mouse button on one of the devices, for example, you can carry out the startup. Further information can be found in the online help.

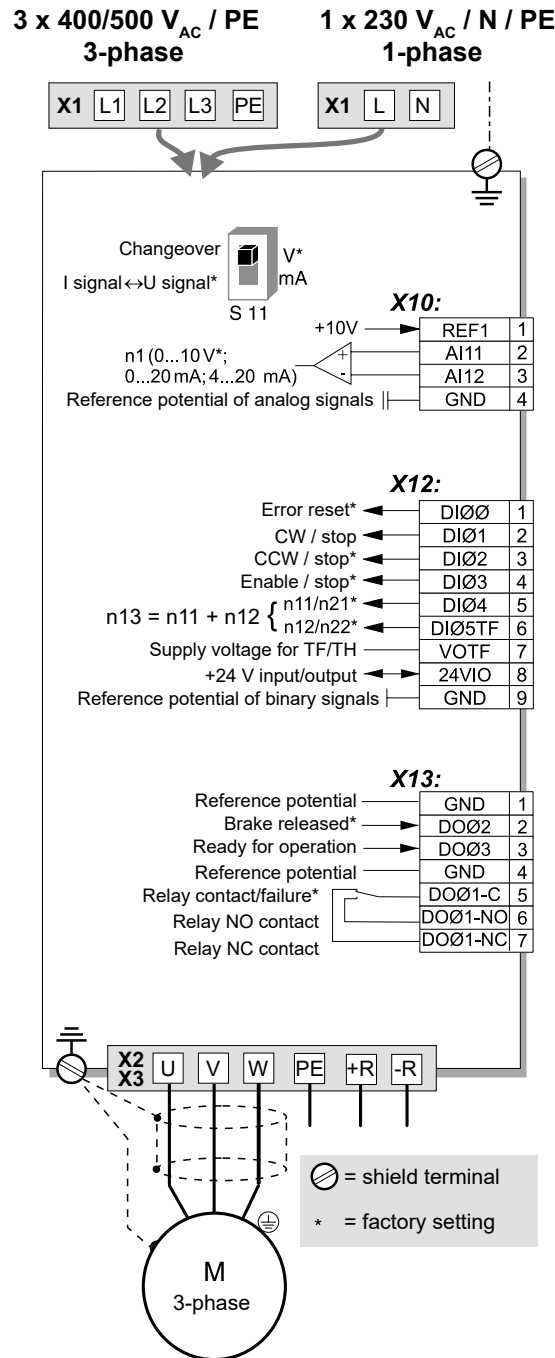
6.5 Short description of important startup steps

You can connect the MOVITRAC® B frequency inverter directly to a motor with the same power. For example: A motor with 1.5 kW power can be connected directly to an MC07B0015.

6.5.1 Procedure

1. Connect the motor to the MOVITRAC® B (terminal X2).
2. Connect an optional braking resistor (terminal X2/X3).
3. The following signal terminals must be controlled by your controller:
 - Enable DIØ3
 - Optionally CW/hold DIØ1 or CCW/hold DIØ2
 - Setpoint:
 - Analog input (X10) and/or
 - DIØ4 = n11 = 150 1/min and/or
 - DIØ5 = n12 = 750 1/min and/or
 - DIØ4 + DIØ5 = n13 = 1500 1/min
 - With a brakemotor:
DOØ2 = brake control via brake rectifier
4. Optionally connect the following signal terminals:
 - DIØØ = error reset
 - DOØ1 = /failure (designed as relay contact)
 - DOØ3 = ready for operation
5. Check the controller for the desired functionality.

6. Connect the frequency inverter to the supply system (X1).



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6.5.2 Notes

Changes to the functions of the signal terminals and the setpoint settings can be made via the FBG11B operator panel or via a PC. The FSC11B front module and one of the following interface adapters are required for a PC connection: UWS21B / UWS11A / USB11A.

6.5.3 Restoring the factory settings (P802)

You can use *P802 Factory setting* to reset the factory setting stored in the EPROM for almost all parameters.

6.5.4 Adjusting the PWM frequency (P86x)

You can use *P860 / P861* to set the nominal clock frequency at the inverter output. If *P862 / P863* is set to "Off", the clock frequency can change automatically depending on device utilization.

6.5.5 Parameterizing the inverter address (SBus / RS485 / fieldbus) (P81x)

Use *P810* to set the address of the MOVITRAC® B for communication via the serial interface.

6.5.6 Setting the control mode (P700)

This parameter is used to set the basic operating mode of the inverter. Setting on the operator panel.

V/f characteristic curve (standard)

The default setting for the operating mode is V/f. Use this operating mode if you have no special speed quality requirements and for applications where a maximum output frequency above 150 Hz is required.

VFC characteristic curve (vector control)

You must commission the inverter in VFC or VFC and DC braking operating mode for:

- High torque
- Continuous duty at low frequencies
- Accurate slip compensation
- More dynamic behavior

To do this, you must select the operating mode VFC or VFC& DC braking in point P01 during startup.

6.5.7 Application type specification**Speed control****Hoist**

The hoist function automatically provides all the functions required for the operation of an unbalanced hoist. For safety reasons, activate monitoring functions in particular that can prevent the drive from starting unintentionally.

DC braking

With DC braking, the asynchronous motor brakes via current injection. The motor brakes without a braking resistor on the inverter.

Flying start function

The flying start function enables the inverter to be connected to a rotating motor. Especially for drives that are not actively braked, phase out for a long time or are also moved by the flowing medium, such as pumps and fans. The maximum flying start time is approx. 200 ms.

6.5.8 Selection of operating mode (4-quadrant operation P82x)

You can use *P820 / P821* to switch 4-quadrant operation on and off. If you connect a braking resistor to the MOVITRAC® B, 4-quadrant operation is possible. If no braking resistor is connected to the MOVITRAC® B and therefore no generator mode is possible, you must set *P820 / P821* to "Off". In this operating mode, the MOVITRAC® B attempts to extend the deceleration ramp. As a result, the generator mode performance is not too high and the DC link voltage remains below the switch-off threshold.

6.5.9 Setpoint specification (P10x)

With P100 "Setpoint source" and P101 "Control signal source", you can also select a communication interface as the setpoint or control signal source. However, the interfaces are not automatically deactivated with these parameters, as the frequency inverter must remain ready to receive via all interfaces at all times.

Fixed setpoints always have a higher priority than other setpoints. A complete list of the selection options can be found in the description of parameter P100.

Specification via fieldbus/SBus

To set the setpoint source to fieldbus or SBus, select the value "SBus1/fixed setpoint" for P100. The sign of the setpoint value determines the direction of rotation.

Specification via analog value

The following selection options are available for P100 to set the setpoint source to an analog value:

- Bipolar (signed processing of analog input 1 or fixed setpoint)
- Unipolar (absolute value-based processing of analog input 1 or fixed setpoint)
- Motor potentiometer (virtual potentiometer)
- Fixed setpoint + AI1 (sum of selected fixed setpoint and value of analog input AI1 → P112 AI1 operating mode also applies)
- Fixed setpoint × AI1 (weighting factor for analog input AI1 → 0 – 10 V = 0 – 100%)
- Bipolar AI2 (analog input 2 or fixed setpoint)

Specification via fixed setpoint (digital control)

To define the setpoint source on digital inputs, set P100 to the value "Frequency setpoint input / fixed setpoint" (frequency at digital input DI04 specifies setpoint). You can use P102 "Frequency scaling" to set the input frequency at which the system setpoint reaches 100%.

6.5.10 Protection functions

Parameterization of current limit (P303)

The internal current limitation refers to the apparent current, i.e. the output current of the inverter. In the field weakening range, the inverter automatically reduces the current limit internally. This enables the inverter to implement stall protection for the motor.

Parameterization of speed monitoring (P50x)

The drive only reaches the speed required by the setpoint if it has sufficient torque. If the inverter reaches *P03 Current limit*, it assumes that it will not reach the desired speed. If the inverter exceeds the current limit for longer than *P501 Delay time*, the speed monitoring system responds.

Parameterization of fault responses (P83x)

The error "EXT. ERROR" only triggers in inverter status "ENABLED". With *P830* you can program the error response, which is triggered via an input terminal programmed to "/EXT. ERROR".

Parameterization of motor protection (P340)

MOVITRAC® B takes over the thermal protection of the connected motor electronically when this function is activated. In most cases, the motor protection function is comparable to standard thermal protection (motor circuit breaker) and, in addition, it takes account of speed-dependent cooling by the integrated fan. The motor utilization is determined via the inverter output current, type of cooling, motor speed and time. The thermal motor model is based on the motor data entered during startup (MOVITOOLS® MotionStudio/DBG60B) and compliance with the operating conditions specified for the motor.

6.5.11 Specification of system limits

Minimum speed (P301)

Speed value that cannot be undershot even if the setpoint input is zero. The minimum speed is also valid if $n_{\min} < n_{\text{Start/Stop}}$ has been set.

Maximum speed (P302)

A setpoint input cannot exceed the value set here. If you set $n_{\min} > n_{\max}$, the value set in $n_{\max}$ applies to the minimum speed and the maximum speed.

Speed ramps (P13x)

The ramp times refer to a setpoint change of $\Delta n = 3000 \text{ 1/min}$. The ramps t_{11} / t_{21} up and t_{11} / t_{21} down are effective when the setpoint is changed. When the enable signal is removed with the STOP/RESET button or via terminals, the stop ramp t_{13} / t_{23} is effective.

6.5.12 Activating the energy-saving function (P770)

The energy-saving function can be activated for the VFC / VFC & FLYING START / V/f CHARACTERISTIC operating modes. In no-load operation, the power consumption of the motor can be reduced by up to 70%.

Energy savings can be achieved in the operation of pumps, fans, conveyor belts, etc. With this method, the magnetization of the asynchronous motor is controlled depending on the load by adjusting the voltage-frequency ratio, the motor is undermagnetized.

6.5.13 Activating the technology functions

In addition to the features of the standard version, you can use the software module available in the MOVITOOLS® MotionStudio engineering software with the devices in the technology version. You can recognize the technology function by the digits "0T" at the end of the type designation or in the MOVITOOLS® MotionStudio under "Device data" as "Unit design: Technology".

The "simple positioning" software module currently exists in combination with SEW-EURODRIVE built-in encoders as a replacement for rapid/creep speed switching using initiators.

Enabling can also be done retrospectively in an emergency. In this case, the correct TAN must be entered in MOVITOOLS® MotionStudio via the "Working with the device" / "Technology enable" menus.

6.5.14 Settings for low motor speeds (P32x)

Only use the function *P320 / P330 Automatic adjustment* for single-motor operation. You can use this function for all motors and control modes. The inverter measures the motor during premagnetization and sets parameter *P322 / P332 IxR adjustment*. The values are stored in volatile memory.

6.5.15 Defining the assignment of the digital inputs (P60x)

Information can be found in the section "Parameter group 6.. Terminal assignment".

6.5.16 Setting the brake function (P73x)

The MOVITRAC® B inverters are able to control a brake attached to the motor. The brake function acts on the digital output assigned with the function "/BRAKE" (24 V = brake released). Use DO02 for brake control.

6.6 Starting the motor in manual mode

Note that you must exit manual mode before you can enable the motor via terminals.

6.6.1 Analog setpoint specification

The following table shows which signals must be present at terminals X11:2 (AI1) and X12:1 – X12:4 (DIØØ – DIØ3) for setpoint preselection "Unipolar / fixed setpoint" (*P100*) in order for the drive to be operated with analog setpoint input. The terminal assignment here is to be understood as an example and can be changed on request via the parameters *P601 – 608*. However, CW/stop DIO1 is permanently assigned.

Function	X10:2 (AI1) Analog input n1	X12:1 (DIØØ) /Controller inhibit ¹⁾	X12:2 (DIØ1) CW / stop ²⁾	X12:3 (DIØ2) CCW / stop	X12:4 (DIØ3) Enable / stop	X12:5 (DIØ4) n11 / n21	X12:6 (DIØ5) n12 / n22
Controller inhibit	X	0	X	X	X	0	0
Stop	X	1	X	X	0	0	0
Enable and stop	X	1	0	0	1	0	0

Function	X10:2 (AI11) Analog input n1	X12:1 (DI00) /Controller inhibit ¹⁾	X12:2 (DI01) CW / stop ²⁾	X12:3 (DI02) CCW / stop	X12:4 (DI03) Enable / stop	X12:5 (DI04) n11 / n21	X12:6 (DI05) n12 / n22
CW rotation at 50% n_{max}	5 V	1	1	0	1	0	0
CW rotation at n_{max}	10 V	1	1	0	1	0	0
CCW rotation at 50% n_{max}	5 V	1	0	1	1	0	0
CCW rotation at n_{max}	10 V	1	0	1	1	0	0

1) No default setting

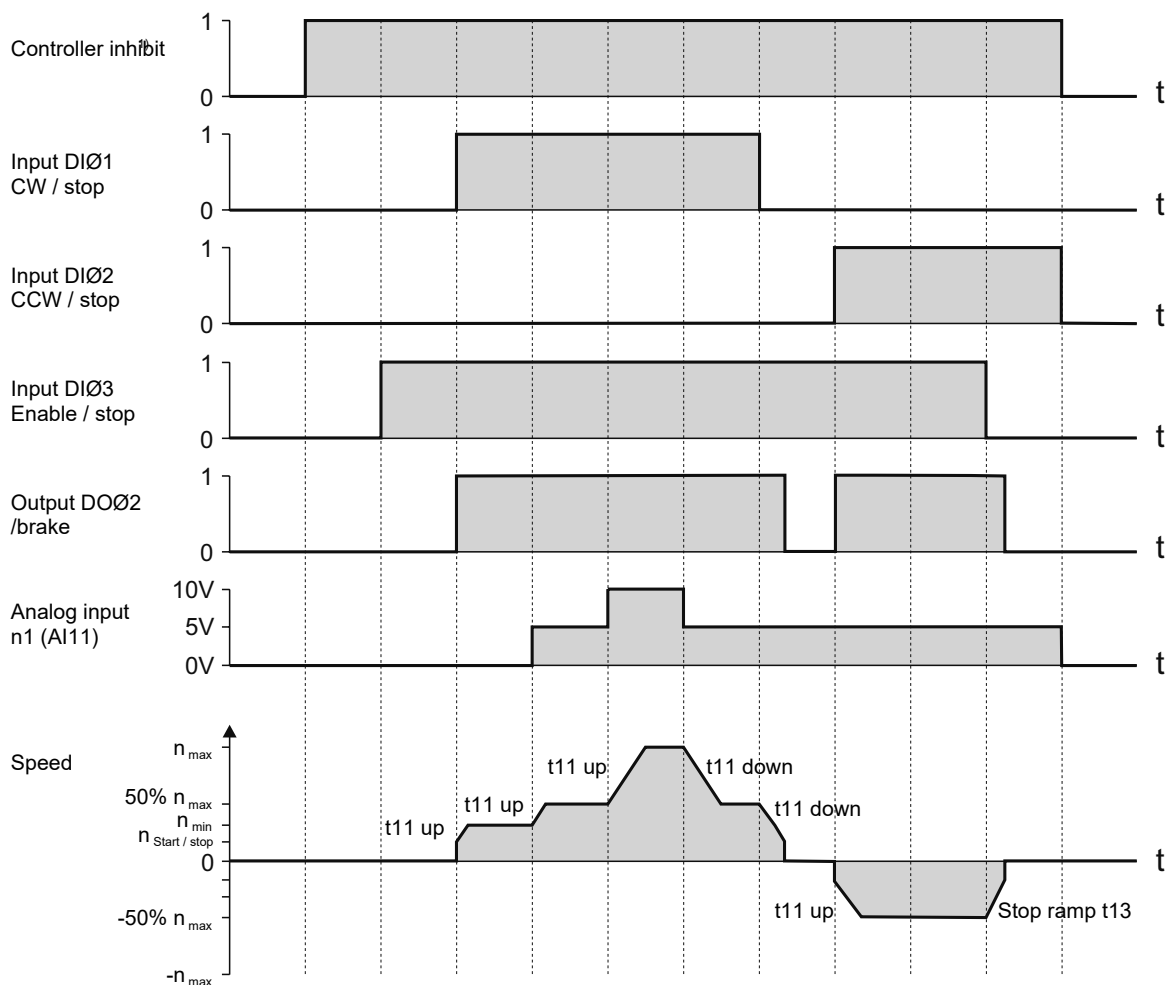
2) Permanently assigned

0 = 0 signal

1 = 1 signal

X = not relevant

The following travel diagram shows an example of how the motor is started with the connection of terminals X12:1 – X12:4 and analog setpoints. The digital output X10:2 (DO02 "/Brake") is used to switch the braking contactor K12.



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1) If a terminal is programmed to controller inhibit.

INFORMATION



The motor is not energized during controller inhibit. A motor without brakes then coasts to a halt.

6.6.2 Fixed setpoints

The following table shows which signals must be present at terminals X12:1 – X12:6 (DIØØ – DIØ5) for the "Unipolar / fixed setpoint" setpoint preselection (*P100*) in order for the drive to be operated with the fixed setpoints. The terminal assignment here is to be understood as an example and can be changed on request via the parameters *P601 – 608*. However, CW/stop DIO1 is permanently assigned.

Function	X12:1 (DIØØ) /Controller inhibit ¹⁾	X12:2 (DIØ1) CW / stop ²⁾	X12:3 (DIØ2) CCW / stop	X12:4 (DIØ3) Enable / stop	X12:5 (DIØ4) n11 / n21	X12:6 (DIØ5) n12 / n22
Controller inhibit	0	X	X	X	X	X
Stop	1	X	X	0	X	X
Enable and stop	1	0	0	1	X	X
CW rotation at n11	1	1	0	1	1	0
CW rotation at n12	1	1	0	1	0	1
CW rotation at n13	1	1	0	1	1	1
CCW rotation at n11	1	0	1	1	1	0

1) No default setting

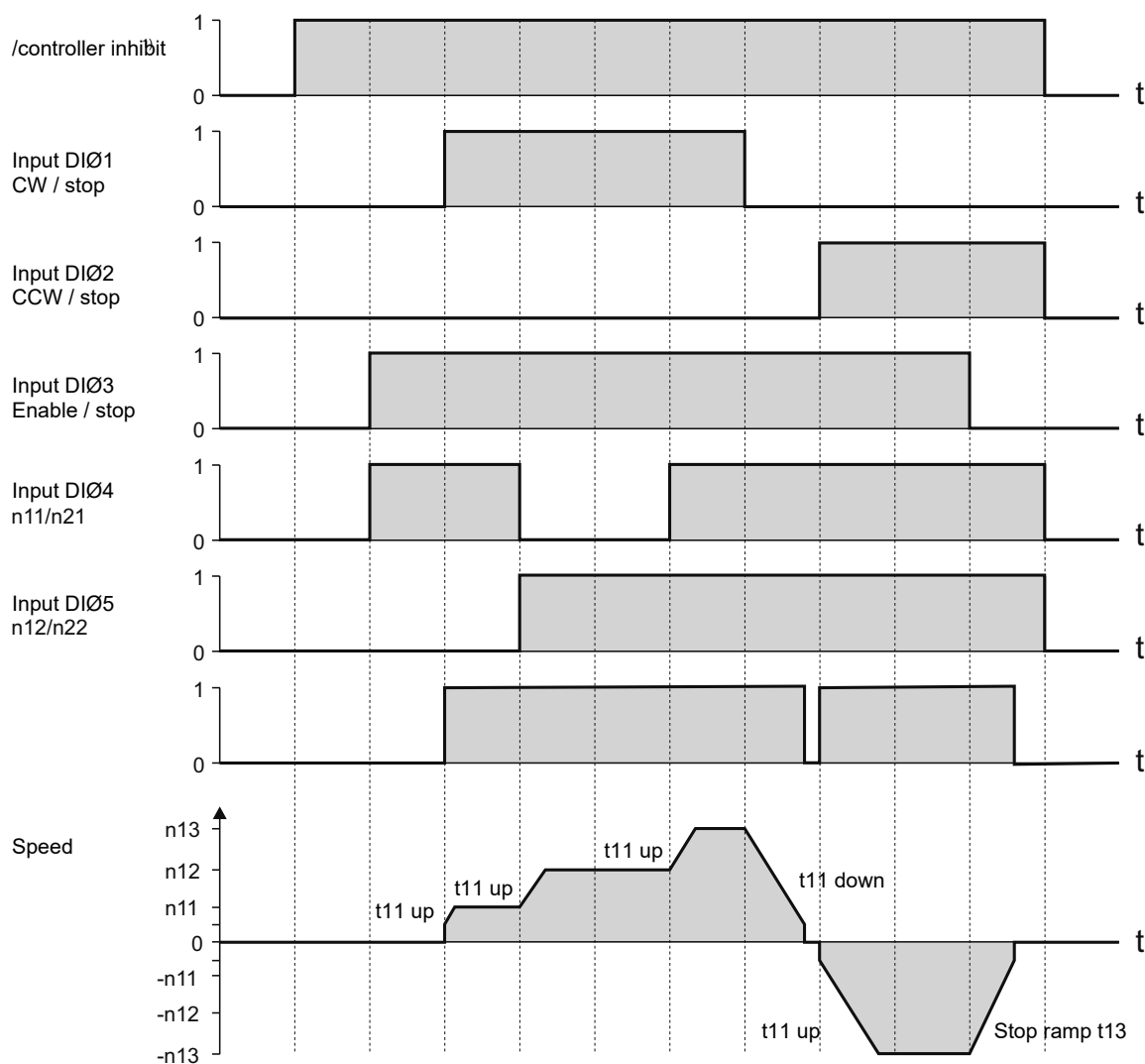
2) Permanently assigned

0 = 0 signal

1 = 1 signal

X = not relevant

The following travel diagram shows an example of how the drive is started with the internal fixed setpoints using the connection of terminals X12:1 – X12:6. The digital output X10:2 (DOØ2 "/Brake") is used to switch the braking contactor K12.



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1) If a terminal is programmed to controller inhibit.

INFORMATION



The motor is not energized during controller inhibit. A motor without brakes then coasts to a halt.

6.7 PI controller (P25x)

Information on the PI controller can be found in the chapter "Project planning/PI controller".

After the motor has started up, current limiting I_1 is active. The current limit I_2 describes the permanently permitted current (shaded area).

You can document the startup parameters and values with MOVITOOLS® MotionStudio. This is displayed in the "ATEX information" field.

INFORMATION



Further information can be found in the operating instructions "Explosion-proof AC motors EDR.71 – 225".

6.11 Communication and unit profile

MOVITRAC® B offers you digital access to all drive parameters and functions via the communication interfaces.

The frequency inverter is controlled via the fast cyclical process data. Via this process data channel, you have the option of specifying setpoints, such as setpoint speed, integrator time for acceleration/deceleration, as well as triggering various drive functions such as enable, controller inhibit, stop, rapid stop, etc. At the same time you can also use this channel to read back actual values from the frequency inverter, such as actual speed, current, device status, error number or reference signals.

In combination with the IPOS^{plus}® sequence and positioning control integrated in the frequency inverter, the process data channel can also be used as a direct connection between the PLC and IPOS^{plus}®. In this case, the process data is not evaluated by the frequency inverter, but directly by the IPOS^{plus}® program.

While the process data exchange is usually cyclical, the drive parameters can be read or written acyclically using functions such as READ and WRITE. This exchange of parameter data allows the implementation of applications in which all important drive parameters are stored in the higher-level automation device, so that no manual parameterization has to be carried out on the frequency inverter itself.

The use of a fieldbus system requires additional monitoring functions for the drive technology, such as time monitoring of the fieldbus (fieldbus timeout) or special emergency-off concepts.

You can tailor the monitoring functions of the MOVITRAC® B specifically to your application. For example, you can determine which error response the frequency inverter should trigger in the event of a bus error. A rapid stop will be useful for many applications, but you can also freeze the last setpoints.

As the functionality of the control terminals is also guaranteed in fieldbus operation, you can still implement fieldbus-independent emergency off concepts via the terminals of the frequency inverter.

The MOVITRAC® B frequency inverter offers you numerous diagnostics methods for startup and service. You can use the DBG60B keypad to check both the setpoints sent by the higher-level controller and the actual values. You also receive a wealth of additional information about the status of the communication interfaces.

The MOVITOOLS® MotionStudio engineering software offers you an even more convenient diagnostics method, which allows you to set all drive and communication parameters as well as a detailed display of the interfaces and device status information.

6.11.1 Process data

The term *process data (PD)* refers to all time-critical (real time) data of a process that needs to be processed or transferred quickly. It is characterized by its high dynamics and immediate relevance.

Process data includes, for example, setpoints and actual values of the frequency inverter, but also peripheral states of limit switches. It is exchanged cyclically between the automation device and the frequency inverter.

The MOVITRAC® B frequency inverter is actually controlled via process data.

In general, the process input data (PI) and process output data (PO) are treated separately. This allows you to define specifically for your application which process output data (setpoints) should be sent from the controller to the frequency inverter or which process input data (actual values) the MOVITRAC® B frequency inverter should transfer in the opposite direction to the higher-level controller.

To control the frequency inverter via a communication interface, it must first be switched to the corresponding control signal source and setpoint source. The distinction between control signal and setpoint source allows a wide variety of combinations, so that the drive is controlled via the fieldbus, for example, and uses the analog setpoint as the setpoint. The parameters for describing the process output data are then used to determine how the frequency inverter should interpret the process data received.

The parameter *P100 Setpoint source* is used to specify the communication interface via which the setpoint is processed by the frequency inverter.

Parameter	Communication interface
P100 Setpoint source	RS485
	Fieldbus
	SBus
	...

The parameter *P101 Control signal source* is used to define how the frequency inverter is to be controlled. The inverter expects the control word from the source set here.

Parameter	Control of the inverter via
P101 Control signal source	Terminals
	RS485
	Fieldbus
	SBus

Setting: TERMINALS

In this setting, the frequency inverter is only controlled via the digital inputs and, if necessary, via the IPOS^{plus}® control program.

Setting: RS485, FIELDBUS, SBus

In this setting, the control word defined in the process output data channel is updated by the set control signal source (RS485 / FIELDBUS / system bus).

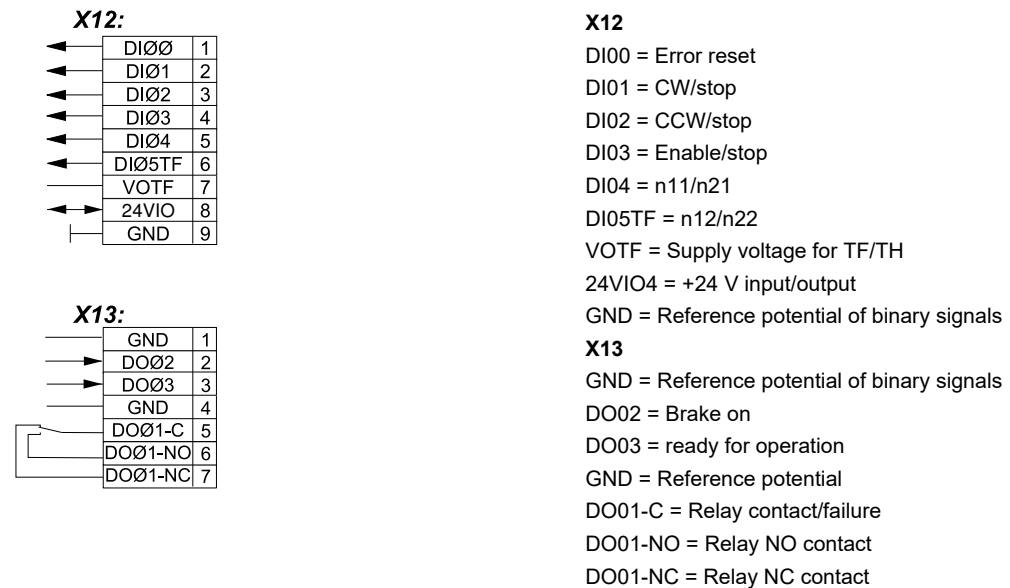
The digital inputs and the IPOS^{plus}® control program are still involved in the control.



⚠ CAUTION

For safety technology reasons, the frequency inverter must also **always** be enabled on the terminal side for control via the process data. As a result, the terminals must be connected or programmed so that the inverter is enabled via the digital inputs.

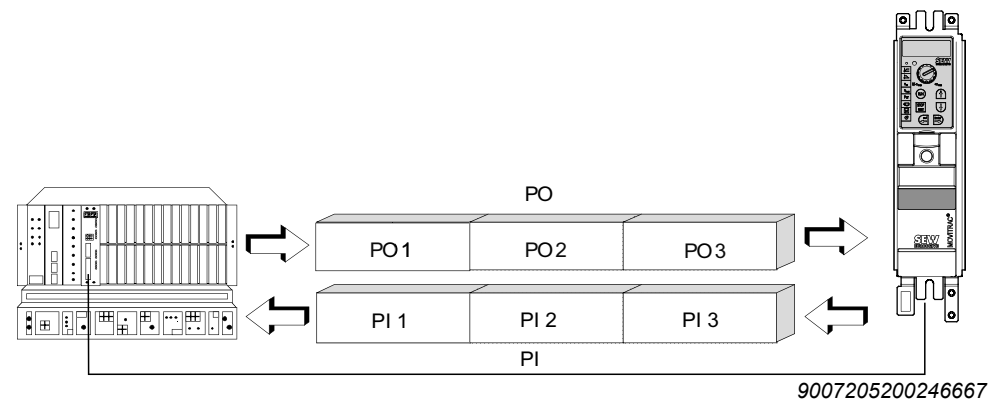
The following figure shows an example of the terminal-side wiring and parameterization for exclusive control of the frequency inverter via the process data.



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6.11.2 Process data configuration

The MOVITRAC® B frequency inverter can be controlled via the communication interfaces with 1 to 10 (with RS485 with 1 to 3) process data words. The number of process input data (PI) and process output data (PO) is identical.



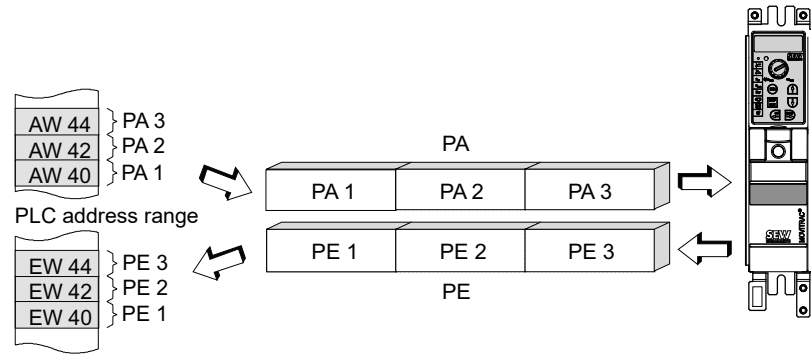
The process data configuration is set either via DIP switches on the option card or via the bus master in the startup of the bus system (e.g. PROFIBUS-DP or RS485). In this way, the frequency inverter automatically receives the correct setting. You can use the keypad or the fieldbus monitor in MOVITOOLS® MotionStudio to check the current process data configuration under the menu item *P090 Fieldbus PD configuration*.

Depending on the fieldbus interface used, process data configurations can become effective according to the following table.

P090 PD configuration	
1 process data word + parameter channel	1PD+PARAM
1 process data word	1PD
2 process data words + parameter channel	2PD+PARAM
2 process data words	2PD
....	
10 process data words + parameter channel	10PD+PARAM
10 process data words	10PD

Information: 3 PD for bus cards, 10 PD for FSE24B in the front module design.

Only the number of process data (i.e. 1PD – 10PD) is of interest for the frequency inverter's process data control. If programmable logic controllers are used as fieldbus masters, the process data is usually mapped directly into the I/O or peripheral area. As a result, the I/O or peripheral area of the PLC must provide sufficient memory space for the frequency inverter's process data (see figure below). The address assignment between the process data of the frequency inverter and the PLC address range is usually carried out on the fieldbus master module.



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6.11.3 Process data description

The process data description defines the content of the process data to be transferred. All process data words can be individually assigned by the user.

The following six fieldbus parameters are available for the definition of the first three process data words:

- P870 Setpoint description PO1
- P871 Setpoint description PO2
- P872 Setpoint description PO3
- P873 Actual value description PI1
- P874 Actual value description PI2
- P875 Actual value description PI3

Changing one of the above parameters automatically locks the acceptance of the process output data for setpoint processing via the fieldbus. Only by reactivating the fieldbus parameter

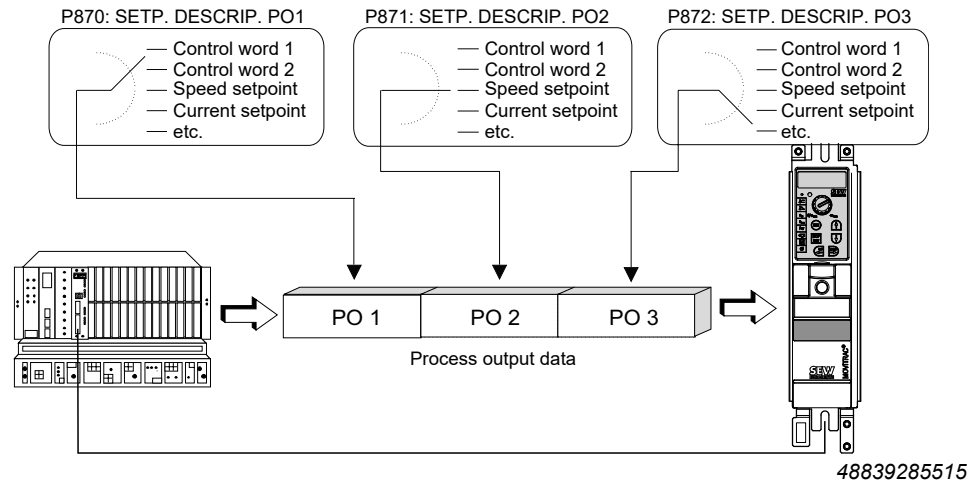
- P876 Enable PO data = ON

is the received process output data processed according to the new actual value and setpoint descriptions.

Process data words 4 to 10 can only be read and written via IPOS^{plus}®.

Setpoint description of the PO data

The parameters *Setpoint description POx* define the content of the process output data words that are sent from the higher-level automation device via the fieldbus system (see figure below).



With the process output data words PO1, PO2 and PO3, the listed setpoints can be transferred via the process output data channel. You can decide yourself in which process data word the higher-value part (High) or the lower-value part (Low) is transmitted.

Assignment	Meaning	Scaling
NO FUNCTION	The setting <i>NO FUNCTION</i> means that the frequency inverter does not use this process output data word for setpoint processing. The content of the process output data word programmed to <i>NO FUNCTION</i> is ignored, although the controller might specify a real setpoint via the fieldbus system. The <i>NO FUNCTION</i> setting only blocks the processing of this process output data word in the inverter system. However, you can access the process output data at any time via IPOS ^{plus} .	
SPEED	With the setting <i>SPEED</i> , the MOVITRAC® B frequency inverter interprets the setpoint value transferred in this process data word as a speed setpoint, provided the set operating mode (<i>P700 Operating mode 1</i> , <i>P701 Operating mode 2</i>) permits a speed setpoint. If no speed setpoint is programmed, although a communication interface (FIELD-BUS, RS485, system bus) is set as the setpoint source, the frequency inverter runs with speed setpoint = 0.	1 digit = 0.2/min
MAX. SPEED	With the setting <i>MAX. SPEED</i> , the MOVITRAC® B frequency inverter interprets the transferred setpoint as a speed limitation. The speed limitation is specified in the unit 1/min and is interpreted as an absolute value for both directions of rotation. The supported range of values of the speed limitation via fieldbus corresponds to the range of values of the parameter <i>P302 Maximum speed 1</i> . When the speed limitation is set via the fieldbus, the parameters <i>P302 Maximum speed 1</i> , <i>P312 Maximum speed 2</i> are automatically deactivated.	1 digit = 0.2/min
RAMP	With the setting <i>RAMP</i> , the MOVITRAC® B frequency inverter interprets the transferred setpoint as a run-up or run-down ramp. The specified numerical value corresponds to a time in milliseconds and refers to a speed change of 3000 1/min. The rapid stop and emergency stop function is not affected by this process ramp. When the process ramp is transmitted via the fieldbus system, the ramps t11, t12, t21 and t22 become ineffective.	1 digit = 1 ms
CONTROL WORD 1 / CONTROL WORD 2	The assignment of control word 1 or control word 2 to the process output data enables almost all drive functions to be activated via the fieldbus system. The description of control word 1 and 2 can be found in the chapter "Control word definition".	
SPEED [%]	With the setting <i>SPEED [%]</i> , the MOVITRAC® B frequency inverter interprets the setpoint transferred in this process data word as a percentage speed setpoint. The relative speed setpoint always refers to the currently valid maximum speed limit, i.e. either <i>P302/312</i> or <i>MAX. SPEED</i> or <i>PO speed limitation</i> .	4000 _{hex} = 100% n _{max}

Assignment	Meaning	Scaling
IPOSplus® PO-DATA	The <i>IPOSplus® PO-DATA</i> setting means that the frequency inverter does not use this process output data word for setpoint processing. The content of the process output data word programmed on <i>IPOSplus®-PO-DATA</i> is ignored by the inverter system and is available for exclusive processing in the IPOS ^{plus} ® control program. Within IPOS ^{plus} ®, you can use the command <i>GetSys PO-Data</i> to directly access the process output data of the communication interfaces. Further information can be found in the IPOS ^{plus} ® sequence and positioning control manual.	3 words can each be individually coded with 16 bits and exchanged between the higher-level automation device and IPOS ^{plus} ®.

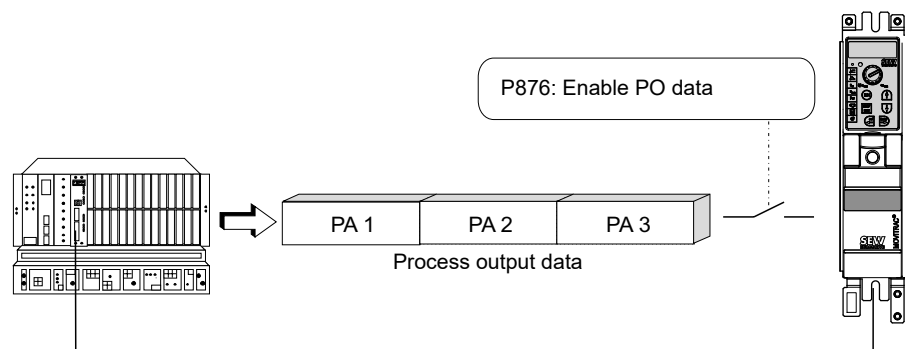
Special cases of PO data processing

The separate setting of the process output data description allows a large number of combinations, although not all of them make technical sense.

In addition to the process output data, the digital input terminals and, in special cases, the analog setpoint of the MOVITRAC® B frequency inverter are generally also used.

Setpoint input via fieldbus missing	If a communication interface is entered as the setpoint source and no setpoint is programmed in the process output data description, setpoint = zero is generated internally by the inverter.
No control word input via fieldbus	If a communication interface is entered as the control signal source and no control word is programmed in the process output data description, the control command ENABLE is set internally by the inverter.
Double assignment of the process output data channel	If several process output data words receive the same setpoint description, only the process output data word read first becomes valid. The processing sequence in the frequency inverter is PO1 – PO2 – PO3, i.e. if, for example, PO2 and PO3 have the same setpoint description, only PO2 will take effect. The content of PO3 is ignored.

Enable PO data



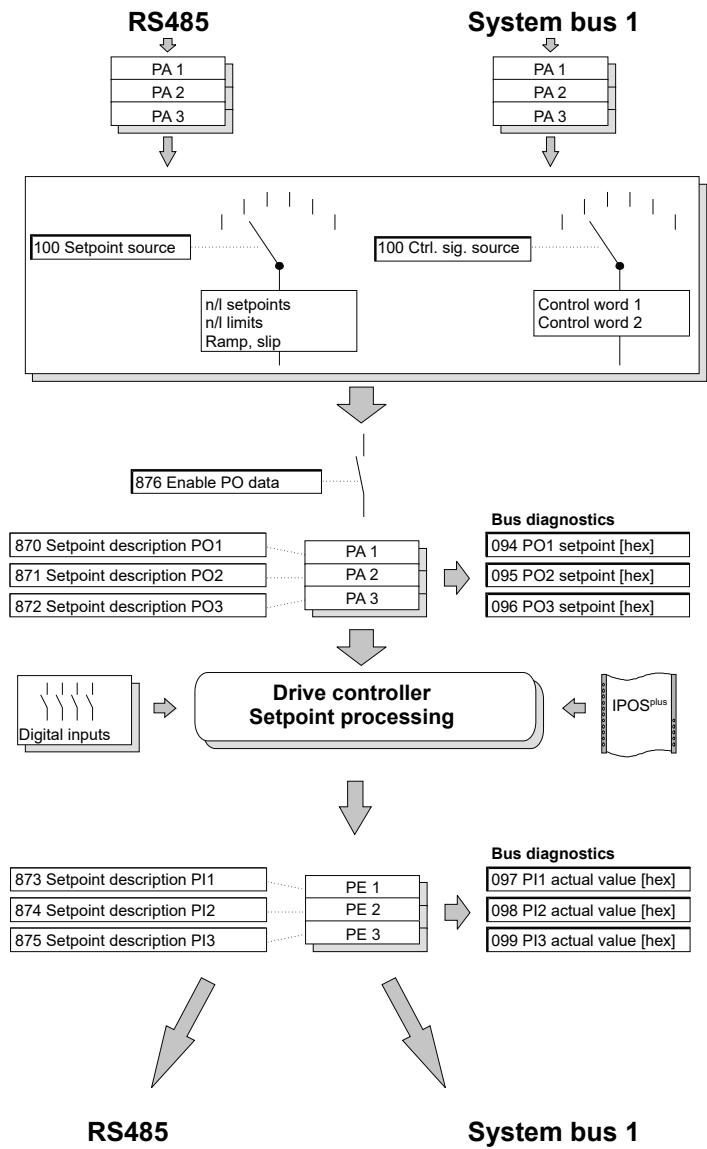
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Changing the parameters *Setpoint description PO1 – PO3* automatically locks the process output data with *Enable PO data* = no. The process output data channel is only re-enabled for processing with the parameterization *Enable PO data* = YES (e.g. from the higher-level controller).

NO	Process output data locked. The frequency inverter's setpoint processing continues to operate with the last valid (frozen) process output data until the fieldbus setpoints are reactivated.
YES	Process output data enabled. The frequency inverter works with the process output data specified by the master.

PO/PI data processing

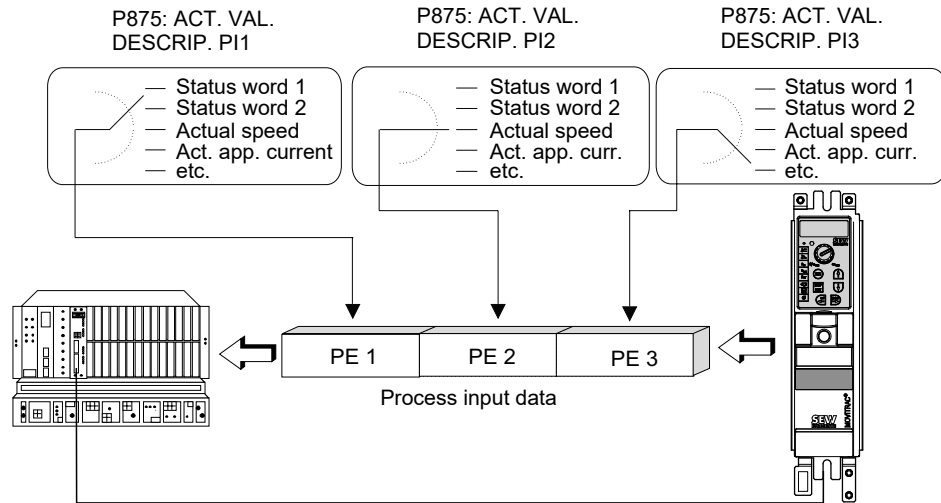
The process input data of the inverter (actual values, status information, etc.) can be read via all communication interfaces of the inverter and are therefore not linked to the control signal and setpoint source.



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Actual value description of PI data

The parameters *Actual value description PI1 – PI3* define the content of the process input data words that are transferred from the frequency inverter to the higher-level automation device (see following figure). Each process data word is defined with a separate parameter, meaning that three parameters are required to describe the process input data.



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The following parameters can be transferred via the process data channel using the process input data words PI1 to PI3. 32-bit values, such as the actual position, are transmitted in 2 process data words. You can decide yourself in which process data word the higher-value part (High) and the lower-value part (Low) is transmitted.

Assignment	Meaning	Scaling
NO FUNCTION	The assignment of a process input data word with <i>NO FUNCTION</i> means that the inverter system does not update this process input data word. In this case, MOVITRAC® B generally returns the value 0000hex to the higher-level controller.	
SPEED	With the setting <i>SPEED</i> , the frequency inverter returns the current actual speed value with the unit 1/min to the higher-level automation system. The exact actual speed value can only be returned if the frequency inverter can determine the actual motor speed via speed feedback. For applications with slip compensation, the deviation from the real motor speed depends on the accuracy of the user-adjusted slip compensation.	1 digit = 0.2/min
OUTPUT CURRENT	With the setting <i>OUTPUT CURRENT</i> , the frequency inverter returns the current actual value of the output current with the unit [% I _N] (as a percentage, in relation to the nominal current of the frequency inverter) to the higher-level automation system.	1 digit = 0.1% I _N
ACTIVE CURRENT	With the assignment of a process input data word with <i>ACTIVE CURRENT</i> , the frequency inverter returns the current active actual current value with the unit % I _N to the higher-level automation system.	1 digit = 0.1% I _N
STATUS WORD 1 / STATUS WORD 2	The assignment of status word 1 or status word 2 to the process input data enables access to numerous status information items, failure and reference messages.	
SPEED [%]	With the setting <i>SPEED [%]</i> , the frequency inverter returns the current relative actual speed value with the unit % n _{max} / P302 to the higher-level automation system.	4000 _{hex} = 100% n _{max}
IPOSplus® PI-DATA	With the setting <i>IPOSplus® PI</i> (IPOSplus® Process Input Data), an individual actual value can be transferred from the IPOSplus® program to the higher-level controller via the process input data. This setting thus allows the exchange of up to 48 bits individually coded between the IPOSplus® program and the higher-level controller via the process data channel. Within IPOSplus® you can use the command <i>SetSys PI-Data</i> to write directly to the process input data. Further information can be found in the IPOSplus® sequence and positioning control manual.	3 words, each individually coded with 16 bits, can be exchanged between the higher-level automation device and IPOSplus®.

Scaling of process data

The process data is always transmitted as fixed-point values so that it can be calculated as easily as possible during the ongoing system process. Parameters with the same unit of measurement are given the same scaling, so that direct comparisons of setpoint and actual values are possible in the application program of the higher-level automation device. A distinction is made between three process data types:

- Speed in 1/min
- Current in % I_N (nominal current)
- Ramp in ms

The different variants of the control or status word are coded as a bit field and are dealt with in a separate chapter.

Process data	Type	Resolution	Reference	Range
Speed setpoint / Actual speed value / Speed limitation slip compensation	Integer 16	1 digit = 0.2 min ⁻¹		Negative: C000 _{hex} – FFFF _{hex} ⁻ 49152 _{dec} – 65535 _{dec} Positive: 0000 _{hex} – 4000 _{hex} 0 _{dec} – 16384 _{dec}
Relative speed setpoint [%] / Relative actual speed value [%]	Integer 16	1 digit = 0.0061% (4000 _{hex} = 100%)	Maximum speed of the inverter	-100-0%: C000 _{hex} – FFFF _{hex} ⁻ 49152 _{dec} – 65535 _{dec} 0-100%: 0000 _{hex} – 4000 _{hex} 0 _{dec} – 16384 _{dec}
Apparent current actual value / Active actual current value / Current setpoint Current limiting	Integer 16	1 digit = 0.1% I_N	Nominal current of the frequency in- verter	-3276.8% – 0 – +3276.7% 8000 _{hex} – 0 – 7FFF _{hex}
Process ramp up / Process ramp down /	Unsigned 16	1 digit = 1 ms	delta-f = 100 Hz	0 ms – 65535 ms 0000 _{hex} – FFFF _{hex}

Positive speed values correspond to the direction of rotation CW when the motor is connected correctly.

Examples

Process data	Value	Scaling	Transferred process data item
Speed	CW 400 min ⁻¹	400/0.2 = 2000 _{dec} = 07D0 _{hex}	2000 _{dec} or 07D0 _{hex}
	CCW 750 min ⁻¹	-(750/0.2) = 3750 _{dec} = F15A _{hex}	-3750 _{dec} or F15A _{hex}
Relative speed	CW 25% f_{max}	25 x (16384/100) = 4096 _{dec} = 1000 _{hex}	4096 _{dec} or 1000 _{hex}
	CCW 75% f_{max}	-75 x (16384/100) = -12288 _{dec} = D000 _{hex}	-12288 _{dec} or D000 _{hex}
Current	45% I_N	(45/0.1) = 450 _{dec} = 01C2 _{hex}	450 _{dec} or 01C2 _{hex}
	115.5% I_N	(115.5/0.1) = 1155 _{dec} = 0483 _{hex}	1155 _{dec} or 0483 _{hex}
Ramp	300 ms	300 ms → 300 _{dec} = 012C _{hex}	300 _{dec} or 012C _{hex}
	1.4 s	1.4 s = 1400 ms 400 _{dec} = 0578 _{hex}	1400 _{dec} or 0578 _{hex}

6.11.4 Sequence control

Definition of the control word

The control word is 16 bits wide. Each bit is assigned a function of the frequency inverter. The low byte consists of 8 fixed function bits that are always valid. The assignment of the higher-order control bits varies for the different control words.

Functions that are generally not supported by the frequency inverter cannot be activated via the control word. In this case, the individual control word bits must be regarded as reserved and set to logic 0 by the user.

Basic control block

In the lower-order part of the control word (bits 0 to 7), 8 function bits are permanently defined for the most important drive functions. The following overview shows the assignment of the basic control block.

Bit	Function
0	Controller inhibit = "1" / enable = "0"
1	Enable = "1" / rapid stop = "0"
2	Enable = "1" / stop = "0"
3	Reserved
4	Integrator switching: Integrator 1 = "1" / integrator 2 = "0"
5	Parameter set changeover: Parameter set 2 = "1" / parameter set 1 = "0"
6	Reset: reset pending failure = "1" / not active = "0"
7	Reserved
8	Depending on the control word
9	
10	
11	
12	
13	
14	
15	

Linking the safety-relevant control commands

In general, the control commands

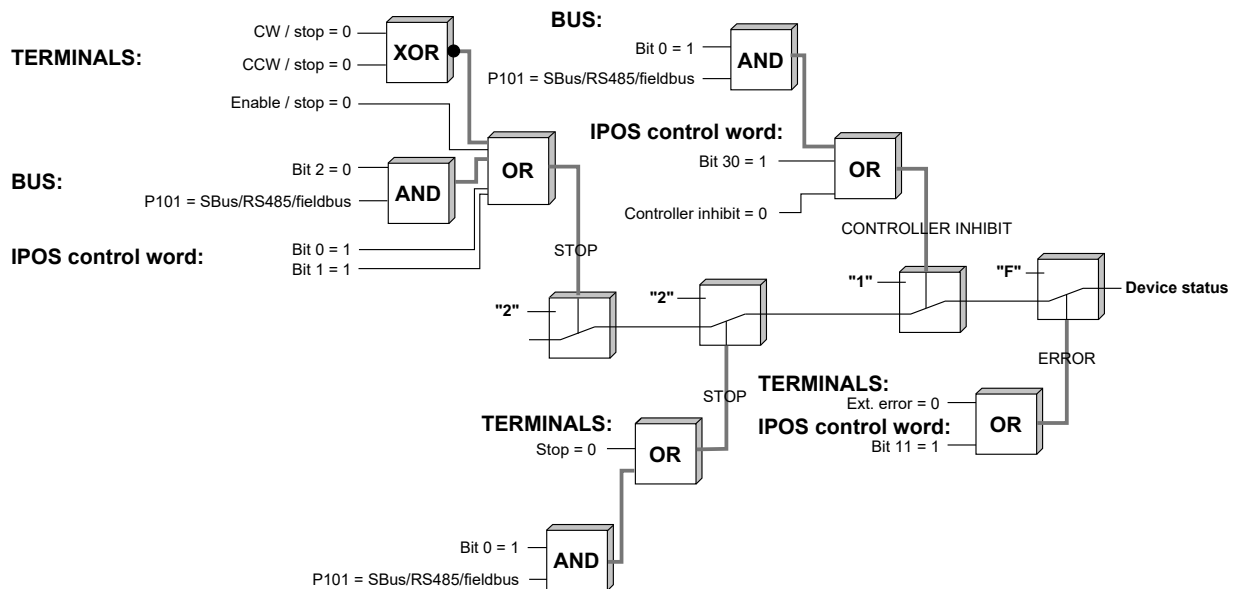
- CONTROLLER INHIBIT
- RAPID STOP/STOP
- STOP
- ENABLE

can be activated simultaneously via the set control signal source, the digital inputs and by the IPOS^{plus}® control program. The safety-relevant linking of these control functions is achieved by prioritizing the individual control commands. The following figure shows, for example, that all three processing blocks (terminal processing, control word processing and IPOS^{plus}® program) must generate the enable signal to enable the frequency inverter. However, as soon as one of the three processing blocks triggers a higher-priority control command (e.g. *STOP* or *CONTROLLER INHIBIT*), this becomes effective.

After the frequency inverter is switched on, IPOS^{plus}® generally supplies the control command *ENABLE* so that the drive can be controlled immediately even without the IPOS^{plus}® program.

In general, the digital inputs remain active even when controlling the frequency inverter via the process data (*P101 Control signal source = RS485/FIELDBUS/SBus*). Safety-relevant functions such as controller inhibit and enable are processed equally by both the terminal strip and the fieldbus, i.e. the frequency inverter must first be en-

abled on the terminal side for control via the fieldbus. All other functions that can be activated both via terminals and via the control word are processed with OR linking. The following figure shows the device status depending on the various control signal sources (terminals, bus or IPOSplus® control word)



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For safety reasons, the basic control block is defined in such a way that the frequency inverter with the control word specification 0000_{hex} assumes the status *No enable*, as all common fieldbus master systems reset the outputs to 0000_{hex} in the event of an error. In this case, the frequency inverter performs a rapid stop and then activates the mechanical brake.

Control commands

Controlling the frequency inverter with bits 0 - 2

If the frequency inverter has been enabled on the terminal side, it can be controlled with bit 0 – bit 2 for applications with speed feedback of the basic control block.

									Bit 2: Enable / stop
									Bit 1: Enable / rapid stop
									Bit 0: Controller inhibit / enable
Priority		Control command:	Bit 2	Bit 1	Bit 0				
High	.	Controller inhibit:	X	X	1				e.g. 01 _{hex} , 03 _{hex} , 05 _{hex} , 07 _{hex}
	.	Rapid stop:	X	0	0				e.g. 00 _{hex} , 04 _{hex}
	.	Stop:	0	1	0				e.g. 02 _{hex}
Low	.	Enable:	1	1	0				06 _{hex}
			X = irrelevant						

Control command "Controller inhibit"

You can use the *Controller inhibit* control command to disable the power output stages of the frequency inverter and thus switch them to high impedance. At the same time, the frequency inverter activates the application of the mechanical motor brake so that the drive immediately comes to an idle state due to the mechanical braking. Motors that do not have a mechanical brake will coast to a stop when this control command is used.

Setting *bit 0* is sufficient to trigger the control command *Controller inhibit*. *Controller inhibit/enable* in the control word, as all other bits are irrelevant. This control bit therefore has the highest priority in the control word.

Control command "Rapid stop"

Use the *Rapid stop* control command to cause the frequency inverter to perform a deceleration at the currently valid rapid stop ramp. The following parameterized rapid stop ramps are generally effective:

- P136 T13 Stop ramp (with active parameter set 1)
- P146 T23 Stop ramp (with active parameter set 2)

The process ramp that might be specified via fieldbus has no influence on the rapid stop.

This control command is activated by resetting *bit 1*: *Enable/rapid stop*.

Control command "Stop"

Use the *Stop* control command to cause the frequency inverter to perform a deceleration. If the process ramp is transmitted via the fieldbus system, this control command uses the currently specified ramp value as the deceleration ramp. Otherwise, the frequency inverter uses the typical integrator ramp for this control command depending on the set parameter and integrator set.

The control command *Stop* is triggered with *bit 2*: *Enable/stop*.

Control command "Enable"

Use the *Enable* control command to enable the frequency inverter via the fieldbus system. If the process ramp is also transmitted via the fieldbus system, this control command uses the currently specified ramp value as the acceleration ramp. Otherwise, the frequency inverter uses the typical integrator *Ramp up* for this control command, depending on the set parameter and integrator set.

For the control command *Enable*, all three bits must be switched to *Enable* (110_{bin}).

Selecting the valid parameter set

The valid parameter set is selected via bit 5 in the control word. The parameter set changeover is generally only possible in the *Controller inhibit* state.

This bit is OR-linked with the input terminal function *Parameter set changeover*, i.e. the logical state "1" of the input terminal OR of the control word bit activates parameter set 2.

Reset after a fault

Bit 6 of the control word is used to execute a reset via the process data channel in the event of an error. A reset can only be triggered with a 0/1 edge in the control word.

Control word 1

In addition to the most important drive functions of the basic control block, control word 1 contains function bits for internal setpoint functions that are generated within the MOVITRAC® B frequency inverter in the higher-order byte.

Bit	Functionality	Assignment
0	Permanently defined	Controller inhibit "1" / enable "0"
1		Enable "1" / rapid stop "0"
2		Enable "1" / stop "0"
3		Reserved
4		Integrator changeover
5		Parameter set changeover
6		Reset
7		Reserved
8	Direction of rotation for motor potentiometer	0 = CW direction of rotation 1 = CCW direction of rotation
9 10	Motor potentiometer run-up Motor potentiometer run-down	10 9 0 0 = no change 1 0 = down 0 1 = up 1 1 = no change
11 12	Selection of the internal fixed setpoints n11 – n13 or n21 – n23	12 11 0 0 = Speed setpoint via process output data word 2 0 1 = Internal setpoint n11 (n21) 1 0 = Internal setpoint n12 (n22) 1 1 = Internal setpoint n13 (n23)
13	Fixed setpoint changeover	0 = fixed setpoints of the active parameter set can be selected via bits 11/12 1 = fixed setpoints of the other parameter set can be selected via bit 11/12
14	Reserved	Reserved bits must always be set to zero.
15	Reserved	Reserved bits must always be set to zero.

These internal setpoint functions are activated by setting parameter P100 accordingly to fixed setpoint or motor potentiometer and setting the corresponding bits in control word 1. The specification of a speed setpoint via an SBus process output data word is then no longer effective.

Motor potentiometer via fieldbus

The motor potentiometer setpoint function is controlled via the fieldbus interface in the same way as via the standard input terminals. The process ramp, which might be specified via an additional process output data word, has no influence on the motor potentiometers. Only the following motor potentiometer integrators are generally used.

- P150 T3 Ramp up
- P151 T4 Ramp down

Control word 2

Control word 2 contains function bits for the most important drive functions in the basic control block and the virtual input terminals in the higher-order part. These are freely programmable input terminals, but are not physically available due to a lack of hardware (option cards). These input terminals are thus mapped to the virtual input terminals of the fieldbus. Each virtual terminal is assigned to an optional and **physically unavailable** input terminal and its functionality can be freely programmed.

Bit	Function	Definition
0	Controller inhibit "1" / enable "0"	Permanently defined
1	Enable "1" / rapid stop "0"	
2	Enable "1" / stop "0"	
3	Reserved	
4	Integrator changeover	
5	Parameter set changeover	
6	Reset	
7	Reserved	
8	Virtual terminal 1 = P610 / digital input DI10	Virtual input terminals
9	Virtual terminal 2 = P611 / digital input DI11	
10	Virtual terminal 3 = P612 / digital input DI12	
11	Virtual terminal 4 = P613 / digital input DI13	
12	Virtual terminal 5 = P614 / digital input DI14	
13	Virtual terminal 6 = P615 / digital input DI15	
14	Virtual terminal 7 = P616 / digital input DI16	
15	Virtual terminal 8 = P617 / digital input DI17	

⚠ CAUTION



If the FIO21B option is also plugged into the frequency inverter in addition to the fieldbus interface, the inputs of the FIO21B option have priority. The virtual inputs are not evaluated in this case.

Status word definition

The status word is 16 bits wide. The lowest value byte, known as the basic status block, consists of 8 fixed status bits that reflect the most important drive states. The assignment of the higher-value status bits varies between the different status words.

Basic status block

The basic status block of the status word contains status information that is required for almost all drive applications.

Bit	Function / assignment	Definition
0	Output stage enabled "1" / output stage disabled "0"	Permanently defined
1	Inverter ready for operation "1" / inverter not ready for operation "0"	
2	PO data enabled "1" / PO data disabled "0"	
3	Current integrator set: Integrator 2 "1" / integrator 1 "0"	
4	Current parameter set: Parameter set 2 "1" / parameter set 1 "0"	
5	Failure / warning: Failure/warning present "1" / no failure "0"	
6		
7		

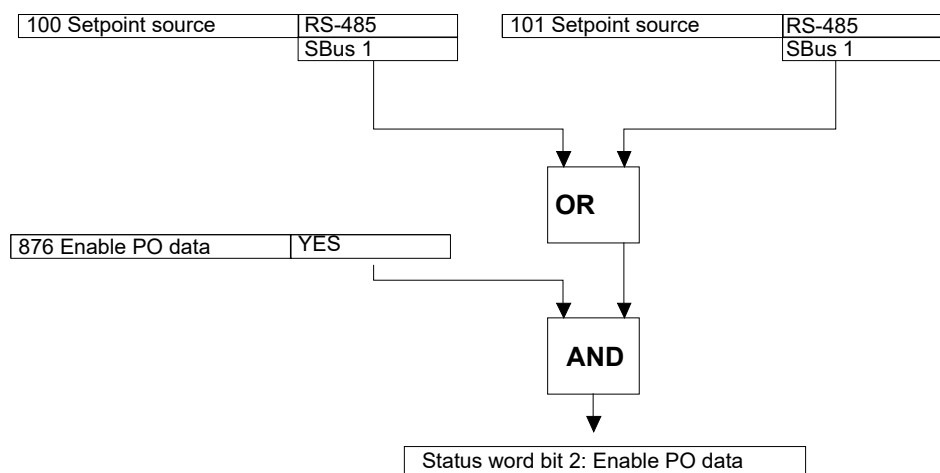
Message "Inverter ready for operation"

Bit 1 in the status word reports that the frequency inverter is ready to respond to control commands of an external controller with the value *Inverter ready for operation* = 1. The frequency inverter is not ready for operation if

- MOVITRAC® B reports an error
- The factory setting is active (setup)
- No line voltage is present

Message "PO data enabled"

Bit 2 signals with *PO data enabled* = 1 that the frequency inverter is responding to control or setpoint values from the communication interfaces. The following image shows which conditions must be met for the PO data to be enabled:



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Fault/warning

With bit 5 in the status word, the frequency inverter reports a failure or warning that might have occurred. A failure generally means that the frequency inverter is no longer operational. However, a warning can occur temporarily without affecting the operating behavior of the frequency inverter. You should therefore evaluate bit 1 – *Inverter ready for operation* in addition to this fault bit for exact filtering of a failure (prerequisite: Line voltage ON).

Bit 1: Ready	Bit 5: Failure / warning	Meaning
0	0	Inverter not ready for operation
0	1	Failure
1	0	Inverter is ready for operation
1	1	Warning

Status word 1

In addition to the status information in the basic status block, status word 1 contains either the *device status* or the *fault number* in the high-order status byte. Depending on the fault bit, the device status is displayed if the fault bit = 0 and the fault number is displayed in the event of a fault (fault bit = 1). Resetting the failure also resets the fault bit and the current device status is displayed again. For the meaning of the fault numbers and the device status, refer to the system manual or the MOVITRAC® B operating instructions.

Bit	Function	Definition
0	Output stage enabled	Permanently defined
1	Inverter ready for operation	
2	PO data enabled	
3	Current integrator set	
4	Current parameter set	
5	Failure / warning	
6	Reserved	
7	Reserved	
8	Failure / warning? Bit 5 = 1 → Fault number: 01 Overcurrent 02 ... Bit 5 = 0 → Device status: 0x1 Controller inhibit 0x2 ...	Device status / fault number
9		
10		
11		
12		
13		
14		
15		

Status word 2

In addition to the status information in the basic status block, status word 2 contains the virtual output terminals DO10 – DO17 in the higher-order status byte. By programming the terminal functions for the output terminals, all conventional signals can be processed via the fieldbus system.

Bit	Function	Definition
0	Output stage enabled	Permanently defined
1	Inverter ready for operation	
2	PO data enabled	
3	Current integrator set	
4	Current parameter set	
5	Failure / warning	
6	Reserved	
7	Reserved	
8	Virtual terminal 1 = P630 / digital output DO10	Virtual output terminals
9	Virtual terminal 2 = P631 / digital output DO11	
10	Virtual terminal 3 = P632 / digital output DO12	
11	Virtual terminal 4 = P633 / digital output DO13	
12	Virtual terminal 5 = P634 / digital output DO14	
13	Virtual terminal 6 = P635 / digital output DO15	
14	Virtual terminal 7 = P636 / digital output DO16	
15	Virtual terminal 8 = P637 / digital output DO17	



⚠ CAUTION

If the FIO21B option is also plugged into the frequency inverter in addition to the fieldbus interface, the inputs of the FIO21B option have priority. The virtual inputs are not evaluated in this case.

Fault number and unit status



INFORMATION

An up-to-date list of fault numbers and device statuses can be found in the parameter list corresponding to the firmware of your devices. For more information, refer to the operating instructions and the MOVITRAC® B system manual.

Device status

With the status word, the operating status of the MOVITRAC® B is displayed and, in the event of a fault, a fault or warning code is displayed.

Device status (high byte in status word 1)	Meaning	Status LED
0	24 V operation (inverter not ready)	Flashing yellow
1	Controller inhibit active	Steady yellow
2	No enable	Steady yellow
3	Standstill current	Lights up green
4	Enable	Lights up green
5	Control	Lights up green
8	Factory setting	
13	Flying start	Lights up green
14		
Fault number is displayed in the status word	Error display (flashing)	Flashing red
The actual device status is displayed	Manual mode	Lights up green
16	Inverter waiting for data	Flashing green/yellow
17	Safe Torque Off" active	Flashing yellow

⚠ WARNING



Incorrect interpretation of the display U = "Safe Torque Off" active.
Severe or fatal injuries.

6.11.5 Monitoring functions

For safe operation of the MOVITRAC® B frequency inverter via the communication interfaces, additional monitoring functions are implemented which, for example, trigger a user-configurable drive function in the event of a bus error. There are two independent parameters for each communication interface.

- Timeout interval
- Timeout response

These parameters enable application-dependent drive behavior in the event of a communication error.

Timeout error message / timeout interval / timeout response

The frequency inverter generates a timeout if no new telegrams are received via the bus system within a set time window (timeout time). The adjustable timeout response defines the failure variant (error/warning) and the error response of the drive.

Timeout error message

MOVITRAC® B generates a separate **timeout error message** for each communication interface:

Communication interface	Error number	Timeout error message
RS485	F 43	RS485 TIMEOUT
SBus	F 47	SBUS 1 TIMEOUT

Timeout interval

The **timeout** can be set separately for each communication interface.

Communication interface	Parameter number	Parameter name	Timeout interval
RS485	812	RS485 timeout interval	0.00 seconds
SBus	883	SBus 1 timeout interval	0.10 seconds

Timeout response

The **timeout response** can be set separately for each communication interface.

Parameter number	Parameter name	Timeout response
833	Response RS485-TIMEOUT	RAPID ST./WARN.
836	Response SBus1-TIMEOUT	RAPID ST./WARN.

The **timeout monitoring** is useful for all communication interfaces, but can vary considerably between the individual bus systems.

Fieldbus timeout interval parameter	Range of values
Unit	Seconds
Range	0.01 s to 650.00 s in 10 ms steps
Special case	0 or 650.00 = fieldbus timeout switched off
Factory setting	0.5 s

INFORMATION



For MOVILINK® via RS485 and SBus, the timeout interval must be set manually in P812 or P883. For control via CANopen or the FSE24B, the timeout interval is set automatically in parameter P883.

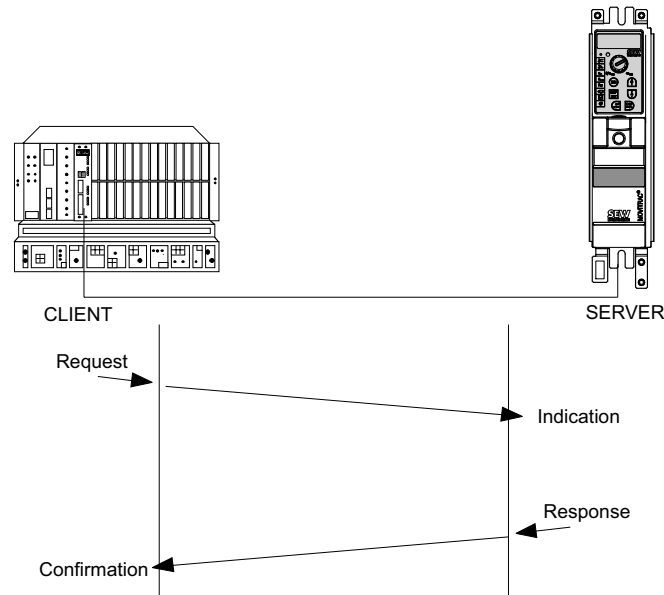
6.11.6 Setting the inverter parameters

The drive parameters of the inverter are usually accessed via the bus-specific READ and WRITE services. Additional services can be executed for all bus systems via the MOVILINK® parameter channel. This parameter channel is available for all bus systems and is explained in more detail below.

In addition, you will find further programming information on using the MOVILINK® parameter channel via the various bus systems in the documentation for the fieldbus interface.

Parameter setting procedure

The parameterization of the MOVITRAC® B frequency inverter is generally carried out according to the client-server model, i.e. the frequency inverter only supplies the requested information when requested by the higher-level automation device. MOVITRAC® B therefore generally only has server functionality (see figure below).



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Structure of the MOVILINK® parameter channel

The MOVILINK® parameter channel enables bus-independent access to all drive parameters of the frequency inverter. Special services are available within this parameter channel to read various parameter information. In principle, it is made up of a management byte, a reserved byte, an index word and four data bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Subindex	Index High	Index Low	MSB data	Data	Data	LSB data
Parameter index				4 byte data			

Management of the parameter channel (byte 0)

The entire parameterization sequence is coordinated with byte 0 "Management". This byte is used to provide important service parameters such as service identification, data length, execution and status of the executed service.

Index addressing (bytes 1 – 3)

Byte 2 "Index-High", byte 3 "Index-Low" and byte 1 "Subindex" are used to determine the parameter that is to be read or written via the fieldbus system. All parameters of the MOVITRAC® B frequency inverter are listed in the MOVITRAC® B system manual. Each parameter is assigned a special number (index) under which this parameter can be read or written.

Data range (bytes 4 – 7)

The data is located in byte 4 to byte 7 of the parameter channel. This means 4 bytes of data can be transmitted per service. The data is always entered right-aligned, i.e. byte 7 contains the least significant data byte (data LSB), byte 4 the most significant data byte (data MSB).

Description of the parameter services

The individual parameter adjustment services are defined via bits 0 – 3 of the management byte. The following parameter adjustment services are supported by MOVITRAC® B.

No service

This coding signals that there is no parameter adjustment service.

Read parameter

This parameter adjustment service is used to read a drive parameter.

Write parameter

This parameter adjustment service is used for non-volatile writing of a drive parameter. The written parameter value is stored in a non-volatile memory (e.g. in an EEPROM). This service should not be used for cyclical write accesses, as the memory modules only allow a limited number of write cycles.

Write parameter volatile

This parameter adjustment service is used for the volatile writing of a drive parameter, provided the parameter allows this. The written parameter value is only stored in volatile memory in the inverter's RAM and is lost when the inverter is switched off. When the inverter is switched on again, the last value written with Write Parameter is available again.

Read minimum

This service can be used to determine the smallest configurable value (minimum) of a drive parameter. The coding is done in the same way as the parameter value.

Read maximum

This service can be used to determine the largest configurable value (maximum) of a drive parameter. The coding is done in the same way as the parameter value.

Read default

This service can be used to determine the factory setting (default) of a drive parameter. The coding is done in the same way as the parameter value.

Read scale

This service can be used to determine the scaling of a parameter. The inverter returns a measurement index and conversion index.

Byte 4	Byte 5	Byte 6	Byte 7
MSB data	Data	Data	LSB data
Reserved		Measurement index	Conversion index

Measurement index:

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The measurement index is used for coding physical variables. This index is used to transmit information to a communication partner about the physical variable of the associated parameter value. Coding is carried out in accordance with the PROFIBUS user organization (PNO) sensor technology/actuator profile. The entry FF_{hex} means that no measurement index is specified. You can also find the measurement index in the parameter list of the inverter.

Conversion index:

The conversion index is used to convert the transferred parameter value into an SI basic unit. Coding is carried out in accordance with the PROFIBUS user organization (PNO) sensor technology/actuator technology profile.

Example:

Drive parameters: P131 Ramp t11 down CW

Measurement index: 4 (= time with the unit second)

Conversion index: 3 (10^{-3} = milli)

Transmitted numerical value: 3000 dec

The numerical value received via the bus is interpreted by the frequency inverter as follows: $3000 \text{ s} \times 10^{-3} = 3 \text{ s}$

Read attribute

This service can be used to read the access attributes and the index of the next parameter. The following table shows the coding of the data for this parameter adjustment service.

Byte 4	Byte 5	Byte 6	Byte 7
MSB data	Data	Data	LSB data
Next available index		Access attributes	

The access attributes are coded device-specifically. The attribute definition for MOVITRAC® B frequency inverters is shown in the following table.

Byte 6	Byte 7	
Bit	Bit	Meaning
	0	1 = parameter allows write access
	1	1 = parameter is stored resident on EEPROM
	2	1 = factory setting overwrites RAM value
	3	1 = factory setting overwrites EEPROM value
	4	1 = after initialization EEPROM value valid
	5	1 = controller inhibit status not required for write access
	6	1 = password required
8	7	00 = parameter is generally valid 01 = parameter is assigned to parameter set 1 10 = parameter is assigned to parameter set 2 11 = parameter is assigned to both parameter sets
9 – 15		Reserved

Parameter list

Detailed information on coding and access attributes of all parameters can be found in the parameter list.

Incorrect service execution

If the received handshake bit is identical to the transmitted handshake bit, the inverter has executed the service.

Byte 0 Byte 1 Byte 2 Byte 3 Byte 4 Byte 5 Byte 6 Byte 7

Management	Subindex	Index High	Index Low	Error class	Error code	Add. Code High	Add. Code Low
------------	----------	------------	-----------	-------------	------------	----------------	---------------



Status bit = 1: Incorrect service execution

Return codes for parameterization

In the event of faulty parameterization, the frequency inverter returns various return codes to the parameterizing master, which provide detailed information about the cause of the error. In general, these return codes are structured according to EN 50170. A distinction is made between the elements

- Error class
- Error code
- Additional code

These return codes apply to all communication interfaces of the MOVITRAC® B.

Error class

The Error-Class element is used to classify the error type more precisely. According to EN 50170, a distinction is made between the following error classes.

Class (hex)	Designation	Meaning
1	vfd state	Status error of the virtual field unit
2	application-reference	Error in control program
3	definition	Definition error
4	resource	Resource error
5	service	Error during service execution
6	access	Access error
7	ov	Error in the object directory
8	other	Other error (see additional code)

The error class is generated by the communication software of the fieldbus interface if there is faulty communication. This does not apply to *Error class 8 = Other error*, however. Return codes supplied by the frequency inverter system all fall under *Error-Class 8 = other error*. A more detailed breakdown of the error is provided by the Additional-Code element. The Ethernet error code is then "0".

Error code

The error code element allows you to clearly identify the cause for the error within the Error class. It is generated by the communication software of the fieldbus interface in the event of faulty communication.

Additional code

The additional code contains SEW-EURODRIVE-specific return codes for faulty parameterization of the frequency inverters. They are sent back to the master under *Error-Class 8 = other error*. The following table shows all possible codings for the additional code.

MOVILINK®			
	Additional Code		
Error Class	High	Low	Description
0x05	00	0x00	Unknown Error
		0x01	Illegal Service
		0x02	No Response
		0x03	Different Address
		0x04	Different Type
		0x05	Different Index
		0x06	Different Service
		0x07	Different Channel
		0x08	Different Block
		0x09	No Scope Data
		0x0A	Illegal Length
		0x0B	Illegal Address
		0x0C	Illegal Pointer
		0x0D	Not enough memory
		0x0E	System Error
		0x0F	Communication does not exist
		0x10	Communication not initialized
		0x11	Mouse Conflict
		0x12	Illegal Bus
		0x13	FCS Error
		0x14	PB Init
		0x15	SBUS – Illegal Fragment Count
		0x16	SBUS – Illegal Fragment Type
		0x17	Access denied
	Not Used		

MOVILINK®			
	Additional Code		
Error Class	High	Low	Description
0x08	00	0x00	No Error
		0x10	Illegal Index
		0x11	Not yet implemented
		0x12	Read Only
		0x13	Parameter blocking
		0x14	Setup runs
		0x15	Value too large
		0x16	Value too small
		0x17	Required hardware does not exist
		0x18	Internal Error
		0x19	Access only via RS485 (via X13)
		0x1A	Access only via RS485 (via XT)
		0x1B	Parameter protected
		0x1C	"Controller inhibit" required
		0x1D	Value invalid
		0x1E	Setup started
		0x1F	Buffer overflow
		0x20	"No Enable" required
		0x21	End of File
		0x22	Communication Order
		0x23	"IPOSplus® Stop" required
		0x24	Autosetup
		0x25	Encoder Nameplate Error
		0x29	PLC State Error

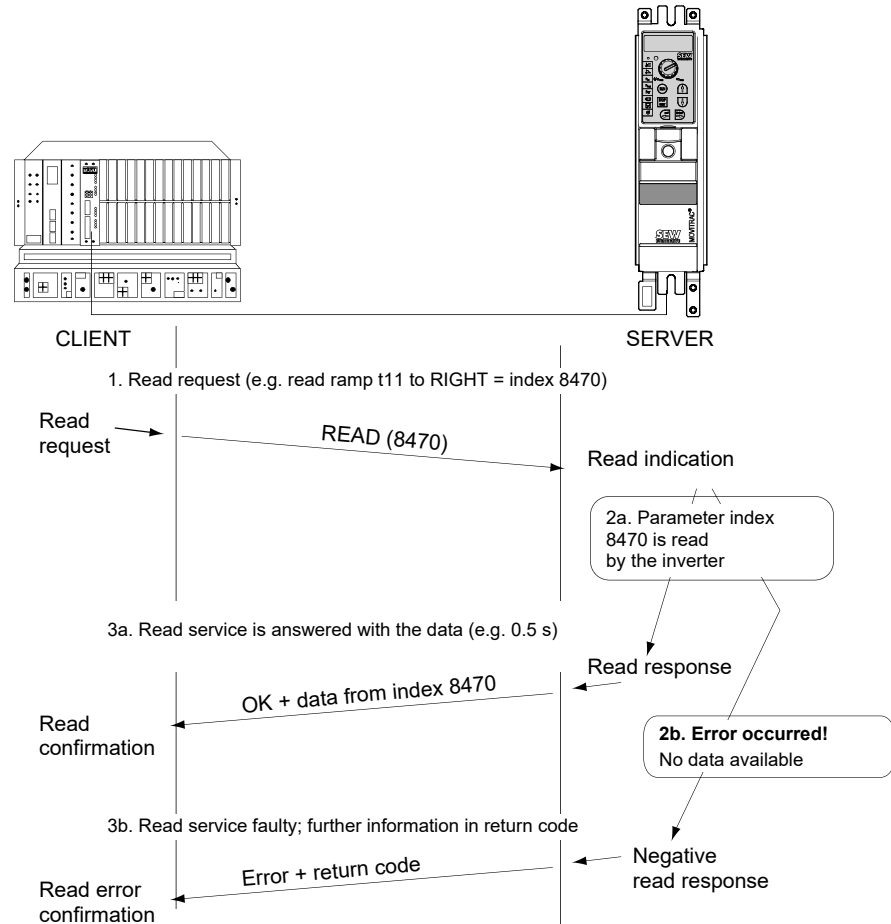
Example: Parameterization error

An incorrect index was entered when executing a read or write service.

	Code (hex)	Meaning
Error class	0x08	Other
Error code	0x00	–
Add. code high	0x00	–
Add. code low	0x10	Illegal Index

Example: Reading a parameter (READ)

A parameter is read via the communication interface with the read request (*Read-Request*) from the automation device to the MOVITRAC® B frequency inverter (see following figure).



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If it is not possible to execute the read service in the frequency inverter, this is reported back to the automation device in a negative response (*negative read response*). The automation device thus receives a negative confirmation (*Read-Error-Confirmation*) with a precise breakdown of the error.

Reading a parameter cyclically

With the cyclical transmission variant, the handshake bit must be changed in order to activate service processing (read service execution). When using the acyclical PDU types, the inverter processes each request message and thus always executes the parameter channel.

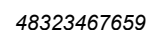
The parameterization is carried out as follows:

1. Enter the index of the parameter to be read in byte 2 (index high) and byte 3 (index low).
2. Enter the service identification for the read service in the management byte (byte 0).

- The inverter now processes the read service and returns the service confirmation by setting the handshake bits to the same value.

X = not relevant
0/1 = value of the bit is changed

A parameter is written in the same way as a parameter is read via the fieldbus interface (see figure below).



If it is not possible to execute the write service in the frequency inverter, e.g. because incorrect parameter data was transferred, this is reported back to the automation device in a negative response (*negative write response*). The automation device thus receives a negative confirmation (*Write-Error-Confirmation*) with an exact breakdown of the error.

Writing a parameter cyclically

With the cyclical transmission variant, the handshake bit must be changed so that the service processing (execution of WRITE service) is activated. When using the acyclical PDU types, the inverter processes each request message and thus always executes the parameter channel.

The parameterization is carried out as follows:

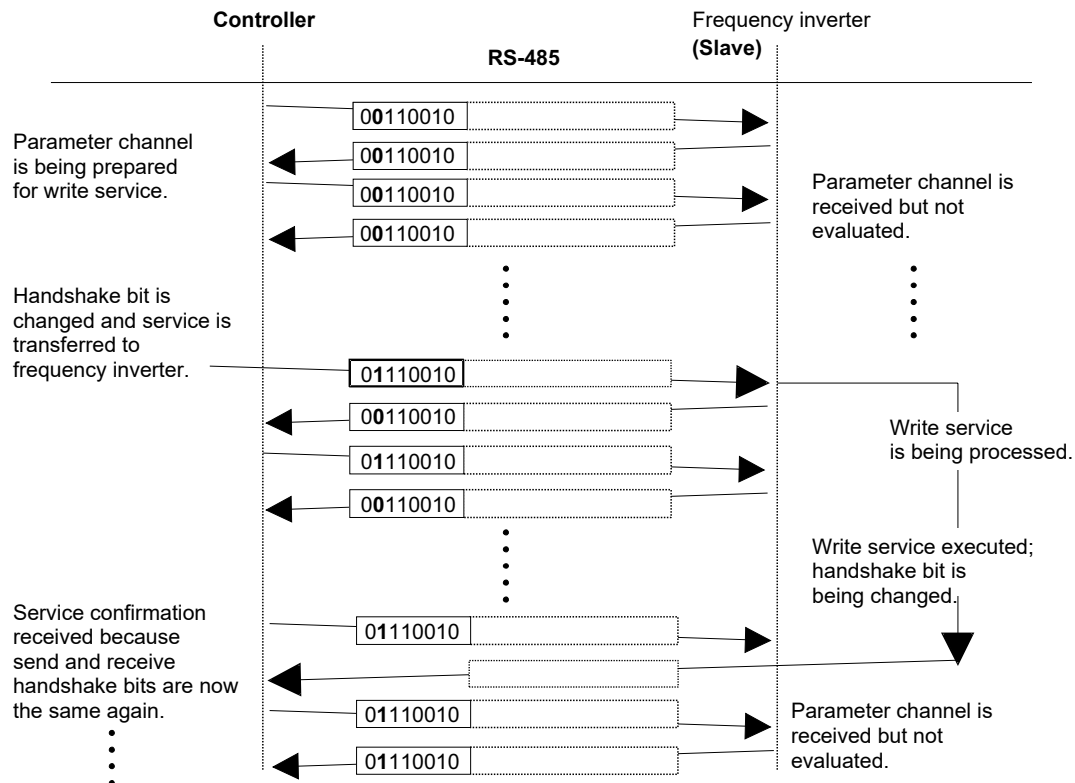
1. Enter the index of the parameter to be written in byte 2 (index high) and byte 3 (index low).
2. Enter the data to be written in bytes 4 – 7.
3. Enter the service identification and the data length for the Write service in the management byte (byte 0).
4. With cyclical PDU types, you only transfer the WRITE service to the inverter by changing the handshake bit. With acyclical PDU types, the parameter channel is always evaluated.

The inverter now processes the write service and returns the service confirmation by setting the handshake bits to the same value.

Byte 0: Management								
7	6	5	4	3	2	1	0	
0	0/1	1	1	0	0	1	0	

The data length is 4 bytes for all parameters of SEW-EURODRIVE frequency inverters.

Using the WRITE service as an example, the following figure illustrates a parameter setting procedure between the controller and inverter via a cyclical PDU type. To simplify the process, only the management byte of the parameter channel is displayed.



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While the master prepares the parameter channel for the write service, the parameter channel is only received and sent back by the frequency inverter. The service is not activated until the moment when the handshake bit is changed (in this example, when it changes from 0 to 1). The frequency inverter now interprets the parameter channel and processes the write service; however, it continues to respond to all telegrams with handshake bit = 0. Confirmation that the service has been executed occurs when the handshake bit in the response telegram of the frequency inverter is set to the same value. The master now recognizes that the received handshake bit matches the sent one and can now prepare a new parameterization.

6.11.7 Notes on parameterization

Parameterization of the MOVITRAC® B frequency inverter via the fieldbus system generally allows you to access all drive parameters. However, as some drive parameters are directly related to communication via the fieldbus system, you should observe the following information during parameterization.

Parameter setting in **CONTROLLER INHIBIT** status

Some parameters can only be changed (written) in the drive status *CONTROLLER INHIBIT*. The inverter signals this with a negative confirmation of the Write service. You can find out which parameters have this restriction in the parameter list. In general, however, these parameters can also be changed during an error or in *24 V operation* status.

Factory setting

When executing the factory setting, almost all parameters are reset to the default value. For bus operation, this means that the control signal source and the setpoint source are reset to the default value.

INFORMATION



The frequency inverter must be enabled for control via the process data on the terminal side. This means that the drive is enabled after the factory setting under certain conditions. Therefore, before activating the factory setting, make sure that the signals of the digital inputs do not trigger an enable of the frequency inverter after the factory setting. Switch on the line voltage only after completing parameterization of the inverter by way of precaution.

Parameter lock

When activated via *P803 Parameter lock = Yes*, the parameter lock blocks any adjustment of adjustable parameters. It makes sense to activate the parameter lock if the frequency inverter has been fully parameterized and no further changes are required. You can use this parameter, for example, to disable a change to the drive parameters, e.g. via the frequency inverter's keypad.

INFORMATION



The parameter lock generally blocks the writing of parameters. This means that write access via the communication interfaces is also blocked when the parameter lock is active.

6.12 External setpoint selection

6.12.1 Setpoint direction

You can specify the set direction of rotation via:

- "CW/stop" and "CCW/stop" at *P101 Control signal source = terminals* or *P101 Control signal source = 3 Wire control*.
- The polarity of the setpoint in the process data word for *P101 Control signal source = RS485 or SBus* and *P100 Setpoint source = RS485 or SBus*.

6.12.2 Setpoint speed

You can specify the setpoint speed with:

- Setpoint adjuster if *P121 Addition FBG setpoint adjuster* is set to ON
- *P100 Setpoint source*
 - Fixed setpoints

- Fixed setpoints with analog input
- Process data word from SBus or RS485
- Motor potentiometer

6.12.3 Enabling the direction of rotation with RS485 or SBus

Unipolar setpoint sources:

Unipolar/fixed setpoint
Motor potentiometer/fixed setpoint
Fixed setpoint + AI1
Fixed setpoint * AI1
Frequency setpoint input/fixed setpoint

The direction of rotation is specified by the CW or CCW terminals.

Bipolar setpoint sources:

Bipolar/fixed setpoint
RS485/fixed setpoint
SBus 1/fixed setpoint

The direction of rotation is determined by the setpoint. CW or CCW terminal is required for enable.

6.12.4 Startup for MBG11A setpoint adjuster

It is not possible to establish communication between MOVITRAC® B/MBG11A and MOVITRAC® B/PC via RS485 at the same time.

The MBG11A can specify a setpoint for up to 31 MOVITRAC® B devices at the same time.

Parameter settings

The following parameters must be set differently from the factory setting in MOVITRAC® B. If you are using an FBG11B for parameterization, set the bracket value:

- *P100 Setpoint source*: RS485 (2)
- *P101 Control signal source*: RS485 (1)
- *P871 Setpoint description PO2*: to "Speed %", then *P876 Enable PO data* to "Yes"

The speed is now displayed: -100% to +100% correspond to $-n_{\max}$ to $+n_{\max}$.

Input terminals

The following input terminals must be connected to 24 V:

- DI01 CW/stop: positive + negative direction of rotation possible by selecting the sign on the MBG11A
- DI03 Enable/stop

Settings for process data word

If the process data word PO2 is not changed, the MBG11A can also be used. Then the conversion is 1% = 32 1/min. This results from the relationship 4000 hex = 100% speed. You can see the respective values in the following tables.

The setpoint speed is specified via the MBX keypads as a percentage. The scaling changes according to the tables below depending on the PO2 setting (speed in percent or speed in revolutions):

PO2 = speed (standard parameterization *P871* = speed)

Percentage	Hex	Decimal	Speed
1%	A4 hex	164 dec	32
10%	666 hex	1638 dec	328
25%	1000 hex	4096 dec	819.2
33%	1555 hex	5461 dec	1092.3
50%	2000 hex	8192 dec	1638.4
75%	3000 hex	12288 dec	2457.6
100%	4000 hex	16384 dec	3276.8

PO2 = speed % (changed parameterization *P871* = speed %)

Percentage	Hex	Decimal	Speed
1%	A4 hex	164 dec	n_max / 100
10%	666 hex	1638 dec	n_max / 10
25%	1000 hex	4096 dec	n_max / 4
33%	1555 hex	5461 dec	n_max / 3
50%	2000 hex	8192 dec	n_max / 2
75%	3000 hex	12288 dec	n_max / 1333
100%	4000 hex	16384 dec	n_max

7 Operation

7.1 IT security

7.1.1 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.
- 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.

7.1.2 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".

7.1.3 Guidelines for user account management



The device has no user accounts.

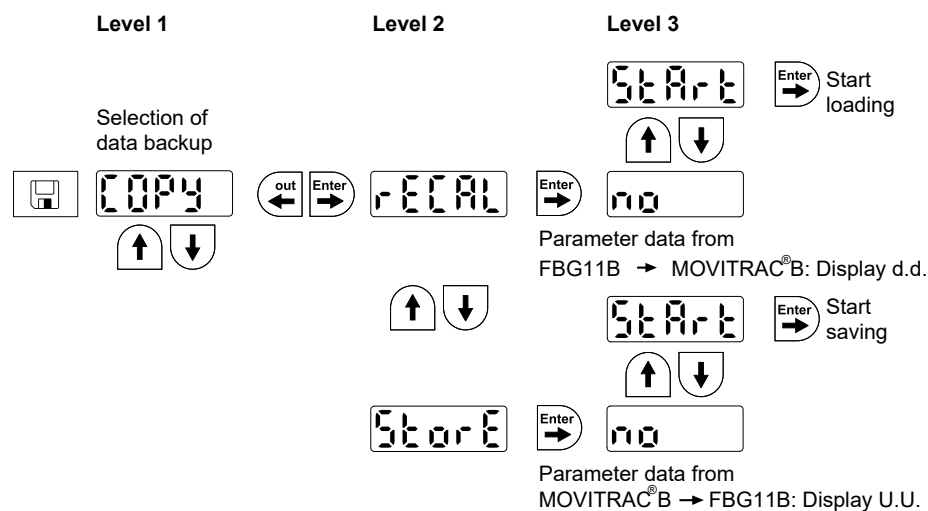
7.2 Data backup

7.2.1 Data backup with FBG11B

You can use the FBG11B keypad to save parameter data from the MOVITRAC® B to the keypad or retrieve it from the keypad to the MOVITRAC® B.

Check that the desired data set has been copied to the inverter.

Data backup with FBG11B



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After copying data, the MOVITRAC® B is locked. The locked state is indicated in the status display by a flashing STOP. In addition, the status LED flashes yellow slowly.

You can remove the lock by doing one of the following:

- Push the RUN button on the FBG11B.
- Switch off the supply system, wait 10 seconds and then switch the supply system back on.

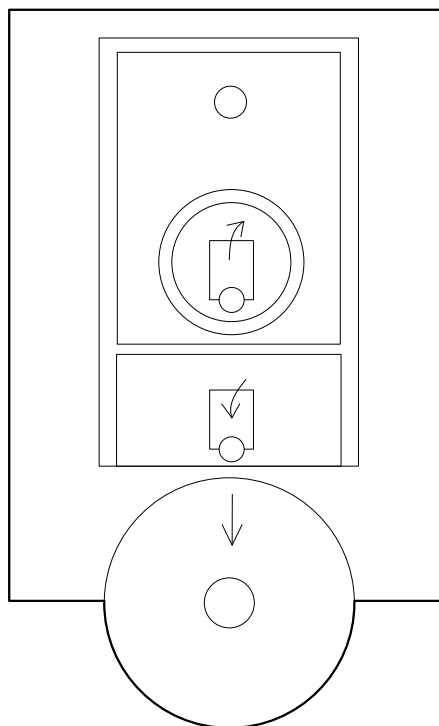
7.2.2 Data backup using DBG60B

Copy the parameter set from the MOVITRAC® B to the DBG60B keypad. You have the following options:

- Call up the menu item "COPY TO DBG" in the context menu. Confirm with the OK button. The parameter set is copied from MOVITRAC® B to the DBG60B.
- Call up the "PARAMETER MODE" menu item in the context menu. Select the parameter *P807 Copy MOVITRAC® B → DBG*. The parameter set is copied from MOVITRAC® B to the DBG60B.
- Press the Run button on the FB11B or DBG60B, or switch the device off and on again.

7.2.3 Data backup using UBP11A

Copy the parameter set from MOVITRAC® B to the UBP11A parameter module. To do this, push the button at the bottom of the module, which can only be pressed with a pointed object.



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When you restore the data to the inverter, press the <arrow up> button on the UBP11A parameter module.

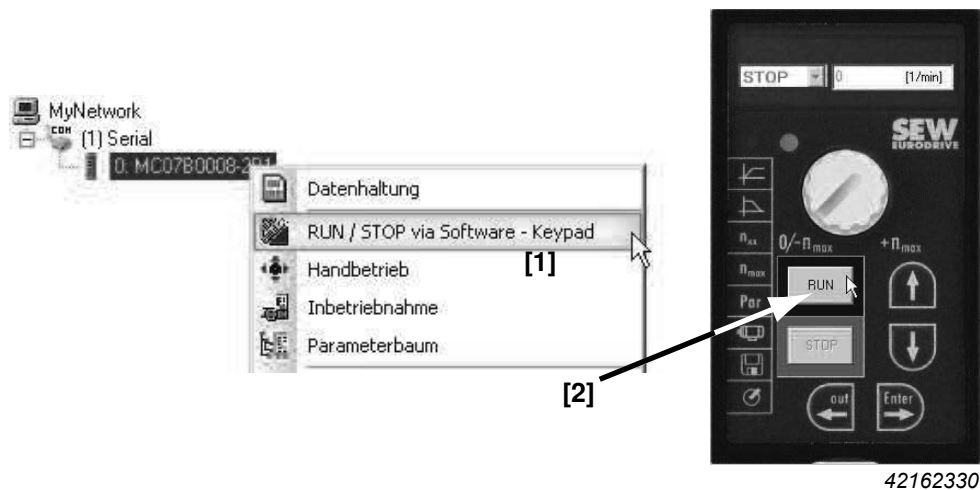
Press the Run button on the FBG11B or DBG60B, or switch the device off and on again.

7.2.4 Data backup with MOVITOOLS® MotionStudio

If data is transferred to the MOVITRAC® B frequency inverter using MOVITOOLS® MotionStudio, the inverter must then be enabled again as follows:

- Select the device in the network.
- Open the context menu with the right mouse button.
- Select the menu [RUN/STOP via software keypad] [1].
- In the software keypad, select [RUN] [2], or

Alternatively, you can enable the inverter by switching it off and on again or by pressing the <RUN> button on the FBG11B.



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7.3 Status displays

7.3.1 FBG11B basic device / keypad

The status displays on the device are as follows:

State	Display (optionally with FBG11B keypad)	Flashing code of status LED in the basic device	Device status (high byte in status word 1)
"ENABLE"	Speed	Green, steady light	4
"ENABLE" at current limit	Speed flashing	Green, fast flashing	
"STANDSTILL CURRENT"	dc	Green, slow flashing	3
"NO ENABLE"	Stop	Yellow, steady light	2
"FACTORY SETTING"	SEt	Yellow, fast flashing	8
"CONTROLLER INHIBIT"	oFF	Yellow, fast flashing	1
"24 V operation"	24U Flashing	Yellow, slow flashing	0
"SAFE TORQUE OFF" ¹⁾	U Flashing or 24U flashing	Yellow, slow flashing	17
FBG manual mode active or inverter stopped using STOP button	FBG manual mode symbol or "stop" flashing	Yellow, long on, short off	
Timeout	Error 43 / 47	Green / yellow, flashing	
Copy	Fault 97	Red / yellow, flashing	
System error	Errors 10 / 17 – 24 / 25 / 32 / 37 / 38 / 45 / 77 / 80 / 94	Red, steady light	
Overvoltage / phase failure	Errors 4 / 6 / 7	Red, slow flashing	
Overload	Errors 1 / 3 / 11 / 44 / 84	Red, fast flashing	
Monitoring	Errors 8 / 26 / 34 / 81 / 82	Red, 2 x flashing	
Motor protection	Errors 31 / 84	Red, 3 x flashing	
Waiting for data	t	Yellow, steady light	16

1) "U" flashing (status 17) when connected to the supply system, "24U" flashing (status 0) when in backup mode.

Saving the parameter set to the FBG11B → display u. u.

Saving the parameter set to the device → display d. d.

- **▲ WARNING!** Incorrect interpretation of the display U = "Safe Torque Off" active

Severe or fatal injuries.

- The display U = "Safe Torque Off" is not safety-related and must not be used for safety-related purposes.

Causes for controller inhibit (OFF)

The possible causes of controller inhibit (OFF) are:

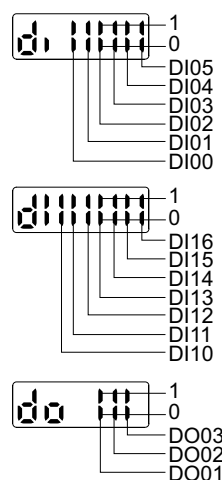
- Binary input terminal programmed to controller inhibit and active.
- Controller inhibit through PC manual mode via MOVITOOLS® MotionStudio.
- Temporary controller inhibit: Is triggered if an enable would occur directly when the parameter *P100 Setpoint source* is changed. The temporary controller inhibit is deleted as soon as the enable signal is reset for the first time.
- Controller inhibit set via IPOS^{plus}® control word H484.

7.3.2 Status of the digital inputs / digital outputs

The following parameters are available as display parameters in the parameter menu:

- *P039 Digital inputs of basic device*
- *P048 Digital inputs option*
- *P059 Digital outputs*

The status display is digital. Each digital input or output is assigned 2 vertically overlapping segments of the 7-segment display. The upper segment lights up when the digital input or output is set and the lower segment lights up when the digital input or output is not set. The two 7-segment displays on the right show whether *P039* (di = digital inputs of basic device), *P048* (di = digital inputs option) or *P059* (do = digital outputs) is being output.



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If there is no FIO21B with digital inputs, d1 - - - is displayed.

7.4 Return codes (r19 – r38)

Return codes when entering / changing a device parameter in the FBG11B:

No.	Designation	Meaning
	Read access only	Parameter cannot be changed
19	Parameter lock activated	No change of parameters possible
	Factory setting running	No change of parameters possible
	Option card missing	Option card required for function is missing
	Option card missing	Option card required for function is missing
	Controller inhibit necessary	Controller inhibit necessary

No.	Designation	Meaning
	Value for parameter not permitted	- Value for parameter not permitted - Selection of FBG manual mode not permitted, as PC manual mode is active
	Enable	You cannot execute the function in the ENABLE state
	Processing error	- Error during saving to FBG11B - Startup with FBG did not take place. Perform startup with MOVITOOLS®MotionStudio or select another motor or third-party motor
	FBG11B incorrect data set	Saved data set does not match the device

7.5 DBG60B keypad

Basic displays:

0.00rpm
0.000Amp
CONTROLLER IN-
HIBIT

Display when X13:1 (DIØØ "/controller inhibit") = "0".

0.00rpm
0.000Amp
NO ENABLE

Display when X13:1 (DIØØ "/controller inhibit") = "1" and in-
verter is not enabled ("enable/stop" = "0").

950.00rpm
0.990Amp
ENABLE (VFC)

Display for enabled inverter.

INFORMATION 6:
VALUE TOO HIGH

Information message

(DEL)=Quit
ERROR 9
STARTUP

Error info

7.6 Information messages

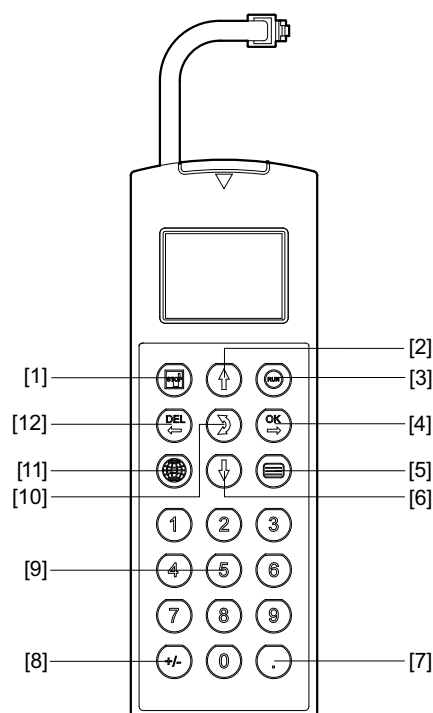
Information messages on the DBG60B (ca. 2 s in duration) or in MOVITOOLS® MotionStudio (message that can be acknowledged):

No.	Text DBG60B/ MotionStudio	Description
1	ILLEGAL INDEX	Index addressed via interface not available.
2	NOT IMPLEMENT.	- Attempt to execute a non-implemented function. - An incorrect communication service has been selected. - Manual operation selected via invalid interface (e.g. fieldbus).

No .	Text DBG60B/ MotionStudio	Description
3	READ ONLY VALUE	Attempt to edit a read-only value.
4	PARAM. INHIB- ITED	Parameter lock P 803 = "ON", parameter cannot be altered.
5	SETUP ACTIVE	Attempt to alter parameters during active factory setting.
6	VALUE TOO HIGH	Attempt to enter a value that is too high.
7	VALUE TOO LOW	Attempt to enter a value that is too low.
8	REQ. CARD MISS- ING	The option card required for the selected function is missing.
10	ONLY VIA ST1	Manual mode must be completed using X13:ST11/ST12 (RS485).
11	ONLY TERMINAL	Manual operation must be exited via TERMINAL (DBG60B or USB11/UWS21B).
12	NO ACCESS	Access to selected parameter denied.
13	REG. INHIBIT MISSING	Set terminal DIØØ "/Controller inhibit" = "0" for the selected function.
14	INVALID VALUE	Attempt to enter an invalid value.
16	PARAM. NOT SAVED	Overflow of EEPROM buffer, e.g. through cyclic write access. Parameter not stored in non-volatile EEPROM.
17	INVERTER EN- ABLED	- Parameter to be changed can only be set in the state "CONTROLLER INHIBIT". - You tried to change to manual mode during live operation.

7.7 Functions of the DBG60B keypad

7.7.1 Key assignments for DBG60B



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[1]	Key		Stop
[2]	Key		Up arrow, moves up to the next menu item
[3]	Key		Start
[4]	Key		OK, confirms the entry
[5]	Key		Activate the context menu
[6]	Key		Down arrow, moves down to the next menu item
[7]	Key		Decimal point
[8]	Key		Sign reversal
[9]	Key	0 – 9	Digits 0 – 9
[10]	Key		Change menu
[11]	Key		Select language
[12]	Key		Delete previous entry

7.7.2 Copy function of the DBG60B

The DBG60B keypad can be used for copying complete parameter sets from one MOVIDRIVE® device to other MOVIDRIVE® devices. Proceed as follows:

- In the context menu, select the menu item "COPY TO DBG". Confirm your selection using the key.

- After the copying process has finished, plug the keypad in the other inverter.
- In the context menu, select the menu item "COPY TO MDX". Confirm your selection using the  key.

7.7.3 Parameter mode

Proceed as follows to set the parameters in parameter mode:

1. Press the  key to activate the context menu.

BASIC VIEW
**PARAMETER
MODE**
VARIABLE MODE
WAKE UP PARA-
METER

2. Press the  key to start PARAMETER MODE. The first display parameter P000 "SPEED" is displayed. Use the  or  key to select main parameter groups 0 to 9.

P 000 1/min
SPEED
0.0
CONTROLLER IN-
HIBIT

3. Use the  or  key to select the desired main parameter group. The flashing cursor is positioned under the number of the main parameter group.

P 1.. SETPOINTS/
RAMP GENERAT-
ORS
CONTROLLER IN-
HIBIT

4. Press the  key to activate the parameter subgroup selection in the required main parameter group. The flashing cursor moves one position to the right.

P 1.. SETPOINTS/
RAMP GENERAT-
ORS
CONTROLLER IN-
HIBIT

5. Use the  or  key to select the desired parameter subgroup. The flashing cursor is positioned under the number of the parameter subgroup.

\ 13. SPEED
RAMPS 1
CONTROLLER IN-
HIBIT

6. Press the  key to activate the parameter selection in the required parameter subgroup. The flashing cursor moves one position to the right.

\ 13. SPEED
RAMPS 1
CONTROLLER IN-
HIBIT

7. Use the  or  key to select the desired parameter. The flashing cursor is positioned under the third digit of the parameter number.

\ 132 s
T11 UP CCW
0.13
CONTROLLER IN-
HIBIT

8. Press the  key to activate the setting mode for the selected parameter. The cursor is positioned under the parameter value.
9. Use the  or  key to set the required parameter value.
10. Press the  key to confirm the setting. To exit the setting mode, press the  key. The flashing cursor is positioned under the third digit of the parameter number again.
11. Use the  or  key to select another parameter, or press the  key to switch to the menu of the parameter subgroups.
12. Use the  or  key to select another parameter subgroup or press the  key to switch to the menu of the main parameter groups.
13. Use the  key to return to the context menu.

\ 132 s
T11 UP CCW
0.13_
CONTROLLER IN-
HIBIT

\ 132 s
T11 UP CCW
0.20_
CONTROLLER IN-
HIBIT

\ 132 s
T11 UP CCW
0.20
CONTROLLER IN-
HIBIT

\ 13. SPEED
RAMPS 1
CONTROLLER IN-
HIBIT

P 1.. SETPOINTS/
RAMP GENERAT-
ORS
CONTROLLER IN-
HIBIT

BASIC VIEW
**PARAMETER
MODE**
VARIABLE MODE
WAKE UP PARA-
METER

7.7.4 Variable mode

H... variables are displayed in the variable mode. To call up the variable mode, proceed as follows:

- Press the  key to call up the context menu. Select the "VARIABLE MODE" menu item and confirm with the  key. The variable mode display appears.
- Use the  key to edit the variables.

7.7.5 User menu

The DBG60B keypad has a standard user menu containing the parameters that are used most often. The parameters in the user menu are displayed with a "\ " before the parameter number (→ chapter "Complete parameter list"). You can add or delete parameters. You can save a maximum of 50 parameter entries. The parameters are displayed in the order in which they are stored in the inverter. The parameters are not sorted automatically.

- Press the  key to call up the context menu. Select the menu item "USER MENU" and press the OK key to confirm. The user menu with the most frequently used parameters appears.

Adding parameters to the user menu

Proceed in this order to add parameters to the user menu:

- Press the  key to call up the context menu. Select the "PARAMETER MODE" menu item.
- Select desired parameter and press the  key to confirm.
- Use the  key to return to the context menu. In the context menu, select the menu item "ADD Pxxx". "xxx" is the parameter you selected previously. Confirm your selection using the  key. The selected parameter is stored in the user menu.

Deleting parameters from the user menu

Proceed in this order to delete parameters from the user menu:

- Press the  key to call up the context menu. Select the menu item "USER MENU".
- Select the parameter that is to be deleted. Confirm your selection using the  key.
- Use the  key to return to the context menu. In the context menu, select the "DELETE Pxxx" menu item. "xxx" is the parameter you selected previously. Confirm your selection using the  key. The selected parameter is deleted from the user menu.

7.7.6 Wake-up parameter

The wake up parameter is the parameter that is displayed when the DBG60B is switched on. The factory setting for the wake up parameter is the basic display. You can select which parameter should be the wake up parameter. The following options can be used as the wake up parameter:

- Parameter (→ parameter mode)
- Parameter from the user menu (→ user menu)
- H variable (→ variable mode)
- Basic display

Proceed as follows to save a wake-up parameter:

- First select the required parameter in parameter mode.
- In the context menu, select the "XXXX WAKE-UP PARAM." menu item. "XXXX" is the selected wake-up parameter. Confirm your selection using the  key.

7.7.7 IPOS^{PLUS}®

MOVITOOLS[®] MotionStudio is required for programming IPOS^{PLUS}®. You can only use the DBG60B keypad to edit or change IPOS^{PLUS}® variables (H__).

The IPOS^{PLUS}® program is also stored in the DBG60B keypad when it is saved and is consequently also transferred when the parameter set is copied to another MOVIDRIVE[®] unit.

Parameter P931 can be used to start and stop the IPOS^{PLUS}® program from the DBG60B keypad.

7.8 List of faults (F00 – F113)

No.	Designation	Response	Possible cause	Measure
00	No fault	–	–	–
01	Overcurrent	Immediate switch-off with interlocking	• Short circuit at the output • Switching at the output • Motor too large • Defective output stage	• Remove the short circuit • Switching only when the output stage is disabled • Connect a smaller motor • Contact the SEW Service for advice if the fault still cannot be reset
03	Ground fault	Immediate switch-off with interlocking	• Ground fault in the motor • Ground fault in the inverter • Ground fault in the motor cable • Overcurrent (see F01)	• Replace motor • Replace MOVITRAC[®] B • Eliminate ground fault • See F01
04	Brake chopper	Immediate switch-off with interlocking	• Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Braking resistance too high • Brake chopper defective • Ground fault	• Extend deceleration ramps • Check supply cable to braking resistor • Remove the short circuit • Check the technical data of the braking resistor • Replace MOVITRAC[®] B • Eliminate ground fault
06	Supply system phase failure	Immediate switch-off with interlocking (only with 3-phase inverter)	• Phase failure • Line voltage too low	• Check the supply system cable • Check line voltage
07	DC link over-voltage	Immediate switch-off with interlocking	• DC link voltage too high • Ground fault	• Extend deceleration ramps • Check supply cable to braking resistor • Check the technical data of the braking resistor • Eliminate ground fault
08	Speed monitoring	Immediate switch-off with interlocking	Current controller operates at the control limit due to: • Mechanical overload • Phase failure on supply system • Phase failure on the motor • Maximum speed for VFC operating modes exceeded	• Reduce the load • Check current limitation • Extend deceleration ramps • Increase the set deceleration time P501¹⁾ • Check line phases • Check motor cable and motor • Reduce the maximum speed
09	Startup	Immediate switch-off with interlocking	• Inverter startup not yet performed • Unknown motor selected • VFC&Hoist selected and P207 not set	• Perform inverter startup • Select a different motor • Set P207

No.	Designation	Response	Possible cause	Measure
10	IPOSplus®-ILLOP	Stop with interlocking Only with IPOSplus®	• Incorrect command during program execution	• Check program
			• Faulty conditions during program execution	• Check the program sequence
			• Function not available / implemented in the inverter	• Use another function
11	Overtemperature	Stop with interlocking	• Thermal overload of the inverter	• Reduce load and/or ensure adequate cooling • If braking resistor integrated in the heat sink: Mount the braking resistor externally
17 – 24	System fault	Immediate switch-off with interlocking	• Malfunction of inverter electronics, possibly due to EMC influence	• Check grounding and shielding and improve, if necessary • Consult SEW-EURODRIVE Service if the error occurs again
25	EEPROM	Stop with interlocking	• Error when accessing EEPROM	• Activate factory settings, perform reset and re-parameterize • If this happens again, consult SEW-EURODRIVE Service
26	External terminal	Programmable	• External failure signal read via programmable input	• Eliminate the cause of the error, reprogram the terminal if necessary
31	TF/TH trigger	Stop without interlocking • Message "Ready for operation" is retained	• Motor too hot, TF has triggered	• Allow motor to cool down and reset error
			• TF of the motor not connected or not connected correctly • Connection of MOVITRAC® B and TF on motor interrupted	• Check connections between MOVITRAC® B and TF
32	IPOSplus® index overflow	Stop with interlocking	• Programming principles violated, leading to internal stack overflow	• Check and correct the user program
34	Ramp timeout	Immediate switch-off with interlocking	• Exceeding of the set deceleration ramp times of the down ramp, stop ramp or emergency stop ramp	• Extend the ramp time
			• If you remove the enable and the drive exceeds the stop ramp time t13 by a certain time, the inverter will signal F34 error message	• Extend stop ramp time
35	Ex-e protection operating mode	Immediate switch-off with interlocking	• Wrong operating mode selected	Permitted modes: • V/f, VFC, VFC hoist Impermissible process: • Flying start function • DC braking • Group operation
			• Non-permitted parameter set	• Only use parameter set 1
			• Ex-e motor startup not performed	• Perform startup of Ex-e motor
			• Incorrect parameterization of the frequency points	• Frequency A < frequency B • Frequency B < frequency C
			• Incorrect parameterization of the current limits	• Current limit A < current limit B • Current limit B < current limit C
36	Option missing	Immediate switch-off with interlocking	• Option card type not permitted	• Use the correct option card
			• Setpoint source, control signal source or operating mode not permitted for this option card	• Set the correct setpoint source • Set the correct control signal source • Set the correct operating mode • Check parameters P120 and P121
			• Required option missing	• Check the following parameters: • P121 for FBG11B • P120 and P642 for FIO12B
			• Front module FIO21B not supplied	• P808 set to "On" or supply basic device with external 24 V
37	System watchdog	Immediate switch-off with interlocking	• Error while executing system software	• Check grounding and shielding and improve, if necessary • Consult SEW-EURODRIVE Service if the error occurs again

No.	Designation	Response	Possible cause	Measure
38	System software	Immediate switch-off with interlocking	• System fault	• Check grounding and shielding and improve, if necessary • Consult SEW-EURODRIVE Service if the error occurs again
43	RS485 timeout	Stop without interlocking ²⁾	• Communication between inverter and PC interrupted • Communication to FSE24B interrupted	• Check connection between inverter and PC • Check voltage supply • Check parameter <i>P808</i>
44	Device utilization	Immediate switch-off with interlocking	• Device utilization ($I \times t$ value) too high	• Reduce power output • Extend ramps • If the above points are not possible: Use a larger inverter
45	Initialization	Immediate switch-off with interlocking	• Initialization error	• Contact SEW Service for advice
47	System bus 1 timeout	Stop without interlocking ²⁾	• Error during communication via system bus	• Check system bus connection • Check <i>P808</i> • Check voltage supply of FSE24B • Check EtherCAT® communication with connected FSE24B
77	IPOSplus® control word	Stop with interlocking	• System fault	• Contact SEW Service for advice
80	RAM test	Immediate switch-off	• Internal device fault, random access memory defective	• Contact SEW Service for advice
81	Start condition	Immediate switch-off with interlocking	Only in "VFC hoist" operating mode: The inverter could not be supplied with the correct amount of current during the pre-magnetizing time: • Rated motor power too small in relation to rated inverter power • Motor cable cross section too small	 • Check connection between inverter and motor • Check startup data and repeat startup if necessary • Check the cross section of the motor cable and increase if necessary
82	Open output	Immediate switch-off with interlocking	Only in "VFC hoist" operating mode: • 2 or all output phases are interrupted • Rated motor power too small in relation to rated inverter power	 • Check connection between inverter and motor • Check startup data and repeat startup if necessary
84	Motor protection	Stop with interlocking	• Motor capacity utilization too high	• Check <i>P345</i> / <i>P346</i> I_N UL monitoring • Reduce the load • Extend ramps • Longer pause times
94	Checksum EEPROM	Immediate switch-off with interlocking	• EEPROM defective	• Contact SEW Service for advice
97	Copy error	Immediate switch-off with interlocking	• Removing the parameter module during the copying process • Switching off/on during the copying process	Prior to fault confirmation: • Load factory setting or complete data set from the parameter module
98	CRC flash error	Immediate switch-off	• Internal device fault, flash memory defective	• Send in device for repair
100	Vibration/warning	Display errors	• Vibration sensor warning (see "DUV10A diagnostic unit" operating instructions)	• Determine cause of vibration, operation still possible until <i>F101</i> occurs
101	Vibration error	Rapid stop	• Vibration sensor reports error	• SEW-EURODRIVE recommends eliminating the cause of the vibration immediately
102	Oil aging/warning	Display errors	• Oil aging sensor issues a warning	• Schedule oil change
103	Oil aging/fault	Display errors	• Oil aging sensor reports error	• SEW-EURODRIVE recommends changing the gear unit oil immediately
104	Oil aging/overtemperature	Display errors	• Oil aging sensor signals overtemperature	• Allow the oil to cool • Check that the gear unit cooling system is working properly

No.	Designation	Response	Possible cause	Measure
105	Oil aging/ready signal	Display errors	Oil aging sensor is not operational	- Check the voltage supply of the oil aging sensor - Check the oil aging sensor, replace if necessary
106	Brake wear	Display errors	Brake lining worn down	Replace brake lining (see "Motors" operating instructions)
110	Ex-e protection	Emergency stop	Duration of operation below 5 Hz exceeded	- Check the project planning - Shorten the duration of operation below 5 Hz
111	System bus (SBus) error	This error number signals the EtherCAT® or fieldbus master that the communication between FSE24B and MOVITRAC® B is interrupted. MOVITRAC® B device would detect error 47.		Check FSE24B plug-in connection
113	Analog input wire break	Programmable	Analog input wire break AI1	Check the wiring
116	Software module error <i>Subfault:</i> 14: Encoder fault 29: Limit switch hit 42: Lag error 78: Software limit switch hit			

- 1) To set speed monitoring, change parameter P500 / P502 and P501 / P503. The sagging of hoists cannot be avoided safely if the delay time is set to an excessively high value.
- 2) No reset required, error message disappears after communication is reestablished.

8 Service

8.1 Device information

8.1.1 Fault memory

The inverter saves the error message in the fault memory *P080*. The inverter does not save a new error until the error message has been acknowledged. The local operating unit displays the last error that occurred. As a result, the value stored in *P080* and the value displayed on the control plate are different in the event of duplicate errors. This occurs, for example, with *F07 DC link overvoltage* and then *F34 Ramp timeout*.

At the time of the failure, the inverter stores the following information:

- Error that has occurred
- Status of the digital inputs / digital outputs
- Operating state of the inverter
- Inverter status
- Heat sink temperature
- Speed
- Output current
- Active current
- Device utilization
- DC link voltage

8.1.2 Switch-off responses

Depending on the failure, there are 3 switch-off responses:

Immediate stop/malfunction (immediate switch-off with locking)

This error response leads to immediate interlocking of the output stage with simultaneous control of the brake output, so that an existing brake is applied. The inverter sets the "Fault message" and cancels the "Ready for operation message".

This state can only be exited by an explicit error reset.

Rapid stop/malfunction (stop with locking)

This error response leads to a stop at the set stop ramp t_{13} (*P136 / P146*). This error stop is time-monitored. If the drive does not reach the start/stop speed within a specified time interval, it branches to the error state, the output stage is disabled and an existing brake is applied. The error message *F34 Ramp timeout* is generated. The original error message is overwritten. When the drive reaches the start-stop speed, it branches to the error state, the brake is applied and the output stage is disabled. The "Fault message" is set and the "Ready for operation message" is canceled.

This state can only be exited by an explicit error reset.

Rapid stop/warning (stop without locking)

The error response is the same as for rapid stop / failure, with the difference that the inverter does not reset the ready signal, but only sets the fault output.

With RS485/SBus timeout:

If the inverter is controlled via a communication interface (RS485 or SBus) and power off and power on have been performed, the enable remains ineffective until the inverter receives valid data again via the interface monitored for timeout. Once communication is restored, the error message itself is reset.

8.1.3 Reset

Reset basic device

An error message can be reset by:

- Reset via input terminals with a correspondingly assigned digital input. DI00 is assigned an error reset by default.

Reset keypad

An error message can be acknowledged by a manual reset on the control section (STOP/RESET button).

The STOP/RESET button has priority over a terminal enable or an enable via interface.

After an error has occurred and the error response has been programmed, you can perform a reset using the STOP/RESET button. The drive is disabled after the reset. You must enable the drive with the RUN button.

Interface reset

An error message can be acknowledged by:

- Manual reset in MOVITOOLS® MotionStudio / *P840 Manual reset* = Yes or in the status window of the reset button.

8.2 SEW electronics service

8.2.1 Hotline

You can reach a service specialist from SEW-EURODRIVE Service around the clock, 365 days a year, by calling the Drive Service Hotline.

Simply dial the code **0800** and then enter the key combination for **SEWHELP**. Or simply dial **0800-739-4357**.

8.2.2 Send in for repair

If you are unable to rectify an error, contact the **SEW-EURODRIVE Electronics Service**.

Always specify the digits of the device status when contacting the SEW-EURODRIVE Electronics Service team. The SEW-EURODRIVE Service can then help you more effectively.

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

- Serial number (see nameplate)
- Type designation
- Brief application description (application, control via terminals or serial)
- Connected motor (motor voltage, star or delta connection)
- Type of fault

- Accompanying circumstances
- Your own presumptions
- Any unusual events preceding the problem

8.3 Extended storage

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

Procedure in the event of failure to perform maintenance:

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

In the event of failure to perform maintenance, SEW-EURODRIVE recommends that you slowly increase the line voltage up to the maximum voltage. This can be done, for example, using a variable transformer whose output voltage is set according to the following overview. SEW-EURODRIVE recommends increasing the voltage from 0 V to the first stage within a few seconds.

SEW-EURODRIVE recommends the following graduations:

AC 400/500 V devices:

- Stage 1: AC 350 V for 15 minutes
- Stage 2: AC 420 V for 15 minutes
- Stage 3: AC 500 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

Following this regeneration, the device can be used immediately or, with maintenance, remain in extended storage.

8.4 Disposal

Observe the current national regulations.

Dispose of materials separately in accordance with the nature of the materials and the regulations currently in force, for example:

- Waste electrical and electronic products (printed circuit boards)
- Plastic
- Sheet metal
- Copper
- Aluminum.

8.5 IT security guidelines for secure disposal

8.5.1 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." (→ 133)

8.5.2 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.

8.5.3 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
- 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

8.5.4 Removing a customer data backup



The product does not create local customer data backups.

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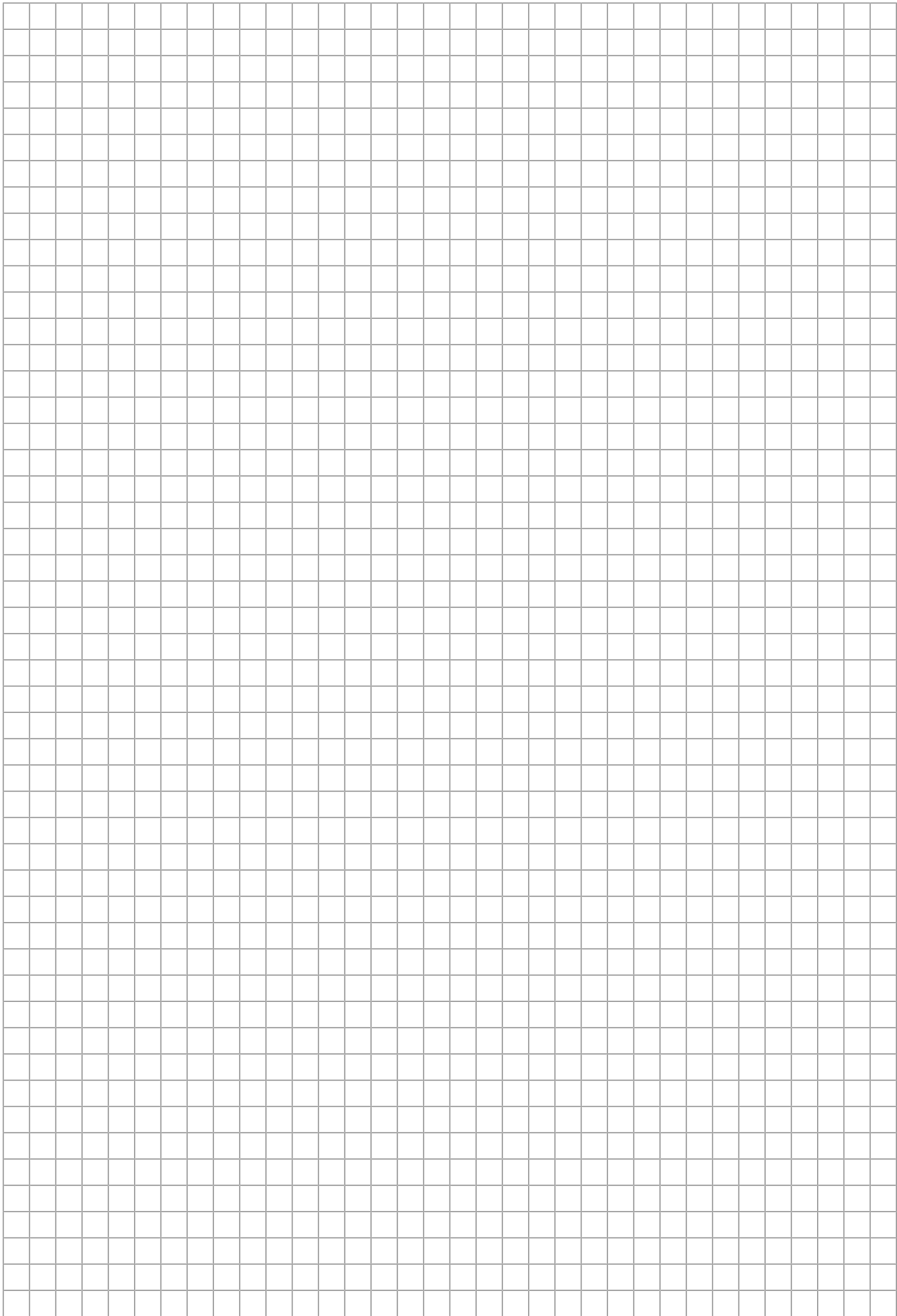
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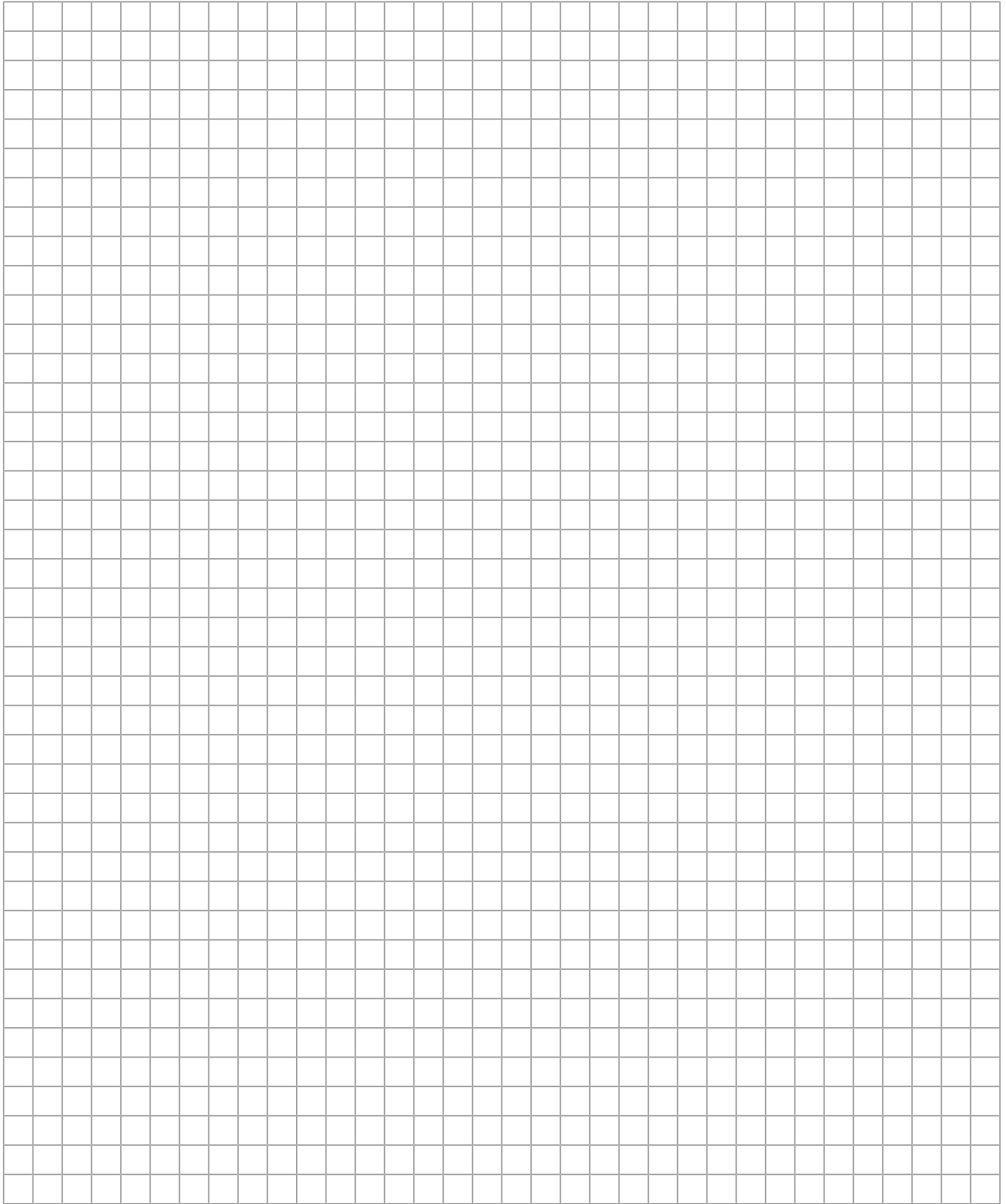
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