SEW EURODRIVE

Operating Instructions

Frequency Inverters

MOVITRAC® LTE-B+

Edition 01/2018

24802948/EN

Contents

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1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is intended for all employees who perform assembly, installation, startup, and service work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

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1.2 Structure of the safety notes

1.2.1 Meaning of signal words

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

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

1.2.2 Structure of section-related safety notes

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

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

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

1.2.3 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

- ⚠ **SIGNAL WORD** Type and source of hazard.

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Read the documentation before you start working with the product.

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1.4 Exclusion of liability

You must comply with the information contained in this documentation to ensure safe operation and to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

1.5 Product names and trademarks

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

1.6 Copyright notice

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2 Safety notes

2.1 Preliminary information

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

2.2 Duties of the user

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

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

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

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

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

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

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2.3 Target group

Specialist for mechanical work

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

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

Specialist for electrotechnical work

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

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

Additional qualification

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation. The persons must have the express authorization of the company to operate, program, parameterize, label, and ground units, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is that the persons are capable of performing the required tasks and work steps in a safe and correct manner.

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2.4 Designated use

The product is intended for installation in electrical plants or machines.

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

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

The systems can be mobile or stationary. The motors must be suitable for operation with inverters. Do not connect any other loads to the product. Never connect capacitive loads to the product.

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

- AC asynchronous motors with squirrel-cage rotor

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

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

Do not use the product as a climbing aid.

2.4.1 Lifting applications

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

2.5 Transport

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

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- Before transportation, cover the connections with the supplied protection caps.
- Only place the product on the cooling fins or on the side without connectors during transportation.
- Always use lifting eyes if available.

If necessary, use suitable, sufficiently dimensioned handling equipment.

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

2.6 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in the documentation.

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

Observe the notes in chapter Mechanical installation in the documentation.

2.7 Restrictions of use

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

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- Use at an elevation of more than 4000 m above sea level

The product can be used at altitudes above 1000 m above sea level up to 4000 m above sea level under the following conditions:

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

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2.8 Electrical installation

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

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

2.8.1 Required preventive measure

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

2.8.2 Stationary application

Necessary preventive measure for the product is:

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

2.9 Protective separation

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

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2.10 Startup/operation

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

Make sure that the present transport protection is removed.

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

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. You have to check the protection devices after each modification.

When in doubt, switch off the product whenever changes occur in relation to normal operation. Possible changes are e.g. increased temperatures, noise, or oscillation. Determine the cause. Contact SEW-EURODRIVE if necessary.

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

Do not separate the connection to the product during operation.

This may result in dangerous electric arcs damaging the product.

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

10 minutes.

Observe the corresponding information signs on the product.

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

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

Risk of burns: The surface temperature of the product can exceed 60 °C during operation.

Do not touch the product during operation.

Let the product cool down before touching it.

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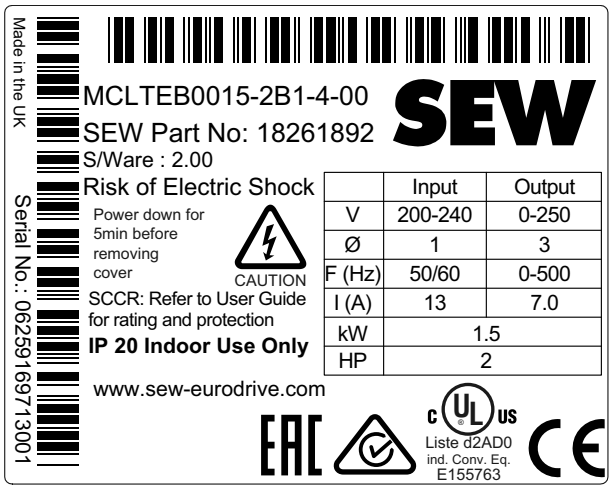
3 Device structure

3.1 Nameplate

The following figure shows an example of a nameplate.



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3.2 Type designation

Example: MCLTE-1-B 0015-201-1-00		
Product name	MCLTE	MOVITRAC® LTE-B
Version	B	Version status of the device series
Motor	1	Only single-phase motors
Recommended motor power	0015	0015 = 1.5 kW
Connection voltage	2	• 1 = 115 V • 2 = 200 – 240 V • 5 = 380 – 480 V
Interference suppression on the input	0	• 0 = Class 0 • A = C2 (class A) • B = C1 (class B)
Connection type	1	• 1 = 1-Phase • 3 = 3-Phase
Quadrants	1	• 1 = 1-Quadrant operation without brake chopper • 4 = 4-Quadrant operation with brake chopper
Design	00	• 00 = Standard IP20 housing • 30 = IP66/NEMA-4X housing without switch • 40 = IP66/NEMA-4X housing with switch
Country-specific variant	(60 Hz)	60 Hz = 60 Hz design

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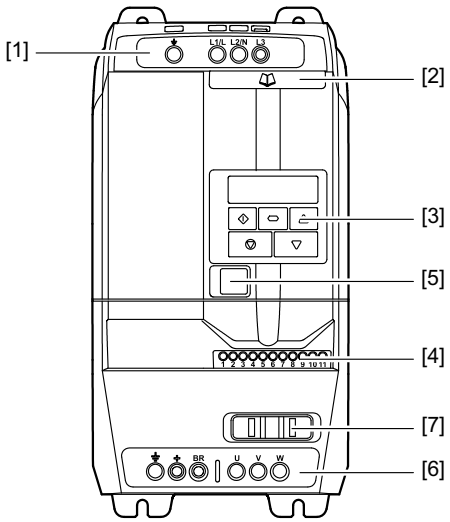
3.3 Device structure of the standard inverter

3.3.1 Inverters with degree of protection IP20/NEMA 1



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[1] Connecting terminal strip PE, L1/L, L2/N, L3

[2] Help card with terminal assignment and basic parameters

[3] Keypad with a 6-digit 7-segment display

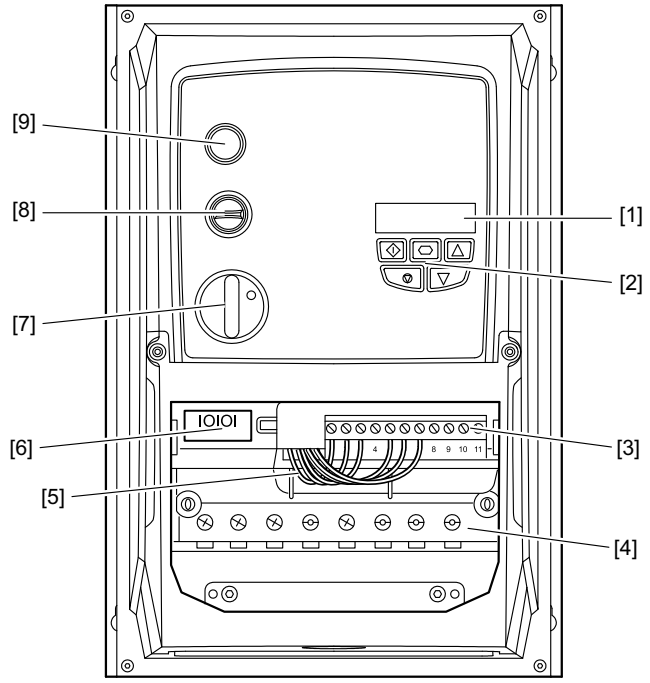
[4] Control terminal strip

[5] RJ45 communication socket

[6] Connecting terminal strip PE, +, BR, U, V, W (with BG1 no +- and BR connection present)

[7] Tab for fastening the control cable

3.3.2 Inverters with degree of protection IP66/NEMA 4X



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[1] 6-digit 7-segment display

[2] Keypad

[3] Control terminal strip

[4] Connecting terminal strip PE, L1/L, L2/N, L3, +, BR, U, V, W

[6] RJ45 communication socket

The following items are only present in the device design with switch option.

[5] Connection wires of the optional switches

[7] Main switch for power supply disconnection

[8] Rotary switch for direction of rotation CW/0/CCW

[9] Rotary potentiometer for speed

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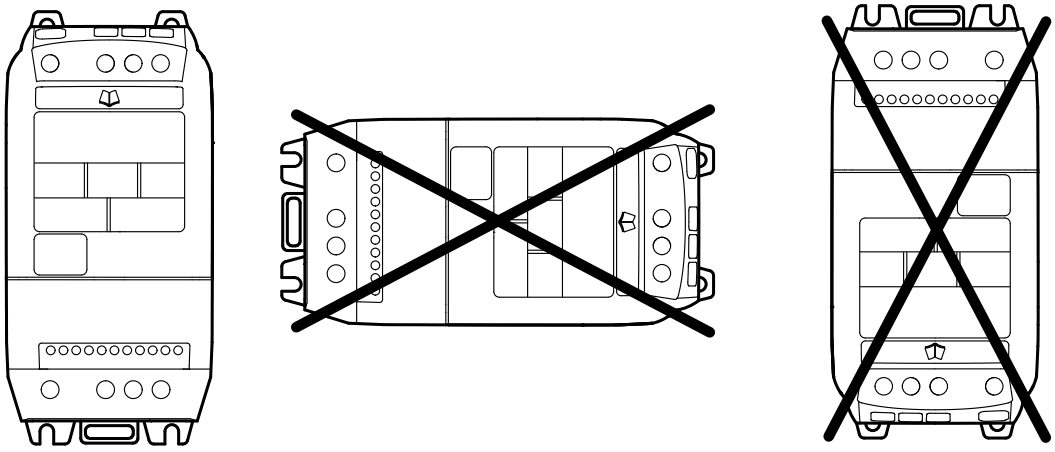
4 Installation

4.1 General information

- Carefully check the frequency inverter for damage before installation.
- Store the frequency inverter in its original packaging until it is used. The storage location must be clean and dry with an ambient temperature between -40 °C and +60 °C.
- Install frequency inverter in a suitable housing on a level, vertical, non-flammable, and vibration-free surface. If a certain IP degree of protection is required, observe EN 60529.
- Keep flammable materials away from the frequency inverter.
- Prevent the ingress of conductive or flammable foreign objects.
- The relative humidity must be kept below 95 % (condensation is not permitted).
- Protect the IP66 frequency inverter from direct sunlight. Use a cover when using the inverter outdoors.
- Frequency inverters can be installed next to each other. Ensure sufficient ventilation space between the individual devices. If the frequency inverter is to be installed above another frequency inverter or another device that dissipates heat, then there must be a vertical minimum clearance of 150 mm. To enable self-cooling, the control cabinet must either be cooled through forced ventilation, or dimensioned accordingly. See chapter "IP20 housing: Installation and installation space" (→ 🗎 20).
- The permitted ambient temperatures are defined in chapter "Ambient conditions" (→ 🗎 111).
- The mounting rail installation is only possible for the following inverters with degree of protection IP20.
  - 110 V: 0.37 – 1.1 kW
  - 230 V: 0.37 – 2.2 kW
  - 400 V: 0.75 – 4 kW

  The mounting rail must have the dimensions 35 × 15 mm or 35 × 7.5 mm and be designed according to EN 50022.
- Install the frequency inverter only as depicted in the following figure:



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4.2 Permitted tightening torques

Power of the inverters in kW	Tightening torque in Nm	
	Control terminals	Power terminals
Nominal line voltage 115 V		
0.37 – 1.1	0.5	1
Nominal line voltage 230 V		
0.37 – 5.5	0.5	1
7.5 – 11[1)]	0.5	15
15 – 18.5[1)]	0.5	20
Nominal line voltage 400 V		
0.75 – 11	0.5	1
15 – 22[1)]		15
30 – 37[1)]		20

1) In preparation

4.3 Mechanical installation

4.3.1 IP20 housing: Installation and installation space

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

- The control cabinet must be made of a heat conductive material unless it has forced cooling.
- When using a control cabinet with ventilation openings, the openings must be provided above and underneath the inverter to allow for unobstructed circulation of air. The air must be supplied underneath the inverter and dissipated above it.
- If the inverter is operated in environments with particles of dirt (such as dust), ventilation openings either have to be equipped with a suitable particle filter or forced cooling has to be used. The filter has to be serviced and cleaned.
- In environments with a high level of humidity, salt or chemicals, a suitable enclosed control cabinet (without ventilation openings) must be used.
- The inverters with degree of protection IP20 can be installed right next to each other without clearance.

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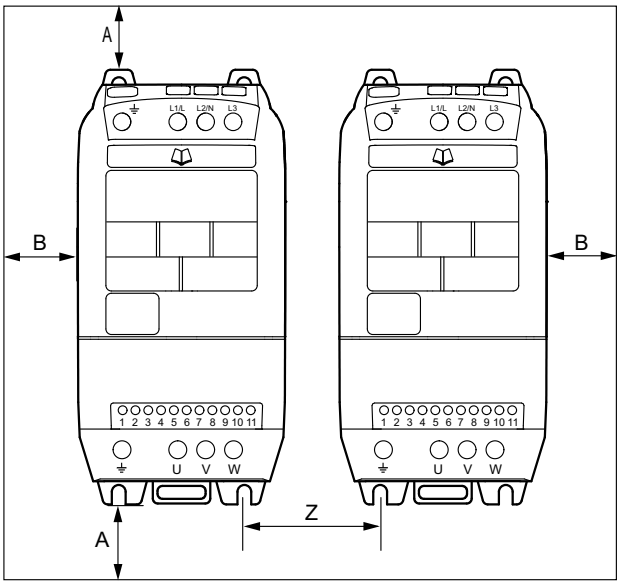

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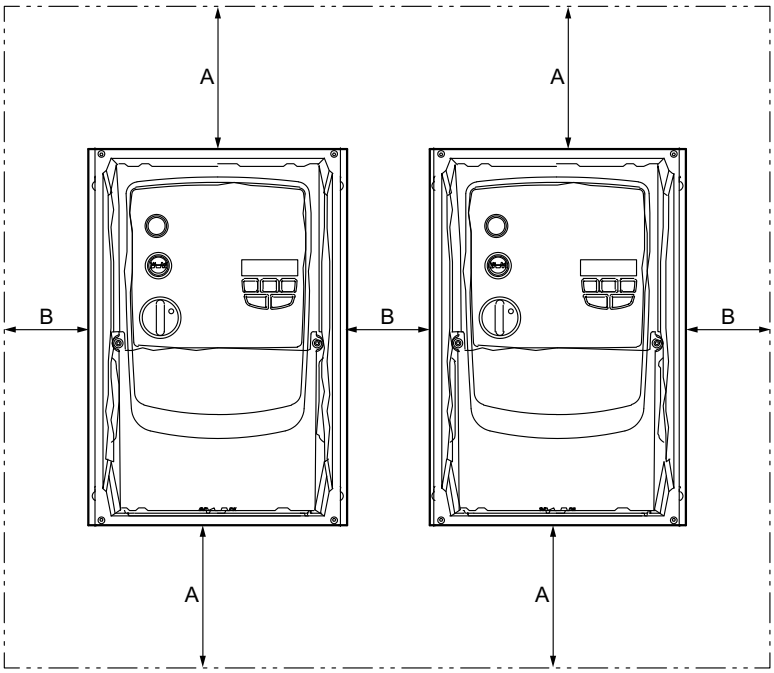
Size	A	B	Z
	mm	mm	mm
1	50	50	33
2	75	50	47
3	100	50	52
4[1)]	100	50	34
5[1)]	100	50	46

1) In preparation

4.3.2 IP66 housing: Installation and control cabinet dimensions

Inverters with IP66 degree of protection can be used indoors.

In control cabinets or in field, the following minimum distances must not be underrun.



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Size	A	B
	mm	mm
1	200	10
2	200	10
3	200	10

INFORMATION

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

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4.4 Electrical installation

⚠ WARNING

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

Severe or fatal injuries.

- Wait 10 minutes after you have de-energized the inverter and have switched off the line voltage and the DC 24 V voltage. Do not start working on the device until you have made sure that it is de-energized.

- The inverters may only be installed by electrical specialists in compliance with the applicable directives and regulations.
- The grounding cable must be designed for the maximum fault current of the voltage source that is usually limited by fuses or motor protection switches.
- The inverter has IP20 degree of protection. For a higher IP degree of protection, a suitable enclosure or the IP66/NEMA 4X design has to be used.
- Make sure the devices are properly grounded. Observe the wiring diagram in chapter "Wiring diagram" (→ 🗎 38).

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4.4.1 Before installation

- Make sure that supply voltage, frequency, and number of phases (single- or three-phase) correspond with the nominal values of the inverter on delivery.
- A disconnecting switch or similar disconnecting element must be installed between voltage supply and inverter.
- Never connect the power supply to the output terminals U, V or W of the inverter.
- Do not install contactors between inverter and motor. Adhere to a minimum clearance of 100 mm at points where control cables and electric power lines are installed close to each other, and an angle of 90° for crossing cables.
- The cables are only protected by slow-blow high-power fuses or motor protection switch. For more information, refer to section "Permitted voltage supply systems" (→ 🗎 27).
- It is recommended that you use a 4-core PVC-insulated and shielded cable as the power cable. Route this cable according to the applicable national regulations of the industry sector as well as the rules and standards. Conductor end sleeves are required for connecting the power cables to the inverter.
- Make sure that shielding and sheaths of power cables are designed according to the wiring diagram in section "Wiring diagram" (→ 🗎 38).
- The grounding terminal of each inverter must be connected individually and **directly** to the ground busbar (mass) of the installation site (via filter, if available).
- Do not loop the ground connections of the inverter from one inverter to the other. Neither route the ground connections to the inverters from other inverters.
- The impedance of the ground circuit must comply with the local safety regulations of the industry sector.
- Make sure that all terminals are tightened with the respective tightening torques; see chapter "Technical data" (→ 🗎 111).
- To comply with UL regulations, all earth connections must be designed with UL listed crimping cable lugs.

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

INFORMATION

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

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

4.4.2 Line contactors

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

Make sure to wait at least 30 seconds between 2 switching cycles.

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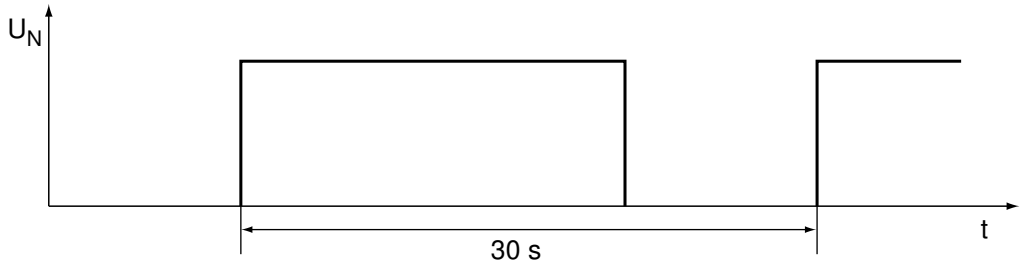

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4.4.3 Mains fuses

Fuse types:

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

Residual current device

⚠ WARNING

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

Severe or fatal injuries.

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

- Inverters generate a DC current component in the leakage current and can significantly reduce the sensitivity of a residual current device of type A. A type A residual current device is thus not permitted as protection device.
- If the use of a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not to use a residual current device.

4.4.4 Operation on IT system

Only IP20 devices can be operated at the IT system. To operate a MOVITRAC® LTE-B+ on the IT system, the integrated EMC filter must be deactivated.

- On sizes 1 – 3, unscrew the EMC screw from the side of the device.
- On sizes 4 and 5, unscrew the two EMC screws from the supply and motor terminals.

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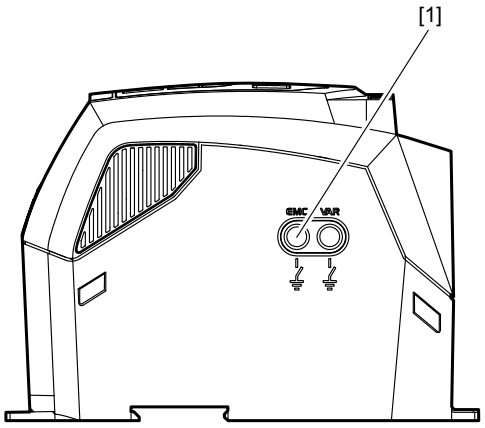
⚠ WARNING

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

Severe or fatal injuries.

- Disconnect the frequency inverter from the power supply at least 10 minutes before you screw out the EMC screw.



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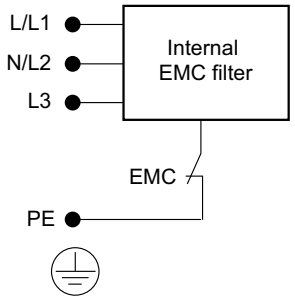
[1] EMC screw



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

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4.4.5 Permitted voltage supply systems

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

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

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

  Operation on voltage supply systems with non-grounded star point (for example IT systems) is only permitted for inverters with IP20 degree of protection. See chapter "Operation on IT system" (→ 🗎 25).

- **Voltage systems with grounded outer conductor**

  On voltage supply systems, the inverters with all degrees of protection may only be operated with a maximum phase-to-ground AC voltage of 300 V.

4.4.6 Help card

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

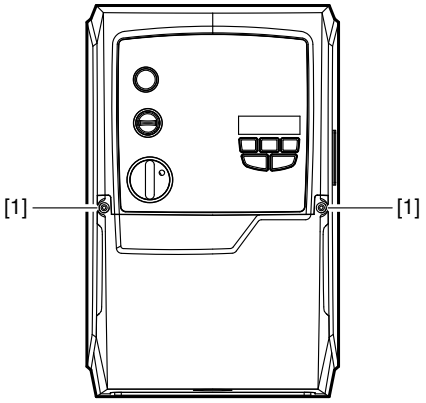
In the IP66 housing, the help card is attached behind the removable front cover.

In the IP20 housing, the help card is inserted in a slot above the display.

4.4.7 Opening the front cover

IP66 for all sizes

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



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[1] Screws on the front cover

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4.4.8 Connecting and installing the braking resistor

⚠ WARNING

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

Severe or fatal injuries.

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

⚠ CAUTION

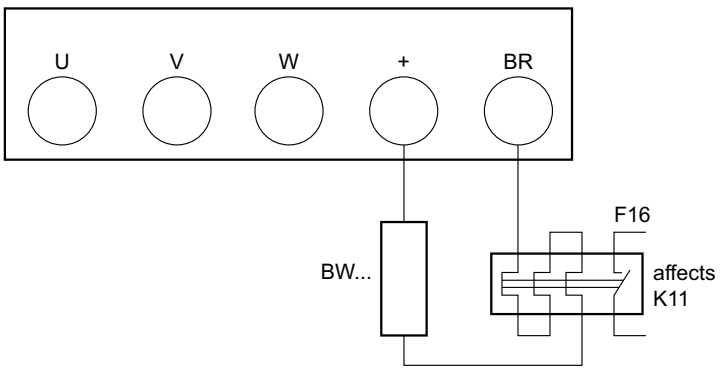
Risk of burns. The surfaces of the braking resistors get very hot when the braking resistors are loaded with P_N.

Minor injuries.

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

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

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



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4.4.9 Motor temperature protection TF, TH

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

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

The following options can be selected for motor protection monitoring:

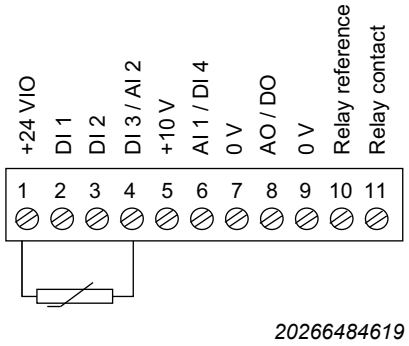
- PTC-th for thermal sensor TF or bimetallic switch TH with trigger threshold 2.5 kΩ

In "P-15 Digital input function selection" (→ 🗎 86), select a function with "External error at DI3/AI2" and set "P-47 Analog input 2 format" (→ 🗎 106) to "Ptc-th".

Connection example for temperature sensors:

Thermal sensor TF

Bimetallic switch TH



P-47 = Ptc-th

4.4.10 Multi-motor drive/group drive

The total of the motor currents must not exceed the nominal current of the inverter. The maximum permitted cable length for the group is limited to the values of single connection. See chapter Technical data.

The motor group is limited to five motors and must not differ by more than 3 frame sizes.

Multi-motor operation is only possible with AC asynchronous motors, not with synchronous motors.

SEW-EURODRIVE recommends to use an output choke "HD LT xxx", additionally unshielded cables, and a maximum permitted output frequency of 4 kHz for groups of more than 3 motors.

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4.4.11 Motor cables and fusing

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

Determine the permitted length of all motor cables connected in parallel as follows:

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

3172400139

I_{tot} = Total length of the motor cables connected in parallel

I_{max} = Recommended maximum motor cable length

n = Number of motors connected in parallel

No additional fusing is required if the cross section of the motor cable corresponds to the cross section of the supply system lead. If the cross section of the motor cable is smaller than the cross section of the supply system lead, you must protect the motor cable against a short circuit for the corresponding cross section. Motor protection switches are suited to this purpose.

4.4.12 Connecting AC brakemotors

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

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

INFORMATION

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

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4.4.13 Information Regarding UL

INFORMATION

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

Ambient Temperature

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

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

1) 200 – 240 V, 2.2 kW, max. 45 °C

Thermal motor protection

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

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

Parameter

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

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

Functional principle

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

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

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

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Branch Circuit Protection

1 × 110 – 115 V devices			
Devices	**Fuses or MCB (type B)**	**Max. supply short circuit current**	**Max. line voltage**
0004	10 A	100 kA rms (AC)	115 V
0008	20 A		
0011	30 A		

1 × 200 – 240 V devices			
Devices	**Fuses or MCB (type B)**	**Max. supply short circuit current**	**Max. line voltage**
0004	6 A	100 kA rms (AC)	240 V
0008	10 A		
0015	17.5 A		
0022	25 A		
0040	40 A		

3 × 200 – 240 V devices			
Devices	**Fuses or MCB (type B)**	**Max. supply short circuit current**	**Max. line voltage**
0015	15 A	100 kA rms (AC)	240 V
0022	17.5 A		
0040	30 A		
0055[1)]	40 A		
0075[1)]	50 A		
0110[1)]	70 A		
0150[1)]	80 A		
0185[1)]	100 A		

1) in preparation

3 × 3800 – 480 V devices			
Devices	**Fuses or MCB (type B)**	**Max. supply short circuit current**	**Max. line voltage**
0008	6 A	100 kA rms (AC)	240 V
0015	10 A		
0022	10 A		
0040	15 A		
0055	25 A		
0075	30 A		
0110	35 A		
0150[1)]	45 A		
0185[1)]	60 A		
0220[1)]	70 A		
0300[1)]	80 A		
0370[1)]	100 A		

1) in preparation

4.4.14 Electromagnetic compatibility (EMC)

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

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Interference immunity

With regard to interference immunity, the frequency inverter with an EMC filter meets the limit values defined in the standard EN 61800-3 and can therefore be used for both industrial and domestic (light industrial) applications.

Interference emission

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

Install the inverters as specified in chapter Installation to ensure best possible electromagnetic compatibility. Ensure proper ground connections for the inverters. Use shielded motor cables to comply with the specifications on interference emission.

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

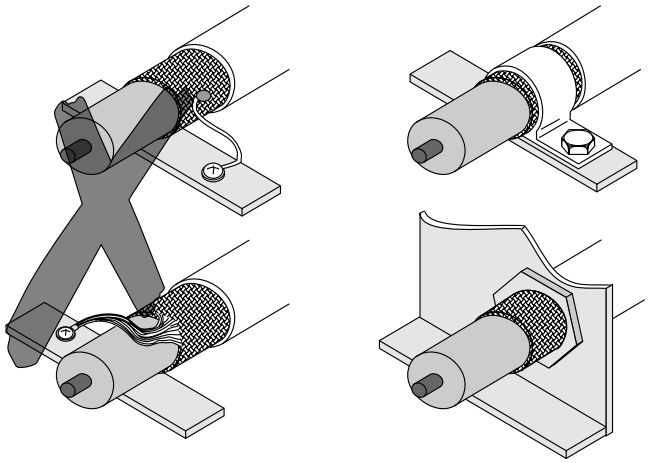
<table>
<tr><th>Inverter type with filter</th><th>Cat. C1 (class B)</th><th>Cat. C2 (class A)</th><th>Cat. C3</th></tr>
<tr><td>230 V, 1-phase
LTE-B xxxx 2B1-x-xx</td><td colspan="3">No additional filtering required.
Use a shielded motor cable.</td></tr>
<tr><td rowspan="2">230 V/400 V, 3-phase
LTE-B xxxx 2A3-x-xx
LTE-B xxxx 5A3-x-xx</td><td>Use an external filter of the type NF LT 5B3 0xx.</td><td colspan="2">No additional filtering required.</td></tr>
<tr><td colspan="3">Use a shielded motor cable.</td></tr>
</table>

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

General information about connecting the motor shield

For all applications with a expectedly higher EMC load, using shielded cables is recommended. The shield must be connected as follows:

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



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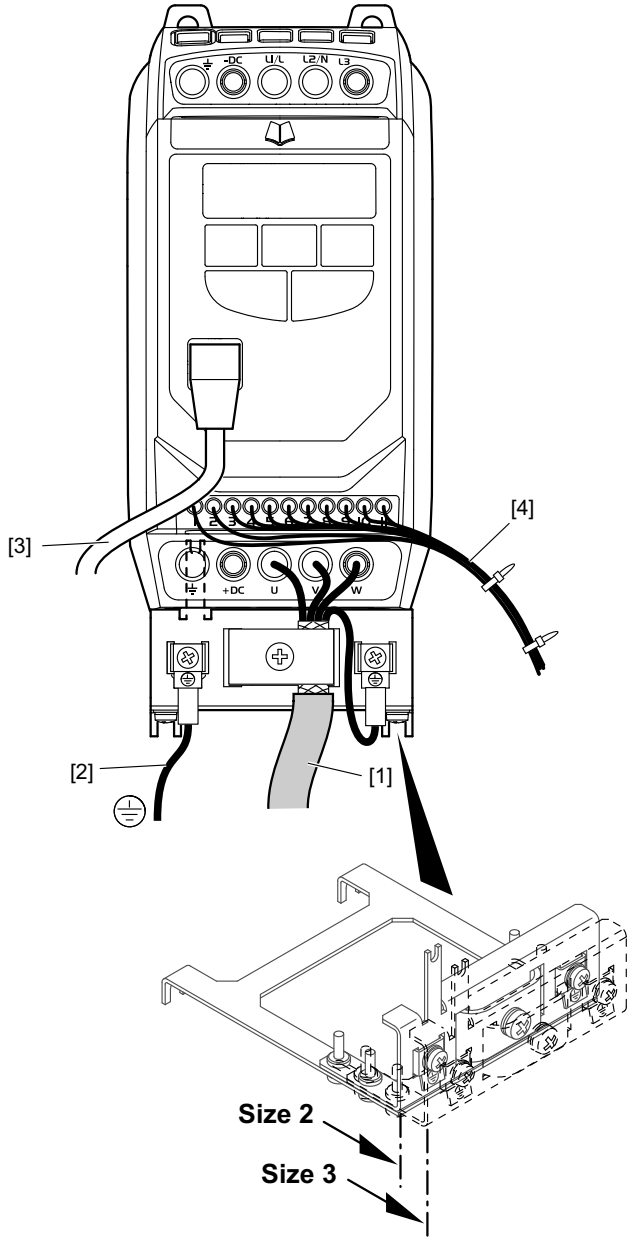
Recommendation for motor shield connection at frequency inverters with IP20

Size 2 and 3



17304181003

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

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

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

Make sure that the plate is correctly attached to the PE connection.

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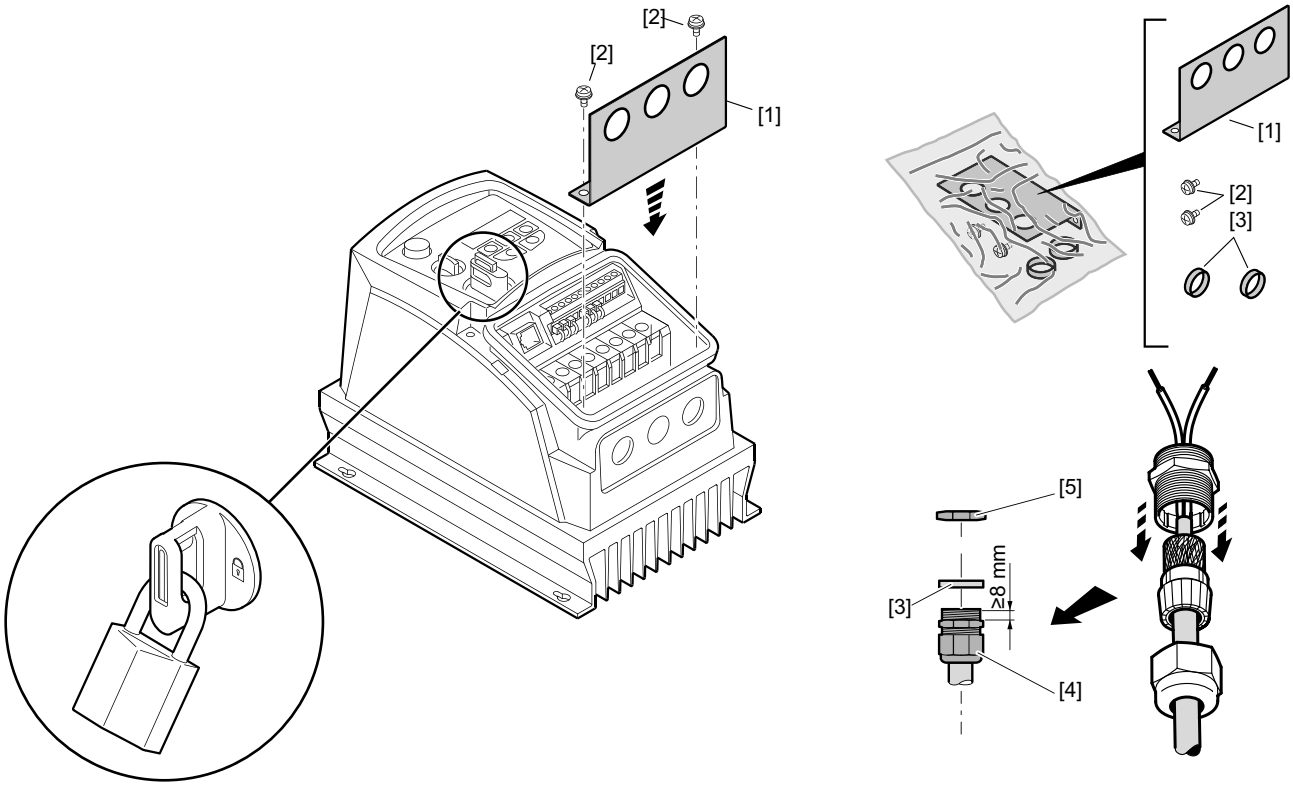
Recommendation for motor shield connection at frequency inverters with IP66

Install the additional internal shield plate that is included in the delivery of each LTE-B IP66 device at the designated position in the inverter.



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[1] Shield plate
[2] Retaining screws
[3] Cable gland seals
[4] EMC cable gland
[5] EMC counternut

The use of metal screw fittings is recommended to connect the motor shield to the device. For size 2, the threads must be at least 8 mm.

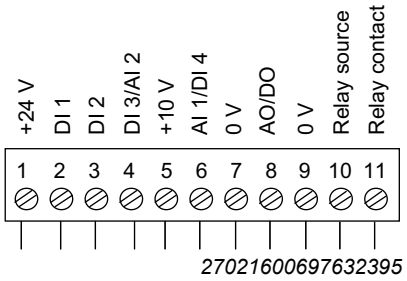
4.4.15 Overview of signal terminals

⚠ CAUTION

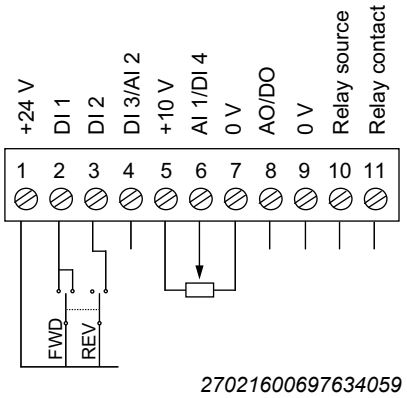
Applying voltages of more than 30 V to the signal terminals can damage the controller.

Possible damage to property.

- The voltage applied to the signal terminals must not exceed 30 V.



IP20 and IP66



IP66 with switch option

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The signal terminal block is equipped with the following signal terminals:

Terminal no.	Signal	Connection	Description
1	+24 V	Output +24 V: Reference voltage	Reference voltage for control of the digital inputs (100 mA max.)
2	DI 1	Digital input 1	Compatible with PLC requirement if 0 V is connected to terminal 7 or 9.
3	DI 2	Digital input 2	
4	DI 3/AI 2	Digital input 3 Analog input 2 (12 bit)	digital: 0/24 V analog: 0 – 10 V, 0 – 20 mA, 4 – 20 mA, 20 – 4 mA, Ptc-th
5	+10 V	Output +10 V: Reference voltage	10 V reference voltage for analog input (Pot. supply +, 10 mA max., 1 k Ω min.)
6	AI 1/DI 4	Analog input 1 (12 bit) Digital input 4	analog: 0 – 10 V, -10 – 10 V, 0 – 20 mA, 4 – 20 mA, 20 – 4 mA digital: 0/24 V
7	0 V	0 V: Reference potential	0 V: Reference potential for analog input (potential supply -)
8	AO/DO	Analog output (10 bits) Digital output	analog: 0 – 10 V, max. 20 mA digital: 0/24 V, max. 20 mA
9	0 V	0 V: Reference potential	0 V: Reference potential for analog output
10	Relay source	Input relay switching voltage	NO contact (AC 250 V / DC 30 V max. 5 A)
11	Relay contact	Relay contact	

The following switching threshold applies to all digital and multi-functional inputs that are digitally operated:

Logic "1" input voltage range 8 – 30 V

Logic "0" input voltage range 0 – 2 V

INFORMATION

When the inputs of the inverter are supplied by an external 24 V voltage supply or PLC, the GND reference potential must be connected to terminals 7 and 9. The control electronics of the inverter work without potential.

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

4.4.16 Communication socket RJ45

NOTICE

Voltage at socket not suitable for PCs.

Damage to PC when connected directly to RJ45 communication socket.

- Use the engineering adapters as described in chapter Software LT Shell.

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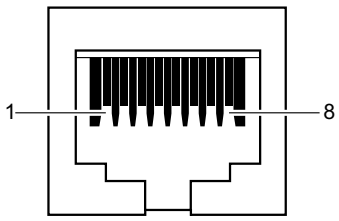
Socket at device



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

4.4.17 DC link connection, U_Z connection

The DC link connection is not possible for LTE-B$^+$ inverters in size 1 – 3, but it is possible to supply the inverter directly with a DC voltage.

For inverters of size 4 and 5, the DC link is extended out to terminals.

Contact SEW-EURODRIVE in such a case.

4.4.18 Wiring diagram

⚠ WARNING

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

Severe or fatal injuries.

- Adhere to the following.

In the following applications, always cut-off the brake in the AC and DC circuits:

- Applications that require a quick brake reaction time.

Please note the following:

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

INFORMATION

On a new device, the terminal slots + (DC+) and BR are initially equipped with covers that have to be broken out when required.

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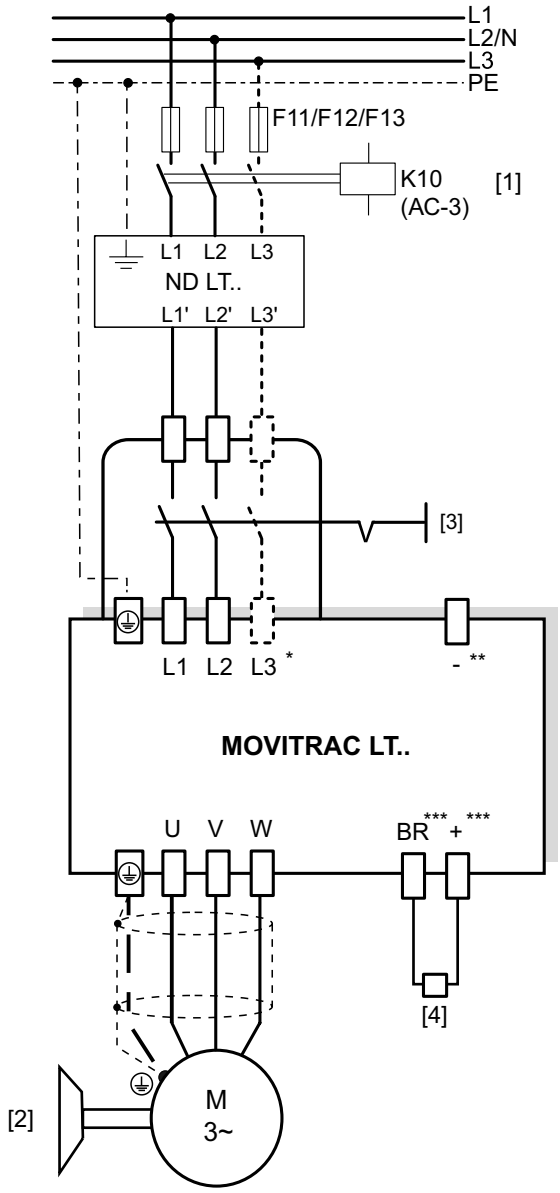

20268767371

[1] Line contactor between supply system and inverter.
[2] Brake
[3] Main switch (only for device design IP66/NEMA 4x housing with switch (MC LTE-B..-40))
[4] Connection of BW../BW..T braking resistor
* Not with 1-phase 230 V
** No $-U_z$ connection for size 1 – 3
*** No BR and $+U_z$ connection for size 1

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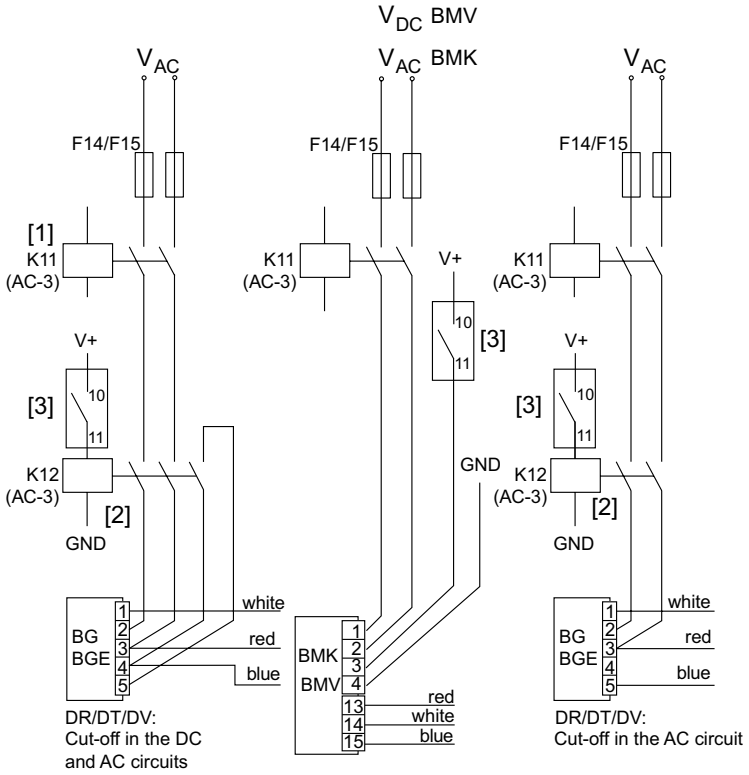
Brake control



20268785675

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

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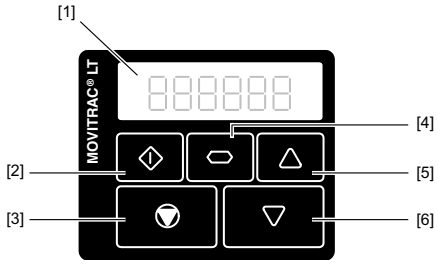
5 Startup

5.1 User interface

5.1.1 Keypads

The inverters are equipped with a standard keypad.

Standard keypad



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

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Operation

Both keypads have 5 keys with the following functions:

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

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

- To switch between the menu for changing parameters and real-time display (operating speed/operating current): keep the key pressed for longer than 1 second.
- Switch between operating speed and operating current of the running inverter: press the key briefly (< 1 second).

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

5.1.2 Resetting parameters to default settings

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

1. The inverter must not be enabled and the display must show "Stop".
2. Press the 3 keys  ,  , and  simultaneously for at least 2 s.
   "P-deF" appears on the display.
3. Press the  key to acknowledge the "P-deF" message.

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5.1.3 Software LT Shell

The LT Shell software enables an easy and quick startup of the inverters. It is available for download on the SEW-EURODRIVE website. After the installation, perform software updates on a regular basis.

In combination with the engineering package (cable set C) and the USB11A interface adapter, the inverter can be connected to the software.

Maximum 63 inverters can be connected to an LT Shell in a network.

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

- Observe, upload and download parameters.
- Save parameter settings.
- Firmware update (manual and automatic).
- Export inverter parameters to Microsoft® Word.
- Monitor the state of the inputs and outputs and the motor.
- Control inverter/manual mode.
- Scope.

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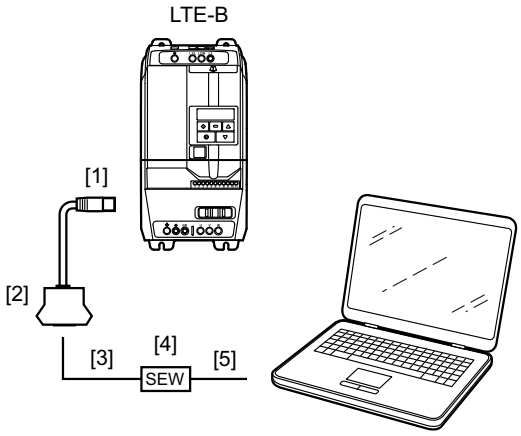
Connection to LT Shell

The connection is performed via an RS485 interface (USB11A + PC engineering package) or via Bluetooth® (parameter module).

RS485



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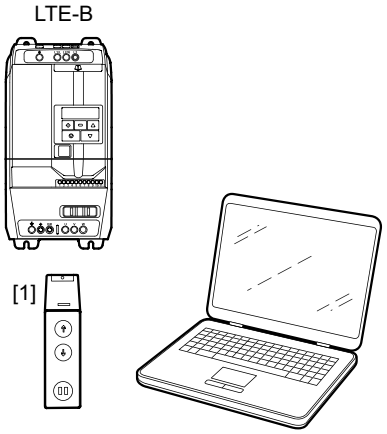
[1] RJ45 to RJ45 cable
[2] RJ adapter (2 x RJ45, 1 x RJ10)
[3] RJ10 to RJ10 cable
[4] USB11A
[5] Cable USB A-B

Bluetooth®



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[1] Parameter module

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5.1.4 MOVITOOLS® MotionStudio engineering software

The software can be connected to the inverter as follows:

- Via an SBus-connection between PC and inverter. A CAN dongle is required. A prefabricated cable is not available and must be manufactured according to the RJ45 assignment and the inverter interface.
- Via a connection of the PC with a gateway or a MOVI-PLC®. The connection between PC and gateway/MOVI-PLC® is possible via USB11A, USB or Ethernet.

The following functions are available in MOVITOOLS® MotionStudio:

- Observe, upload and download parameter
- Save parameter settings
- Monitor the state of the inputs/outputs and the motor.

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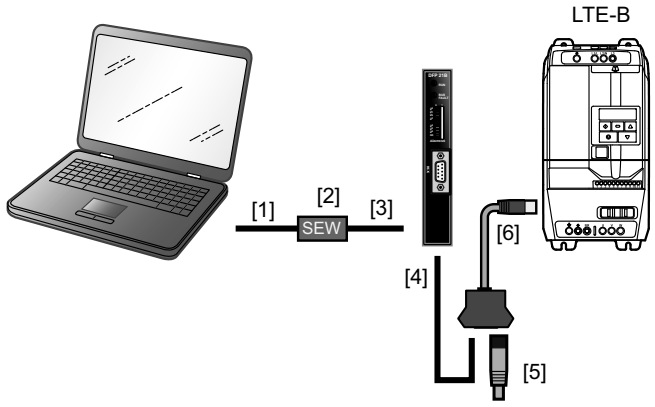
Connection to MOVITOOLS® MotionStudio

The connection can be set up indirectly via SEW-EURODRIVE gateway or SEW-EURODRIVE controller.

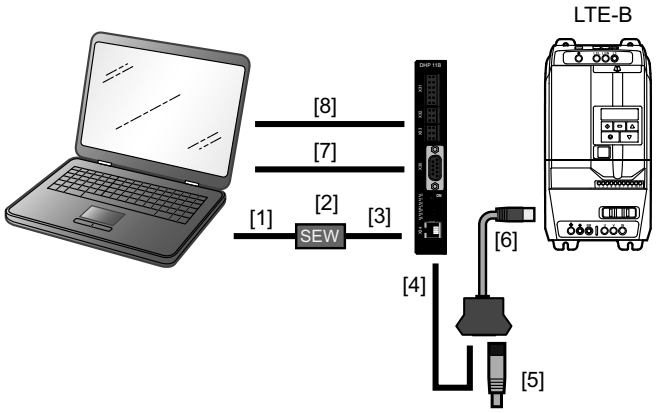
Gateway



21436360459

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

Controllers



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

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5.2 Automatic measuring procedure "Auto tune"

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

Do not interrupt the measuring procedure.

Only enable the inverter after you have entered all motor data correctly in the parameters.

Enable is not required. "Stop" has to be displayed.

5.3 Startup for motors

⚠ WARNING

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

Severe or fatal injuries.

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

INFORMATION

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

5.3.1 Startup for asynchronous motors with V/f control

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

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5.3.2 Startup for asynchronous motors with LVFC speed control

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

5.3.3 Startup with LSPM motors from SEW-EURODRIVE

DR..J type motors are motors with LSPM technology (line start permanent magnet motors).

1. Connect the motor to the inverter. During the connection, adhere to the nominal motor voltage.
2. Enter the motor data of the motor nameplate:
   - *P-07* = synchronous internal voltage (EMF) at nominal motor speed
   - *P-08* = rated current of the motor
   - *P-09* = rated frequency of the motor
   - *P-10* = rated speed of the motor
   - *P-14* = 101 (extended parameter access)
   - *P-51* = 5 (LSPM speed control).
3. Set the maximum speed *P-01* and minimum speed *P-02* = 300 min^{-1}.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the automatic motor measurement procedure "Auto Tune" as described in chapter Auto Tune.
6. Adjust the boost with *P-11*.
7. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

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5.4 Startup of control

⚠ WARNING

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

Severe or fatal injuries.

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

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

For operation in terminal mode (factory setting):

- *P-12* must be set to "0" (factory setting).
- Change the input terminal configuration according to your demands in *P-15*. For the possible settings, see chapter "P-15 Digital input function selection" (→ 🗎 86).
- Connect a switch between terminals 1 and 2 on the user terminal block.
- Connect a potentiometer (1 k – 10 k) between terminals 5, 6 and 7. The center tap is connected to terminal 6.
- Enable the inverter by establishing a connection between terminals 1 and 2.
- Set the speed using the potentiometer.

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

For operation in keypad mode:

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

INFORMATION

You can preset the required target speed by pressing the <Stop/reset> key at standstill. Pressing the <Start> key then moves the drive along the preset ramp until it has reached the required speed.

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

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

General information on use

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

You can set the target reference for the PI controller using *P-45 level 1*.

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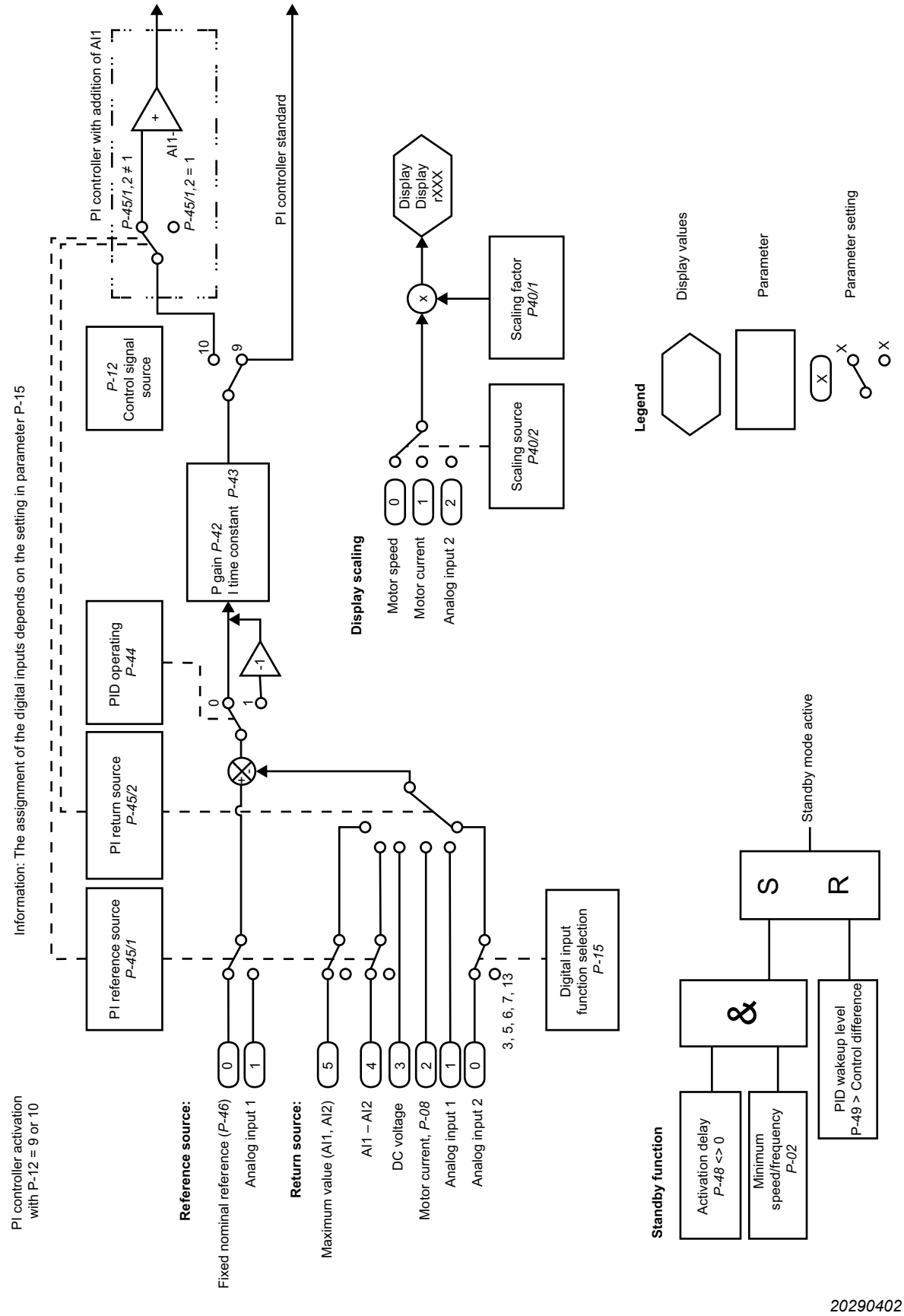
The following figure shows the configuration options for the PI controller.



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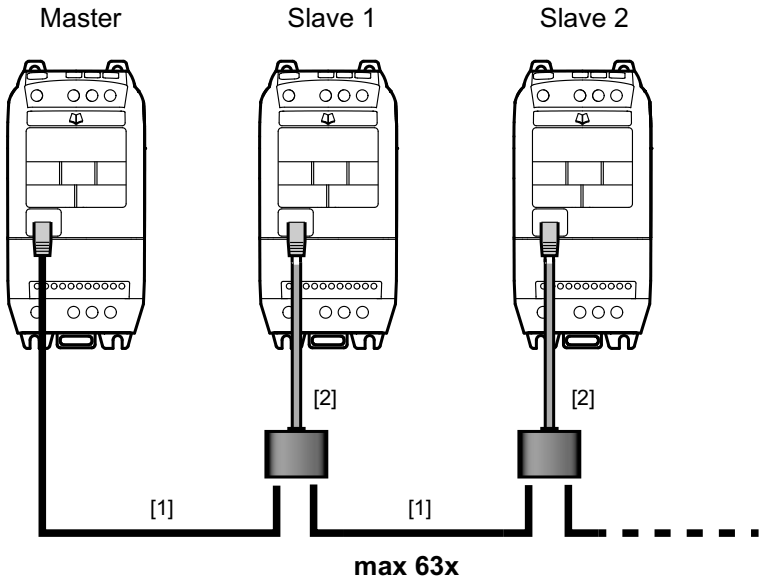
5.4.4 Master-slave mode (*P-12* = 11)



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

The inverter has an integrated master-slave function.

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

One inverter is configured as master, the remaining inverters as slaves. Each network may have only one master inverter. This master inverter sends its operating state (such as stopped, running) and output frequency every 30 ms. The slave inverters then follow the state of the master frequency inverter.

Configuring the master inverter

The master inverter of each network must have the communication address "1". Set:

- *P-12* ≠ 11 (control signal source)
- *P-14* = 101 (extended parameter access)
- *P-36 level 1* = 1 (inverter address communication)

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Configuring the slave inverters

- Each connected slave must have a unique slave communication address that is set with the inverter address *P-36 level 1*. You can assign slave addresses from 2 to 63. Set:
- *P-12* = 11 (control signal source)
- *P-14* = 101 (extended parameter access)
- *P-36 level 1* = 2 - 63 (inverter address communication)
- Slave scaling can be set via *P-35*.
- Make sure that the ramps at the slave inverter are set equal to or smaller than the value at the master.

INFORMATION

Cable set B can be used for setting up the master slave network. It is not necessary to use a terminating resistor. For information on the cable sets, refer to the catalog.

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

See chapter "Fieldbus mode" (→ 🗎 62).

5.5 Fire mode/emergency mode

Set the fire mode/emergency mode as follows:

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

P00-47 can be read out to evaluate the fire mode/emergency mode.

INFORMATION

Activating the fire mode/emergency mode has the inverter drive the motor with the preset values. In this mode, the inverter ignores all faults, shutdowns, and setpoints and operates the motor until it is destroyed or even until the voltage supply is lost. It is also not possible in this mode to perform a reset to the factory setting. The enable stops operation.

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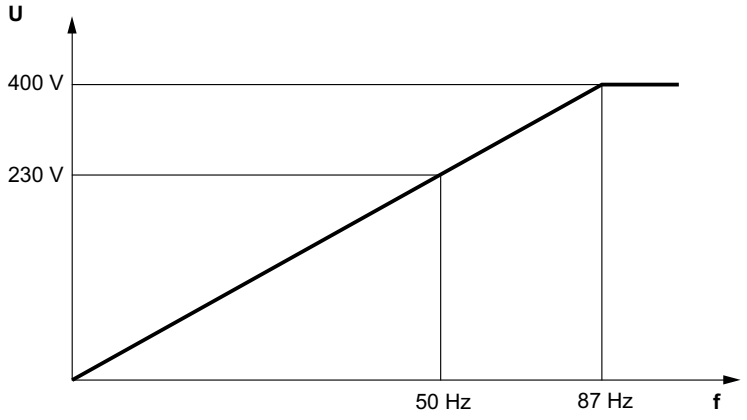
5.6 Operation at 87 Hz characteristic (50 Hz motors)

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



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Do the following to set "87 Hz characteristic" operation:

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

Example for calculating P-10:

DRN80M4: 0.75 kW, 50 Hz

Nominal speed 1440 min^{-1}

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

INFORMATION

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

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5.7 Fans and pumps

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

- Voltage increase / boost *(P-11*)
- Adjustment of the V/f characteristic curve (*P-28, P-29*)
- Energy-saving function (*P-06*)
- Flying start function (*P-33*)
- DC voltage holding function (*P-32*)
- Standby mode (*P-48*)
- PI controller, see chapter "PI controller" (→ 🗎 50)
- Fire mode / emergency mode, see the "Fire mode/emergency mode" chapter (→ 🗎 53)
- Deactivating slip compensation via rated motor speed (*P-10*)
- Blanking function (*P-26/P-27*)

5.8 Motor potentiometer

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

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

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

To be able to use the motor potentiometer function, select a function in parameter P-15 in which the digital inputs are used to increase or reduce the speed. See also chapter "P-15 Digital input function selection" (→ 🗎 86) under the keypad mode table.

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

5.9 3-wire control

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

The 3-wire control principle determines the control.

The enable and direction of rotation signals of the inverter then react edge controlled.

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

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

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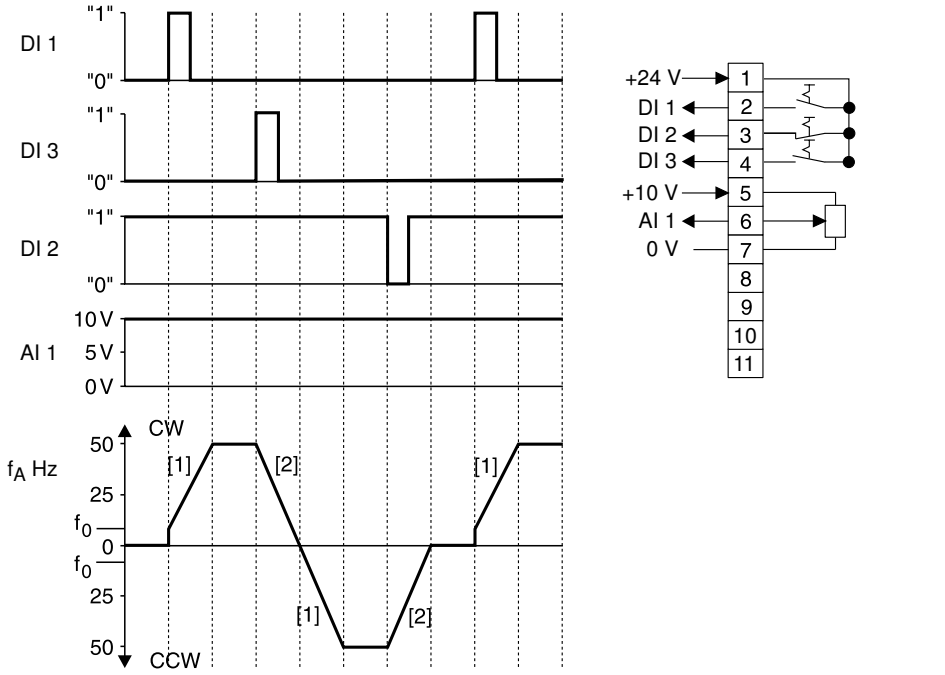
5.9.1 Control signal source 3-wire control



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

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6 Operation

6.1 Status of the inverter

6.1.1 Static inverter status

The following table shows the status messages for a non-enabled inverter.

Message	Description
StoP	Power section of inverter disabled. This message is displayed when the motor is at standstill and no error is present. The inverter is ready for normal operation.
P-deF	Parameter factory settings have been loaded. This message appears when the user issues the command for loading the parameter factory settings. To take the inverter into operation again, press the <Reset> key.
Standby	Inverter is in standby mode. This message is displayed when the inverter reports a speed of 0 for 30 seconds and the speed setpoint is also 0.

6.1.2 Operating state of the inverter

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

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

Message	Description
H xxx	Output frequency of the frequency inverter (in Hz) Displayed, when the frequency inverter is enabled.
A xxx	Output current of the frequency inverter (in Ampere) Displayed, when the frequency inverter is enabled.
P xxx	Output power of the motor (in kW) Displayed, when the frequency inverter is enabled.
L xxx	The parameter is locked for changes. Make sure that: • The parameter lock in *P-38* is not activated. • The inverter is not enabled. • The inverter is supplied with line voltage.
xxxx	Output speed of the frequency inverter (in min^{-1}) This display appears when the frequency inverter is enabled and a value > 0 has been entered in parameter *P-10*.
C xxx	The scaled speed (*P-40*).
Auto-t	An automatic measurement of the motor parameters is being performed. This process can take up to 2 minutes.
. . . . . . (flashing dots)	The output current of the frequency inverter exceeds the current value entered in *P-08*. The frequency inverter monitors load and duration of the overload. The frequency inverter triggers error message "I.t-trP" depending on the overload.
. . (alternately flashing dots)	Phase failure or supply voltage outside of specification
. (blinking dot)	Fire mode/emergency mode activated
dELAy.t	Time-delayed reset; see also error description O-I (→ 🗎 59)

6.1.3 Error reset

You can reset an error in the event of an error response (see section "Error codes" (→ 🗎 59)) by pressing the <Stop> key or by enabling or disabling digital input 1.

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6.2 Troubleshooting

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

6.3 Error history

The parameter *P00-28* archives the last 4 errors. Each error is displayed in abbreviated form. The most recent error is shown first (when *P00-28* is called). The oldest fault will be deleted from the history.

- **INFORMATION**

  If the last error in the error history is an undervoltage fault, no further undervoltage faults will be saved in the error history. The reason is to avoid that the error history is filled with undervoltage faults, which occur every time the inverter is switched off.

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6.4 Error codes

Error message Inverter display P00-28 error history		Error code status word if Bit5 = 1		CANopen Emergency Code	Explanation	Solution
Inverter display	**MotionStudio coding dec**	**dec**	**hex**	**hex**		
4-20 F	18	113	0x71	0x1012	Signal loss 4 – 20 mA	• Check whether the input current in *P-16* and *P-48* lies within the defined range. • Check the connection cable.
AtF-01	40	81	0x51	0x1028	The measured stator resistance fluctuates between the phases.	The measured stator resistance of the motor is asymmetrical. Check to see, if: • the motor is connected correctly and without error. • the winding has the correct resistance and symmetry.
AtF-02	41	81	0x51	0x1029	The measured stator resistance is too high.	The measured stator resistance of the motor is too high. Check to see, if: • the motor is connected correctly and without error. • the power rating of the motor corresponds with the power rating of the connected inverter.
AtF-03	42	81	0x51	0x102A	Measured motor inductance is too low.	The measured motor inductivity is too low. Make sure that the motor is connected correctly and without error.
AtF-04	43	81	0x51	0x102B	Measured motor inductance is too high.	The measured motor inductivity is too high. Check to see, if: • the motor is connected correctly and without error. • the power rating of the motor corresponds with the power rating of the connected inverter.
AtF-05	44	81	0x51	0x102C	Timeout of inductance measurement	The measured motor parameters are not convergent. Check to see, if: • the motor is connected correctly and without error. • the power rating of the motor corresponds with the power rating of the connected inverter.
dAtA-E	19	98	0x62	0x1013	Internal memory error (DSP)	Contact the SEW-EURODRIVE Service.
dAtA-F	17	98	0x62	0x1011	Internal memory error (IO)	Contact the SEW-EURODRIVE Service.
DC-trP	–	46	0x2E	0x100C	Communication failure error	Check the communication connection Make sure each inverter in the network is assigned a unique address.
E-triP	11	26	0x1A	0x100B	External error at digital input 3.	NC contact was opened. • Check motor thermistor (if connected).
Err-SC					The keypad lost the communication connection to the inverter.	Press the STOP key to reset. Check the address of the frequency inverter.
F-Ptc	21	31	0x1F	0x1015	Motor protection triggered	The motor protection sensor (TF, TH) is connected at analog input 2 (terminal 4).
FAN-F	22	50	0x32	0x1016	Internal fan error.	Contact the SEW-EURODRIVE Service.
FAULtY					The communication between controller and power section is interrupted.	Contact the SEW-EURODRIVE Service.
FLt-dc	13	7	0x07	0x320D	DC link ripple too high.	Check the current supply.
I.t-trp	04	8	0x08	0x1004	Overload of inverter/motor (I2t error)	Make sure that: • The motor nameplate parameters are correctly inserted in *P-07*, *P-08* and *P-09*. • Auto Tune has correctly been performed. Check to see, if: • The decimals flash (inverter overloaded), increase the acceleration ramp (*P-03*) or decrease the motor load. • The length of the cable meets the requirements. • The load can move freely and there are no blockages or other mechanical faults (mechanically check the load). • The thermal motor protection to UL508C is activated in *P-41*.

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Error message Inverter display P00-28 error history		Error code status word if Bit5 = 1		CANopen Emergency Code	Explanation	Solution
Inverter display	**MotionStudio coding dec**	**dec**	**hex**	**hex**		
O-I	03	1	0x01	0x2303	Short-term overcurrent at the inverter output. High motor overload.	**Fault during stop procedure:** Check for premature brake application. **Error when enabling the drive:** Check to see, if: • The motor nameplate parameters are correctly inserted in *P-07*, *P-08* and *P-09*. • Auto Tune has correctly been performed. • The load can move freely and there are no blockages or other mechanical faults (mechanically check the load). • A short circuit between the phases or a ground fault of a phase occurred at the motor and motor connection cable. • The brake is connected correctly, controlled correctly and correctly releases when the motor has a holding brake. **Error during operation:** Check: • For sudden overload or malfunction. • the cable connection between inverter and motor. The acceleration/deceleration time is too short and requires too much power. If you cannot increase *P-03* or *P-04*, use a larger inverter. **Measures:** Reduce the settings of the voltage enhancement in *P-11*. Set a longer run-up time in *P-03*. Disconnect the motor from the inverter. Enable the inverter again. If this error occurs again, check the entire system and completely replace the inverter. **Error reset delay** If the error occurs again directly after the O-I or hO-I error messages are reset, the following delay times result for repeated resetting: • First reset after 2 seconds • Second reset after 4 seconds • Third reset after 8 seconds • Fourth reset after 16 seconds • Fifth reset after 32 seconds • Further resets after 64 seconds
hO-I	15	1	0x01	0x230F	Hardware overcurrent error at the inverter output (IGBT self-protection in case of overload).	
O-hEAt	23	124	0x7C	0x4117	Ambient temperature too high.	Check if the ambient conditions are within the range specified for inverters.
O-t	8	11	0x0B	0x4208	Heat sink overtemperature	The heat sink temperature can be displayed via *P00-09*. A historical protocol is saved in parameter *P00-16* in 30 s intervals prior to a switch off with error. This error message is displayed at a heat sink temperature of ≥90 °C. Check: • The ambient temperature of the inverter. • The inverter cooling and housing dimensions. • The function of the internal cooling fan of the inverter. Reduce the settings of the effective clock frequency in parameter *P-17*, or the load at motor/inverter.
O-Volt	06	7	0x07	0x3206	DC link overvoltage	The error occurs if a high flywheel load or overhauling load is connected, and the excess regenerative energy is transferred back to the inverter. If an error occurs while stopping or during deceleration, increase the deceleration ramp time *P-04* or connect a suitable braking resistor to the inverter. The proportional gain in *P-53/1* is reduced in vector mode. Additionally check if the supply voltage is within the specified range. Note: The value of the DC link voltage (U_z) can be displayed on *P00-08*. A historical protocol is saved in parameter *P00-15* in 256 ms intervals prior to a switch off with error.
OI-b	01	4	0x04	0x2301	Brake channel overcurrent, Brake resistor overload	Make sure that the connected braking resistor does not fall below the minimum value approved for the inverter (see technical data). Check the braking resistor and the wiring for possible short circuits.

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Error message Inverter display P00-28 error history		Error code status word if Bit5 = 1		CANopen Emergency Code	Explanation	Solution
Inverter display	MotionStudio coding dec	dec	hex	hex		
OL-br	02	4	0x04	0x1002	Braking resistor overload	The software detected an overload at the braking resistor and switches off to protect the resistor. Make sure that the braking resistor is operated within the planned parameters before performing any changes to parameters or system. To reduce the load at the resistor, increase the deceleration time, reduce the loads mass moment of inertia, or connect additional braking resistors in parallel. Note the minimum resistor values for the used inverter.
Out-F	26	82	0x52	0x101A	Inverter output stage error	Contact the SEW-EURODRIVE Service.
P-LOSS	14	6	0x06	0x310E	Input phase failure	An input phase has been disconnected or interrupted. Check the supply voltage.
P-dEF	10	9	0x09	0x100A	Factory settings are restored.	
PS-trP	05	200	0xC8	0x1005	Output stage error (IGBT self-protection in case of overload)	See error **O-I**.
SC-F01	50	43	0x2B	0x1032	Modbus communication error	Check the communication settings.
SC-F02	51	47	0x2F	0x1033	SBus/CANopen communication error	Check: • The communication connection between inverter and external devices. • The clearly assigned address per inverter in the network.
SC-FLt	–	–	–	–	Internal inverter error	Contact the SEW-EURODRIVE Service.
SC-trP	–	46	0x2E	0x100C	Communication failure error	Check the communication connection. Make sure each inverter in the network is assigned a unique address.
SC-OBS	12	46	0x2E	0x100C	The keypad lost the communication connection to the frequency inverter.	Press the <Stop> key to reset. Check the address of the inverter.
StoP					The inverter is not enabled.	Activate the enable.
th-Flt	16	31	0x1F	0x1010	Faulty thermistor at heat sink.	Contact the SEW-EURODRIVE Service.
type-f					Parameter module and inverter are not compatible.	The used parameter module is not of type LT BP C.
U-t	09	117	0x75	0x4209	Undertemperature	Occurs at an ambient temperature below -10 °C. Increase the temperature to above -10°C to start the inverter.
U-Volt	07	198	0xC6	0x3207	DC link undervoltage	Occurs routinely when switching off the inverter. Check line voltage if this occurs while the inverter is running.

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7 Fieldbus mode

7.1 General information

7.1.1 Structure and settings of process data words

The process data assignment is set as standard.

The structure of process data words is identical for SBus/Modbus RTU/CANopen, as well as with inserted communication card.

	High byte	Low byte
Bit	15 – 8	7 – 0

Process output words

Description		Bit		Settings
PO1	Control word	0	Output stage inhibit (the motor coasts to a stop), for brakemotors the brake is applied immediately.	0: Start 1: Stop
		1	Rapid stop along the second Deceleration ramp/rapid stop ramp (*P-24*)	0: Rapid stop 1: Start
		2	Stop along process ramp *P-03* / *P-04* or PO3	0: Stop 1: Start
		3 – 5	Reserved	0
		6	Error reset	Edge 0 set to 1 = fault reset
		7 – 15	Reserved	0
PO2	Setpoint speed	CW rotation: 0 – 16384 dec ≙ 0 – 100% of *P-01* Counterclockwise rotation (formation of the two's complement): 49152 dec – 65535 dec ≙ -100% – 0 of *P-01*		
PO3	Ramp time if *P-12* = 4, 6, 8	1 digit = 1 ms (100 ms – 65535 ms)		
	if *P-12* = 3, 5, 7	No function Ramp specification via *P-03*, *P-04*		

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Process input words

Description		Bit		Settings	Byte
PI1	Status word	0	Output stage enable	0: Locked 1: Approved	Low byte
		1	Inverter ready	0: Not ready for operation 1: Ready	
		2	PO data enabled	1 if *P-12* = 3 or 4	
		3 – 4	Reserved		
		5	Fault/warning	0: No fault 1: Fault	
		6 – 7	Reserved		
		8 – 15	Inverter status, if bit 5 = 0 0x01 = Output stage inhibited 0x02 = Not enabled/not running 0x04 = Enabled/running 0x05 = Factory setting activated		High byte
		8 – 15	Inverter status if bit 5 = 1 See chapter Error codes		
PI2	Actual speed	Scaling equals PO2			
PI3	Actual current	1 dec ≙ 0.1% of nominal inverter current			

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7.1.2 Communication example

The following information is sent to the inverter if

- The digital inputs have been configured and wired properly to enable the inverter.

Description		Value	Description
PO1	Control word	0x0000	Stop along the second Deceleration ramp (*P-24*).
		0x0001	Coasting
		0x0002	Stop along the process ramp (*P-04)* or (PO3).
		0x0003 - 0x0005	Reserved
		0x0006	Accelerate along a ramp (*P-03*) or (PO3) and run at setpoint speed (PO2).
PO2	Setpoint speed	0x4000	= 16384 dec = maximum speed, e.g., 50 Hz (*P-01*) CW
		0x2000	= 8192 dec = 50% of the maximum speed, e.g., 25 Hz CW
		0xC000	= 49152 dec = maximum speed, e.g., 50 Hz (*P-01*) CCW
		0x0000	= 0 dec = minimum speed, set in *P-02*
		0xDFFF	= 57343 dec = 50% of the maximum speed, e.g., 25 Hz CCW

The process data sent by the inverter should look as follows during operation:

Description		Value	Description
PI1	Status word	0x0407	Status = running, output stage enabled; inverter ready, PO data enabled
PI2	Actual speed	Should correspond to PO2 (setpoint speed)	
PI3	Actual current	Depends on speed and load	

7.1.3 Parameter settings for the inverter

- Take the inverter into operation as described in chapter "Startup for motors" (→ 🗎 47).
- Set the following parameters depending on the bus system used:

Parameter	SBus	CANopen	Modbus RTU
P-12 (control signal source)	3, 4[1)]	7, 8[1)]	5,6[1)]
P-14 (Extended parameter access)	101	101	101
P-15 (function selection digital inputs)	1[2)]	1[2)]	1[2)]
P-36/1 (inverter address)	1 – 63	1 – 63	1 – 63
P-36/2 (baud rate)	Baud rate	Baud rate	Baud rate
P-36/3 (timeout and reaction in the case of communication failure)	t_x: Coasting to a stop after x ms r_x: Stop ramp after x ms	Communication monitoring is covered by the Lifetime function integrated in CANopen.	t_x: Coasting to a stop after x ms r_x: Stop ramp after x ms

1) With ramp specification via fieldbus

2) Default setting; for more setting options, refer to the description of parameter P-15.

7.1.4 Connecting the signal terminals at the inverter

For bus operation, the signal terminals can be connected according to the setting in *P-15*.

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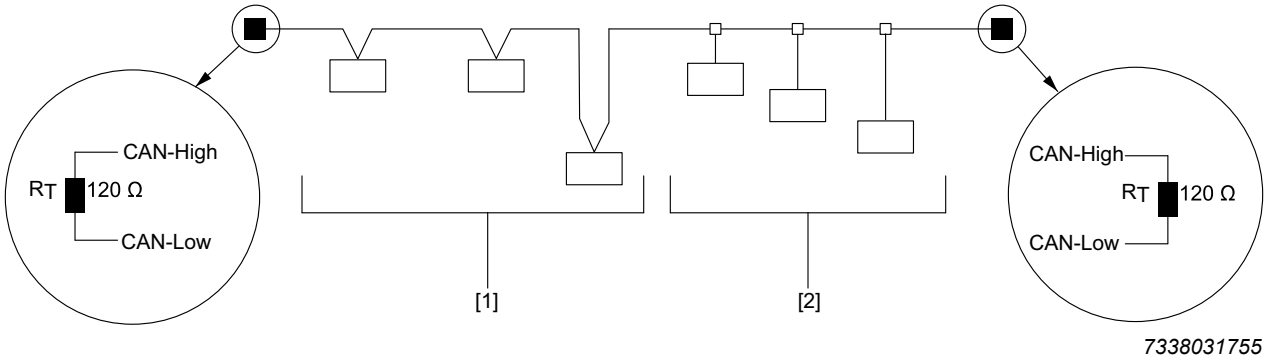
7.1.5 Establishing a CANopen/SBus network

A CAN network as depicted in the figure below should always have a linear bus structure without stub lines [1] or only with very short ones [2]. The network must have exactly one terminating resistor R_T = 120 Ω installed on both ends of the bus. The cable sets described in the catalog are available for easily establishing such a network.



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Cable length

The permitted total cable length depends on the baud rate set in parameter *P-36/2*:

- 125 kBaud: 500 m (1640 ft)
- 250 kBaud: 250 m (820 ft)
- 500 kBaud: 100 m (328 ft)
- 1000 kBaud: 25 m (82 ft)

7.2 Connecting a gateway or controller (SBus MOVILINK®)

7.2.1 Specification

The MOVILINK® profile via CAN/SBus is an application profile from SEW-EURODRIVE specifically adjusted to SEW inverters. For detailed information, refer to the "MOVIDRIVE® MDX60B/61B Communication and Fieldbus Device Profile" manual.

To use SBus, configure the inverter as described in chapter "Parameter settings for the inverter" (→ 🗎 64).

Detailed information regarding the structure of the process data words can be found in the chapter "Structure and settings of process data words" (→ 🗎 62). There is a detailed list of all parameters including the necessary indexes as well as the scaling in chapter "Overview of parameters" (→ 🗎 76).

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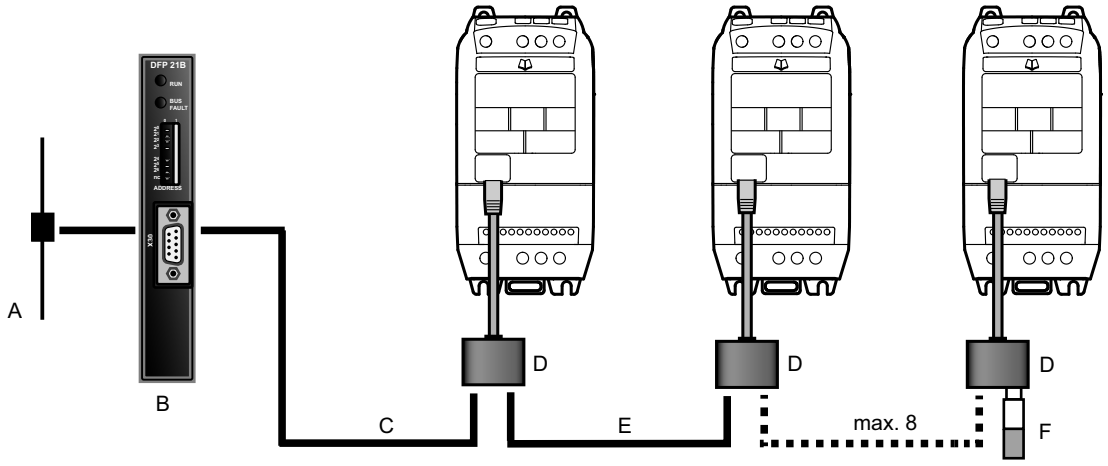
7.2.2 Electrical installation

Connecting gateway and MOVI-PLC®.



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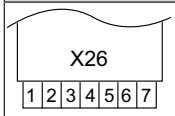
[A] Bus connection
[B] Gateway, e.g. DFx/UOH
[C] Connection cable
[D] Splitters
[E] Connection cable
[F] Y connector with terminating resistor

INFORMATION

The terminating connector [F] is equipped with 2 terminating resistors and therefore establishes the terminating connection to CAN/SBus and Modbus RTU.

Instead of a terminating connector of cable set A, you can use the Y adapter of engineering cable set C. This set also includes a terminating resistor. For detailed information on the cable sets, refer to the catalog.

Wiring from the control to the Communication socket RJ45 of the inverter:

Side view	Designation	Terminal at CCU/PLC	Signal	RJ45 socket[1]	Signal
	MOVI-PLC® or Gateway (DFX/UOH)	X26:1	CAN 1H	2	SBus/CAN bus h
		X26:2	CAN 1L	1	SBus/CAN bus l
		X26:3	DGND	3	GND
		X26:4	Reserved		
		X26:5	Reserved		
		X26:6	DGND		
		X26:7	DC 24 V		
	Third-party controller	X:?[2]	Modbus RTU+	8	RS485+ (Modbus RTU)
		X:?[2]	Modbus RTU-	7	RS485- (Modbus RTU)
		X:?[2]	DGND	3	GND

1) Please observe: The terminal assignment for the socket of the inverter, not the connector, is specified above.
2) Assignment depends on the third-party controller.

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7.2.3 Startup at gateway

- Connect the gateway as described in chapter "Electrical installation" (→ 🗎 66).
- Reset all settings of the gateway to the factory setting.
- If required, set all connected inverters to SBus MOVILINK® mode as described in chapter "Parameter settings for the inverter" (→ 🗎 64). Assign unique SBus addresses (≠ 0!) and set a baud rate matching the gateway (default = 500 kBaud).
- Set DIP switch AS (auto-setup) on the DFx/UOH gateway from "OFF" to "ON" to perform an auto-setup for the fieldbus gateway.

  The "H1" LED on the gateway lights up repeatedly and then goes off completely. When the "H1" LED is lit, the gateway or one of the inverters at the SBus has not been wired properly or has not been taken into operation properly.
- Refer to the relevant DFx manual for information on how to establish fieldbus communication between DFx/UOH gateway and bus master.

Monitoring sent data

The data sent via gateway can be monitored as follows:

- Using MOVITOOLS® MotionStudio via the X24 engineering interface of the gateway or optionally via Ethernet.
- Via the website of the gateway, for example to the DFE3x Ethernet gateway.
- You can check which process data are transferred with the respective parameters in parameter group 0.

7.3 Modbus RTU

The inverters support communication via Modbus RTU. Holding registers (03) are used for reading, and single holding registers (06) for writing. To use Modbus RTU, configure the inverter as described in chapter "Parameter settings for the inverter" (→ 🗎 64).

7.3.1 Specification

Protocol	Modbus RTU
Error checking	CRC
Baud rate	9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps (default)
Data format	1 start bit, 8 data bits, 1 stop bit, no parity
Physical format	RS485 2 core
User interface	RJ45

7.3.2 Electrical installation

The structure is the same as for the CAN/SBus network. The maximum number of bus nodes is 32. The permitted cable length depends on the baud rate. With a baud rate of 115200 bps and a 0.5 mm^2 cable, the maximum cable length is 1200 m. For the connection assignment for the RJ45 communication socket, refer to chapter "RJ45 communication socket" (→ 🗎 37).

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7.3.3 Register allocation of the process data words

The process data words are allocated to the Modbus registers shown in the table.

The table shows the default allocation of process data words. All other registers are usually allocated in such a way that they correspond to the parameter number (101 = *P-01*). However, this does not apply to parameter group 0.

Tabs	Upper byte	Lower byte	Com-mand	Type
1	PO1 control word		03, 06	Read/Write
2	PO2 setpoint speed		03, 06	Read/Write
3	PO3 ramp time		03, 06	Read/Write
4	Reserved		03, 06	Read/Write
5	Reserved	-	03	Read
6	PI1 status word		03	Read
7	PI2 actual speed		03	Read
8	PI3 actual current		03	Read
9	PE4 motor torque		03	Read
…	For more registers, refer to chapter "Parameters" (→ 🗎 76).			

The complete allocation of parameters and registers as well as the scaling of data is contained in the memory allocation plan in chapter "Parameters" (→ 🗎 76).

INFORMATION

Many bus masters address the first register as register 0. It might therefore be necessary to deduct the value "1" from the register number given below to obtain the correct register address.

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7.3.4 Data flow example

In this example, the following parameters are read by the controller (PLC address base = 1):

- *P-07* (rated motor voltage, Modbus register 135)
- *P-08* (rated motor current, Modbus register 136).

Reading register information

Request master → slave (Tx)

Address	Function	Data				CRC check
		Start address		Number of registers		
	Read	High byte	Low byte	High byte	Low byte	crc16
01	03	00	86	00	02	crc16

Response slave → master (Rx)

Address	Function	Data				CRC check
		Number of data bytes (n)		Information n/2 register		
	Read	High byte	Low byte	Register 107/108		crc16
01	03	04		00 E6	00 2B	5B DB

Communication example explanations:

Tx = Send from perspective of the bus master.

Address	Device address 0x01 = 1
Function	03 read/06 write
Start address	Register start address = 0x0086 = 134
Number of registers	Number of requested registers from start address (register 135/136).
2 × CRC bytes	CRC_high, CRC_low

Rx = Received from perspective of the bus master.

Address	Device address 0x01 = 1
Function	03 read/06 write
Number of data bytes	0x04 = 4
Register 108 high byte	0x00 = 0
Register 108 low byte	0x2B = 43% of the nominal inverter current
Register 107 high byte	0x00 = 0
Register 107 low byte	0xE6 = 230 V
2 × CRC bytes	CRC_high, CRC_low

The following example describes the second process data word of the inverter (PLC address base = 1):

Process output data word 2 = Modbus register 2 = setpoint speed.

Sending register information

Request master → slave (Tx)

Address	Function	Data				CRC check
		Start address		Information		
	write	High byte	Low byte	High byte	Low byte	crc16
01	06	00	01	07	00	DB 3A

Response slave → master (Rx)

Address	Function	Data				CRC check
		Start address		Information		
	write	High byte	Low byte	High byte	Low byte	crc16
01	06	00	01	07	00	DB 3A

Explanation to the communication example:

Tx = Send from perspective of the bus master.

Address	Device address 0x01 = 1
Function	03 read/06 write

Start address	Register start address =0x0001 = 1 (first register to be written on = 2 PA2)
Information	0700 (setpoint speed)
2 × CRC bytes	CRC_high, CRC_low

7.4 CANopen

The inverters support communication via CANopen. For using CANopen, configure the inverter as described in chapter "Parameter settings for the inverter" (→ 🗎 64).

Following a general overview of how to establish a communication connection via CANopen and the process data communication. The CANopen configuration is not described.

For detailed information on the CANopen profile, refer to the "MOVIDRIVE® MDX60B/61B Communication and Fieldbus Unit Profile" manual.

7.4.1 Specification

CANopen communication is implemented according to the specification DS301 version 4.02 of CAN in automation (see www.can-cia.de). A specific device profile, such as DS402, is not implemented.

7.4.2 Electrical installation

See chapter Establishing a CANopen/SBus network.

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7.4.3 COB IDs and functions in the inverter

The CANopen profile provides the following COB ID (Communication Object Identifier) and functions.

Messages and COB IDs		
Type	**COB ID**	**Function**
NMT	000h	Network management
Sync	080h	Synchronous message with dynamically configurable COB ID
Emergency	080h + device address	Emergency message with dynamically configurable COB ID
PDO1[1] (Tx)	180h + device address	PDO (Process Data Object) PDO1 is pre-mapped and activated by default. PDO2 is pre-mapped and activated by default. Transmission mode (synchronous, asynchronous, event), COB ID and mapping can be configured as required.
PDO1 (Rx)	200h + device address	
PDO2 (Tx)	280h + device address	
PDO2 (Rx)	300h + device address	
SDO (Tx)[2]	580h + device address	SDO channel for parameter data exchange with the CANopen master
SDO (Rx)[2]	600h + device address	
Error control	700h + device control	Guarding and heartbeat functions are supported. COB ID can be set to another value.

1) The inverter supports up to 2 process data objects (PDO). All PDOs are pre-mapped and active with transmission mode 1 (cyclical and synchronous). This means that the Tx-PDO is sent after every SYNC pulse regardless of whether the content of the Tx-PDO has changed or not.
2) The inverter SDO channel supports only expedited transmission. The SDO mechanisms are described in detail in the CANopen specification DS301.

INFORMATION

Transmitting speed, current or similar values that change quickly via Tx-PDO results in a very high load on the bus.

To limit the bus load to predictable values, you can use the inhibit time, see section "Inhibit time" in the "MOVIDRIVE® MDX60B/61B Communication and Fieldbus Device Profile" manual.

- Tx (transmit) and Rx (receive) are depicted from perspective of the slave.

7.4.4 Supported transmission modes

The various transmission types can be selected for every process data project (PDO) in the network management (NMT).

The following transmission types are supported for Rx-PDOs:

Rx PDO transmission mode		
Transmission type	**Mode**	**Description**
0 – 240	Synchronous	The received data are transmitted to the inverter as soon as the next synchronization message is received.
254, 255	Asynchronous	The received data are transmitted to the inverter without delay.

The following transmission types are supported for Tx PDOs:

Tx PDO transmission mode		
Transmission type	**Mode**	**Description**
0	Acyclic synchronous	Tx PDO is only transmitted if the process data have changed and a SYNC object was received.
1 – 240	Cyclic synchronous	Tx PDOs are transmitted synchronously and cyclically. The transmission type indicates the number of the SYNC object required for triggering transmission of the Tx PDO.
254	Asynchronous	Tx PDOs are only transmitted when the corresponding Rx PDO has been received.
255	Asynchronous	Tx PDOs are always transmitted as soon as the PDO data has changed.

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7.4.5 Default allocation plan of process data objects (PDO)

The following table shows the default mapping of the PDOs:

PDO default mapping					
	Object no.	Mapped object	Length	Mapping with default setting	Transmission type
Rx PDO1	1	2010h	Unsigned 16	PO1 control word	1
	2	2012h	Integer 16	PO2 setpoint speed	
	3	0006	Unsigned 16	Reserved	
	4	2014h	Unsigned 16	PO3 ramp time	
Tx PDO1	1	2110h	Unsigned 16	PI1 status word	1
	2	2112h	Integer 16	PI2 actual speed	
	3	2113h	Unsigned 16	PI3 actual current	
	4	2114h	Integer 16	PI4 motor torque	
Rx PDO 2	1	0006h	Unsigned 16	Reserved	1
	2	0006h	Unsigned 16	Reserved	
	3	0006h	Unsigned 16	Reserved	
	4	0006h	Unsigned 16	Reserved	
Tx PDO2	1	2118h	Unsigned 16	Status analog input 1	1
	2	2119h	Integer 16	Status analog input 2	
	3	211Ah	Unsigned 16	Status of digital inputs and outputs	
	4	2116h	Unsigned 16	Frequency inverter temperature	

INFORMATION

Tx (transmit) and Rx (receive) are depicted from perspective of the slave.

Note: Modified default settings are lost after power off and on again. This means the settings are restored to default values after power off.

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7.4.6 Data flow example

Process data communication example with default setting:

				Word 1		Word 2		Word 3		Word 4		
	COB ID	D	DB	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 5	Byte 6	Description
1	0x701	Tx	1	"00"	-	-	-	-	-	-	-	BootUpMessage
2	0x000	Rx	2	"01"	"01"	-	-	-	-	-	-	Node Start (operational)
3	0x201	Rx	8	"06"	"00"	"00"	"20"	"00"	"00"	"00"	"00"	Enable + setpoint speed
4	0x080	Rx	0	-	-	-	-	-	-	-	-	SYNC telegram
5	0x181	Tx	8	"C7"	"05"	"00"	"20"	"A2"	"00"	"28"	"00"	Process data object 1
6	0x281	Tx	8	"29"	"09"	"00"	"00"	"01"	"1F"	"AC"	"0D"	Process data object 2

After a byte swap, the table looks as follows:

				Word 4		Word 3		Word 2		Word 1		
	COB ID	D	DB	Byte 8	Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Description
1	0x701	Tx	1	-	-	-	-	-	-		"00"	BootUpMessage
2	0x000	Rx	2	-	-	-	-	-	-	"01"	"01"	Node Start (operational)
3	0x201	Rx	8	"00"	"00"	"00"	"00"	"20"	"00"	"00"	"06"	Enable + setpoint speed (byte swap)
4	0x080	Rx	0	-	-	-	-	-	-	-	-	SYNC telegram
5	0x181	Tx	8	"00"	"28"	"00"	"A2"	"20"	"00"	"05"	"C7"	Process data object 1
6	0x281	Tx	8	"0D"	"AC"	"1F"	"01"	"00"	"00"	"09"	"29"	Process data object 2

Explanation of the data:

			Word 4		Word 3		Word 2		Word 1	
	COB ID	Explanation of the COB ID	Byte 8	Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1
1	0x701	BootUp message + device address 1	-	-	-	-	-	-	-	Place-holder
2	0x000	NMT service	-	-	-	-	-	-	Bus status	Device ad-dress
3	0x201	Rx-PDO1 + device ad-dress 1	-	-	Ramp specification		Setpoint speed		Control word	
4	0x080	SYNC telegram	-	-	-	-	-	-	-	-
5	0x181	Tx PDO1 + device ad-dress	Output power		Output current		Actual speed		Status word	
6	0x281	Tx PDO2 + device ad-dress	Inverter temperature		IO status		Analog input 2		Analog input 1	

Example of reading the index allocation by means of service device object (SDO):

Request controller → inverter (index: 1A00h)

Response inverter → controller: 10 00 01 21h → byte swap: 2101 00 10 h.

Explanation of the response:

→ 2101 = index in the manufacturer-specific object table

→ 00h = subindex

→ 10h = data width = 16 bit x 4 = 64 bit = 8 byte mapping length.

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7.4.7 Table of CANopen-specific objects

CANopen-specific objects						
Index	**Sub index**	**Function**	**Access**	**Type**	**PDO map**	**Default value**
1000h	0	Device type	RO	Unsigned 32	N	0
1001h	0	Error register	RO	Unsigned 8	N	0
1002h	0	Manufacturer status register	RO	Unsigned 16	N	0
1005h	0	COB-ID Sync	RW	Unsigned 32	N	00000080h
1008h	0	Manufacturer device name	RO	String	N	“LTEB” or “LT1B”
1009h	0	Manufacturer hardware version	RO	String	N	x.xx (e.g. 1.00)
100Ah	0	Manufacturer software version	RO	String	N	x.xx (e.g. 2.00)
100Ch	0	Guard time [1 ms]	RW	Unsigned 16	N	0
100Dh	0	Life time factor	RW	Unsigned 8	N	0
1014h	0	COB-ID EMCY	RW	Unsigned 32	N	00000080h+Node ID
1015h	0	Inhibit time emergency [100 µs]	RW	Unsigned 16	N	0
1017h	0	Producer heart beat time [1 ms]	RW	Unsigned 16	N	0
1018h	0	Identity object no. of entries	RO	Unsigned 8	N	4
	1	Vendor ID	RO	Unsigned 32	N	0x00000059
	2	Product code	RO	Unsigned 32	N	Drive depended
	3	Revision number	RO	Unsigned 32	N	x.xx
	4	Serial number	RO	Unsigned 32	N	e.g. 1234/56/789
1200h	0	SDO parameter no. of entries	RO	Unsigned 8	N	2
	1	COB-ID client -> server (RX)	RO	Unsigned 32	N	00000600h+Node ID
	2	COB-ID server -> client (TX)	RO	Unsigned 32	N	00000580h+Node ID
1400h	0	RX PDO1 comms param no. of entries	RO	Unsigned 8	N	2
	1	RX PDO1 COB-ID	RW	Unsigned 32	N	40000200h+Node ID
	2	RX PDO1 transmission type	RW	Unsigned 8	N	1
1401h	0	RX PDO2 comms param no. of entries	RO	Unsigned 8	N	2
	1	RX PDO2 COB-ID	RW	Unsigned 32	N	40000300h+Node ID
	2	RX PDO2 transmission type	RW	Unsigned 8	N	1
1600h	0	RX PDO1 mapping / no. of entries	RW	Unsigned 8	N	4
	1	RX PDO1 1st mapped object	RW	Unsigned 32	N	20100010h
	2	RX PDO1 2nd mapped object	RW	Unsigned 32	N	20120010h
	3	RX PDO1 3rd mapped object	RW	Unsigned 32	N	00060010h
	4	RX PDO1 4th mapped object	RW	Unsigned 32	N	20140010h
1601h	0	RX PDO2 mapping / no. of entries	RW	Unsigned 8	N	4
	1	RX PDO2 1st mapped object	RW	Unsigned 32	N	00060010h
	2	RX PDO2 2nd mapped object	RW	Unsigned 32	N	00060010h
	3	RX PDO2 3rd mapped object	RW	Unsigned 32	N	00060010h
	4	RX PDO2 4th mapped object	RW	Unsigned 32	N	00060010h
1800h	0	TX PDO1 comms param no. of entries	RO	Unsigned 8	N	3
	1	TX PDO1 COB-ID	RW	Unsigned 32	N	40000180h+Node ID
	2	TX PDO1 transmission type	RW	Unsigned 8	N	1
	3	TX PDO1 Inhibit time [100 µs]	RW	Unsigned 16	N	0
1801h	0	TX PDO2 comms param no. of entries	RO	Unsigned 8	N	3
	1	TX PDO2 COB-ID	RW	Unsigned 32	N	40000280h+Node ID
	2	TX PDO2 transmission type	RW	Unsigned 8	N	1
	3	TX PDO2 Inhibit time [100 µs]	RW	Unsigned 16	N	0
1A00h	0	TX PDO1 mapping / no. of entries	RW	Unsigned 8	N	4
	1	TX PDO1 1st mapped object	RW	Unsigned 32	N	21100010h
	2	TX PDO1 2nd mapped object	RW	Unsigned 32	N	21120010h
	3	TX PDO1 3rd mapped object	RW	Unsigned 32	N	21130010h
	4	TX PDO1 4th mapped object	RW	Unsigned 32	N	21140010h

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CANopen-specific objects						
Index	**Sub index**	**Function**	**Access**	**Type**	**PDO map**	**Default value**
1A01h	0	TX PDO2 mapping / no. of entries	RW	Unsigned 8	N	4
	1	TX PDO2 1st mapped object	RW	Unsigned 32	N	21180010h
	2	TX PDO2 2nd mapped object	RW	Unsigned 32	N	21190010h
	3	TX PDO2 3rd mapped object	RW	Unsigned 32	N	211A0010h
	4	TX PDO2 4th mapped object	RW	Unsigned 32	N	21160010h

7.4.8 Table of manufacturer-specific objects

The manufacturer-specific objects of the frequency inverter are defined as follows:

Manufacturer-specific objects						
Index	**Sub index**	**Function**	**Access**	**Type**	**PDO map**	**Remark**
2000h	0	Reserved	RW	Unsigned 16	Y	Read as 0, writing not possible
2001h – 200Fh	0	Reserved	RW	Unsigned 16	Y	Read as 0, writing not possible
2010h	0	Control command register	RW	Unsigned 16	Y	S-Bus control word format
2011h	0	Speed reference (RPM)	RW	Integer 16	Y	1 = 0.2 min^{-1}
2012h	0	Speed reference (percentage)	RW	Integer 16	Y	4000HEX = 100% P-01
2013h	0	Reserved	RW	Integer 16	Y	Read as 0, writing not possible
2014h	0	User ramp reference	RW	Unsigned 16	Y	1 = 1 ms (reference to 50 Hz)
2015h – 2100h	0	Reserved	RW	Unsigned 16	Y	Read as 0, writing not possible
2101h – 210Fh	0	Reserved	RO	Unsigned 16	Y	Read as 0
2110h	0	Drive status register	RO	Unsigned 16	Y	S-Bus status word format
2111h	0	Motor speed (RPM)	RO	Integer 16	Y	1 = 0.2 min^{-1}
2112h	0	Motor speed (percentage)	RO	Integer 16	Y	4000HEX = 100% of P-01
2113h	0	Motor current	RO	Unsigned 16	Y	4000HEX = 100% of P-08
2114h	0	Motor torque	RO	Integer 16	Y	1000DEC = Motor rated torque
2115h	0	Motor power	RO	Unsigned 16	Y	1000DEC = Drive rated power
2116h	0	Drive temperature	RO	Integer 16	Y	1DEC = 0.01 °C
2117h	0	DC bus value	RO	Unsigned 16	Y	1DEC = 1 V
2118h	0	Analog input 1	RO	Integer 16	Y	1000HEX = Full scale
2119h	0	Analog input 2	RO	Integer 16	Y	1000HEX = Full scale
211Ah	0	Digital input & output status	RO	Unsigned 16	Y	LB = input, HB = output
211Bh	0	Analog output 1 (percentage)	RO	Unsigned 16	Y	1000 DEC = 100.0%
211Ch – 2120h	0	Reserved	RO	Unsigned 16	Y	Read as 0
2121h	0	Scope channel 1 (internal format)	RO	Unsigned 16	Y	
2122h	0	Scope channel 2 (internal format)	RO	Unsigned 16	Y	
2123h	0	Scope channel 3 (internal format)	RO	Unsigned 16	Y	
2124h	0	Scope channel 4 (internal format)	RO	Unsigned 16	Y	
2AF8h[1)]	0	S-Bus parameter start index	RO	–	N	11000d
–	0	S-Bus parameters	RO/RW	–	N	–
2C6Fh[1)]	0	S-Bus parameter end index	RW	–	N	11375d

1) Objects 2AF8h – 2C6EF correspond with SBus parameter indexes 11000d – 11375d, some of them are read-only.

7.4.9 Emergency code objects

See chapter Error codes.

8 Parameters

8.1 Overview of parameters

8.1.1 Parameters for realtime monitoring (read only)

Parameter group 0 gives access to internal inverter parameters for monitoring purposes. These parameters cannot be changed.

Parameter group 0 is visible when *P-14* is set to "101".

Access to parameter group 0

- Press the <Menu> button for 2 s to go to the parameter menu.
- Set *P-14* to "101" or the value from *P-37* in the case of a user-defined password.
- Set the parameter *P-00* with the <Up> or <Down> key.
- Press the <Menu> button for 1 s to switch to the parameter group *P00-xy*.
- Select the required parameters with the <Up> or <Down> key.
- Press the <Menu> button for 1 s to display the value (<Up>/<Down> key for several levels)
- To return to the parameter menu, press the <Menu> key for 1 s.
- To exit the parameter menu, press the <Menu> key for 2 s.

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Description of parameter group 0

Parameter	CANopen/ SBus index	Modbus register	Description	Display range	Explanation
P00-01	11210	20	Value of analog input 1	0 – 100%	Index value 1000 = 100% ≙ max. input voltage or current.
P00-02	11211	21	Value of analog input 2	0 – 100%	Index value 1000 = 100% ≙ max. input voltage or current.
P00-03	11213	22, 40	Speed controller setpoint	P-02 – P-01	Speed display in Hz when *P-10* = 0, else in min^{-1}.
P00-04	11212	11	Digital input connection	Binary value	Status of the digital inputs DI1; DI2; DI3; DI4
P00-05	11232	39	Control electronics temperature	-25°C – 125°C	40 = 40 °C
P00-06	11288		DC link voltage ripple	0 – 1000 V	Voltage ripple of the DC link
P00-07	11270	43	Present motor voltage	AC 0 – 600 V	Inverter output voltage rms value
P00-08	11220	23	DC link voltage ($V_{DC\ link}$)	DC 0 – 1000 V	600 = 600 V (internal DC link voltage)
P00-09	11221	24	Power electronics/ heat sink temperature	-20 °C – 100 °C	40 = 40 °C
P00-10	11296 – 11297	25, 26	Operating hours counter (inverter enabled)	Value 1: Hours Value 2: Minutes, seconds	Total enable time of the inverter since manufacturing (enable). Value cannot be reset
P00-11	11298 – 11299	–	Runtime since the last error 1	Value 1: Hours Value 2: Minutes, seconds	Operating time since the last error or power off. The time will be reset the next time that an enable or power off occurs.
P00-12	11300 – 11301	–	Runtime since the last error 2	Value 1: Hours Value 2: Minutes, seconds	Operating time since the last error. The time will be reset the next time that an enable or power off occurs.
P00-13	11302 – 11303	28	Operating time since the last enable	Value 1: Hours Value 2: Minutes, seconds	Displays the operating time of an enable interval. The timer is reset at each following enable
P00-14	11350	–	Current PWM switching frequency	2 – 16 kHz	Value can be lower than the setting in *P-17* since the inverter automatically reduces upon thermal overload.
P00-15	11305 – 11313	–	DC link voltage protocol	8 values 0 – 1000 V	Displays the last 8 values prior to the switch off with error
P00-16	11322 – 11329	–	Power electronics heat sink temperature protocol (P00-09)	8 values -20 °C – 120 °C	Displays the last 8 values prior to the switch off with error
P00-17	11330 – 11337	–	Motor current protocol	8 values 0 – 2 × nominal motor current	Displays the last 8 values prior to the switch off with error
P00-18	11247 – 11250	15, 16	Firmware version and check sum	4 values, e.g.: "1 2.01", "1 1703" "2 2.01", "2 ECdA"	Firmware and check sum of the control electronics and the power section.
P00-19	11251 – 11254	34 – 37	Serial number	2 values xxxxxx xx-xxx	Serial number of the inverter
P00-20	11255	12 – 14, 17	Inverter type	3 values, e.g.: 0.75/F1 230/3P-out	Power/connection and voltage/motor connection
P00-21	11259 – 11261	–	Outgoing process data (CANopen, Sbus)	4 values: PO1 – PO4	4 entries; outgoing process data from the perspective of the control.
P00-22	11256 – 11258	–	Incoming process data (CANopen, Sbus)	4 values: PI1 – PI4	4 entries; incoming process data from the perspective of the control.
P00-23	11289 – 11290	–	Total runtime > 85 °C (power electronics / heat sink)	Value 1: Hours Value 2: Minutes, seconds	Time during which a temperature of > 85 °C was measured at the heat sink

Parameter	CANopen/ SBus index	Modbus register	Description	Display range	Explanation
P00-24	11237 – 11238	–	Total runtime > 60 °C (control electronics)	Value 1: Hours Value 2: Minutes, seconds	Time in which the inverter was operated at > 60 °C
P00-25	11291	–	Rotor speed (calculated via motor model)	Hz / min^{-1}	Speed display in Hz when *P-10* = 0, else in min^{-1}.
P00-26	11292 – 11293	32, 33	kWh counter/MWh counter	kWh/MWh	The values are reset during factory setting.
P00-27	11304 – 11305	–	Runtime of inverter fan	Value 1: Hours Value 2: Minutes, seconds	Runtime clock for internal fan.
P00-28	11272 – 11281	–	Error log	4 values	Shows the last 4 errors. You can toggle between sub-items by pressing the <Up>/<Down> keys.
P00-29	11219	–	PI controller output	0 – 100%	PI controller output
P00-30	11314 – 11321	–	DC link voltage ripple protocol	8 values 0 – 1000 V	Displays the last 8 values prior to the switch off with error
P00-31	11282 – 11283	–	Magnetizing current Id and torque current Iq	2 values d x.xA q x.xA	Magnetizing current/torque-forming current
P00-32	11239 – 11246	–	Control electronics temperature protocol (P00-05)	8 values -25°C – 125°C	Displays the last 8 values prior to the switch off with error
P00-33	11338	–	Counter for critical errors – O-I	0 – 65000	Counter for overcurrent faults
P00-34	11339	–	Counter for critical errors – O-Volts	0 – 65000	Counter for overvoltage faults
P00-35	11340	–	Counter for critical errors – U-Volts	0 – 65000	Counter for undervoltage faults. Also during power off.
P00-36	11341	–	Counter for critical errors – O-T	0 – 65000	Counter for overtemperature faults of the heat sink
P00-37	11342	–	Counter for critical errors – OI-b	0 – 65000	Counter for short-circuit faults of the brake chopper.
P00-38	11343	–	Counter for critical errors – O-heat	0 – 65000	Counter for overtemperature faults due to high ambient temperature.
P00-39	11224	–	Counter for Modbus communication errors	0 – 65000	
P00-40	11225	–	Counter for CANopen communication errors	0 – 65000	
P00-41	11223	–	Counter for internal I/O communication errors	0 – 65000	
P00-42	11344	–	Counter for internal DSP communication errors in the power section	0 – 65000	Counter for communication errors between the processors of the power electronics
P00-43	11351 – 11352	–	Inverter runtime	Value 1: Hours Value 2: Minutes, seconds	Total switch-on time of the inverter since manufacturing (supply system on). Value cannot be reset.
P00-44	–	–	Current phase offset and reference value for U	Internal value	Value 1: Reference value Value 2: Measured value
P00-45	–	–	Current phase offset and reference value for V	Internal value	Value 1: Reference value Value 2: Measured value
P00-46	–	–	Current phase offset and reference value for W	Internal value	Value 1: Reference value Value 2: Measured value
P00-47	11294 –11295	–	Total switch-on time, fire mode	Value 1: Hours Value 2: Minutes, seconds	Total cyclic duration factor of the fire mode in [h]

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Parameter	CANopen/ SBus index	Modbus register	Description	Display range	Explanation
P00-48	11226 – 11227	18, 19	Display value for channel 1 and 2 internal oscilloscope	Channel 1 Channel 2	Current value of the latest oscilloscope measurement. Unit refers to the set size
P00-49	11228 – 11229	–	Display value for channel 3 and 4 internal oscilloscope	Channel 3 Channel 4	Current value of the latest oscilloscope measurement. Unit refers to the set size
P00-50	11355 – 11356	–	Lib version and DSP bootloader version for motor control	Value 1: L 3.04 Value 2: b 1.00	Value 1: Version of the motor control Value 2: DSP bootloader version

8.1.2 Standard parameters

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P-01	11020	129	Maximum rotational speed (→ 🗎 82)	*P-02* – **50.0 Hz** – 5 × *P-09*[1]
P-02	11021	130	Minimum speed (→ 🗎 82)	**0** – *P-01* Hz[1]
P-03	11022	131	Acceleration ramp time (→ 🗎 82)	0.00 – **5.0** – 600 s
P-04	11023	132	Deceleration ramp time (→ 🗎 82)	0.00 – **5.0** – 600 s
P-05	11024	133	Stop mode (→ 🗎 83)	**0** – 2
P-06	11025	134	Energy-saving function (→ 🗎 83)	**0** – 1
P-07	11012	135	Rated motor voltage (→ 🗎 83)	0 – **230** – 250 V 0 – **400**[2] – 500 V
P-08	11015	136	Rated motor current (→ 🗎 84)	20 – 100%
P-09	11009	137	Rated motor frequency (→ 🗎 84)	25 – **50/60**[2] **Hz** – 500 Hz
P-10	11026	138	Rated motor speed (→ 🗎 84)	**0** – 30 000 min^{-1}
P-11	11027	139	Voltage increase, boost (→ 🗎 85)	0 – 25%[3]
P-12	11028	140	Control signal source (→ 🗎 85)	**0** – 11
P-13	11029	141	Reserved	–
P-14	11030	142	Extended parameter access (→ 🗎 86)	**0** – 9999

1) Note the description under P-10
2) 460 V only American version
3) Power-dependent

8.1.3 Advanced parameters

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P-15	11031	143	Digital input function selection (→ 🗎 86)	**0** – 13
P-16	11064	144	Analog input 1 format (→ 🗎 91)	**U0 – 10** b0 – 10 A0 – 20 t4 – 20 r4 – 30 t20 – 4 r20 – 4
P-17	11003	145	PWM switching frequency (→ 🗎 92)	2 – **4** – 16 kHz[1)]
P-18	11050	146	User relay output function selection (→ 🗎 93)	0 – **1** – 8
P-19	11051	147	Limit value for relay/analog output (→ 🗎 94)	0.0 – **100.0** – 200.0%
P-20	11036	148	Fixed setpoint speed 1 (→ 🗎 94)	*-P-01* – **5.0 Hz** – *P-01*[2)]
P-21	11037	149	Fixed setpoint speed 2 (→ 🗎 94)	*-P-01* – **25.0 Hz** – *P-01*[2)]
P-22	11038	150	Fixed setpoint speed 3 (→ 🗎 94)	*-P-01* – **40.0 Hz** – *P-01*[2)]
P-23	11039	151	Fixed setpoint speed 4 (→ 🗎 94)	*-P-01* – **P-01**[2)]
P-24	11059	152	Second deceleration ramp, rapid stop ramp (→ 🗎 94)	**0.00** – 25 s
P-25	11046	153	Function selection analog output (→ 🗎 95)	0 – **8** – 10
P-26	11045	154	Skip frequency band (→ 🗎 95)	**0 Hz** – *P-01*[2)]
P-27	11044	155	Skip frequency (→ 🗎 95)	**P-02** – *P-01*[2)]
P-28	11099	156	Adjustment of the V/f characteristic curve (voltage value) (→ 🗎 97)	**0** – *P-07* [V]
P-29	11098	157	Adjustment of the V/f characteristic curve (frequency value) (→ 🗎 97)	**0** – *P-09* [Hz]
P-30	11070	158	Start mode selection (→ 🗎 98)	Edge-r, **Auto-0** – Auto-5
P-31	11071	159	Keypad/fieldbus enable behavior (→ 🗎 98)	0 – **1** – 7
P-32	11133	160	DC hold function Level 1: Current holding time (→ 🗎 100)	**0.0** – 25 s
	11132		DC hold function Level 2: Current holding mode (→ 🗎 100)	**0** – 2
P-33	11060	161	Flying start function enable (→ 🗎 100)	**0** – 2
P-34	11131	162	Activation of brake chopper (→ 🗎 100)	**0** – 2
P-35	11065	163	Analog input 1/slave scaling (→ 🗎 101)	0.0 – **100.0** – 2000%
P-36	11105	164	Fieldbus setting Level 1: Inverter address (→ 🗎 103)	0 – **1** – 63
	11106		Fieldbus setting Level 2: Baud rate (→ 🗎 103)	0 – **1** – 5
	11107		Fieldbus setting Level 3: Timeout behavior (→ 🗎 103)	**0** – 8
P-37	11074	165	Advanced parameter access code definition (→ 🗎 104)	0 – **101** – 9999
P-38	11073	166	Parameter lock (→ 🗎 104)	**0** – 1
P-39	11066	167	Analog input 1 offset (→ 🗎 104)	-500 – **0.0** – 500%
P-40	11056	168	Scaling factor display actual value Level 1: Scaling factor (→ 🗎 104)	**0.000** – 16 000
	11057		Scaling factor display actual value Level 2: Display scaling source (→ 🗎 104)	**0** – 2
P-41	–	169	Thermal motor protection to UL508C (→ 🗎 104)	**0** – 1
P-42	11075	170	PI proportional gain (→ 🗎 105)	0.0 – **1.0** – 30.0
P-43	11076	171	PI-integrating time constant (→ 🗎 105)	0.0 – **1.0** – 30.0 s
P-44	11078	172	PI operating mode (→ 🗎 105)	**0** – 1
P-45	11079	173	PI reference selection Level 1: PI reference source (→ 🗎 105)	**0** – 1
	11080		PI reference selection Level 2: PI return source (→ 🗎 105)	**0** – 5
P-46	11081	174	PI fixed setpoint reference (→ 🗎 105)	**0.0** – 100.0%

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Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P-47	11067	175	Analog input 2 format (→ 🗎 106)	**U0 – 10** A0 – 20 t4 – 20 r4 – 30 t20 – 4 r20 – 4 Ptc – th
P-48	11061	176	Standby mode (→ 🗎 106)	**0.0** – 25 s
P-49	11087	177	PI control difference wake-up level (→ 🗎 106)	0.0 – **5.0** – 100%
P-50	11052	178	Hysteresis band user relay (→ 🗎 106)	**0.0** – 100%
P-51	11089	179	Motor control process selection (→ 🗎 107)	0 – **1** – 5
P-52	11090	180	Auto tune (→ 🗎 107)	**0** – 1
P-53	11091	181	Speed controller Level 1: Proportional gain	0 – 250%
	11092		Speed controller Level 2: Integrating time constant	0.00 – 2.50 s
P-54	11095	182	Current limit (→ 🗎 109)	0.1 – **150** – 175%
P-55	11140	183	Motor stator resistance (Rs) (→ 🗎 109)	0.00 – 655.35 Ω
P-56	11142	184	Motor stator inductance (Lsd) (→ 🗎 109)	0.0 – 6553.5 mH
P-57	11145	185	Motor stator inductance (Lsq) (→ 🗎 109)	0.0 – 6553.5 mH
P-58	11134	186	Speed of direct current braking (→ 🗎 110)	**0.0** – *P-01*
P-59	11135	187	Current strength of direct current braking (→ 🗎 110)	0.0 – **20.0** – 100%
P-60	11128	188	Fire mode/emergency mode speed (→ 🗎 110)	*-P-01* – **0** – *P-01* Hz

1) Performance-related

2) Note the explanations under P-10

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8.2 Advanced parameter description

8.2.1 Basic parameters

P-01 Maximum speed

Setting range: *P-02* – **50.0 Hz** – 5 × *P-09* (maximum 500 Hz)

Specifies the upper limit for the frequency (speed) that can be applied to the motor in any operating mode. This parameter is displayed in Hz when factory settings are used or when the parameter for the rated motor speed (*P1-10*) is set to zero. If the rated motor speed was entered in min^{-1} in *P-10*, this parameter will be displayed in min^{-1}.

The maximum speed is also limited by the switching frequency set in *P-17*. The limit is determined by the maximum output frequency to the motor = *P-17: 16*.

P-02 Minimum speed

Setting range: **0** – *P-01* Hz

Specifies the lower limit for the frequency (speed) that can be applied to the motor in any operating mode. This parameter is displayed in Hz when factory settings are used or when the parameter for the rated motor speed (*P1-10*) is set to zero. If the rated motor speed was entered in min^{-1} in *P-10*, this parameter will be displayed in min^{-1}.

The speed drops below this limit only when the inverter enable signal is removed and the inverter decreases the output frequency to zero.

P-03 Acceleration ramp time

Setting range: 0.00 – **5.0** – 600 s

Specifies the time in seconds during which the output frequency (speed) increases from 0 to 50 Hz. Note that the ramp time is not affected by changing either the maximum or minimum speed limit. The reason is that the ramp time refers to 50 Hz, not to the speed *P-01*/*P-02.*

P-04 Deceleration ramp time

Setting range: 0.00 – **5.0** – 600 s

Specifies the time in seconds during which the output frequency (speed) decreases from 50 to 0 Hz. Note that the ramp time is not affected by changing either the maximum or minimum speed limit. The reason is that the ramp time refers to 50 Hz, not to *P-01*/*P-02.*

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P-05 Stop mode

Defines the delay behavior of the drive for normal operation and power failure.

Setting range: **0** – 2

In the event of power failure:

- 0: Operation continues
- 1: Motor coasts to a halt
- 2: Rapid stop along *P-24*

Normal stop:

- 0: Stop along ramp *P-04*
- 1: Motor coasts to a halt
- 2: Stop along ramp *P-04*

If *P-05* = 0, the frequency inverter attempts to continue operation in the case of a power failure by reducing the motor speed and using the load as a generator.

P-06 Energy-saving function

- **0: Off**
- 1: On

If this function is activated, the inverter continuously monitors the motor load condition by comparing the output current with the nominal motor current. If the motor rotates with a constant speed in the partial load range, the inverter automatically reduces the output voltage, thus reducing the motor's energy consumption. This reduces the energy consumption of the motor. If the motor load increases or the frequency setpoint changes, the output voltage increases immediately. The energy-saving function works only if the inverter setpoint remains constant over a certain period of time.

Application examples include, for example, fan applications or conveyor belts for which the energy requirement in the range between full, empty or partial load trips is optimized.

This function is only applicable for asynchronous motors.

P-07 Rated motor voltage

Setting range:

- 230 V inverter: 20 – **230** − 250 V
- 400 V inverter: 20 – **400/460**[1)] – 500 V

Specifies the nominal voltage of the motor connected to the inverter (in accordance with the motor nameplate). The parameter value is used in V/f speed control for controlling the output voltage applied to the motor. In V/f speed control, the output voltage of the inverter amounts to the value set in *P-07* if the output speed corresponds to the motor base frequency set in *P-09*.

"0V" = DC link compensation is disabled. When braking, the V/f ratio shifts as a result of the voltage increase in the DC link, resulting in greater motor losses. The motor heats up more. The additional motor losses during braking might make a braking resistor redundant.

1) 460 V only American version

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P-08 Rated motor current

Setting range: 20 – 100% of the inverter output current. Is given as absolute value in ampere.

Specifies the rated current of the motor connected to the inverter (according to the motor nameplate). This allows the inverter to match its internal thermal motor protection (I x t protection) to the motor.

If the inverter output current is > 100% of the nominal motor current, the inverter switches off the motor after a certain amount of time (I.-trP) before there is any thermal damage to the motor.

P-09 Rated motor frequency

Setting range: 25 – **50/60**[1)] – 500 Hz

Specifies the rated frequency of the motor connected to the inverter (according to the motor nameplate). This is the frequency at which the maximum (rated) output voltage is applied to the motor. Above this frequency, the voltage applied to the motor remains constant at its maximum value.

1) 60 Hz (only American version)

P-10 Rated motor speed

Setting range: **0** – 30 000 min^{-1}

Specifies the rated speed of the motor. When the parameter is ≠ 0, all speed-related parameters, such as minimum and maximum speed are displayed in "min^{-1}".

The slip compensation is activated at the same time. The frequency or speed shown on the display of the inverter corresponds to the calculated rotor frequency or rotor speed.

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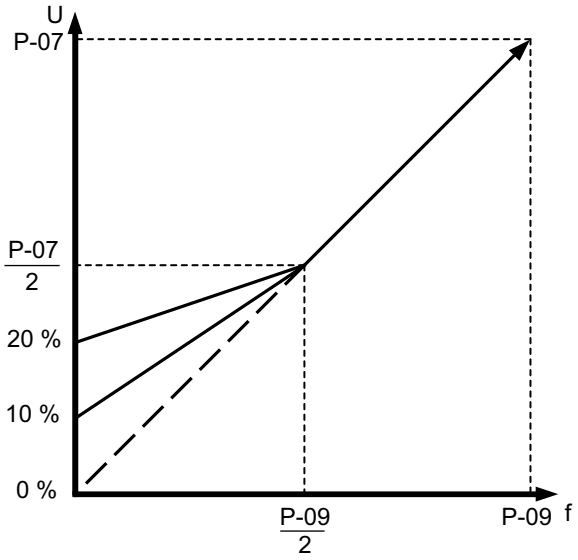
P-11 Voltage increase, boost

Setting range: 0 – 25% of the max. output voltage. Resolution 0.1%

- Size 1: max. 25%
- Size 2: max. 20%
- Size 3: max. 15%
- Size 4: max. 10%

Increases the output voltage of the frequency inverter by a scalable value (in case of low speed) to obtain a higher motor torque generation in this speed range.

Vector operation (*P51* ≠ 1): *P-11* is automatically filled by the auto tune process, if one of the vector control modes was selected in *P-51*.



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A motor with forced cooling fan must be used for continuous duty at low speeds.

P-12 control signal source

Setting range: **0** – 11

- **0: Terminal mode**
- 1: Keypad mode unipolar
- 2: Keypad mode bipolar
- 3: SBus MOVILINK® (with internal ramps *P-03* and *P-04*)
- 4: SBus MOVILINK® (with ramps via process output data word 3)
- 5: Modbus RTU (with internal ramps *P-03* and *P-04*)
- 6: Modbus RTU (with ramps via process output data word 3)
- 7: CANopen (with internal ramps *P-03* and *P-04*)
- 8: CANopen (with ramps via process output data word 3)
- 9: PI controller mode
- 10: PI controller mode with addition of the analog input 1
- 11: Slave mode

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P-13 Reserved

Parameter reserved

P-14 Extended parameter access

Setting range: **0** – 9999

This parameter allows access to all parameters. Access is possible when the following values are valid.

- **0: P-01 – P-15** (basis parameter)
- 101: *P-01* – *P-60* (extended parameters)

The password (101) is defined in parameter *P-37* and can be changed in a user-defined way.

8.2.2 Extended parameterization

P-15 Digital input function selection

Setting range: **0** − 13

Users can set the function of the digital inputs of the inverter, that is the user can select functions required for the application.

The following tables list the functions of the digital inputs depending on the value set in parameters *P-12 (terminal/keypad/SBus control)* and *P-15 (selection of the digital input functions)*.

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Terminal mode

When parameter *P-12* = 0 (terminal mode), the following table applies:

P-15	Digital input 1	Digital input 2	Digital input 3/ Analog input 2	Analog input 1/ Digital input 4	Comments
0	**0**: Stop **1**: Enable + start	**0**: CW rotation **1**: CCW rotation	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1	Analog speed setpoint	_
1	**0**: Stop **1**: Enable + start	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1, 2	**0**: Fixed setpoint speed 1 **1**: Fixed setpoint speed 2	Analog speed setpoint	_
2	**0**: Stop **1**: Enable + start	**0**: Open	**0**: Open	**0**: Fixed setpoint speed 1 – 4 **1**: Max. speed (*P-01*)	Fixed setpoint speed 1
		1: Applied	**0**: Open		Fixed setpoint speed 2
		0: Open	**1**: Applied		Fixed setpoint speed 3
		1: Applied	**1**: Applied		Fixed setpoint speed 4
3	**0**: Stop **1**: Enable + start	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1	External fault **0**: Fault **1**: No fault	Analog speed setpoint	When a TF/TH is used, *P-47* must also be set to "Ptc-th".
4	**0**: Stop **1**: Enable + start	**0**: CW rotation **1**: CCW rotation	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1	Analog speed setpoint	_
5	**0**: Stop **1**: Enable + start clockwise rotation	**0**: Stop **1**: Enable + start counterclockwise rotation	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1	Analog speed setpoint	_
	When both inputs are active, the stop ramp (*P-24*) is activated.				
6	**0**: Stop **1**: Enable + start	**0**: CW rotation **1**: CCW rotation	External fault **0**: Fault **1**: No fault	Analog speed setpoint	When a TF/TH is used, *P-47* must also be set to "Ptc-th".
7	**0**: Stop **1**: Enable + start clockwise rotation	**0**: Stop **1**: Enable + start counterclockwise rotation	External fault **0**: Fault **1**: No fault	Analog speed setpoint	When a TF/TH is used, *P-47* must also be set to "Ptc-th".
	When both inputs are active, the rapid stop ramp (*P-24*) is activated.				
8	**0**: Stop **1**: Enable + start	**0**: CW rotation **1**: CCW rotation	**0**: Open	**0**: Open	Fixed setpoint speed 1
			1: Applied	**0**: Open	Fixed setpoint speed 2
			0: Open	**1**: Applied	Fixed setpoint speed 3
			1: Applied	**1**: Applied	Fixed setpoint speed 4
9	**0**: Stop **1**: Enable + start clockwise rotation	**0**: Stop **1**: Enable + start counterclockwise rotation	**0**: Open	**0**: Open	Fixed setpoint speed 1
			1: Applied	**0**: Open	Fixed setpoint speed 2
	When both inputs are active, the rapid stop ramp (*P-24*) is activated.		**0**: Open	**1**: Applied	Fixed setpoint speed 3
			1: Applied	**1**: Applied	Fixed setpoint speed 4
10	Enable + start pushbutton (NO contact)	Stop pushbutton (NC contact)	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1	Analog speed setpoint	Flank control
11	Enable + start CW rotation pushbutton (NO contact)	Stop pushbutton (NC contact)	Enable + start CCW rotation pushbutton (NO contact)	Analog speed setpoint	When DI1 and DI3 are active at the same time, the rapid stop ramp (*P-24*) is activated.
12	**0**: Stop **1**: Enable + start	**0**: Rapid stop ramp P-24 **1**: Operation	**0**: Analog speed setpoint **1**: Fixed setpoint speed 1	Analog speed setpoint	_
13	**0**: Stop **1**: Enable + start	**0**: Fixed setpoint speed 1 **1**: Analog speed setpoint	0: Emergency mode/fire mode **1**: Normal operation	Analog speed setpoint	Fire mode/emergency mode

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Keypad mode

INFORMATION

The enable/start behavior always depends on the setting made in *P-31*.

When parameter *P-12* = 1 or 2 (keypad mode), the following table applies.

P-15	Digital input 1	Digital input 2	Digital input 3/ Analog input 2	Analog input 1/ Digital input 4	Comments	Up key △	Down key ▽
0, 5, 8−12	**0**: Stop **1**: Enable	Speed up pushbutton (NO contact)	Speed down pushbutton (NO contact)	**0**: CW rotation **1**: CCW rotation	–	Increase the speed	Reduce speed
		When both pushbuttons are actuated simultaneously, the drive is started/enabled.					
1	**0**: Stop **1**: Enable	No function	PI controller function depending on *P-45*		–	No function	No function
2	**0**: Stop **1**: Enable	Speed up pushbutton (NO contact)	Speed down pushbutton (NO contact)	**0**: Speed setpoint keypad **1**: Fixed setpoint speed 1	–	Increase the speed	Reduce speed
		When both pushbuttons are actuated simultaneously, the drive is started/enabled.					
3	**0**: Stop **1**: Enable	Speed up pushbutton (NO contact)	External fault **0**: Fault **1**: No fault	Speed down pushbutton (NO contact)	When a TF/TH is used, *P-47* must also be set to "Ptc-th".	Increase the speed	Reduce speed
4	**0**: Stop **1**: Enable	Speed up pushbutton (NO contact)	**0**: Speed setpoint keypad **1**: Analog speed setpoint	Analog speed setpoint	–	Increase the speed	Reduce speed
6	**0**: Stop **1**: Enable	**0**: CW rotation **1**: CCW rotation	External fault **0**: Fault **1**: No fault	**0**: Speed setpoint keypad **1**: Fixed setpoint speed 1	When a TF/TH is used, *P-47* must also be set to "Ptc-th".	Increase the speed	Reduce speed
7	**0**: Stop **1**: Enable CW	**0**: Stop **1**: Enable CCW	External fault **0**: Fault **1**: No fault	**0**: Speed setpoint keypad **1**: Fixed setpoint speed 1	When a TF/TH is used, *P-47* must also be set to "Ptc-th".	Increase the speed	Reduce speed
	When both inputs are active, the rapid stop ramp (*P-24*) is activated.						
13	**0**: Stop **1**: Enable	**0**: Fixed setpoint speed 1, 2 **1**: Speed setpoint keypad	**0**: Emergency mode/ fire mode **1**: Normal operation	**0**: Fixed setpoint speed 1 **1**: Fixed setpoint speed 2	Fire mode/ emergency mode	Increase the speed	Reduce speed

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SBus, CANopen, Modbus-RTU, and slave control mode

INFORMATION

The enable/start behavior always depends on the setting made in *P-31*

The hardware enable is the prerequisite for the fieldbus enable.

The setpoint switchover (DI2) functions with SBus only in combination with the hardware enable (DI1) and fieldbus enable.

The setpoint switchover (DI2) functions with CAN, Modbus/RTU, and slave mode also only with the hardware enable (DI1) without the fieldbus enable being present.

If parameter *P-12* = 3 or 4 (SBus control mode), the following table applies:

P-15	Digital input 1	Digital input 2	Digital input 3	Analog input	Comments
0, 2, 4, 8 – 12	**0**: Stop **1**: Enable	No function	No function	No function	–
1	**0**: Stop **1**: Enable	No function	PI controller function depending on *P-45*		–
3	**0**: Stop **1**: Enable	**0**: Fieldbus master speed setpoint **1**: Fixed setpoint speed 1	External fault **0**: Fault **1**: No fault	No function	When a TF/TH is used, *P-47* must also be set to "Ptc-th".
5	**0**: Stop **1**: Enable	**0**: Fieldbus master speed setpoint **1**: Fixed setpoint speed 1, 2	**0**: Fixed setpoint speed 1 **1**: Fixed setpoint speed 2	No function	–
6	**0**: Stop **1**: Enable	**0**: Fieldbus master speed setpoint **1**: Analog speed setpoint	External fault **0**: Fault **1**: No fault	Analog speed setpoint	When a TF/TH is used, *P-47* must also be set to "Ptc-th".
7	**0**: Stop **1**: Enable	**0**: Fieldbus master speed setpoint **1**: Speed setpoint keypad	External fault **0**: Fault **1**: No fault	No function	When a TF/TH is used, *P-47* must also be set to "Ptc-th".
13	**0**: Stop **1**: Enable	**0**: Fixed setpoint speed 1, 2 **1**: Fieldbus master speed setpoint	**0**: Emergency mode/ fire mode **1**: Normal operation	**0**: Fixed setpoint speed 1 **1**: Fixed setpoint speed 2	Fire mode/emergency mode

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PI controller control mode

P-15	Digital input 1	Digital input 2	Digital input 3/ Analog input 2	Analog input 1/ Digital input 4	Comments
0, 2, 9 – 12	**0**: Stop **1**: Enable + start	**0**: PI controller **1**: Fixed setpoint speed 1	See comments	See comments	The setpoint and actual value source of the PI controller must be set via P-45 Level 1 and 2.
1	**0**: Stop **1**: Enable + start	**0**: PI controller **1**: Setpoint source analog input 1	See comments	See comments	
3, 7	**0**: Stop **1**: Enable + start	**0**: PI controller **1**: Fixed setpoint speed 1	External fault **0**: Fault **1**: No fault	See comments	The setpoint and actual value source of the PI controller must be set via *P-45* Level 1 and 2. When a TF/TH is used, *P-47* must also be set to "Ptc-th".
4	Enable + start push-button (NO contact)	Stop pushbutton (NC contact)	See comments	See comments	The setpoint and actual value source of the PI controller must be set via *P-45* Level 1 and 2.
5	Enable + start push-button (NO contact)	Stop pushbutton (NC contact)	**0**: PI controller **1**: Fixed setpoint speed 1	See comments	
6	Enable + start push-button (NO contact)	Stop pushbutton (NC contact)	External fault **0**: Fault **1**: No fault	See comments	The setpoint and actual value source of the PI controller must be set via *P-45* Level 1 and 2. When a TF/TH is used, *P-47* must also be set to "Ptc-th".
8	**0**: Stop **1**: Enable + start	**0**: CW rotation **1**: CCW rotation	See comments	See comments	The setpoint and actual value source of the PI controller must be set via *P-45* Level 1 and 2.
13	**0**: Stop **1**: Enable + start	**0**: Fixed setpoint speed 1 **1**: PI controller	**0**: Emergency mode/fire mode **1**: Normal operation	See comments	The setpoint and actual value source of the PI controller must be set via *P-45* Level 1 and 2. Fire mode/emergency mode

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P-16 Analog input 1 format

Setting range:

- **0: U0 – 10 V/unipolar voltage input**
- 1: b0 – 10 V/bipolar voltage input -10 V – 10 V
- 2: A0 – 20 mA/current input
- 3: t4 – 20 mA/current input
- 4: r4 – 20 mA/current input
- 5: t20 – 4 mA/current input
- 6: r20 – 4 mA/current input

"t.." indicates that the inverter shuts down when the signal is removed while the inverter is enabled. t4 – 20 mA, t20 – 4 mA

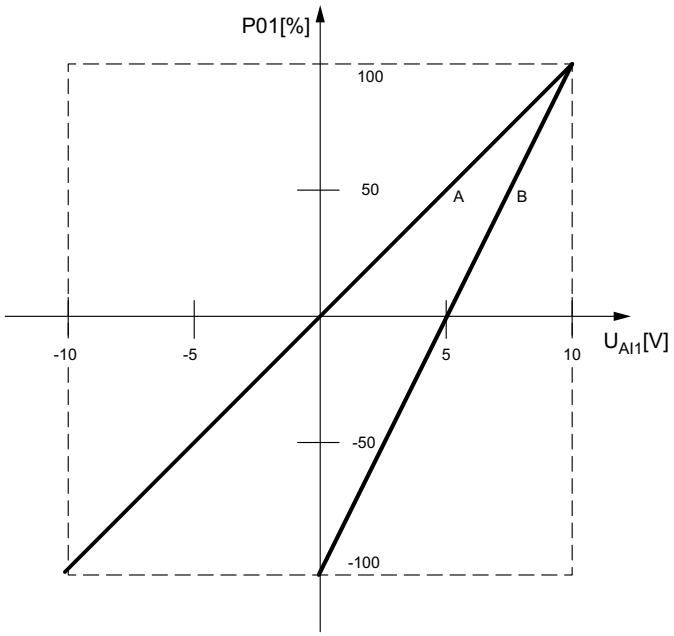
"r.." indicates that the inverter moves along a ramp to *P-20* when the signal is removed while the inverter is enabled. R4 – 20 mA, r20 – 4 mA

INFORMATION

The analog input can be scaled with the parameters *P-35* (→ 🗎 101) and *P-39*.

Example of bipolar speed with unipolar voltage source

This function allows for infinitely variable speeds in the speed range of -100% to +100% via *P-01* without changing the digital input for the direction of rotation reversal.



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Characteristic curve [A]:
Input voltage signal:
-10 V – 10 V
Setting:
P-16 = b0 – 10 V (bipolar)
P-35 = 100% (default)
P-39 = 0% (default)

Characteristic curve [B]:
Input voltage signal:
0 V – 10 V
Setting:
P-16 = b0 – 10 V (bipolar)
P-35 = 200%
P-39 = 50%

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P-17 PWM switching frequency

Setting range: 2 – **4** – 16 kHz (performance-related)

Specifies the pulse width modulated switching frequency. A higher switching frequency means less motor noise, but also higher losses in the output stage. The maximum switching frequency depends on the inverter power rating.

The inverter reduces the switching frequency automatically depending on the following conditions:

- Heat sink temperature
- Output frequency
- Overloads

Heat sink temperature	Output frequency (Upper and lower threshold)	Overloads Output current	Inverter behavior
70°C	7 – 9 Hz	–	Reduction to 12 kHz
75°C	5 – 7 Hz	–	Reduction to 8 kHz
80°C	3 – 5 Hz	–	Reduction to 6 kHz
85°C	1 – 3 Hz	>140%	Reduction to 4 kHz
95°C	–	–	Error message overtemperature

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P-18 User relay output function selection

Setting range: 0 – **1** – 8

The function of the relay output can be selected according to the table below.

If a relay is controlled depending on a limit value, it reacts according to the curve in *P-50* (→ 🗎 106).

Set-tings	Function	Explanation
0	Inverter enabled	Relay contacts closed when inverter is enabled
1	Frequency inverter is ready for operation	Relay contacts closed when inverter is operable (no error)
2	Motor at setpoint speed	Relay contacts closed when output frequency = setpoint frequency ±0.1 Hz
3	Frequency inverter in fault status	Relay contacts closed when the inverter is in fault status
4	Motor speed ≥ limit value *P-19* in relation to *P-01* The switching hysteresis can be set in *P-50*.	Relay contacts closed when output frequency is greater than the value set in parameter "Limit value for relay/ analog output". Relay contacts opened when value is lower than "Limit value for relay/analog output".
5	Motor current ≥ limit value *P-19* in reference to *P-08* The switching hysteresis can be set in *P-50*.	Relay contacts closed when motor current/torque is greater than the current limit set in parameter "Limit value for relay/analog output". Relay contacts opened when value is lower than "Limit value for relay/analog output".
6	Motor speed < limit value *P-19* in relation to *P-01* The switching hysteresis can be set in *P-50*.	Relay contacts closed when output frequency is less than the value set in parameter "Limit value for relay/ analog output". Relay contacts opened when value is greater than "Limit value for relay/analog output".
7	Motor current < limit value *P-19* in reference to *P-08* The switching hysteresis can be set in *P-50*.	Relay contacts closed when motor current/torque is less than the current limit set in parameter "Limit value for relay/analog output". Relay contacts opened when value is greater than "Limit value for relay/analog output"
8	Analog input 2 > limit value *P-19* The switching hysteresis can be set in *P-50*.	Relay contacts closed when second analog input value is greater than the value set in parameter "Limit value for relay/analog output". Relay contacts opened when value is lower than "Limit value for relay/analog output".

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P-19 Limit value for relay/analog output

Setting range: 0.0 – **100.0** – 200.0%

Specifies the limit values for *P-18* and *P-25*.

P-20 Fixed setpoint speed 1

Setting range: *-P-01* – **5.0 Hz** – *P-01*

P-21 Fixed setpoint speed 2

Setting range: *-P-01* – **25.0 Hz** – *P-01*

P-22 Fixed setpoint speed 3

Setting range: *-P-01* – **40.0 Hz** – *P-01*

P-23 Fixed setpoint speed 4

Setting range: *-P-01* – **P-01**

P-24 Second deceleration ramp, rapid stop ramp

Setting range: **0.00** – 25 s

Is selected automatically in the event of a power failure if *P-05* = 2

Can also be selected using digital inputs depending on other parameter settings. With setting "0", the motor coasts to a halt.

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P-25 Analog output function selection

Setting range: 0 – **8** – 10

The function of the analog output/digital output can be selected according to the table below.

If P-25 is parameterized as a digital output, it behaves according to the curve in *P-50* (→ 🗎 106)

Set-tings	Function	Explanation
0	Enable inverter (digital)	Relay contacts closed when inverter is enabled.
1	Frequency inverter is ready for operation (digital)	Relay contacts closed when inverter is operable (no error).
2	Motor at setpoint speed (digital)	Relay contacts closed when output frequency = setpoint frequency ±0.1 Hz.
3	Frequency inverter is in fault status (digital)	Relay contacts closed when the inverter is in fault status
4	Motor speed ≥ limit value *P-19* in reference to *P-01* (digital) The switching hysteresis can be set in *P-50*.	Relay contacts closed when output frequency is greater than the value set in parameter "Limit value for relay/analog output". Relay contacts opened when value is lower than "Limit value for relay/analog output"
5	Motor current ≥ limit value *P-19* in reference to *P-08* (digital) The switching hysteresis can be set in *P-50*.	Relay contacts closed when motor current/torque is greater than the current limit set in parameter "Limit value for relay/analog output". Relay contacts opened when value is lower than "Limit value for relay/analog output".
6	Motor speed < limit value *P-19* in reference to *P-01* (digital) The switching hysteresis can be set in *P-50*.	Relay contacts closed when output frequency is less than the value set in parameter "Limit value for relay/analog output". Relay contacts opened when value is greater than "Limit value for relay/analog output"
7	Motor current < limit value *P-19* in reference to *P-08* (digital) The switching hysteresis can be set in *P-50*.	Relay contacts closed when motor current/torque is less than the current limit set in parameter "Limit value for relay/analog output". Relay contacts opened when value is greater than "Limit value for relay/analog output".
8	Motor speed (analog)	The amplitude of the analog output signal represents the motor speed. It is scaled from 0 to the maximum speed limit defined in *P-01*.
9	Motor current (analog)	The amplitude of the analog output signal represents the inverter output current (torque). It is scaled from 0 to 200% of the rated motor current defined in *P-08*.
10	Motor power (analog)	The amplitude of the analog output signal represents the apparent output power of the inverter. It is scaled from 0 to 200% of the inverter nominal power.

P-26/P-27 Skip frequency band/skip frequency

P-26 setting range: **0 Hz** – *P-01*

P-27 setting range: **P-02** – *P-01*

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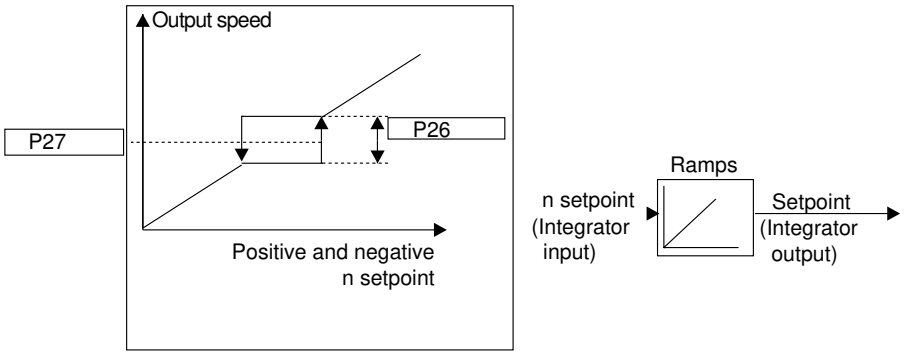
In some applications, mechanical resonance vibrations may occur in certain speed ranges. This may have a negative effect on the machine behavior. The speed skip function can be used to skip the interfering speed range. The drive speed performs the depicted hysteresis with the ramps specified in *P-03* and *P-04*.

If the setpoint speed is within the skipped frequency range, the actual speed remains on the upper or lower limit of the frequency range, depending on the previous setpoint.



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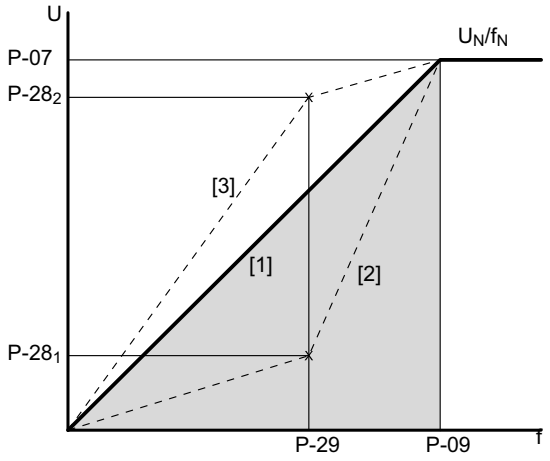
P-28/P-29 V/f characteristic curve adjustment

Setting range *P-28:* **0** – *P-07* in volts

Setting *P-29:* **0** – *P-09* in Hertz

The voltage/frequency characteristic curve determines the voltage level applied to the motor at a given frequency. Parameters *P-29* and *P-28* let the user change the V/f characteristic curve if required.

Parameter *P-29* can be set to any frequency between 0 and the base frequency (*P-09*). It represents the frequency at which the percentage adjustment level set in *P-28* is used. This function is only active when *P-51* = 1.



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[1] Normal V/f characteristic curve

[2] Adjusted V/f characteristic curve (example 1)

[3] Adjusted V/f characteristic curve (example 2)

P-07 = Nominal motor voltage

P-09 = Rated motor frequency

P-28 = Voltage value of adjustment of the V/f characteristic curve

P-29 = Frequency value of adjustment of the V/f characteristic curve

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P-30 Start mode selection

The selection of the start mode defines the inverter behavior with reference to the enable digital input and configures the automatic restart function.

Setting range: Edge-r – **Auto-0** – Auto-5

Edge-r

- Edge-r: After activation or resetting of an error (Reset), the frequency inverter does not start automatically, even if an enable signal is still present at the relevant digital input. To start the frequency inverter after activation or resetting (Reset), the signal must first be deleted (open switch) and then reset (close switch).

Auto-0:

⚠ WARNING

With the setting "Auto-0" and set enable signal, there is a danger of an automatic restart of the drive after an error message has been acknowledged (reset) or after switch-on (voltage on).

Fatal or severe injuries and damage to property.

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

- After activation or resetting (Reset), the frequency inverter starts automatically if an enable signal is still present at the relevant digital input.

Auto-1 to Auto-5

⚠ WARNING

With the setting "Auto-1 – Auto-5" and set enable signal, there is a danger of an automatic restart of the drive after fault elimination or after switch-on (voltage on) as the inverter tries 1 – 5 times to automatically acknowledge the error.

Fatal or severe injuries and damage to property.

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

- Following an error shutdown (trip), the frequency inverter makes up to 5 attempts to restart at intervals of 20 seconds. To reset the counter, the frequency inverter must be de-energized. The number of attempted restarts is counted. If the frequency inverter is unable to start the drive with the final attempt, a permanent error shutdown occurs, which can only be reset by pressing the “Reset” key.

P-31 Keypad/fieldbus enable behavior

Defines the enable behavior of the frequency inverter when controlled via the integrated operator terminal.

The selection depends on the setting in *P-15*.

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Setting range: 0 – **1** – 7

Switchover behavior when the setpoint source switches to keypad mode:	
0	The motor speed continues to run at the minimum speed from *P-02*.
1	The motor speed changes to the last keypad speed set.
2	The motor speed continues to run at the minimum speed from *P-02*.
3	The motor speed changes to the last keypad speed set.
4	The current motor speed is taken on after switchover.
5	The motor speed continues to run with the fixed setpoint speed from *P-23*.
6	The current motor speed is taken on after switchover.
7	The motor speed continues to run with the fixed setpoint speed from *P-23*.

Enable behavior when the inverter is enabled in keypad mode:	
0	The motor starts with the minimum speed from *P-02*.
1	The motor starts with the last keypad speed set.
2	The motor starts with the minimum speed from *P-02*.
3	The motor starts with the last keypad speed set.
4	The motor starts with the minimum speed from *P-02*.
5	The motor starts with the fixed setpoint speed from *P-23*.
6	The motor starts with the minimum speed from *P-02*.
7	The motor starts with the fixed setpoint speed from *P-23*.

With the setting 2, 3, 6, or 7, the inverter is started with the corresponding enable digital input.

The <Start> and <Stop>- keys on the keypad have no function.

The speed can be changed with the <Up> and <Down> keys.

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P-32 DC hold function

The parameter is divided into two levels and only works in combination with settings in *P-58* and *P-59*.

Level 1: Current holding time

Setting range: **0.0** – 25 s

The set value determines the duration of the direct current holding function.

Level 2: Current holding mode

Setting range: **0** – 2

The set value determines the function of the direct current holding function.

- 0: Direct current injection at STOP
- 1: Direct current injection at START
- 2: Direct current injection at START and STOP

P-33 Enable flying start function

Setting range: **0** – 2

When the flying start function is enabled, the frequency inverter first determines the current rotor speed. This causes a short delay between enable and start-up. This function protects the inverter against overcurrent errors when switching to rotating motors.

- 0: Flying start function disabled
- 1: Flying start function enabled
- 2: Flying start function enabled when the following conditions are met:
  - Switch off with error
  - Voltage drop
  - Stop mode coasting to a stop

P-34 Brake chopper activation

Setting range: **0** – 2

- 0: Deactivated
- 1: Activated with software protection for the braking resistor type BW LT 100 002. An error message is issued when the maximum power is exceeded.
- 2: Activates for all other braking resistors without software protection. The braking resistor must be externally protected.

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P-35 Analog input 1/slave scaling

Setting range: See 0.0 – **100.0** – 2000%

Slave scaling (P-12 = 11)

P-35 = (n_{slave}/n_{master}) × 100%

Analog input scaling (P-12 ≠ 11)

The analog input can be scaled using the parameter P-35/P-39. The parameters can be calculated with the following formula depending on the desired characteristic curve:

Calculation of the scaling parameters:

P-01 = Amount from the greater value of n_1 and n_2

P-02 = 0

P-16 = unipolar 0 – 10 V if $n_1 \geq 0$; bipolar -10 – 10 V if $n_1 < 0$

$$\text{P-35} = 10000 * \frac{(n_2 - n_1)}{n_2(AI_2 - AI_1)}$$

$$\text{P-39} = AI_1 - (\frac{n_1(AI_2 - AI_1)}{(n_2 - n_1)})$$

with:

$[AI_1]$; $[AI_2]$ = %

100% ≙ AI_{max} (10 V or 20 mA)

$[n_1]$; $[n_2]$ = min^{-1} or Hz

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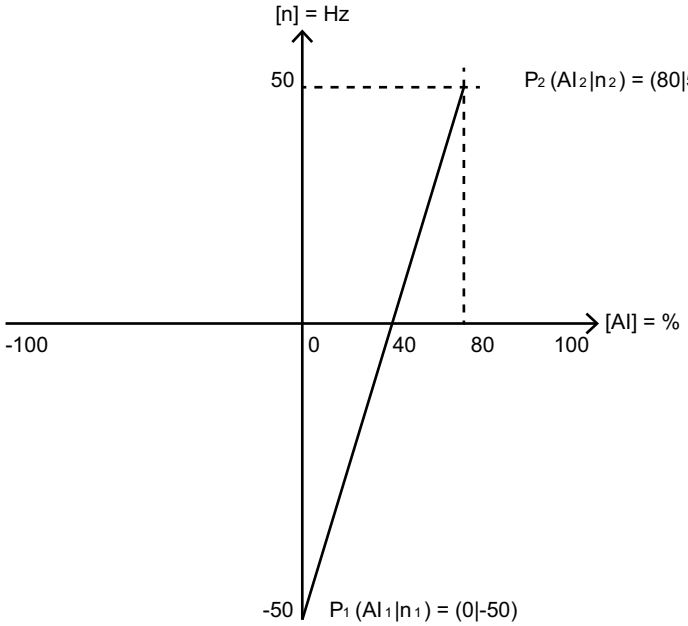
Example with calculation in Hz (P-10 = 0)



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P-01 = 50 Hz, since $|n_2| > |n_1|$

P-02 = 0 Hz

P-16 = -10 – 10 V, since $n_1 < 0$

$$\text{P-35} = 10000 * \frac{(50-(-50))}{50(80-0)} = 250$$

$$\text{P-39} = 0 - \frac{-50(80-0)}{(50-(-50)} = 40$$

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P-36 Fieldbus settings

The parameter is divided into three levels and acts depending on the setting in *P-12*.

Level 1: Inverter address

Setting range: **1** - 63

This parameter is used to set the inverter address for SBus, Modbus, fieldbus and master/slave.

Level 2: Baud rate

Setting range: 0 – **1** – 5

Determines the baud rate depending on the bus system.

Selection	SBus (P-12 = 3/4) CAN (P-12 = 5/6)	Modbus RTU (P-12 = 7/8)
0	500 kb/s	9.6 kb/s
1	**500 kb/s**	**115.2 kb/s**
2	125 kb/s	19.2 kb/s
3	250 kb/s	38.4 kb/s
4	500 kb/s	57.6 kb/s
5	1 Mb/s	76.8 kb/s

Level 3: Timeout behavior

Setting range: **0** – 8

This parameter is used to specify the time in seconds after which the inverter performs the set response when a communication failure occurs.

- 0: The last setpoint is kept. No switch-off with error occurs.
- 1: t30 ms
- 2: t100 ms
- 3: t1000 ms
- 4: t3000 ms
- 5: r30 ms
- 6: r100 ms
- 7: r1000 ms
- 8: r3000 ms

t_x: The frequency inverter immediately switches off and the motor coasts to a halt as soon as the time has been exceeded.

r_x: The motor stops along the rapid stop ramp *P-24* as soon as the time has been exceeded.

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P-37 Extended parameter access code definition

Setting range: 0 – **101** – 9999

The set value determines the code for the full parameter access in *P-14*.

P-38 Parameter lock

Locking parameters means that no parameters can be changed (indicated by "L").

- **0: Deactivated**
- 1: Activated

P-39 Analog input 1 offset

Setting range: -500 – **0.0** – 500%

Specifies an offset as a percentage of the entire input range applied to the analog input signal.

Calculation example, see *P-35* (→ 🗎 101).

P-40 Actual speed value scaling factor

The parameter is divided into two levels. The value is shown in the display in real time as follows (c XXXX).

See also PI controller mode (→ 🗎 50)

Level 1: Scaling factor

Setting range: **0000** – 16 000

Level 2: Display scaling source

Setting range: **0** – 2

- 0: Motor speed information is used as the scaling source.
- 1: Motor current information is used as the scaling source.
- 2: The value of the second analog input is used as the scaling source. In this case, the range of input values is 0 to 4096.

P-41 Thermal motor protection according to UL508C

- **0: Deactivated**
- 1: Activated

The frequency inverters come equipped with a thermal motor protection function according to NEC (National Electrical Code) to protect the motor from overload. In an internal memory, the motor current is accumulated over time.

The frequency inverter goes to fault state as soon as the thermal limit is exceeded (I.t-trP).

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

When *P-41* is disabled, the thermal overload memory is reset when switching power off and on again.

When *P-41* is enabled, the memory is maintained even after power off and on again.

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P-42 PI proportional gain

Setting range: 0.0 – **1.0** – 30.0

PI controller proportional gain. Higher values result in a greater change of the inverter output frequency as response to minor changes of the feedback signal. If the value is too high, it can cause instability.

P-43 PI integral time constant

Setting range: 0.0 – **1.0** – 30.0 s

PI controller integral time constant. Higher values result in a damped response to systems in which the overall process responds slowly.

P-44 PI operating mode

- **0: Direct operation** – The motor speed decreases with increasing feedback signal.
- 1: Inverse operation – The motor speed increases with increasing feedback signal.

P-45 PI reference selection

The parameter is divided into two levels.

Level 1: PI reference source

Setting range: **0** – 1

- 0**: PI fixed setpoint reference P-46**
- 1: Analog input 1

Level 2: PI return source

Setting range: **0** – 5

- **0: Analog input 2**
- 1: Analog input 1
- 2: Motor current
- 3: DC link voltage V_Z
- 4: Difference (AI1 – AI2)
- 5: Maximum value (AI1 or AI2)

P-46 PI fixed setpoint reference

Setting range: **0.0** – 100.0%

Sets the preset digital PI reference/setpoint.

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P-47 Analog input 2 format

Setting range:

- **0: U0 – 10 V/unipolar voltage input**
- 1: A0 – 20 mA/current input
- 2: t4 – 20 mA/current input
- 3: r4 – 20 mA/current input
- 4: t20 – 4 mA/current input
- 5: r20 – 4 mA/current input
- 6: Ptc-th/motor thermistor input

"t.." indicates that the inverter shuts down when the signal is removed while the inverter is enabled. t4 – 20 mA, t20 – 4 mA

"r.." indicates that the inverter moves along a ramp to *P-20* when the signal is removed while the inverter is enabled. R4 – 20 mA, r20 – 4 mA

P-48 Standby mode

Setting range: **0.0** – 25 s

When *P-48* > 0, the inverter goes to standby mode if the minimum speed is maintained for the time specified in *P-48*.

P-49 PI control difference wake-up level

Setting range: 0.0 – **5.0** – 100%

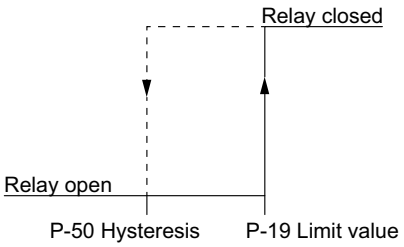
Sets a programmable level. When the drive is in standby or PI mode, the selected feedback signal must fall below this threshold before the inverter returns to normal operation.

P-50 Hysteresis band user relay

Setting range: **0.0** – 100%

This parameter can be used to adjust the switching hysteresis to prevent undesirable unstable relay statuses.

The percentage setting range refers to the selection in *P-18* and *P-25*.



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P-51 Selection of motor control procedure

Setting range: 0 – **1** – 5

- 0: LVFC (light vector flux control)

  Vector speed control for induction motors with calculated rotor speed feedback control. Field-oriented control algorithms are used for motor speed control. As the calculated rotor speed is used to internally close the speed loop, this control mode provides a simple closed loop control system without physical encoder. For optimal control, "auto tune" (*P-52*) should be carried out prior to first operation.

- **1: Extended V/f open-loop speed control (asynchronous motors)**

  With the operating mode V/f, the output voltage and frequency are controlled proportionally in the same ratio. Nearly all asynchronous motors can be controlled in this way. If better performance is required as regards control mode, torque stability and speed range, the LVFC control mode should be used.

  – Slip compensation

    When P-10 ≠ 0 is set, the calculated slip speed is added to the output frequency.

    When P-10 = 0 is set, the slip is not included in the calculation. This causes the motor to react very slightly to load changes and not have a tendency to vibrate. SEW-EURODRIVE recommends this motor control for fans, pumps, and applications with direct drive.

- 2: Reserved
- 3: Reserved
- 4: Reserved
- 5: LSPM speed control (line start permanent magnet motor)

  Use this setting when a Line Start Permanent Magnet motor (LSPM motor) by SEW-EURODRIVE is connected to the MOVITRAC® LTE-B inverter.

P-52 Auto tune

- **0: Inhibited**
- 1: Enable

Only enable the inverter after you have entered all nominal motor data correctly in the parameters. You can also start the automatic measuring procedure "Auto tune" manually with this parameter after entering the motor data.

The measurement process lasts up to 2 minutes depending on the control mode.

INFORMATION

After changing the nominal motor data, auto tune has to be started again.

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P-53 Controller parameter

The parameter is divided into two levels.

Level 1: Speed controller proportional gain

Setting range: 0 – 250%

Defines the proportional gain for the speed controller. Higher values provide for better output frequency regulation and response. If the value is too high, it can cause instability or even overcurrent errors. For applications that require the best possible control, you can adapt the value to the connected load by gradually increasing the value and observing the actual speed of the load. Continue this process until you have achieved the required dynamics without or with only slightly exceeding the control range, i.e. the setpoint value of the output speed.

In general, higher friction loads can tolerate higher values of proportional gain. It might be necessary to reduce the gain for loads with high inertia and low friction.

Level 2: Speed controller integrating time constant

Setting range: 0.00 – 2.50 s

Defines the integral time for the speed controller. Small values result in a faster response to changes in the motor load but bear the risk that they cause instability. For optimal dynamics, the value must be adjusted to match the connected load.

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P-54 Current limit

Setting range: 0.1 – **150** – 175%

The set value refers to the nominal motor current *P-08* and determines the maximum current limit of the inverter.

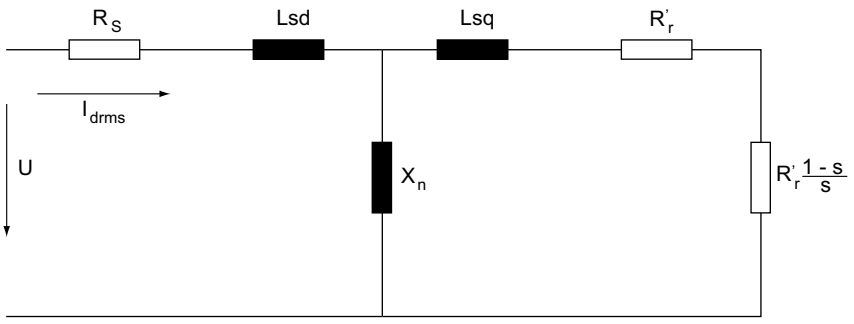
NOTICE

Possible damage to the frequency inverter when the internal parameters are set incorrectly

Damage to property

- To ensure the most optimum motor control possible, the following parameters are used internally by the inverter. If the parameters are set incorrectly, power reductions and unexpected motor behavior can occur.
- Adjustments may be made only by experienced users who fully understand the functions of these parameters.

Equivalent wiring diagram for AC motors



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P-55 Motor stator resistance (Rs)

Setting range: depends on the motor (Ω)

The stator resistance value is the ohmic phase-phase resistance of the copper winding. This value can be determined and set automatically during "auto tune".

Instead, you can enter this value manually.

P-56 Motor stator inductance (Lsd)

Setting range: depends on the motor (H)

For induction motors: Phase stator inductance value.

For synchronous motors: Phase d-axis stator inductance.

P-57 Motor stator inductance (Lsq) − only for synchronous motors

Setting range: depends on the motor (H)

For synchronous motors: Phase q-axis stator inductance.

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P-58 DC braking speed

Setting range: **0.0** – P-01

This parameter defines the limit speed starting at which DC braking becomes active.

This parameter only acts together with *P-32* (level 1 and 2) and *P-59*.

P-59 Current strength of DC holding function

Setting range: 0 – **20.0** – 100%

This parameter determines the percentage current strength depending on *P-08*.

P-60 Fire mode/emergency mode speed

Setting range: *-P-01* – **0** – *P-01* Hz

The speed used in fire mode/emergency mode.

To use the function, set *P-15* to 13.

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9 Technical data

9.1 Markings

The following table lists all markings that can be given on a nameplate or attached to the motor and an explanation of what they mean.

Marking	Meaning
CE	CE mark to state compliance with the Low Voltage Directive 2014/35/EU. EU directive 2011/65/EU (RoHS) serves for limiting the use of hazardous substances in electric and electronic equipment.
c UL us LISTED	UL logo to confirm that a component is UL (Underwriters Laboratory) tested, also valid for CSA in conjunction with the register number.
EAC	EAC mark (EurAsian Conformity) Confirms compliance with the technical regulations of the economic and customs union of Russia, Belarus, Kazakhstan, Armenia.
RCM	RCM logo (Regulatory Compliance Mark). Confirmation of compliance with technical regulations of the Australian Communications and Media Authority ACMA.

All products meet the following international standards:

- UL 508C power converter
- EN 61800-3:2004/A1:2012 Variable-speed electrical drives – part 3
- Degree of protection according to NEMA 250, EN 60529
- Flammability class according to UL 94

9.2 Ambient conditions

Ambient temperature range during operation (For PWM frequency 2 kHz)	-20 °C to +50 °C (IP20/NEMA 1) -20 °C to +40 °C (IP66/NEMA 4X)
Derating depending on the ambient temperature	4%/°C to 55 °C for inverters with IP degree of protection IP20/NEMA 1
	4%/°C to 45 °C for inverters with IP degree of protection IP66/ NEMA 4X
Storage temperature	-40 °C to +60 °C
Maximum installation altitude for nominal operation	1000 m
Derating above 1000 m	1%/100 m to max. 2000 m with UL 1%/100 m to max. 4000 m without UL
Maximum relative humidity	95% (condensation not permitted)
Device designs	IP20/NEMA 1 IP66/NEMA 4X

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9.3 Output power and current carrying capacity without EMC filter

The "Horsepower" (HP) data is specified as follows.

- 200 – 240 V devices: NEC2002, table 430-150, 230 V
- 380 – 480 V devices: NEC2002, table 430-150, 460 V

9.3.1 1-phase system AC 115 V for 3-phase AC 230 V motors (voltage doubler)

MOVITRAC® LTEB+ – EMC filter class 0 according to EN 61800-3				
Power in kW		**0.37**	**0.75**	**1.1**
		IP20/NEMA 1		
	MC LTE-B..	0004-101-1-00	0008-101-1-00	0011-101-4-00
	Part number	18261663	18261671	18261868
		IP66/NEMA 4X housing without switches		
	MC LTE-B..	0004-101-1-30	0008-101-1-30	0011-101-4-30
	Part number	18262171	18262198	18262287
		IP66/NEMA 4X housing with switches		
	MC LTE-B..	0004-101-1-40	0008-101-1-40	0011-101-4-40
	Part number	18262422	18262430	18262538
INPUT				
Nominal line voltage V_{line} according to EN 50160	V	1 × AC 110 – 115 ±10%		
Line frequency f_{line}	Hz	50 / 60 ±5%		
Line fuse	A	10	20	25 (30)[1]
Rated input current	A	7.8	15.8	21.9
OUTPUT				
Recommended motor power	kW	0.37	0.75	1.1
Output voltage V_{motor}	V	3 × 0 – 250		
Output current	A	2.3	4.3	5.8
PWM frequency	kHz	2/**4**/6/8/12/16		
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Cross section of motor cable Cu 75C	mm^2	1.5		
	AWG	16		
Maximum motor cable length shielded	m	50		100
Maximum motor cable length unshielded		75		150
GENERAL				
Size		1		2
Nominal power loss 24 V	W	3.1		4.5
Nominal power loss power section	W	11.1	22.5	33
Minimum braking resistance value	Ω	–		47
Maximum device terminal cross section	mm^2	2.5 (6)[2]		
	AWG	8		
Maximum control terminal cross section	mm^2	0.05 – 2.5		
	AWG	30 – 12		

1) Recommended values for UL compliance

2) When using forked cable lugs

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9.4 Output power and current carrying capacity with EMC filter

The "Horsepower" (HP) data is specified as follows.

- 200 – 240 V devices: NEC2002, table 430-150, 230 V
- 380 – 480 V devices: NEC2002, table 430-150, 460 V

9.4.1 1-phase system AC 230 V for 3-phase AC 230 V motors

MOVITRAC® LTE-B+ – EMC filter class C1 according to EN 61800-3							
Power in kW		**0.37**	**0.75**	**1.5**		**2.2**	**4**
		IP20/NEMA 1					
MC LTE-B..		0004-2B1-1-00	0008-2B1-1-00	0015-2B1-1-00	0015-2B1-4-00	0022-2B1-4-00	0040-2B1-4-00
Part number		18261728	18261752	18261787	18261892	18261930	18262139
		IP66/NEMA 4X housing without switches					
MC LTE-B..		0004-2B1-1-30	0008-2B1-1-30	0015-2B1-1-30	0015-2B1-4-30	0022-2B1-4-30	0040-2B1-4-30
Part number		18262201	18262228	18262236	18262295	18262309	18262384
		IP66/NEMA 4X housing with switches					
MC LTE-B..		0004-2B1-1-40	0008-2B1-1-40	0015-2B1-1-40	0015-2B1-4-40	0022-2B1-4-40	0040-2B1-4-40
Part number		18262465	18262473	18262481	18262570	18262589	18262597
INPUT							
Nominal line voltage V_{line} according to EN 50160	V	1 × AC 200 – 240 ±10%					
Line frequency f_{line}	Hz	50 / 60 ±5%					
Line fuse	A	10 (6)[1]	10	16 (17.5)[1]		25	40
Rated input current	A	3.7	7.5	12.9		19.2	29.2
OUTPUT							
Recommended motor power	kW	0.37	0.75	1.5		2.2	4
Output voltage V_{motor}	V	0 – V_{line}					
Output current	A	2.3	4.3	7		10.5	16
PWM frequency	kHz	2/**4**/8/12/16					2/**4**/6/8/12
Speed range	min^{-1}	-30000 – 0 – +30000					
Maximum output frequency	Hz	500					
Cross section of motor cable Cu 75C	mm^2	1.5					2.5
	AWG	16					18
Maximum motor cable length shielded	m	50			100		
Maximum motor cable length unshielded		75			150		
GENERAL							
Size		1			2		3
Nominal power loss 24 V	W	3.1			4.5		5.2
Nominal power loss power section	W	11.1	22.5	45		66	120
Minimum braking resistance value	Ω	–			47		
Maximum device terminal cross section	mm^2	2.5 (6)[2]					
	AWG	8					
Maximum control terminal cross section	mm^2	0.05 – 2.5					
	AWG	30 – 12					

1) Recommended values for UL compliance

2) When using forked cable lugs

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9.4.2 3-phase system AC 230 V for 3-phase AC 230 V motors

Power 1.5 – 4 kW

MOVITRAC® LTE-B+ – EMC filter class C2 according to EN 61800-3				
Power in kW		**1.5**	**2.2**	**4.0**
		IP20/NEMA 1		
	MC LTE-B..	0015-2A3-4-00	0022-2A3-4-00	0040-2A3-4-00
	Part number	18261884	18261922	18262058
		IP66/NEMA 4X housing without switches		
	MC LTE-B..	0015-2A3-4-30	0022-2A3-4-30	0040-2A3-4-30
	Part number	18262317	18262325	18262392
		IP66/NEMA 4X housing with switches		
	MC LTE-B..	0015-2A3-4-40	0022-2A3-4-40	0040-2A3-4-40
	Part number	18262600	18262619	18262635
INPUT				
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 200 – 240 ±10%		
Line frequency f_{line}	Hz	50 / 60 ±5%		
Line fuse	A	16 (15)[1]	16 (17.5)[1]	25 (30)[1]
Rated input current	A	9.5	12.1	20.9
OUTPUT				
Recommended motor power	kW	1.5	2.2	4.0
Output voltage V_{motor}	V	0 – V_{line}		
Output current	A	7	10.5	18
PWM frequency	kHz	2/**4**/6/8/12/16		2/**4**/6/8/12
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Cross section of motor cable Cu 75C	mm^2	1.5		2.5
	AWG	16		12
Maximum motor cable length shielded	m	100		
Maximum motor cable length unshielded		150		
GENERAL				
Size		2		3
Nominal power loss 24 V	W	4.5		5.2
Nominal power loss power section	W	45	66	120
Minimum braking resistance value	Ω	47		
Maximum device terminal cross section	mm^2	2.5 (6)[2]		
	AWG	8		
Maximum control terminal cross section	mm^2	0.05 – 2.5		
	AWG	30 – 12		

1) Recommended values for UL compliance

2) When using forked cable lugs

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Power 5.5 – 18.5 kW

MOVITRAC® LTE-B+ – EMC filter class C2 according to EN 61800-3 (in preparation)						
Power in kW		**5.5**	**7.5**	**11**	**15**	**18.5**
		IP20/NEMA 1				
MC LTE-B..		0055-2A3-4-00	0075-2A3-4-00	0110-2A3-4-00	0150-2A3-4-00	0185-2A3-4-00
Part number		18267416	18267424	18267432	18267440	18267459
INPUT						
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 200 – 240 ±10%				
Line frequency f_{line}	Hz	50 / 60 ±5%				
Line fuse	A	40	40 (50)[1]	63 (70)[1]	80	100
Rated input current	A	26.4	33.3	50.1	70.2	82.9
OUTPUT						
Recommended motor power	kW	5.5	7.5	11	15	18.5
Output voltage V_{motor}	V	3 × 20 – V_{line}				
Output current	A	24	30	46	61	72
PWM frequency	kHz	2/**4**/8/12				
Speed range	min^{-1}	-30000 – 0 – +30000				
Maximum output frequency	Hz	500				
Cross section of motor cable Cu 75C	mm^2	6	10	16	25	35
	AWG	10	8	6	4	2
Maximum motor cable length shielded	m	100				
Maximum motor cable length unshielded		150				
GENERAL						
Size		3	4		5	
Nominal power loss 24 V	W	5.2	7.5		8.8	
Nominal power loss power section	W	165	225	330	450	555
Minimum braking resistance value	Ω	22	22	12	6	6
Maximum device terminal cross section	mm^2	2.5 (6)[2]	16	16	35	35
	AWG	8	6	6	2	2
Maximum control terminal cross section	mm^2	0.05 – 2.5				
	AWG	30 – 12				

1) Recommended values for UL compliance

2) When using forked cable lugs

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9.4.3 3-phase system AC 400 V for 3-phase AC 400 V motors

Power 0.75 – 4 kW

MOVITRAC® LTE-B+ – EMC filter class C2 according to EN 61800-3						
Power in kW		**0.75**	**1.5**		**2.2**	**4**
		IP20/NEMA 1				
MC LTE-B..		0008-5A3-1-00	0015-5A3-1-00	0015-5A3-4-00	0022-5A3-4-00	0040-5A3-4-00
Part number		18261809	18261825	18261957	18261973	18262007
		IP66/NEMA 4X housing without switches				
MC LTE-B..		0008-5A3-1-30	0015-5A3-1-30	0015-5A3-4-30	0022-5A3-4-30	0040-5A3-4-30
Part number		18262244	18262252	18262333	18262341	18262368
		IP66/NEMA 4X housing with switches				
MC LTE-B..		0008-5A3-1-40	0015-5A3-1-40	0015-5A3-4-40	0022-5A3-4-40	0040-5A3-4-40
Part number		18262449	18262457	18262546	18262554	18262562
INPUT						
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%				
Line frequency f_{line}	Hz	50/60 ±5%				
Line fuse	A	6	10		16 (10)[1]	16 (15)[1]
Rated input current	A	3.5	5.6		7.5	11.5
OUTPUT						
Recommended motor power	kW	0.75	1.5		2.2	4
Output voltage V_{motor}	V	0 – V_{line}				
Output current	A	2.2	4.1		5.8	9.5
PWM frequency	kHz	2/**4**/6/8/12/16				
Speed range	min^{-1}	-30000 – 0 – +30000				
Maximum output frequency	Hz	500				
Cross section of motor cable Cu 75C	mm^2	1.5				2.5
	AWG	16				14
Maximum motor cable length shielded	m	50		100		
Maximum motor cable length unshielded		75		150		
GENERAL						
Size		1		2		
Nominal power loss 24 V	W	4.6		6.4		
Nominal power loss power section	W	22	45		66	120
Minimum braking resistance value	Ω	–		100		
Maximum device terminal cross section	mm^2	2.5 (6)[2]				
	AWG	8				
Maximum control terminal cross section	mm^2	0.05 – 2.5				
	AWG	30 – 12				

1) Recommended values for UL compliance

2) When using forked cable lugs

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Power 5.5 – 11 kW

MOVITRAC® LTE-B+ – EMC filter class C2 according to EN 61800-3				
Power in kW		**5.5**	**7.5**	**11**
		IP20/NEMA 1		
MC LTE-B..		0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
Part number		18262074	18262090	18262112
		IP66/NEMA 4X housing without switches		
MC LTE-B..		0055-5A3-4-30	0075-5A3-4-30	–
Part number		18262406	18262414	–
		IP66/NEMA 4X housing with switches		
MC LTE-B..		0055-5A3-4-40	0075-5A3-4-40	–
Part number		18262643	18262651	–
INPUT				
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%		
Line frequency f_{line}	Hz	50/60 ±5%		
Line fuse	A	25	25 (30)[1]	30 (35)[1]
Rated input current	A	17.2	21.2	27.5
OUTPUT				
Recommended motor power	kW	5.5	7.5	11
Output voltage V_{motor}	V	0 – V_{line}		
Output current	A	14	18	24
PWM frequency	kHz	2/**4**/6/8/12		2/**4**/6/8
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Cross section of motor cable Cu 75C	mm^2	2.5		6
	AWG	14		10
Maximum motor cable length shielded	m	100		
Maximum motor cable length unshielded		150		
GENERAL				
Size		3		
Nominal power loss 24 V	W	6.4		
Nominal power loss power section	W	165	225	330
Minimum braking resistance value	Ω	47		
Maximum device terminal cross section	mm^2	10[2]		
	AWG	8		
Maximum control terminal cross section	mm^2	0.05 – 2.5		
	AWG	30 – 12		

1) Recommended values for UL compliance

2) When used with forked cable lugs

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Power 15 = 22 kW

MOVITRAC® LTE-B+ – EMC filter class C2 according to EN 61800-3 (in preparation)				
Power in kW		**15**	**18.5**	**22**
		IP20/NEMA 1		
	MC LTE-B..	0150-5A3-4-00	0185-5A3-4-00	0220-5A3-4-00
	Part number	18262147	18262155	18262163
INPUT				
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%		
Line frequency f_{line}	Hz	50/60 ± 5%		
Line fuse	A	40 (45)[1)]	50 (60)[1]	63 (70)[1]
Rated input current	A	34.2	44.1	51.9
OUTPUT				
Recommended motor power	kW	15	18.5	22
Output voltage V_{motor}	V	3 × 20 – V_{line}		
Output current	A	30	39	46
PWM frequency	kHz	2/**4**/6/8/12		
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Cross section of motor cable Cu 75C	mm^2	6	10	16
	AWG	10	8	6
Maximum motor cable length shielded	m	100		
Maximum motor cable length unshielded		150		
GENERAL				
Size		4		
Nominal power loss 24 V	W	14.6		
Nominal power loss power section	W	450	555	660
Minimum braking resistance value	Ω	39		
Maximum device terminal cross section	mm^2	16		
	AWG	5		
Maximum control terminal cross section	mm^2	0.05		
	AWG	30 – 12		

1) Recommended values for UL compliance

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Power 30 – 37 kW

MOVITRAC® LTE-B+ – EMC filter class C2 according to EN 61800-3 (in preparation)			
Power in kW		**30**	**37**
		IP20/NEMA 1	
	MC LTE-B..	0300-5A3-4-00	0370-5A3-4-00
	Part number	18267394	18267408
INPUT			
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%	
Line frequency f_{line}	Hz	50/60 ±5%	
Line fuse	A	80	100
Rated input current	A	63.8	76.4
OUTPUT			
Recommended motor power	kW	30	37
Output voltage V_{motor}	V	3 × 20 – V_{line}	
Output current	A	61	72
PWM frequency	kHz	2/**4**/6/8/12	
Speed range	min^{-1}	-30000 – 0 – +30000	
Maximum output frequency	Hz	500	
Cross section of motor cable Cu 75C	mm^2	25	35
	AWG	4	2
Maximum motor cable length shielded	m	100	
Maximum motor cable length unshielded		150	
GENERAL			
Size		5	
Nominal power loss 24 V	W	18.6	
Nominal power loss power section	W	900	1110
Minimum braking resistance value	Ω	12	
Maximum device terminal cross section	mm^2	35	
	AWG	2	
Maximum control terminal cross section	mm^2	0.05 – 2.5	
	AWG	30 – 12	

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9.5 Input voltage ranges

Depending on the model and the nominal power, the frequency inverters are designed for direct connection to the following voltage sources:

MOVITRAC® LTE-B		
Nominal voltage	**Connection type**	**Rated frequency**
110 – 115 V ± 10%	1-phase	50 – 60 Hz ± 5%
200 – 240 V ± 10%	1-phase	
200 – 240 V ± 10%	3-phase	
380 – 480 V ± 10%	3-phase	

Units that are connected to a 3-phase supply system are designed for a maximum power grid imbalance of 3% between the phases. For supply systems with a power grid imbalance of more than 3% (for example, in India and parts of the Asia-Pacific region including China), SEW-EURODRIVE recommends that you use input chokes.

INFORMATION

Single-phase frequency inverters can also be connected to 2 phases of a three-phase power supply system of 200 – 240 V.

Taking into account 50% derating of the nominal output current, all 3-phase inverters can also be operated as 1-phase.

9.6 Speed setting range

Control mode	Speed setting range
V/f	1:10
LVFC	1:20
LSPM	1:10

9.7 Overload capacity

All MOVITRAC® LTE-B products have the following overload capacity:

- 150% for 60 seconds
- 175% for 2 seconds

With an output frequency of < 10 Hz, the overload capacity is reduced to 150% for 7.5 seconds.

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9.8 Protection functions

- Short circuit output, phase-phase, phase-ground
- Overload protection of the inverter
- Overload protection of the motor
- Overvoltage shutdown
- Undervoltage shutdown
- Shutdown caused by overtemperature
- Shutdown caused by undertemperature

9.9 Housing variants and dimensions

9.9.1 Housing variants

MOVITRAC® LTE-B+ is available with 2 housing designs:

- IP66/NEMA 4X
- IP20 housing for installation in control cabinets

The IP66 / NEMA-4X housing protects against moisture and dust. These frequency inverters can be operated indoors in a dusty or damp environment.

In degree of protection IP66, the frequency inverters are also available with switch options, such as main switch, direction of rotation switch, and potentiometer.

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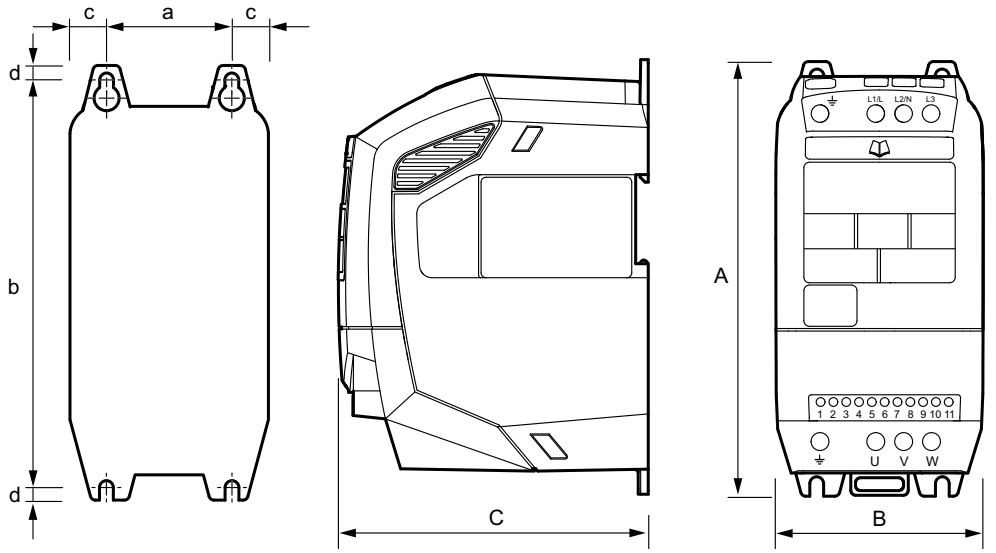
9.9.2 Dimensions of the IP20 housing



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Dimensions	Unit	Size 1	Size 2	Size 3	Size 4	Size 5
Height (A)	mm	173	221	261	420	486
Width (B)	mm	83	110	131	171	222
Depth (C)	mm	123.5	150	175	212	226
Mass	kg	1.0	1.7	3.2	9.1	18.1
a	mm	50	63	80	125	175
b	mm	162	209	247	400	463
c	mm	16	23.5	25.5	23	24
d	mm	6	6	7	10	11.5
Recommended screws		4 × M4	4 × M4	4 × M4	4 × M8	4 × M8

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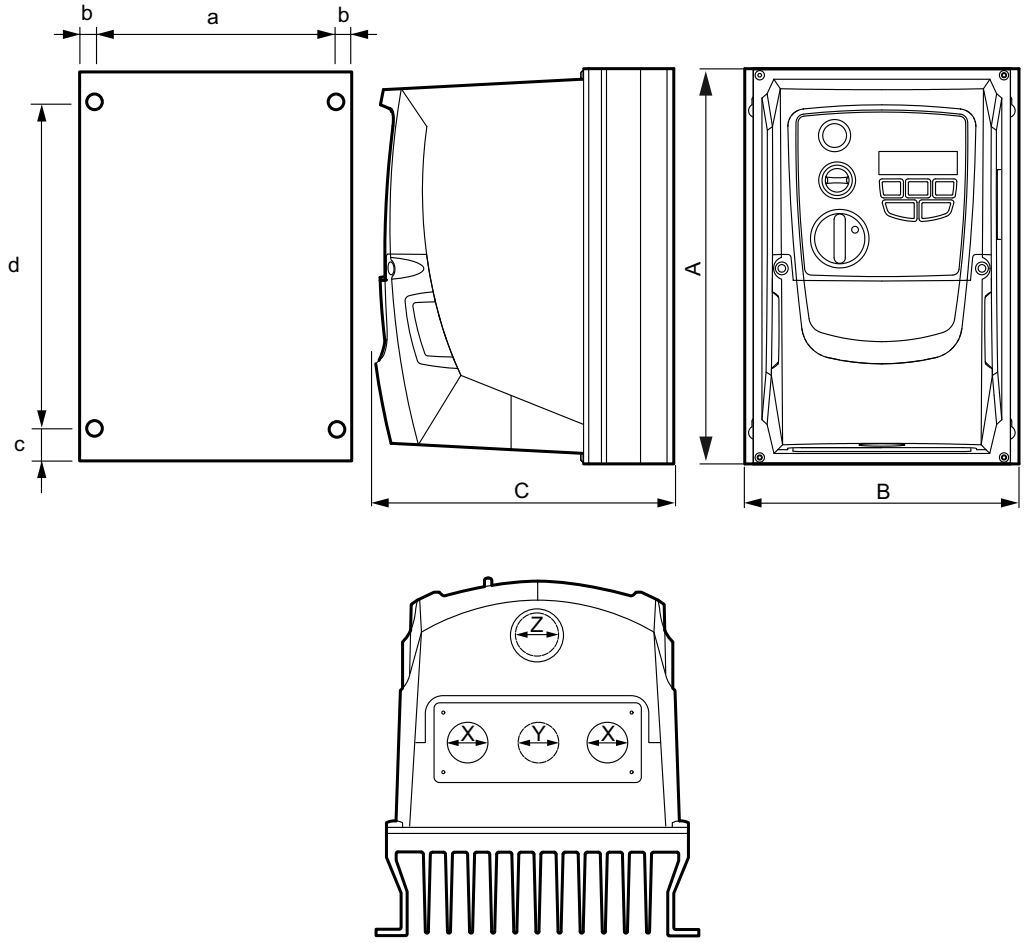
9.9.3 Dimensions of IP66/NEMA-4X housings (LTE xxx -30 and -40)



9007205178204043

9.9.4 Dimension table

Dimensions		Size 1	Size 2	Size 3
Height (A)	mm	232	257	310
Width (B)	mm	161	187	211
Depth (C)	mm	179	186.5	252
Mass	kg	3.1	4.1	7.6
a	mm	148.5	176	197.5
b	mm	6.25	6	6.75
c	mm	25	28.5	33.4
d	mm	189	200	251.5
Recommended screw size		4 × M4	4 × M4	4 × M4

IP66 cable openings: Use suitable cable glands to achieve the corresponding IP/NEMA classification.

Dimensions		Size 1	Size 2	Size 3
X[1]	mm	22	28.2	28.2
	PG/M[2]	PG13.5/M20	PG21/M25	PG21/M25
Y[3]	mm	22	22	22
	PG/M[2]	PG13.5/M20	PG13.5/M20	PG13.5/M20
Z[4]	mm	22	22	22
	PG/M[2]	PG13.5/M20	PG13.5/M20	PG13.5/M20

1) Cable bushing X is open ex works
2) The data above refers to plastic screw connections.
3) Cable bushing Y is prepunched and can be broken out with a suitable tool.
4) Cable bushing Z is provided on the cover but has to be drilled.

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10 Address list

Algeria			
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Assembly Sales	Buenos Aires	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 http://www.sew-eurodrive.com.ar sewar@sew-eurodrive.com.ar
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Belarus			
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	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. Tilbury Industrial Park 7188 Honeyman Street Delta, BC V4G 1G1	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
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	Paris	SEW-USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil l'Étang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
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	Drive Service Hotline / 24 Hour Service		Tel. 01924 896911
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyí út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 http://www.varmaverk.is vov@vov.is
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Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
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Lithuania			
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Luxembourg			
representation: Belgium			
Macedonia			
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Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
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Namibia			
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Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl

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Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro
Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» а. я. 36 195220 Санкт-Петербург	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

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Sambia			
representation: South Africa			
Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Sales	Bratislava	SEW-Eurodrive SK s.r.o. Rybničná 40 831 06 Bratislava	Tel.+421 2 33595 202, 217, 201 Fax +421 2 33595 200 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
	Košice	SEW-Eurodrive SK s.r.o. Slovenská ulica 26 040 01 Košice	Tel. +421 55 671 2245 Fax +421 55 671 2254 Mobile +421 907 671 976 sew@sew-eurodrive.sk
Slovenia			
Sales Service	Celje	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za
South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE KOREA CO., LTD. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com

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South Korea			
	Busan	SEW-EURODRIVE KOREA CO., LTD. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230
Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sri Lanka			
Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
Swaziland			
Sales	Manzini	C G Trading Co. (Pty) Ltd PO Box 2960 Manzini M200	Tel. +268 2 518 6343 Fax +268 2 518 5033 engineering@cgtrading.co.sz
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
Switzerland			
Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Taiwan			
Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
Tanzania			
Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
Thailand			
Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn
Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRİVE Hareket Sistemleri San. Ve TIC. Ltd. Sti Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr

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United Arab Emirates			
Sales Service	Dubai	SEW-EURODRIVE FZE PO Box 263835 Office No. S3A1SR03 Jebel Ali Free Zone – South, Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 http://www.sew-eurodrive.ae info@sew-eurodrive.ae
Ukraine			
Assembly Sales Service	Dnipropetrovsk	ООО «СЕВ-Евродрайв» ул. Рабочая, 23-В, офис 409 49008 Днепр	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	Nam Trung Co., Ltd Huế - South Vietnam / Construction Materials 250 Binh Duong Avenue, Thu Dau Mot Town, Binh Duong Province HCM office: 91 Tran Minh Quyen Street District 10, Ho Chi Minh City	Tel. +84 8 8301026 Fax +84 8 8392223 khanh-nguyen@namtrung.com.vn http://www.namtrung.com.vn
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn

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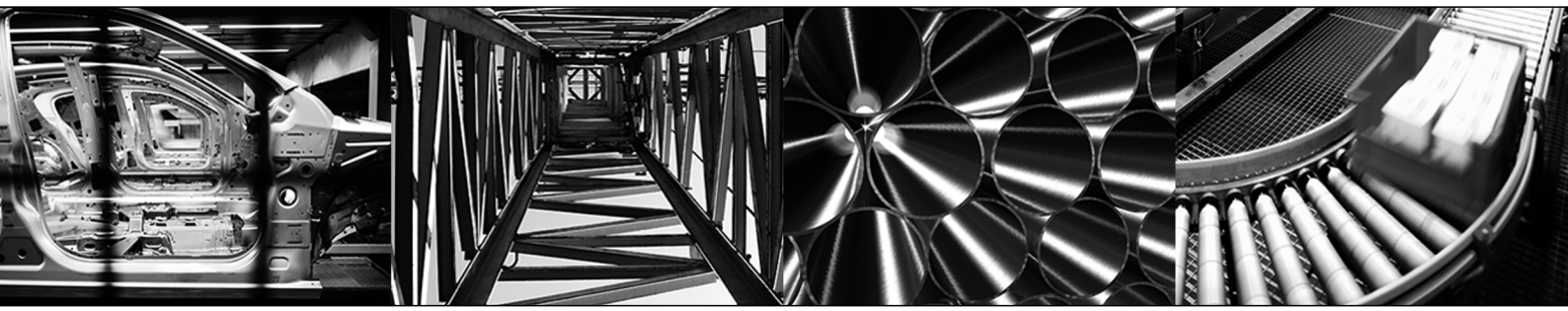

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